PRODUCT TECHNICAL GUIDE

UPS and Critical Power Solutions

2026

When **energy** matters

socomec
Innovative Power Solutions

CONTENTS

Innovative Power Solutions

EN

Overview

The system setup

1. POWER QUALITY ISSUES AND SOLUTIONS

It goes without saying that in order for power to be used by the load, it must be present. A less obvious concept is that the power must have characteristics that make it ideal for use, e.g. it must fall within the tolerances permitted by the electric load or utility.

The concept of Power Quality (PQ) is, therefore, the set of limits which make energy useable and, consequently, the branch of study which defines assessment criteria and methods of measurement, in addition to analysing causes and proposing solutions.

The concept of PQ is not absolute, but always depends on the energy load. For example, in general terms, it can be stated that IT equipment has more stringent PQ requirements than a motor for industrial applications. Normally, PQ requirements and the measures for achieving them, depend on techno-economical considerations and compromises.

Loads, in addition to being sensitive to poor-quality power, are often also the cause of power quality issues. The diffusion of non-linear loads (typically electronic equipment) and the connection of large utilities on weak lines are just some of the many causes. Another cause is atmospheric phenomena.

The most common disturbances that adversely affect the operation of a component or an electrical utility are:

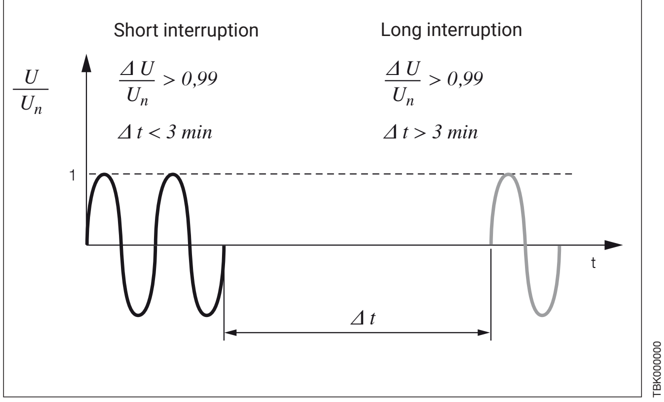
- power sags or outages due to network faults
- short voltage variations due to the connection of heavy loads or the presence of faults in the network
- distortion of currents and voltages due to non-linear loads present in the system or in the systems of other utilities, etc.
- flicker due to large intermittent loads
- asymmetry in the supply voltage system

1.1. Power interruptions and voltage dips

All elements in an electrical system are sensitive, in different ways, to power dips or interruptions.

Long interruptions are the result of permanent faults which occur in public distribution networks or within the user's system. The duration may vary from a few minutes to several hours in the most critical cases. By contrast, micro-interruptions are linked to faults which occur in the distributor's networks and normally last for less than a second.

1.1-1 Accidental power interruptions.



1.2. Voltage and current distortions

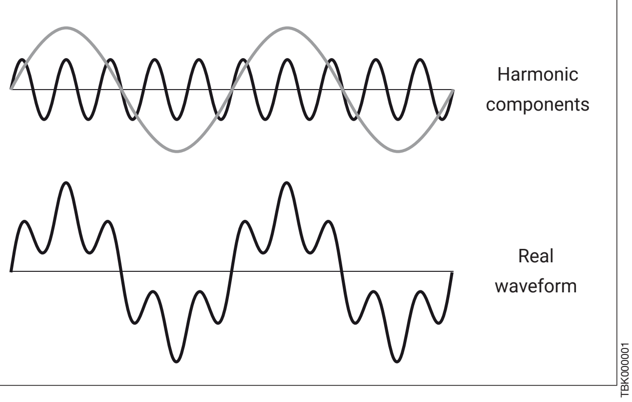
Waveform distortions are mainly caused by non-linear loads which, even if powered using sinusoidal voltages, draw highly distorted currents.

Typical non-linear loads include:

- devices which perform AC/DC and DC/AC conversions (present in all electronic power supplies, for example computers)
- fluorescent lamps
- electric soldering irons
- arc furnaces (also responsible for flicker)
- electrical drives

Any periodic waveform can be represented through Fourier series analysis by a fundamental sinewave and by sinusoidal components of varying amplitude and with multiple frequencies, known as harmonics (Figure 1.2-1).

1.2-1 Sinusoidal waveform distortion.



Harmonic currents circulating in the network cause voltage drops of the same order of magnitude and depending on the line impedance, with resulting voltage distortion.

This means that the magnitude of the disturbance caused at each point of the system (both the user and at the point of delivery) depends not only on the characteristics of the load, but also on the characteristics of the plant itself. All electrical components are affected by waveform distortion.

Harmonic distortion is also known as THD (total harmonic distortion).

The negative consequences of harmonics generally include thermal overloading and sometimes dielectric problems (which can occur in power-factor correction batteries, for example).

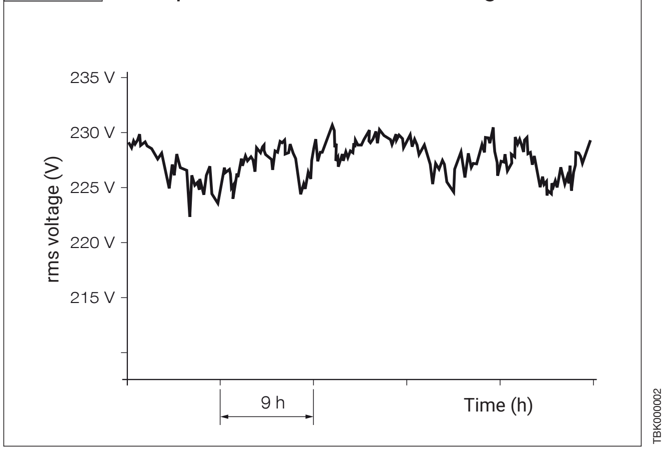
Harmonics typically increase the risk of overheating in system components or nuisance trips.

1.3. Flicker

The connection and disconnection of loads in an electrical system generate rapid and repetitive voltage variations. In particular, certain types of consumers such as arc furnaces and soldering irons draw current in an irregular and variable manner during their operating cycle, giving rise to **flicker**.

Loads which are most sensitive to voltage fluctuations are incandescent lamps, as the flicker produced by variations in light flow can cause irritation to those who use them.

1.3-1 Example of fluctuations of voltage RMS value



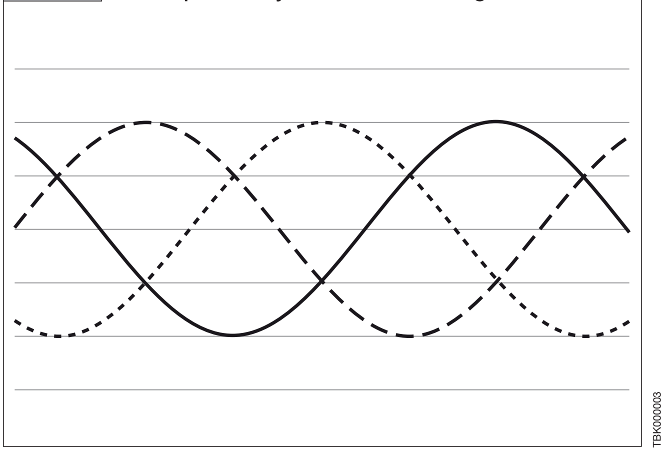
1.4. Voltage asymmetry

There are two main causes for asymmetry in the supply voltage system, with the first one being most prevalent:

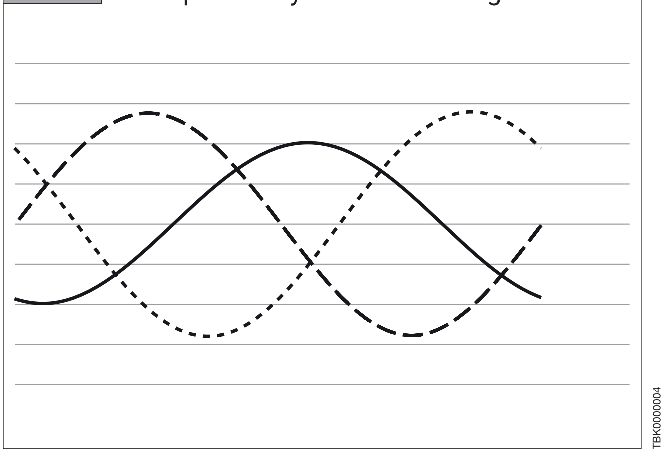
- Presence of highly unbalanced loads supplied from the same line. This includes high-power single-phase loads which in certain cases may also be intermittent (e.g. high-power single-phase soldering irons). The severity of this phenomenon increases in proportion to the degree of load imbalance and the impedance of the power supply line (length, diameter). The worst affected loads are those located near to or downstream of the unbalanced load.
- Asymmetrical impedance of the power line. This problem is significant in the case of long backbone lines with no transpositions between the conductors along the route.

Asymmetrical voltage can create problems especially in rotating synchronous and asynchronous machines such as, for example, overheating windings, reduced starting torque and vibrations.

1.4-1 Three-phase symmetrical voltage



1.4-2 Three-phase asymmetrical voltage

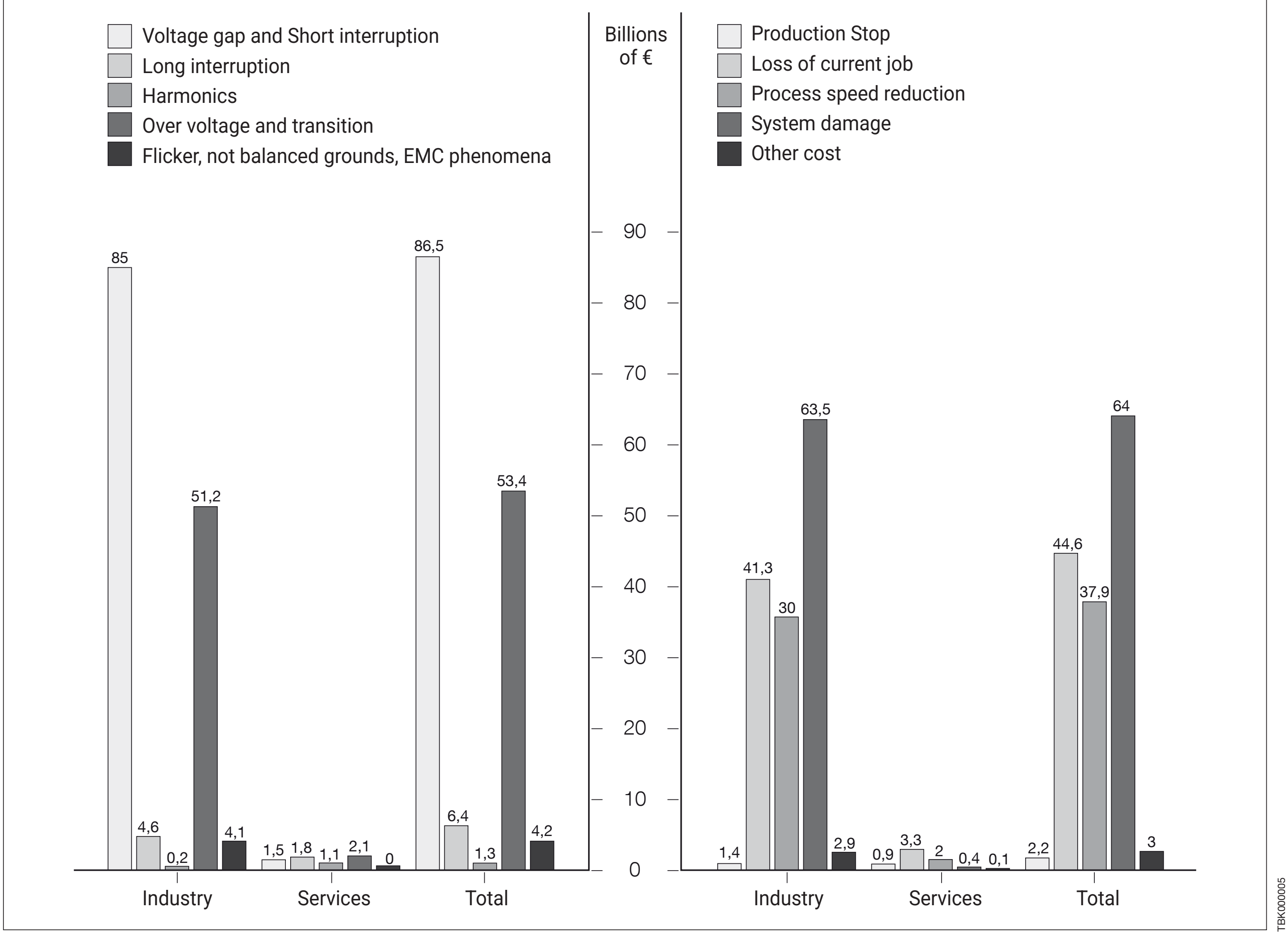


In general, even the nominal power of the transformers and the cable ratings are reduced in the case of significant asymmetry. In fact, the operating limit of these components is determined by the effective value of the total current which, in the case of imbalance, also consists of non-direct sequence currents. This fact must also be taken into account when adjusting the trip thresholds of protection devices which are sensitive to the total current.

1.5. Costs of poor-quality power

The following estimated costs of poor power quality are provided for indication purposes (source: LPQI).

1.5-1 Power quality costs in Europe (billions of €)



2. ELECTRICAL POWER AVAILABILITY

2.1. Definition

The general concept of availability (A) refers to the length of time that a system is able to perform its intended function.

Normally, availability is indicated as a value per unit or as a percentage of the system's total lifespan.

Electrical power availability refers to the length of time a load is supplied with high-quality power. More intuitively, it is the length of time the power distribution system performs its intended function without interruptions due to breakdown or [routine] maintenance. In information technology terms, this concept is known as 'uptime' and is the opposite of downtime, e.g. periods when a system is unavailable.

The mathematical definition of availability is:

$$A = \frac{MTBF}{MTBF + MTTR} = 1 - \frac{MTTR}{MTBF + MTTR} \cong 1 - \frac{MTTR}{MTBF}$$

All parameters involved are statistical and describe:

- MTBF: mean time between failure;
- MTTR: mean time to repair.

The approximation derives from the fact that, due to the intrinsic characteristics of standard-compliant power supply systems, MTTR is at least two orders of magnitude less than MTBF.

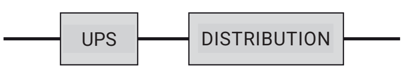
Availability is always less than 1 or at 100% and is always expressed in nines (99.99..%)

It is self-evident that the availability of an electrical power supply depends on the availability of its constituent components: distribution network, transformers, lines or cables, protection devices, UPS, generator sets, etc.

2.2. Availability of parallel or series systems

Below are three examples for comparing availability based on the different topologies. For simplicity, the availability value of both the source and the load are the same and are equal to 0.998.

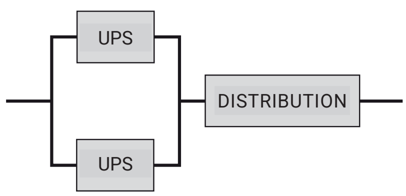
2.2-1 Single source with single distribution



$A_{TOT} = A*A =\sim$ 0.996004
STATISTICAL ANNUAL DOWNTIME: 35 HOURS.

TBK000006

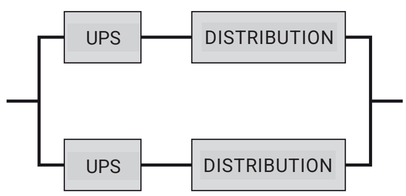
2.2-2 Double source with single distribution



$A_{TOT} = A^2\,(2\text{-}A) \cong 0.997996$
STATISTICAL ANNUAL DOWNTIME: 17 HOURS.

TBK000007

2.2-3 Double source with double distribution



$A_{TOT} = A^2\,(2\text{-}\ A2) \cong 0.999984$
STATISTICAL ANNUAL DOWNTIME: 8 MINUTES.

TBK000008

2.3. Importance of topology

Topology is fundamental. This is demonstrated not only by the previous example but by experience. Human error, fire and flooding are just some of the possible causes of physical damage to equipment. You can imagine the consequences of having two redundant UPS systems installed in the same equipment room or two distribution lines in the same channels or conduits: a vital and expensive redundancy system would be at serious risk due to physical causes.

In view of technical and economic considerations, it is advisable not only to ensure redundancy of the various systems, but also to physically separate them.

3. STATIC UNINTERRUPTIBLE POWER SUPPLY (UPS) SYSTEMS

3.1. Definition

Uninterruptible power systems, perhaps more commonly known as UPS, primarily consist of an energy storage system in various forms, on the basis of which an initial classification can be made, and a system for converting this into power.

In a static UPS, energy is stored in an electrochemical form in either special storage batteries or in kinetic form, using flywheels, and reconverted into the desired form using static electronic converters.

In dynamic UPS systems, energy storage is exclusively in kinetic form, and uses a rotary generator for reconversion.

3.2. Types

The standard EN 62040-3 was developed in response to the need to classify the various types of static UPS systems currently available on the market. It distinguishes between three major product families, according to the internal schemes adopted:

- VFD - passive standby;
- VI - line-interactive;
- VFI - double conversion.

3.2.1. Passive Standby

Utilities are normally powered by the mains supply. At the same time, the mains power supply also supplies the battery charger, which maintains the storage batteries at the maximum load level.

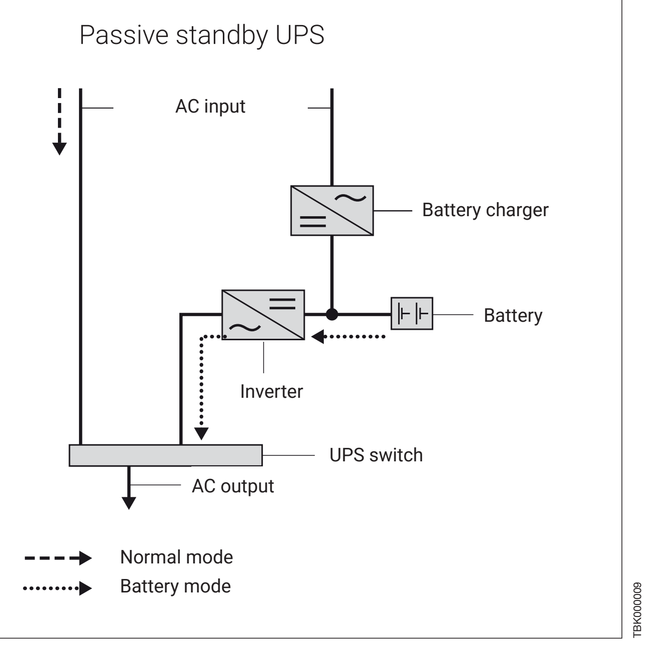
In the event of power loss, a solid-state or electromechanical commutator transfers the load to the inverter, which now activates, supported by the batteries. This mode of functioning continues until ordinary mains power conditions are restored or until the stored energy is exhausted.

The merits of this solution are essentially in its simple design, which helps to contain the cost of the equipment.

Being the least expensive option, this type of UPS offers extremely limited performance, e.g:

- no decoupling between the upstream distribution system and the load;
- switching times of approximately 10 milliseconds, which are not always compatible with the loads needs;
- no system for regulating the output frequency;

3.2-1 Operation of passive standby UPS



Because of these disadvantages, UPS systems in this category are now used only for loads with low power ratings, typically up to 2kVA.

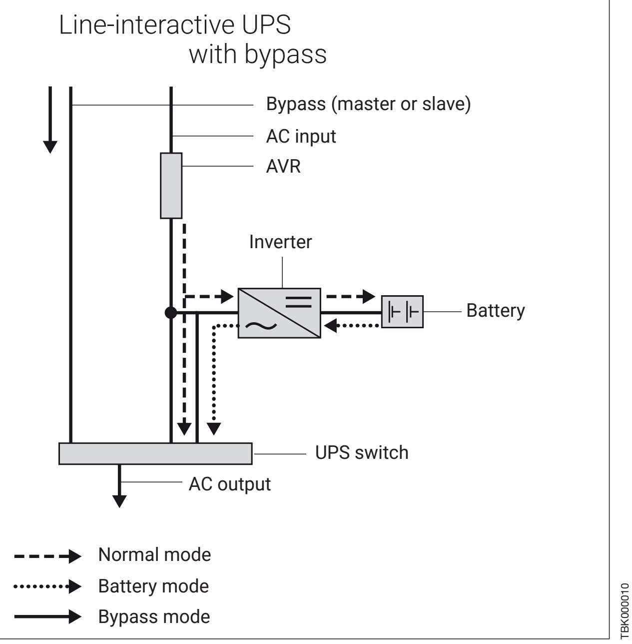
3.2.2. Line-Interactive

This configuration is characterised by the presence of a reversible AC/DC converter which can function both as an inverter and as a battery charger. In ordinary conditions, the load is supplied by the mains power supply through a solid-state breaker, which allows isolation of the system when the inverter is activated, preventing power from being fed back to the mains power supply. The voltage supplied to the load is conditioned by an AVR autotransformer (Automatic Voltage Regulator). In contrast to a passive-standby system, a line-interactive UPS system operates when mains power is available. Owing to its position in parallel with the ordinary power supply line, it guarantees a certain improvement in voltage quality, although this is limited to aspects such as magnitude fluctuations.

If the mains power is lost, the solid-state breaker is opened automatically, and the load is powered exclusively by the battery

- inverter unit, until ordinary conditions are restored or until the storage batteries are exhausted.

3.2-2 Operation of line-interactive UPS with bypass



Compared to passive-standby systems, line-interactive UPS provide better waveform conditioning, but with some drawbacks:

- no decoupling between the upstream distribution system and the load;
- no system for regulating the output frequency;
- switching times of a few milliseconds (4-5 ms).

3.2.3. Double conversion

Unlike the configurations considered above, double-conversion UPS systems constitute true electric generators that are completely isolated - with few exceptions - from the mains network, in which power is supplied by the mains network itself. Since the power to the load is transformed solely by the UPS inverter, without any interaction with the mains network and regardless of whether the power originates from the mains supply or the battery, it is possible to fully exploit the versatility of the static converter, which is able to manipulate the voltage supplied to the load under any condition. In fact, based on the direct current supplied from other components of the UPS such as the rectifier or battery, the inverter control system ensures an output waveform which is totally independent of the input waveform, with an undistorted frequency and amplitude.

The advantages of this type of UPS system are numerous:

- isolation of loads from the upstream distribution network (thereby allowing for precise regulation of the output frequency)
- very wide input voltage tolerance
- instantaneous switching between mains power and battery (more a case of seamless transfer than switching)
- no-break transfer to bypass mode

The efficiency of double conversion UPS, typically 90-96%, is less than that of a line-interactive or passive-standby system, since the current supplied by the mains power is converted twice by a rectifier and an inverter, each of which are equipped with semiconductors (diodes, SCR, IGBT), which are prone to conduction and commutation losses. Nevertheless, the advantages of maximum-quality power obtained using a double-conversion system compensate for the losses which would otherwise occur on the cables and switches as a result of harmonics or other power quality issues. It is the recommended and most widely used technology for applications with a power rating of 5 kVA or higher.

3.2.4. Classification in accordance with EN 62040-3

In addition to the technology, the EN 62040-3 standard classifies UPS systems according to the output waveform and voltage drops, both in clearly defined switching conditions.

Standard EN 62040-3 table D.1 - Type of UPS, additional characteristics and system requirements

a) single

b) multi-module

c) bypass to primary power or backup power

d) AC generator backup power system (if applicable)

e) bypass transfer time (if applicable)

f) galvanic separation between input and/or DC connection and/or output

g) earthing of the input and/or DC connection and/or output

h) bypass circuits for maintenance and other installation requirements, such as UPS disconnectors and connection switches

i) compatibility with the existing power system (for example according to IEC 60364-4)

j) remote shutdown or emergency power-off (EPO) device

3.3. Double conversion UPS functional modules

3.3.1. Rectifier

When mains power is available, the rectifier converts alternating voltage into direct voltage (AC/DC converter) to power the DC bus.

Different types of rectifier are available according to the electronic components used, the topology and the control system.

The quality of the rectifier is determined by three parameters, namely:

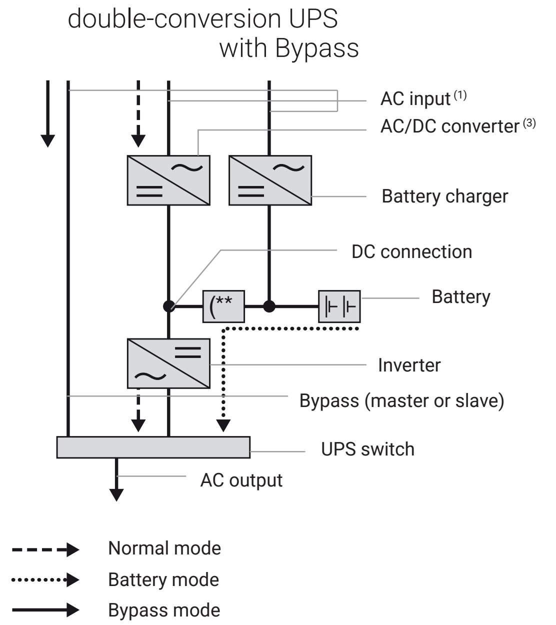
- conversion efficiency;
- input frequency and voltage tolerances;
- input power factor
- generation of harmonics to the mains.

The most widespread types of rectifier and the typical harmonic content of three-phase current absorbed by the mains are:

- 6-pulse SCR: 32%
- 12-pulse SCR: 12%
- Boost: 27%
- Inverter: 4%

From the DC side, the battery charger is unable to supply perfect direct voltage due to residual ripple which causes premature ageing of the batteries.

3.3-1 Operation of double-conversion UPS



(1) AC input can be combined.
(2) Blocking diode or switch.
(3) The converter could be a rectifier, a phase shift rectifier or a mix of rectifier and DC/DC converter.

TBK000011

socomec
Innovative Power Solutions

3.3.2. DC bus

The DC bus is the part of the UPS power circuit in DC voltage.

A high-quality automatic bypass typically has a wide range of tolerable DC voltages: it therefore provides greater flexibility in the number of batteries based on the required back-up time.

3.3.3. Battery charger

The battery charger is the DC/DC converter which decouples the battery voltage from the DC bus voltage.

The advantage of this is twofold:

- the battery voltage is independent of the DC bus voltage;
- elimination of output ripple from the rectifier

3.3.4. Inverter

Converts direct current from the rectifier into sinewave current of perfectly stable magnitude and frequency. The inverter is therefore a DC/AC converter.

The quality of the rectifier is determined by three parameters, namely:

- conversion efficiency;
- ability to supply leading power factor loads;
- ability to withstand overloads and short-circuits;
- quality of the voltage waveform in the presence of distorting loads.

3.3.5. Transformers

The transformer is not an obligatory component and is the source of an informal classification which divides UPS systems into "trafoless" (transformer-less) and "trafo" systems It is necessary to determine whether the transformer is present as a functional component of the UPS system or whether its purpose is to manage the neutral.

In UPS units with a transformer on the inverter output, the output neutral, when available, is bonded to the bypass neutral downstream of the transformer, whereas in trafoless systems, the rectifier neutral and bypass neutral are common even inside the unit.

The insertion of a transformer on the static UPS line guarantees the galvanic isolation of the system and a single neutral system downstream of the UPS, in any operating condition.

In any case, it it important to bear in mind that the built-in UPS transformer does not permit the neutral state to be changed.

Advantages of trafo technology compared to trafoless technology:

- high short-circuit capacity, therefore greater flexibility in the choice of protection devices;
- no DC components in the output voltage.
- Disadvantages of trafo technology compared to trafoless technology:
- higher weight;
- larger footprint.

In any case, technical and economic factors should be considered on a case-by-case basis, making selection straightforward and unambiguous.

3.3.6. Automatic bypass

Switches the UPS output to the auxiliary network in the event of an overload or fault in the inverter module.

The network bypass circuit is formed by a SCR module and directly connects the network with the load.

The quality of the automatic bypass is mainly determined by its ability to withstand overloads and short-circuits.

In the case of separate input power supplies, it's common to use a bypass input or back-up input (to distinguish it from the rectifier input), an input which is dedicated exclusively to the bypass with the aim of minimising the probability of the rectifier supply and bypass supply failing at the same time. The bypass supply can be a different power line to that of the inverter input or generator. If there is no separation of the power supplies, this is referred to as a common input.

3.3.7. Maintenance bypass

The manual or maintenance bypass module is not necessary for operation of the UPS and therefore it is not always supplied in the standard configuration.

The aim of this module is to enable routine or non-routine maintenance to be carried out without interrupting the power supply.

3.3.8. Storage systems

The storage system is the power source which supplies the inverter during a mains power outage, preventing power interruptions to the connected applications.

Batteries.

Batteries are the most common means of storing energy. They are electrochemical devices and are therefore sensitive to operating conditions: temperature, charge and discharge cycles. The most commonly used batteries for this purpose are sealed, lead-acid maintenance-free batteries, open-vented or nickel-cadmium.

Battery performance is expressed in terms of design life and the type of discharge permitted. Excellent performance is provided by long-life batteries (10-12 years) with high-rate discharge.

Battery life is theoretical. In practice, it depends on the charge/discharge cycles and the temperature of the place of installation.

To illustrate how temperature affects battery life, EUROBAT (Association of European Storage Battery Manufacturers) states that the expected service life is halved for every 10°C above 25°C. This means that batteries with a "10-12 year" design life which are installed in places within an ambient temperature of 35°C or 45°C will last no longer than 5-6 years and 2.5-3 years respectively.

The place where the batteries are installed must be equipped with adequate ventilation and air conditioning to guarantee the correct operation of the batteries and the safety of the installation. To this effect the following formula can be applied in accordance with Standard EN 50272, which aims to keep the concentration of hydrogen in the room below the threshold of 4%vol.

$$Q = v \cdot q \cdot s \cdot n \cdot I_{gas} \cdot C_{rt} \cdot 10^{-3}\ [m^3/h]$$

where:

Q = ventilation air flow in m^3/h

v = necessary hydrogen dilution factor

q = 0.42 x 10-3 m^3/Ah hydrogen generation

s = 5, general safety factor

n = number of battery cells

I_{gas} = current producing gas expressed in mA/Ah of assigned capacity, for float charging current or for boost charging current

C_{rt} = C10 capacity for lead-acid cells

(Ah), Uf = 1.80 V/cell at 20°C or C5 for nickel-cadmium cells (Ah), Uf = 1.00 V/cell at 20°C.

By combining the constants the formula is simplified to:

$$Q = 0.05 \cdot n \cdot I_{gas} \cdot C_{rt} \cdot 10^{-3}\ [m^3/h]$$

Unless otherwise specified by the battery manufacturer:

I_{gas}	Open cells of lead-acid batteries	VRLA cells of lead-acid batteries	Open cells of nickel-cadmium batteries
During float charge	5	1	5
During boost charge	20	8	50

Protection against power micro-interruptions.

Flywheel and batteries can also be used simultaneously in UPS units, with the advantage of increased battery life. This is possible because the flywheel, in parallel with the batteries, ensures protection during brief interruptions, therefore preserving the capacity of the batteries for longer outages and improving their lifecycle.

The service life of flywheels is over four times longer than batteries. They are also stable, reliable and require minimal maintenance. Furthermore, unlike batteries, they are not subject to significant fluctuations in the cost of lead.

Control.

The brain of the UPS is its control system. The best architectures are based on digital signal processing (DSP) microprocessors which are able to perform complex calculations and algorithms. Architectures enable the machine to respond to different events and to report states and events via communication interfaces.

3.4. Backfeed protection

Backfeed protection prevents voltage from returning to the mains power supply. This issue is governed by standard EN 62040-1-1.

Backfeed protection is mandatory in fixed and mobile installations. In the case of fixed installations, the backfeed protection can be external to the UPS unit when indicated by a suitable warning label.

3.5. UPS sizing

Choosing the power rating of a UPS unit is a process which involves taking into account various elements, both functional and regulatory.

The main elements to be considered may include:

- two of the following parameters regarding the loads to be supplied:
  - Active Power (PRL);
  - Apparent Power (SRL);
  - Power Factor (PF).
- type of load power supply (voltage, frequency, number of phases);
- load coincidence factor;
- required back-up time;
- type of mains power supply (voltage, frequency, number of phases).

In the event of a particular load, which for example requires a high inrush current, this current value must be taken into account. Once the following parameters are known:

- $\hat{I}_{UPS}$ - maximum current of the UPS;
- t_{UPS} - the time for which $\hat{I}_{UPS}$ is sustainable;
- $\hat{I}_{L}$ - overload current required by the load;
- S_{L} - apparent power of the load

the apparent power rating, in case of load crest factor 3:1, is

$$S_{UPS} = S_{L} \cdot \frac{\hat{I}_{L}}{\hat{I}_{UPS}}$$

If the load is also strongly non-linear, as is the case with electronic equipment for example, and if the crest factor is higher than that tolerated by the UPS, it is advisable to consider a derating factor.

3.6. Temperature control in the place of installation

Normally, uninterruptible power systems can function at nominal powers for ambient temperatures up to 40 °C, heating the environment in which they are installed due to electrical losses dissipated in the form of heat. These losses cause the natural temperature to increase (ΔT) and are normally indicated by UPS manufacturers. The temperature of a room, which is 25 °C with the UPS switched off, may increase by up to 15 °C before it is necessary to derate the equipment. Room ventilation or air conditioning may enable these limits to be respected.

For ventilation, the following empirical formula is provided:

$$Q\left[m^3/h\right] = \frac{P\left[kcal/h\right]}{0{,}288 \cdot \Delta T\left[W\right]} = \frac{P\left[W\right]}{0{,}248 \cdot \Delta T\left[K\right]}$$

where:

Q = Air flow rate

P = Power dissipated in the enclosure

ΔT = Difference between maximum air temperature permitted in the enclosure and the maximum temperature of air used for cooling

In terms of temperature difference, degrees Kelvin (°K) and Centigrade (°C) are equal (this does not apply to absolute values).

For ventilation, see also the paragraph "Batteries" regarding safety in the battery room.

Meanwhile as regards air conditioning, you are recommended to contact the equipment supplier with the characteristics of the place of installation and the electrical losses of the UPS. It is advisable to consider the worst-case operating conditions: typically at midday in summer.

3.7. Central power supply systems (CPSS)

Central power supply systems (CPSS) provide a centralized, independent energy supply to essential safety equipment such as emergency escape lighting, electrical circuits of automatic fire extinguishing systems, paging systems and signalling safety installations, smoke extraction equipment and carbon monoxide warning systems for specific buildings (e.g. in high-risk areas).

An uninterruptible power supply, when used to power essential safety systems such as those listed above, must comply not only with the requirements of the EN 62040 series of product standards, but also with the additional requirements of system standard EN 50171.

The main additional characteristics which the system must have can be summarised as follows:

- the enclosures must be resistant to specific thermal stresses (glow wire tests)
- the input voltage must be in conformity with HD472 S1, with frequency within ±2% of the nominal value
- specifically the batteries must be:
  - protected against total discharge
  - long-life batteries
  - protected against polarity inversion of the connection cables
  - quick charging

In order for the power supply system to be effective, suitable precautions must be taken with respect to all of its component parts (protection devices, lines, etc.).

Note that other national requirements may exist in addition to those specified here.

3.8. Generator sizing

When the power source of the uninterruptible power supply includes a generator, in determining the latter it is necessary to take into account the voltage drop in the series impedance of the generator set due to harmonic variations.

The most suitable parameter for this calculation is the subtransitory reactance of the alternator, calculated for each frequency involved.

The subtransitory reactance value is provided in the generator set data sheets and is normally indicated with X''_d.

$$\Delta V_{\%} = \sqrt{\frac{\sum_i X''_d I_i^2}{I_n^2}}$$

The criteria is to choose the generator set which, given the current harmonics of the UPS, has a harmonic voltage drop, and therefore distortion, within the tolerance limit permitted by the line.

3.9. Protection devices

3.9.1. Definitions

- Total selectivity: is guaranteed for all types of fault (overload, short-circuit, earth fault) and for all overcurrent values, between the trip threshold of the upstream device and the prospective short-circuit current at the point where the downstream device is installed.
- Partial selectivity: is guaranteed up to a certain overcurrent limit Is (selectivity limit current).

3.9.2. Selecting and co-ordinating devices to protect against overloads and short-circuits

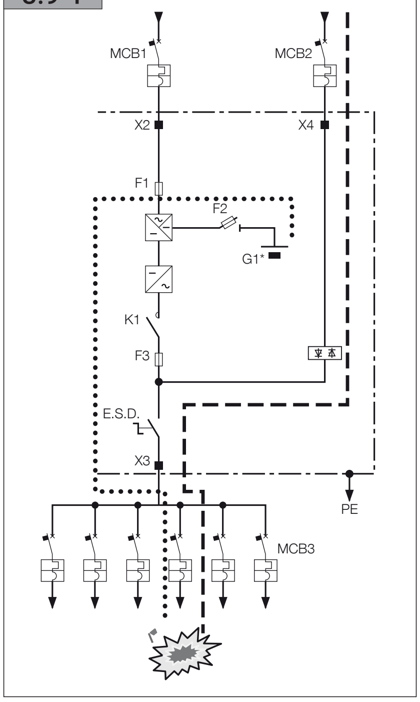
- **Overload selectivity**

For breaker trip times from several hours to several seconds (overcurrents up to 6-8 times the nominal current), the co-ordination curves (breaker time-current curves) must never overlap. In the event of overload, the UPS continues normal operation by switching to the bypass when the thermal limits of the inverter are reached. Consequently, this transfer must be taken into account during co-ordination of the various protection devices. The UPS data sheets normally indicate the overload currents "per unit" or "as a percentage" and the corresponding tolerance time.

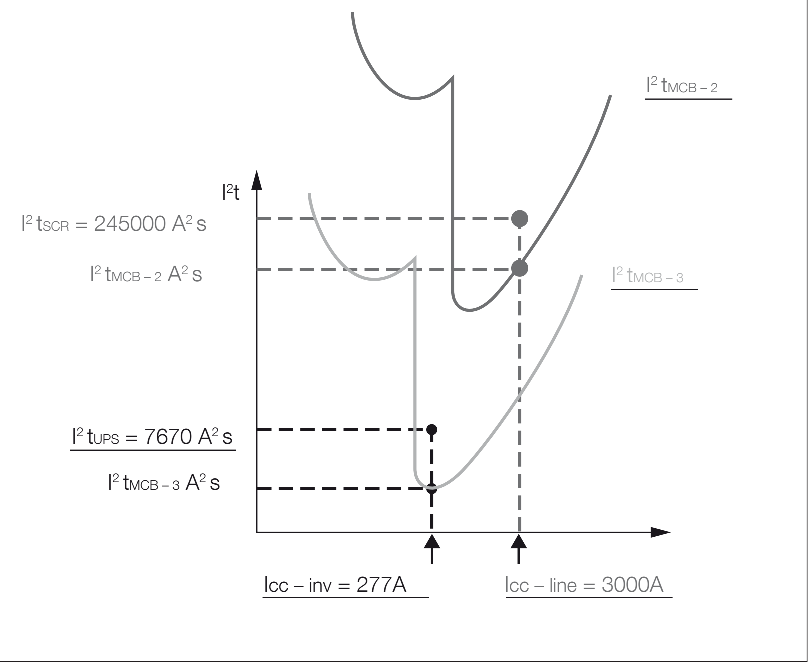
- **Short-circuit selectivity**

Short-circuit currents can be very high, so the protection devices must be tripped within a few milliseconds to prevent burn-out of the cables. The time-current curves used as criteria for selecting overload protection are not valid when considering short-circuit protection, on account of the short trip times. In this case, the breakers must be sized based on the Joule integral curves of the devices. In practice, for a given prospective short-circuit current value, the minimum I^2t let-through of the upstream device must be greater than the maximum I^2t let-though of the downstream device.

3.9-1



3.9-2



In the case of short-circuit of one of the loads connected downstream of the UPS, two cases must be distinguished:

- **The bypass (back-up supply) upstream of the UPS is available.**

For an output short-circuit, the UPS will transfer the load onto the bypass after a delay dependent on the individual model. The thermal-magnetic breakers of the bypass (MCB2) and output which protect the short-circuited load line (MCB3) are positioned in series (short-circuit marked in the diagram by means of the dashed line). For proper co-ordination, the output switch (MCB3) must open before the main input switch (MCB2). Then, the I^2t let-through of MCB3 must be lower than the let-through of MCB2 (at the prospective short-circuit current value):

$I^2t_{MCB3} < I^2t_{MCB2}$

Furthermore, it is necessary to verify the selectivity between the bypass input thermal-magnetic switch and the maximum power tolerated by the bypass SCRs (in the example 245000 A2s) at the prospective short-circuit (line) current (in the example 3000 A), e.g. $I^2t_{SCR} > I^2t_{MCB2}$.

In this case, the line impedance for estimating the short-circuit is that which takes into account the routing of power via the bypass. In the case of a back-up supply provided by a generator set, it is the short-circuit current of the generator set that must be used to correctly co-ordinate the protection devices.

- **The bypass (back-up supply) upstream of the UPS is unavailable.**

Since the load cannot be transferred to the bypass (which is unavailable), the short-circuit energy is supplied entirely by the inverter and batteries. The downstream protection devices must be triggered before the electronic activation of the UPS protection in order to prevent healthy loads being switched off.

The example (in the figure the short-circuit is represented by the dotted line), considers the three-phase short-circuit current from a 277 A battery for a maximum time of 100 ms .

The output short-circuit energy supplied by the UPS is: $I^2tUPS = (277\ A)^2 \times 0.1\ s = 7672\ A^2s$

At the short-circuit current value, in this case is not prospective but actual and coinciding with the short-circuit current value of the UPS, for correct selectivity it must be verified that $I^2t_{MCB3} < I^2t_{UPS}$.

This second case (short-circuit without upstream supply) is nevertheless highly unlikely. In fact the absence of the upstream supply presupposes that a fault has occurred, and it is unlikely that a second fault (output short-circuit) would occur during the period of the power outage, which is usually short. In general, this period coincides with the time that the battery is supplying power (if the rectifier and the bypass do not have separate power supplies) or with the MTTR of the fault by an operator (if the UPS rectifier and the bypass have two different power supplies, as in this example).

In the case of short-circuit without bypass supply, the current will be distorted to a square waveform.

3.9.3. Selecting and sizing differential breakers

There is no hard and fast rule since the behaviour of the mains supply to faults essentially depends on the neutral system used, the UPS filters (which divert certain harmonic components to earth) and the point of the fault.

Note.

The presence of isolation transformers can change the neutral system upstream or downstream of the UPS.

Generally speaking it is advisable to use:

- a single differential in the case of parallel UPS;
- type A differentials for single-phase in, single-phase out UPS;
- type B differentials for three-phase in, single-phase out UPS and three-phase in, three-phase out UPS.

3.9.4. Overvoltage protection devices

In conformity with IEC requirements, UPS systems are equipped with overvoltage protection. Unless otherwise required, the most common protection devices are Class 2. Usually, when the units are installed on the customer's premises, it is not necessary to increase the overvoltage protection class of the device. Nevertheless, if the units are installed in a transformer cabinet, the overvoltage protection class of the connection must be analysed and, if necessary, increased by installing additional protection devices.

3.10. Maintenance

In order to maximise uptime, it is advisable to perform periodic maintenance on components subject to wear:

- Capacitors;
- Fans;
- Batteries:

It is important that the maintenance is performed by expert personnel authorised by the UPS manufacturer.

3.11. Directives and Standards

3.11.1. Directives

- Low Voltage Directive 2006/95/EC
- Electromagnetic Compatibility Directive 2004/108/EC.

3.11.2. Safety Standards

- EN 62040-1-1 "Uninterruptible power systems (UPS) Part 1-1: General and safety requirements for UPS used in operator access areas"
- EN 62040-1-2 "Uninterruptible power systems (UPS) Part 1-2: General and safety requirements for UPS used in restricted access locations".

3.11.3. Electromagnetic Compatibility Standards

EN 62040-2 "Uninterruptible power systems (UPS) Part 2: Electromagnetic compatibility (EMC) requirements"

3.11.4. Performance

EN 62040-3 "Uninterruptible power systems (UPS) Methods of specifying the performance and test requirements".

3.11.5. Other standards

- IEC 60364-X-X "Electrical installations in buildings";
- IEC 60439-1 "Low-voltage switches";
- IEC 60529 "Degrees of protection provided by enclosures"
- EN 50272-2 "Safety requirements for secondary batteries and battery installations - Part 2: Stationary batteries".

4. STATIC TRANSFER SYSTEMS (STS)

4.1. Definition

Static Transfer Systems (STS) are intelligent units which, in the event that the primary power source does not return the tolerance values permitted by the load, transfer the load to an alternative source). This ensures "high availability" of the power supply for sensitive or critical installations.

The purpose of STS devices is to:

- ensure the redundancy of the power supply to critical installations by means of two independent power sources;
- increase power supply reliability for sensitive installations;
- facilitate the design and expansion of installations that guarantee a high-availability power supply.

STS systems incorporate reliable and proven solid-state switching technologies (SCR), enabling them to perform fast, totally safe automatic or manual switching without interrupting power to the supplied systems.

The use of high-quality components, fault-tolerant architecture, the ability to determine the location of the fault, management of faults and loads with high inrush currents: these are just some of the characteristics that make STS systems the ideal solution for achieving maximum power availability.

4.2. Performance (IEC 62310-3 definition)

Standard IEC 62310-3 establishes a code that clearly defines the performance of a STS:

XX	YY	B	TS

where:

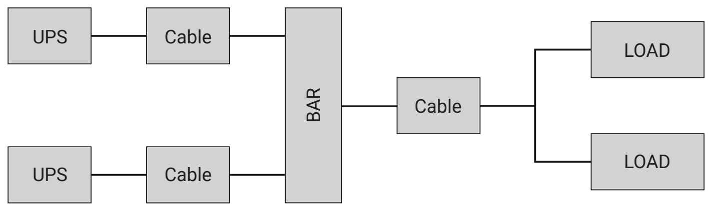
- XX characterises the management of the fault current:
  - which can be CB (STS is capable of withstanding specific short-circuit currents, which incorporates overvoltage protection devices)
  - PC (STS capable of withstanding specific short-circuit currents, which does not incorporate overvoltage protection devices).
- YY refers to the neutral management characteristics:
  - 00: no neutral management;
  - NC: both input neutrals are combined;
  - NS: separation of the two input neutrals by switching;
  - NI: neutral separation by isolation transformer (typically external to the machine).
- B are the transfer characteristics:
  - B: break-before-make (open transition transfer), there is no conduction path between the two sources during switching;
  - M: make-before-break (closed transition transfer), conduction possible between the two sources during switching.
- TS characteristics of the voltage limits permitted by the critical load:
  - T: total transient time to the terminals of the load, including switching time;
  - S: voltage tolerance before the transfer process is activated.

4.3. STS usage examples

Comparison between availability estimates between two architectures respectively with and without STS.

It is advisable to install the STS device as close as possible to the load, so as to ensure redundancy of the up-stream distribution and to keep the single fault point (the conductor between STS and load) as short as possible.

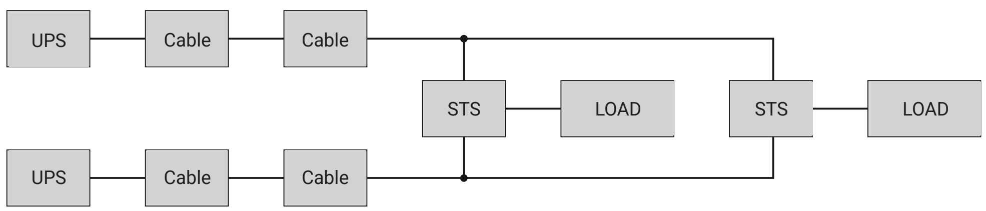
4.3-1 N+1 without STS



Estimated availability: 0.99749 (22 hours of downtime).

TBK000014

4.3-2 2N with STS



Estimated availability: 0.99991 (0.8 hours of downtime).

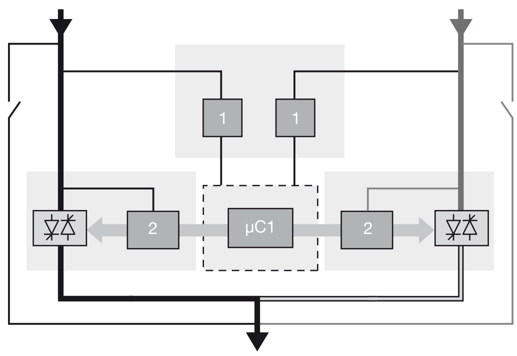
The double cable upstream of the STS serves to cover the same physical distance as the previous case (UPS and STS installed near to the load).

TBK000015

4.4. Functional modules

The aim of the STS is to increase the overall system availability. To achieve this it must be fault-tolerant: the load must be supplied even in the event of an internal fault.

4.4-1



TBK000016

4.4.1. SCR modules

Silicon-controlled rectifiers are solid-state switches which control the flow of current to the load. The SCR is only able to interrupt the current as it passes through zero. In a sinusoidal steady-state, this implies switching times of between 0 ms and a semi-period.

4.4.2. Power supply module

Module which draws power from the primary or alternative source, or from both sources, to supply all of the control electronics. It could be redundant allowing an higher fault tollerance.

4.4.3. Control

- Control logic: the brain of the STS is a microcontroller where all of the decision-making logic is located.
- SCR control modules: components which translate the control signal received by the logic into commands to the SCR.

It could be redundant allowing an higher fault tollerance.

4.4.4. Maintenance bypass

Normally built into the STS, the aim of the bypass is to enable routine and non-routine maintenance to be carried out. When the bypass is in operation, switching is not possible in case the conducting source exceeds the tolerance limits permitted by the load.

The STS device must be designed and operate so the two sources cannot be directly connected, not even in the event of human error.

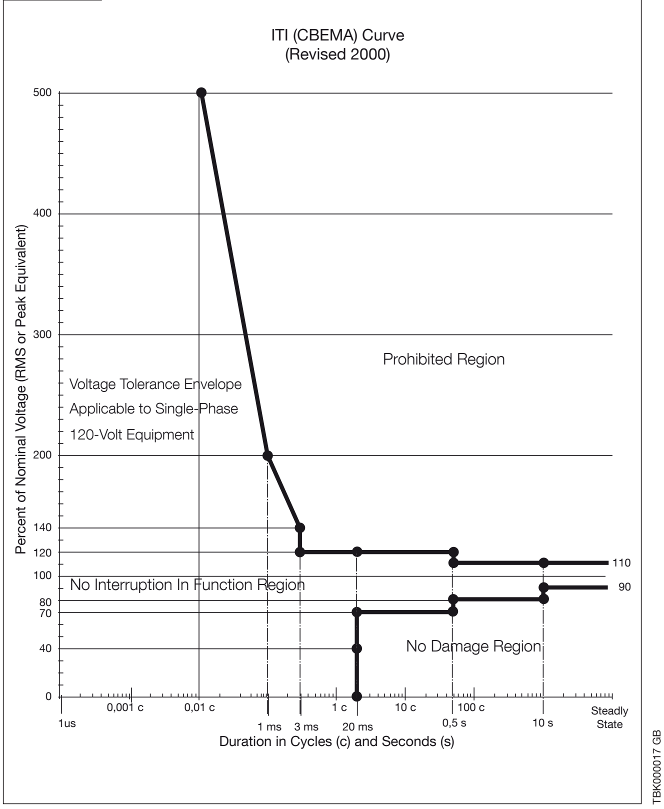
4.5. Backfeed protection

Product standard IEC 62310 establishes a minimum requirement that the STS must control upstream breakers that trip to prevent power flowing from one source to the other.

4.6. Selecting a STS

The STS must be sized on the basis of the system diagram, the currents of the loads supplied by the STS, the distribution network and the power dips admitted by the load. With regard to the power failure tolerance of loads, the Information Technology Industry Council has published a guideline curve which helps users to determine the power supply conditions which can be tolerated by IT loads.

4.6-1



Firstly, it is necessary to identify the rating characteristics of the electrical system and the neutral:

- Voltage and frequency;
- Single or three-phase;
- With or without distributed neutral;
- Neutral condition (TN-C, TN-S, IT, TT);
- Sources (line/line, UPS/generator, UPS/UPS, etc).

Next it is necessary to determine whether the neutral must be switched (broken). In this respect, SOCOMEC offers the following advice:

- TN-C: no switching (regulatory requirement);
- TN-S: switching (requirement if sources provided with differential protection);
- IT: switching.
- TT: switching.

It is then necessary to determine the total current that must pass through the STS device as the sum of the nominal currents of the various downstream loads.

It is also important to verify the installation of loads such as transformers or electric motors downstream of the STS, in order to prevent nuisance trips due to high inrush currents when switching between sources, or residual downstream voltage which impairs power failure detection. If such loads are installed, this must be taken into account during selection and configuration of the STS.

4.7. Protection devices

4.7.1. Selecting and coordinating thermal-magnetic breakers

In order to select the right overload or short-circuit protection devices, it is important to consider the STS system's behaviour in the event of overloads. Normally, the conducting branch of the STS withstands the overload/short-circuit for a time depending on the intensity of the currents, before the STS switches to the other branch. If the two networks have different impedances or short-circuit capacities, these must be taken into account. If the values are insufficient to trigger the breakers within the time limit permitted by the STS, the STS will interrupt the power supply upstream, resulting in all downstream loads being switched off.

4.7.2. Selecting and sizing differential breakers

When present, the neutral between the two sources can be combined and switched or otherwise (see paragraph Choosing an STS). In the case of a TN-C system, the neutral acts as an earth conductor and therefore cannot be broken. In the case of a TN-S system, the installation depends on what type of downstream STS has been selected. If the device does not switch the neutral, any neutral currents could be divided between the two parallel networks by means of the earth connection in the cabinet. The installation of differential breakers is not recommended due to the high probability of them tripping.

By contrast, if the STS device switches the neutral, this will avoid any unexpected current between both sources and earthing.

Differential protection may be installed.

Each IT systems has his own IMD (Insulation Measurement Device). Therefore every neutral has to be switched to avoid any mutual disturbances between the IMDs.

TT systems are typically used in residential or civil applications. This implies the use of differential protection and therefore a STS system which switches the neutral.

4.8. Maintenance

In order to maximise uptime, it is advisable to perform periodic maintenance on the fans (since they are components subject to wear). It is important that maintenance is performed by expert personnel authorised by the STS system manufacturer.

4.9. Directives and Standards

EEC 73/23 "Low-Voltage Directive"

EEC 89/336 "Electromagnetic Compatibility Directive"

IEC 62310-1 "Static Transfer Systems: general and safety requirements"

IEC 62310-2 "Static Transfer Systems: electromagnetic compatibility (EMC) requirements"

IEC 62310-3 "Static Transfer Systems: Method for specifying performance and test requirements"

IEC 60364-4 "Electrical installations of buildings"

IEC 60950-1 "Safety of IT. equipment"

IEC 60529 "Degrees of protection provided by enclosures (IP)"

IEC 60439-1 "Low-voltage switchgear and control gear assemblies"

5. COMMUNICATION

5.1. Protocols

- SMTP: communication protocol for email transmission, supported by all email clients;
- SNMP: protocol used to monitor networked devices; requires compatible software;
- HID: Human Interface Device, a protocol included in Windows and MAC OSx operating systems;
- JBUS/MODBUS: the most commonly available communications protocol for connecting industrial electronic devices;
- TCP/IP: a suite protocols used to transmit information over the Ethernet;
- http: protocol used to transfer web pages in HTML format.

5.2. Physical supports

Physical infrastructures which convey information using communication protocols.

- USB: serial communication standard which enables various peripherals to be connected to a computer;
- Ethernet: interface for local area networks (LAN);
- RS 232: low-speed serial interface for data exchange between digital devices, suitable for distances of up to 10 m;
- RS 485: serial interface for data exchange between digital devices, suitable for distances of up to 1000 m;
- Dry contacts. interface with contacts which have no electrical potential and which can be NO (normally open) or NC (normally closed).

5.3. Remote services

UPS and STS systems must be able to remotely communicate their operating statuses, electrical / environmental parameters and fault alarms. Furthermore, certain commands should be possible for remote control of the equipment.

Some remote monitoring services operate 24 hours a day, 365 days a year, enabling equipment to be installed in places where human supervision is limited (to working hours) or absent. The rapid notification of abnormal events allows for prompt intervention by the technical support service, resulting in reduced risk and MTTR.

6. TOTAL COST OF OWNERSHIP (TCO)

6.1. Definition

Total Cost of Ownership (TCO) includes all of the direct and indirect costs over the lifetime of the equipment. It defines:

- CAPEX: cost of the equipment, its installation, system modifications if required and operator training;
- OPEX: costs of running the equipment, e.g. power consumption, cost of installation space (for example, the share of building rent proportional to the area occupied by the equipment), as well as routine and non-routine maintenance.

6.2. Impact of UPS or STS systems on the TCO

6.2.1. THDi and cosφ input

Valid only for UPS.

High harmonic content of the input current and low cos φ imply the use of harmonic filters, overrating of cables and protection devices as well as the risk of nuisance trips. In economic terms, this means higher project, system and installation costs and higher costs due to system downtime. Optimum situation: low harmonic content and high cos ϕ.

6.2.2. Footprint

The floor space occupied by the equipment. Can be net or gross, plan dimensions of the equipment and plan dimensions plus space required for operation and maintenance respectively.

UPS and STS systems do not generate value, but their purpose is to protect equipment which does generate value (servers, industrial processes). Therefore the space occupied is not available to the actual production process itself. In the case of data centres, it is the space where it is not possible to install the servers. Optimum situation: minimal footprint.

6.2.3. Performance

Efficiency refers to the proportion of input energy available to the load. Indirectly it is the measurement of losses, e.g. energy paid for but not used. Given that fossil fuels can be used to produce electrical energy (releasing gases that cause the greenhouse effect in the atmosphere), energy losses also entail unnecessary gas emissions and their corresponding impact on the environment.

Optimum situation: high efficiency.

6.2.4. Front access and ventilation

An equipment unit with front access notably simplifies routine and non-routine maintenance operations, leading to a considerable reduction in repair times (MTTR) compared to equipment which must be moved in order to gain access to the sides or rear.

Furthermore, equipment with front access only, incorporating a front air inlet and top air outlet, allows for wall-mounted installation and therefore a reduced gross footprint.

6.2.5. Ease of use

In its popular publication Tier Classifications define site infrastructure performance, the Uptime Institute states that 70% of downtime is caused by human error (mistakes in checking and routine maintenance).

Equipment which is easy to use reduces these risks, lowers downtime costs and requires shorter, less intensive training for operators.

6.2.6. Communication systems

Remote monitoring and control enable time and human resources to be streamlined while reducing maintenance and repair times in the event of abnormal situations. For this reason, the equipment must be capable of being integrated into Building Management Systems (BMS).

7. ENVIRONMENTAL COMPATIBILITY

7.1. RoHS and WEEE directives

The official stance of CEMEP (Comité Européen de Constructeurs de Machines Electriques et d'Electronique de Puissance - European Committee of Manufacturers of Electrical Machines and Power Electronics) is that the RoHS and WEEE directives do not apply to UPS.

7.2. Performance

The only reference for efficiency performance is given by the European Code of Conduct (http://re.jrc.ec.europa.eu/energyefficiency/html/AC%20UPS-ParticipantsCoC.htm). Manufacturers can adhere to it on a voluntary basis by committing to the minimum efficiency requirements of the code.

8. DIRECT ENERGY IMPACT

The energy efficiency of an equipment unit is defined as:

$$\eta = \frac{P_{out}}{P_{in}}$$

where:

- P_{in} is the input power
- P_{out} is the output power, which in the case of the UPS coincides with the P_n (nominal power).

Using simple calculations we can determine heat loss (P_{erd}) as follows:

$$P_{erd} = P_n \left[\frac{1-\eta}{\eta}\right]$$

Approximately 0.61 kg of carbon dioxide is generated per kWh of energy lost (http://www.eia.doe.gov/cneaf/electricity/page/co2_report/co2report.html#electric), with the resulting environmental consequences and an average energy cost in Europe of 0.12 €.

$$P_{erd\,93\%} = 150\ kW \left[\frac{1-0{,}93}{0{,}93}\right] \cdot 24 \cdot 365 = 98{,}9\ MWh \longrightarrow 60\ t_{CO2} + 11800\ €$$

$$P_{erd\,96\%} = 150\ kW \left[\frac{1-0{,}96}{0{,}96}\right] \cdot 24 \cdot 365 = 54{,}7\ MWh \longrightarrow 33\ t_{CO2} + 6600\ €$$

On a load-for-load basis, the UPS with 96% efficiency achieves an annual saving of 5200 € and 27 t of carbon dioxide for air conditioning alone, the same output as a car manufactured in 2005 with 170,000 km on the clock. (http://en.wikipedia.org/wiki/European_emission_standards).

socomec
Innovative Power Solutions

9. IMPACT ON AIR CONDITIONING

Electrical losses are dispersed, in the form of heat, into the environment. In applications where the temperature must be controlled and the heat capacity of the environment is insufficient, measures must be taken to cool the environment. There are different ways of doing this: from simple ventilation, e.g. the movement of air masses of the desired temperature which are already available in the vicinity of the installation, to air conditioning, e.g. the cooling and circulation of air masses.

There are also technologies based on the use of water as a heat transfer fluid, but this is less common.

Air conditioning is the most frequently used technology. The parameter which measures the electrical energy needed to release energy in the form of heat is Coefficient of Performance (COP). When talking about electricity, we normally refer to power instead of energy, consequently the definition of COP. becomes:

$$C.O.P. = \frac{P_t}{P_e}$$

where:

- P_t: the thermal power to be released;
- P_e is the electric power needed to do it.

With close approximation, 3 can be considered as a typical COP value.

This means that for every 3 kW of thermal power dissipated, 1 electrical kW is needed.

This means that the efficiency rating of plant equipment is only partly able to quantify heat dissipation, since it does not take into account the energy needed to achieve it.

By way of indication, below are the annual air conditioning costs in relation to the example given in the previous paragraph (two different UPS with respective efficiency ratings of 93% and 96%, considering an average annual energy cost in Europe of 0.12 €/kWh).

$$HVAC_{93\%} = \frac{98{,}9\ MWh}{3} \cong 33\ MWh \longrightarrow 20\ t_{CO2} + 4000\ €$$

$$HVAC_{96\%} = \frac{54{,}7\ MWh}{3} \cong 11\ MWh \longrightarrow 11\ t_{CO2} + 2200\ €$$

On a load-for-load basis, the UPS with 96% efficiency achieves an annual saving, for air conditioning alone, of 1800 € and 9 t of carbon dioxide. Taking into account direct heat loss, the savings increase to 7200 € and 36 t of CO2.

Standard 200 kVA UPS emissions	72.100 CO2 kg
Green Power 200 kVA UPS emissions	40.400 CO2 kg

TECHNICAL GUIDE

EN

MASTERYS BC+

10 to 40 kVA

PRIME
Trustworthy power

RoHS COMPLIANT

3 LEVEL TECHNOLOGY

95% EFFICIENCY

Socomec Resource Center
To download, brochures, catalogues and technical manuals

socomec
Innovative Power Solutions

1. OBJECTIVES

The aim of these specifications is to provide:

- the information required to choose the correct uninterruptible power supply for a specific application.
- the information required to prepare the system and installation site.

The specifications are intended for:

- installation engineers.
- design engineers.
- engineering consultants.

2. INSTALLATION REQUIREMENTS AND PROTECTION

Connection to the mains power supply and load(s) must be implemented using cables of suitable size, in accordance with current standards. If not already present, an electrical control station which can isolate the network upstream of the UPS must be installed. This electrical control station must be equipped with a circuit breaker (or two, if there is a separate bypass line) of an appropriate rating for the power drawn at full load.

If an external manual bypass is required, only the model supplied by the manufacturer must be installed.

We recommend fitting two metres of unanchored flexible cable between the UPS terminals and the cable anchor (wall or cabinet). This makes it possible to move and service the UPS.

For detailed information, see the installation and operating manual.

3. ARCHITECTURE

3.1. Range

MASTERYS BC+ is a full range of high performing UPS designed to protect critical and sensitive appliances in “business critical” applications such as data servers.

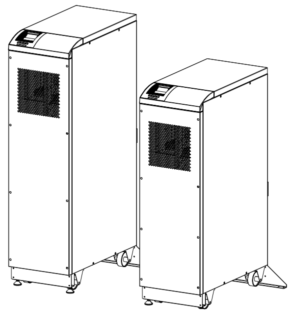
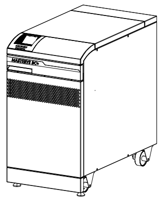
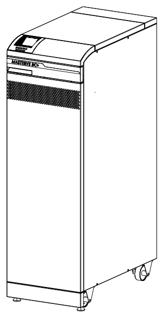
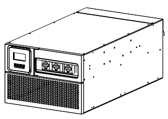
MODELS								
Rated power (kVA)	10	15	20	10	15	20	30	40
	3/1			3/3				
MASTERYS BC+ B3 / M3	•	•	•	•	•	•		
MASTERYS BC+ S4							•	•
MASTERYS BC+ M4	•	•	•	•	•	•	•	•
MASTERYS BC+ FL	•	•	•	•	•	•	•	•

Matrix table for model and kVA power rating

Each family has been specifically designed to meet the demands of loads in specific application contexts, in order to optimise product features and facilitate integration within the system.

4. FLEXIBILITY

4.1. Power ratings 10 to 40 kVA

DIMENSIONS				
Cabinet type		Width (W) [mm]	Depth (D) [mm]	Height (H) [mm]
	B3	370	770	1190
	M3	370	770	1375
	S4	444	800	800
	M4	444	800	1400
	FL	442	830	305

The equipment has been designed with a minimum direct and indirect footprint (the actual space occupied by the unit and the space required around it for maintenance, ventilation and access to operating mechanisms and communication devices).

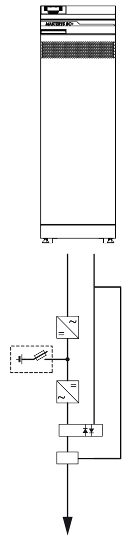
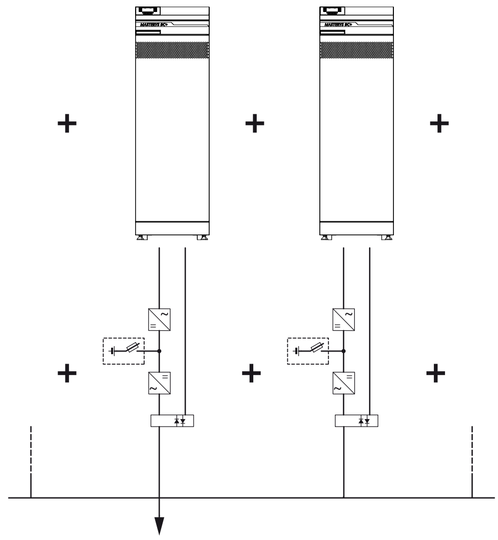
All of the control mechanisms and communication interfaces are located in the upper front section and can be accessed from the first panel with the red surround (for B3 and M3, they are accessible from the back of the UPS).

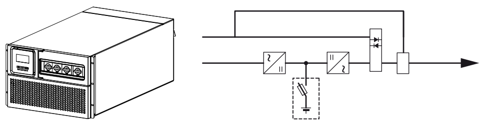
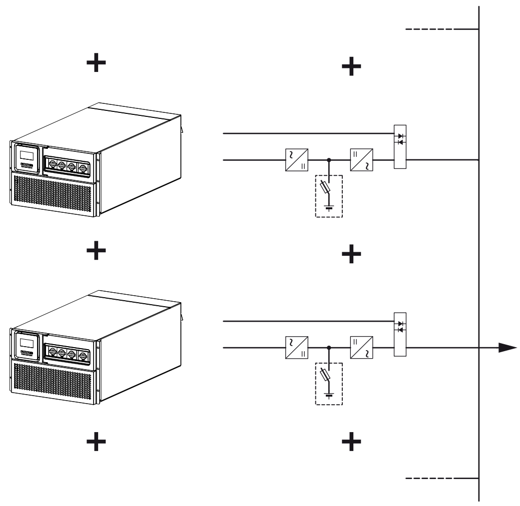
The intelligent design also provides easy access for maintenance and installation.

The air inlet is on the front, with outflow to the rear.

4.2. parallel

MASTERYS BC+ enables 2 configurations of UPS systems in the same range

	
Single unit configuration	Parallel UPS configuration (up to 4 units for B3 and M3, up to 6 units for S4, M4)

	
Single unit configuration	Parallel UPS configuration (up to 6 units)

4.3. Flexible back-up time

Different back-up times are possible by using models with internal battery or FLEX (FL) with external battery cabinets.

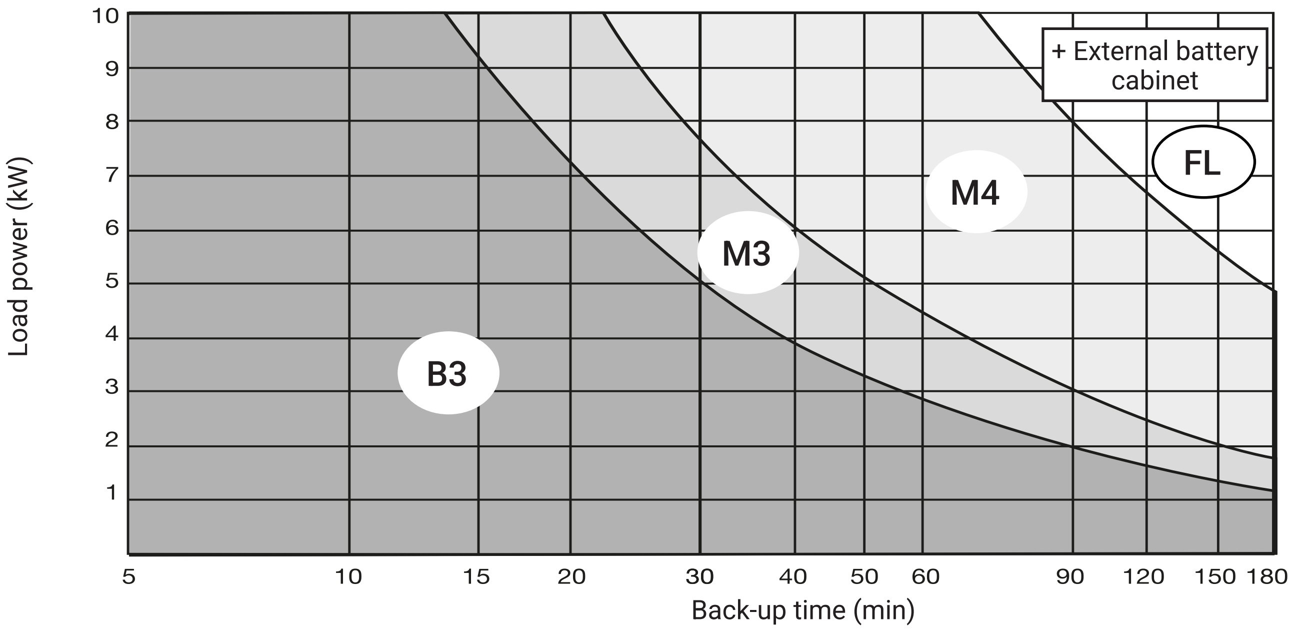
Batteries are installed on acid-proof trays and connected by means of polarised connectors to facilitate their maintenance.

To guarantee maximum back-up time availability and battery life, the MASTERYS BC+ 10-40 series is equipped with an EBS (Expert Battery System).

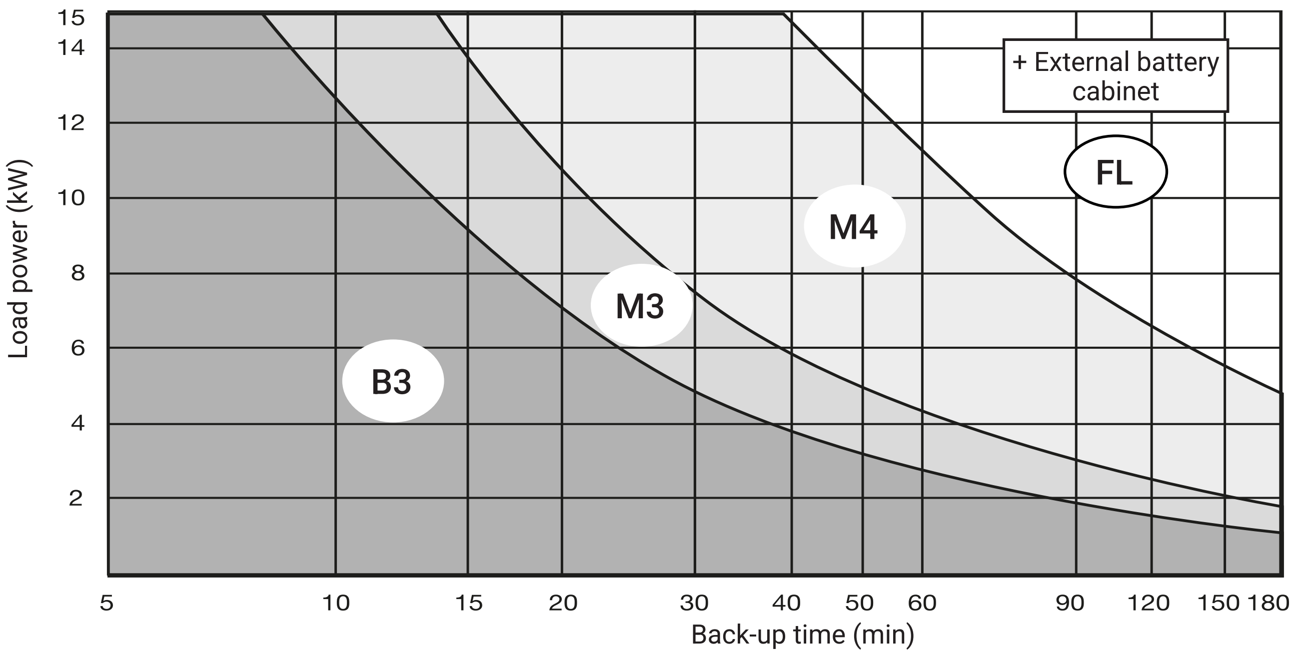
For external battery cabinets use model FL.

For internal batteries, use the following charts to select the model (B3, M3, S4 or M4) in relation to power and back-up time.

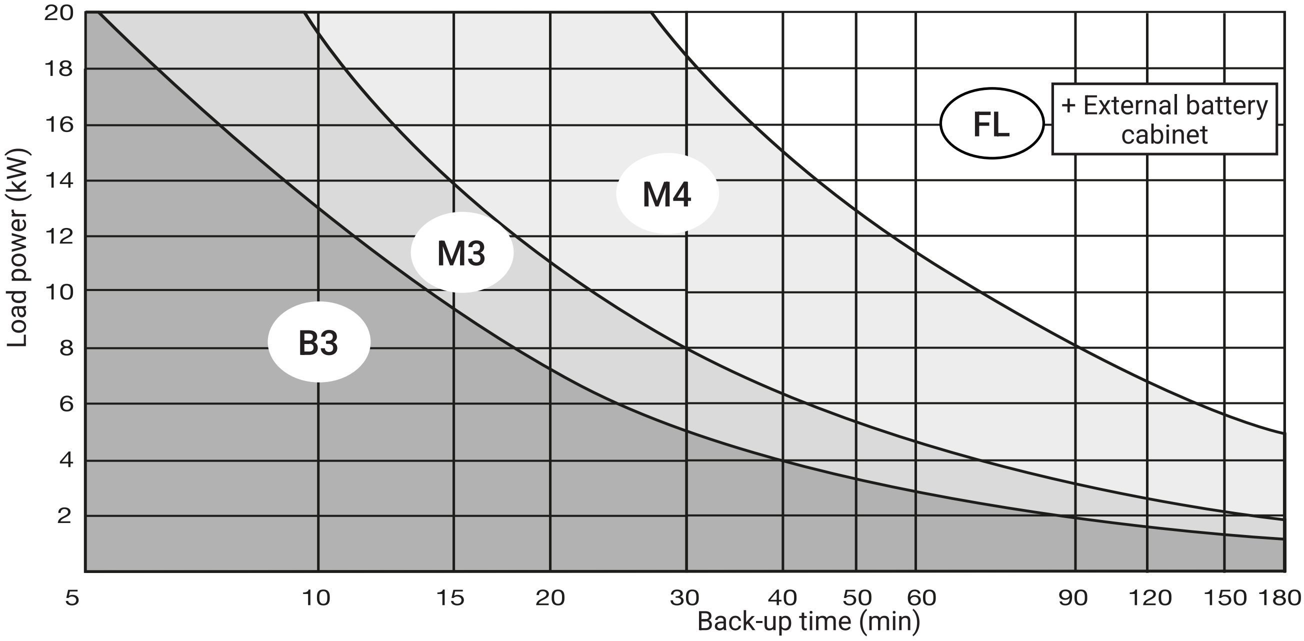
10 kVA



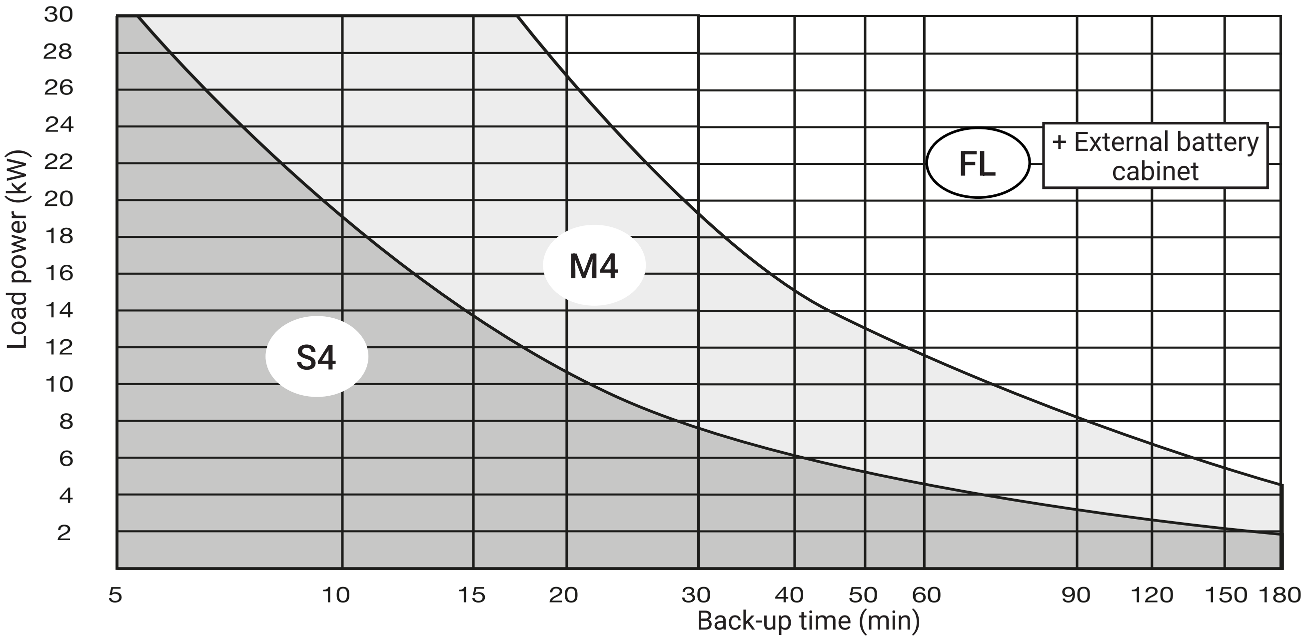
15 kVA



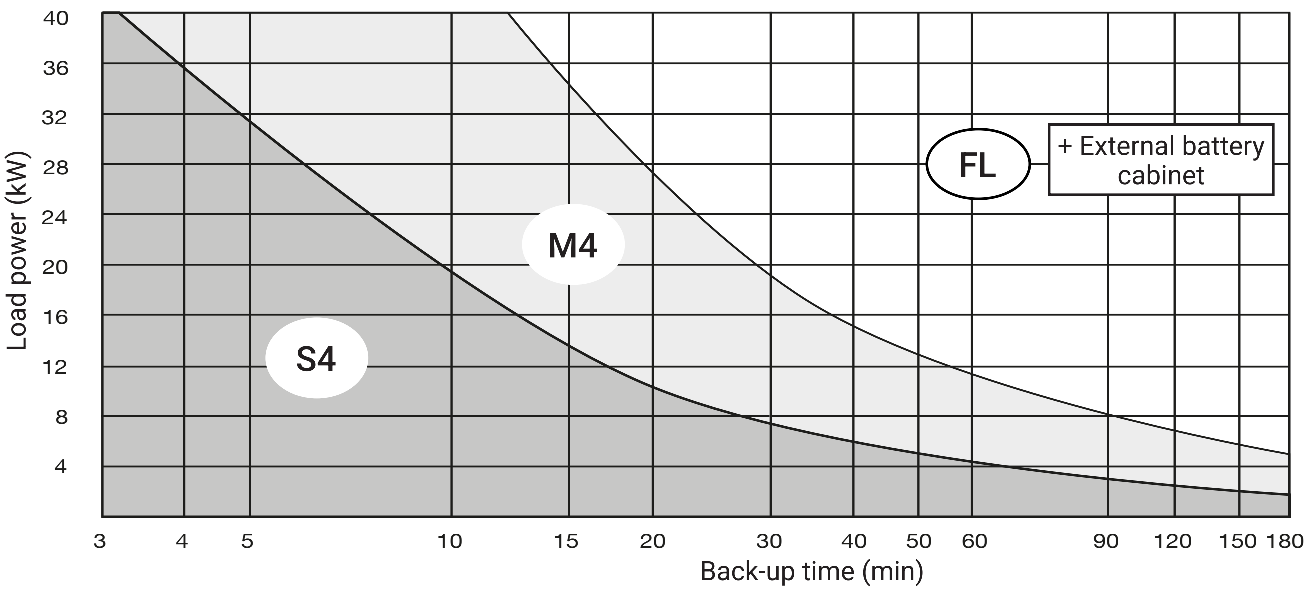
20 kVA



30 kVA



40 kVA



5. STANDARD FEATURES AND OPTIONS

AVAILABILITY	
●	Factory-installed option
○	Available as option (installation on site)
STD	Standard feature

Features	MASTERYS BC+					Notes
	B3 M3	S4 M4		FL		
	10-15-20 kVA	10-15-20 kVA	30-40 kVA	10-15-20 kVA	30-40 kVA	
BATTERY OPTION						
Additional charger		●○	●○	●○	●○	
COMMUNICATION OPTION						
Standard web pages	STD					
ACS card (Automatic Cross Synchronisation)		●○	●○	●○	●○	
ADC+SL card (Advanced Dry Contact + Serial Link)	○	○	○	○	○	
External temperature sensor	○	○	○	○	○	⚠ ❗ ADC+SL card
Remote touchscreen display	○	○	○	○	○	⚠ ❗ ADC+SL card
Modbus TCP interface card	○	○	○	○	○	
Net Vision card (professional WEB/SNMP interface for UPS monitoring)	○	○	○	○	○	
EMD (Environmental Monitoring Device: temperature, humidity, 2 dry contacts)	○	○	○	○	○	⚠ ❗ Net Vision card
ELECTRICAL OPTION						
Parallel card	●○	●○	●○	●○	●○	
External maintenance bypass	○	○	○	○	○	
External maintenance bypass width adapter kit				○	○	
Kit for TN-C / Neutral-Ground connection	○	○	○	○	○	
Internal Backfeed isolation device	●	●	●	●	●	
Kit For Common Mains	STD (3/3)	STD (3/3)	○	STD (3/3)	○	
Kit For Separate Mains	STD (3/1) ● (3/3)	STD (3/1) ● (3/3)	STD	STD (3/1) ● (3/3)	STD	
MECHANICAL OPTION						
Ramp for unloading UPS	○	○	○			
Kit for Front and Lateral Cover		○	○			
Kit for IP21	○	○	○			
Kit for Free Standing	(Tower Mounted)			○	○	
Kit for Top Mounted width adaptation	(Socomec Battery Cabinet)			○	○	
	(Non-Socomec Battery Cabinet)			○	○	

❗ Required option
🚫 Incompatible option

6. SPECIFICATIONS BC+ 10-20 KVA COMPACT

B3 M3

6.1. Installation parameters

INSTALLATION PARAMETERS								
Rated power (kVA)			10	15	20	10	15	20
Phase in/out			3/1			3/3		
Active power		kW	10	15	20	10	15	20
Rated/maximum rectifier input current (EN 62040-3)		A	16/21	23/30	31/39	16/21	23/30	31/39
Rated bypass input current		A	44	65	87	15	22	29
Inverter output current @ 230 V		A	44	65	87	15	22	29
Maximum air flow		m3/h	408	816		408	816	
Sound level		dBA	48	50		48	50	
Power Dissipation in nominal conditions (1)		W	604	841	1164	593	825	1142
		kcal/h	517	720	996	507	706	977
		BTU/h	2060	2869	3971	2023	2814	3895
Power Dissipation (max) in worst conditions (2)		W	684	900	1253	672	883	1230
		kcal/h	585	770	1072	575	755	1052
		BTU/h	2333	3070	4274	2292	3012	4196
Dimensions (with standard back-up time)	Width	mm	370					
	Depth	mm	770					
	Height	mm	1190/1375					
Single unit clearances	Operational	mm	Rear ≥ 200					
	Maintenance	mm	Front ≥ 1500; Top ≥ 800					
Weight, without batteries		kg	95	104	104	93	93	93
Weight, with batteries		kg	152/290	160/299	225/299	138/286	153/288	198/288

(1) Considering nominal input current (400 V, battery charged) and rated output active power.
(2) Considering maximum input current (low input voltage, battery recharged) and rated output active power.

6.2. Electrical characteristics

ELECTRICAL CHARACTERISTICS - INPUT						
Rated power (kVA)	10	15	20	10	15	20
Phase in/out	3/1			3/3		
Rated mains supply voltage	400 V 3ph + N					
Voltage tolerance	3Ph+N 400 V -15% +20% (up to -40% @70% of nominal load)					
Rated frequency	50/60 Hz (selectable)					
Frequency tolerance	40-70 Hz					
Power factor (input at full load and rated voltage)	≥ 0.99					
Total harmonic distortion (THDi)(3)	≤ 3%					
Max inrush current at start-up	< In (no overcurrent)					

(1) Measured with the UPS supplied with a voltage source of negligible distortion (input source THDv ≤ 1% - 50Hz).

ELECTRICAL CHARACTERISTICS - BYPASS						
Rated power (kVA)	10	15	20	10	15	20
Phase in/out	3/1			3/3		
Bypass frequency variation speed	1 Hz/s (settable up to 3 Hz/s)					
Bypass rated voltage	Nominal output voltage ±15%					
Bypass rated frequency	50/60 Hz (selectable)					
Bypass frequency tolerance	±2% (configurable from 1% to 8%)					

ELECTRICAL CHARACTERISTICS - INVERTER							
Rated power (kVA)		10	15	20	10	15	20
Phase in/out		3/1			3/3		
Rated output voltage (selectable)		220/230/240 V			380/400/415 V		
Output voltage tolerance		Static: ±1% Dynamic: VFI-SS-111					
Rated output frequency		50/60 Hz (selectable)					
Output frequency tolerance		±0.01% (on mains power failure)					
Load crest factor		≥ 2.7:1					
Voltage harmonic distortion		< 1% with linear load					
Overload tolerated by the inverter (kW)	10 min	12.5	18.8	25	12.5	18.8	25
	1 min	15	22.5	30	15	22.5	30

ELECTRICAL CHARACTERISTICS - EFFICIENCY						
Rated power (kVA)	10	15	20	10	15	20
Phase in/out	3/1			3/3		
Double conversion efficiency (normal mode) - full load	Up to 95%					
Efficiency in Eco-Mode	98%					

ELECTRICAL CHARACTERISTICS - ENVIRONMENT						
Rated power (kVA)	10	15	20	10	15	20
Phase in/out	3/1			3/3		
Storage temperatures	-5 to +50 °C (15 to 25 °C for better battery life)					
Working temperature	0 to +35 °C (15 to 25 °C for better battery life) Max +50 °C @ 40% Sn for a limited time					
Maximum relative humidity (non-condensing)	95%					
Maximum altitude without derating	1000 m (3300 ft)					
Degree of protection	IP20 (IP21 as option)					
Portability	ASTM D999-08, ASTM D-880, AFNOR NF H 00-042					
Colour	RAL 7016 front E150HVF					

ELECTRICAL CHARACTERISTICS - BATTERY							
Rated power (kVA)		10	15	20	10	15	20
Phase in/out		3/1			3/3		
Standard max. current	A	4					
Battery connection in parallel configuration		UPS work with distributed battery					

6.3. Recommended protections

RECOMMENDED PROTECTION DEVICES - RECTIFIER(1)						
Rated power (kVA)	10	15	20	10	15	20
Phase in/out	3/1			3/3		
C curve circuit breaker (A)	25	32	40	25	32	40
gG fuse (A)	25	32	40	25	32	40

RECOMMENDED PROTECTION DEVICES - GENERAL BYPASS(1)						
Rated power (kVA)	10	15	20	10	15	20
Phase in/out	3/1			3/3		
Max I^2t supported by the bypass (A^2s)	38920			4325		
Max Ipk supported by the Bypass (A)	2790			930		
C curve circuit breaker (A)	80	100	125	25	32	40
gG fuse (A)	63/80	80/100	100/125	20/25	25/32	32/40

RECOMMENDED PROTECTION DEVICES - INPUT RESIDUAL CURRENT CIRCUIT BREAKER(2)						
Rated power (kVA)	10	15	20	10	15	20
Phase in/out	3/1			3/3		
Input residual current circuit breaker	0.5 A Selective					

RECOMMENDED PROTECTION DEVICES - OUTPUT(3)							
Rated power (kVA)		10	15	20	10	15	20
Phase in/out		3/1			3/3		
Short-circuit inverter current (A) (when AUX MAINS is not present)	0 to 40 ms	120	180	240	40	60	80
	40 to 100 ms	97	146	195	32	48	65
C curve circuit breaker(3) (A)		8	10	16	3	4	6
B curve circuit breaker(3) (A)		16	25	32	6	8	10

CABLES - MAXIMUM CABLE SECTION						
Rated power (kVA)	10	15	20	10	15	20
Phase in/out	3/1			3/3		
Rectifier terminals	25 mm^2					
Bypass terminals	25 mm^2					
Output terminals	25 mm^2					

(1) Rectifier protection should only be considered in the event of separate inputs. The bypass protection is given by recommendation. When the bypass and rectifier inputs are combined (common input), the general input protection rating must be whichever is the highest (bypass or rectifier).
(2) Must be selective with residual current circuit breakers downstream of the UPS connected to the UPS output. If the bypass network is separate from the rectifier circuit, or in the event of parallel UPS configurations, use a single residual current circuit breaker upstream of the UPS.
(3) Selectivity of distribution after the UPS with inverter short-circuit current (short-circuit with AUX MAINS not present). The rating of the protection can be increased by “n” times downstream a parallel UPS system, with “n” equal to the number of parallel modules.

7. SPECIFICATIONS1 BC+ 10-40 KVA

S4 M4

7.1. Installation parameters

INSTALLATION PARAMETERS										
Rated power (kVA)			10	15	20	10	15	20	30	40
Phase in/out			3/1			3/3				
Active power		kW	10	15	20	10	15	20	30	40
Rated/maximum rectifier input current (EN 62040-3)		A	15/22	23/30	31/39	15/22	23/30	31/39	46/55	62/73
Rated bypass input current		A	48	72	96	16	24	32	48	64
Inverter output current @ 230 V		A	43	65	87	14	22	29	43	58
Maximum air flow		m^3/h	240							360
Sound level		dBA	50							58
Power Dissipation in nominal conditions (1)		W	500	770	1050	500	770	1050	1600	2330
		kcal/h	430	662	903	430	662	903	1427	2003
		BTU/h	1706	2627	3583	1706	2627	3583	5664	7950
Power Dissipation (max) in worst conditions (2)		W	610	890	1220	610	890	1220	1780	2780
		kcal/h	524	765	1049	524	765	1049	1530	2390
		BTU/h	2081	3037	4163	2081	3037	4163	6074	9485
Dimensions (with standard back-up time)	Width	mm	444							
	Depth	mm	800							
	Height	mm	1400						800 / 1400	
Single unit Clearances	Operational	mm	Rear ≥ 200; Lateral 0							
	Maintenance	mm	Front ≥ 1500; Top ≥ 800							
Weight, with batteries		kg	430 / 624						333 / 624	339 / 630

(1) Considering nominal input current (400 V, battery charged) and rated output active power.
(2) Considering maximum input current (low input voltage) and rated output active power.

7.2. Electrical characteristics

ELECTRICAL CHARACTERISTICS - INPUT								
Rated power (kVA)	10	15	20	10	15	20	30	40
Phase in/out	3/1			3/3				
Rated mains supply voltage	400 V 3ph + N							
Voltage tolerance	3Ph+N 400 V -15% +20% (up to -40% @70% of nominal load)							
Rated frequency 50/60 Hz = nominal frequency	from 40 Hz to 70 Hz							
Frequency tolerance	±10%							
Power factor (input at full load and rated voltage)	≥ 0.99							
Total harmonic distortion (THDi)	≤ 4%	≤ 3%					≤ 2.5%	≤ 2%
Max inrush current at start-up	< In (no overcurrent)							
Power walk-in (from battery to normal mode)	fixed delay of 15 s in switching							

ELECTRICAL CHARACTERISTICS - BYPASS								
Rated power (kVA)	10	15	20	10	15	20	30	40
Phase in/out	3/1			3/3				
Bypass frequency variation speed	1 Hz/s (settable up to 6 Hz/s)							
Bypass rated voltage	Nominal output voltage ±15%							
Bypass rated frequency	50/60 Hz (selectable)							
Bypass frequency tolerance	±8% in operation with generator							

ELECTRICAL CHARACTERISTICS - INVERTER									
Rated power (kVA)		10	15	20	10	15	20	30	40
Phase in/out		3/1			3/3				
Rated output voltage phase neutral (selectable)		208/220/230/240 V			208/220/230/240 V				
Output voltage tolerance		Static: ±1% Dynamic: VFI-SS-11							
Rated output frequency		50/60 Hz (selectable)							
Output frequency tolerance		±0.01% (on mains power failure)							
Load crest factor		≥ 2.7							
Voltage harmonic distortion		± 1% with linear load							
Overload tolerated by the inverter kW	10 min	12.5	18.7	25	12.5	18.7	25	37.5	56.2
	1 min	15	22.5	30	15	22.5	30	45	60

ELECTRICAL CHARACTERISTICS - EFFICIENCY								
Rated power (kVA)	10	15	20	10	15	20	30	40
Phase in/out	3/1			3/3				
Double conversion efficiency (normal mode) - full load	Up to 95%							
Efficiency in Eco-Mode	99%							

ELECTRICAL CHARACTERISTICS - ENVIRONMENT								
Rated power (kVA)	10	15	20	10	15	20	30	40
Phase in/out	3/1			3/3				
Storage temperatures	-5 to +50 °C (15 to 25 °C for better battery life)							
Working temperature	0 to +35 °C (1) (15 to 25 °C for better battery life) Max +45 °C @ 70% Sn for a limited time							
Maximum relative humidity (non-condensing)	95%							
Maximum altitude without derating	1000 m (3300 ft)							
Degree of protection	IP20 (IP21 as option)							
Portability	ASTM D999-08, ASTM D-880, AFNOR NF H 00-042							
Colour	RAL 7016 front E150HVF							

ELECTRICAL CHARACTERISTICS - BATTERY									
Rated power (kVA)		10	15	20	10	15	20	30	40
Phase in/out		3/1			3/3				
Standard max. current	A	5							
Battery connection in parallel configuration		UPS work with distributed battery							

(1) Condition apply.

7.3. Recommended protections

RECOMMENDED PROTECTION DEVICES - RECTIFIER(1)								
Rated power (kVA)	10	15	20	10	15	20	30	40
Phase in/out	3/1			3/3				
C curve circuit breaker (A)	25	32	40	25	32	40	63	80
gG fuse (A)	25	32	40	25	32	40	63	80

RECOMMENDED PROTECTION DEVICES - GENERAL BYPASS(1)								
Rated power (kVA)	10	15	20	10	15	20	30	40
Phase in/out	3/1			3/3				
Max I^2t supported by the bypass (A^2s)	45000			8000			15000	
Max Ipk supported by the Bypass	2120			1200			1700	
C curve circuit breaker (A)	63	100	125	25	32	40	63	80
gG fuse (A)	63	100	125	25	32	40	63	80

RECOMMENDED PROTECTION DEVICES - INPUT RESIDUAL CURRENT CIRCUIT BREAKER(2)								
Rated power (kVA)	10	15	20	10	15	20	30	40
Phase in/out	3/1			3/3				
Input residual current circuit breaker	0.5 A Selective							

RECOMMENDED PROTECTION DEVICES - OUTPUT(3)									
Rated power (kVA)		10	15	20	10	15	20	30	40
Phase in/out		3/1			3/3				
Short-circuit inverter current (A) (when AUX MAINS is not present)	de 0 à 40 ms	120	177	237	40	59	79	117	156
	de 40 à 100 ms	99	147	198	33	49	66	98	130
C curve circuit breaker(3) (A)		≤ 8	≤ 10	≤ 16	≤ 3	≤ 4	≤ 6	≤ 8	≤ 10
B curve circuit breaker(3) (A)		≤ 16	≤ 25	≤ 32	≤ 6	≤ 8	≤ 10	≤ 16	≤ 20

CABLES - MAXIMUM CABLE SECTION								
Rated power (kVA)	10	15	20	10	15	20	30	40
Phase in/out	3/1			3/3				
Rectifier terminals	25	25	25	25	25	25	50	50
Bypass terminals	50	50	50	25	25	25	50	50
Output terminals	50	50	50	25	25	25	50	50

(1) Rectifier protection should only be considered in the event of separate inputs. The bypass protection is given by recommendation. When the bypass and rectifier inputs are combined (common input), the general input protection rating must be whichever is the highest (bypass or rectifier).
(2) Must be selective with residual current circuit breakers downstream of the UPS connected to the UPS output. If the bypass network is separate from the rectifier circuit, or in the event of parallel UPS configurations, use a single residual current circuit breaker upstream of the UPS.
(3) Selectivity of distribution after the UPS with inverter short-circuit current (short-circuit with AUX MAINS not present). The rating of the protection can be increased by “n” times downstream a parallel UPS system, with “n” equal to the number of parallel units.

socomec
Innovative Power Solutions

8. SPECIFICATIONS BC+ FLEX 10-40 KVA

FL

8.1. Installation parameters

INSTALLATION PARAMETERS										
Rated power (kVA)			10	15	20	10	15	20	30	40
Phase in/out			3/1			3/3				
Active power		kW	10	15	20	10	15	20	30	40
Rated/maximum rectifier input current (EN 62040-3)		A	15/22	23/30	31/39	15/22	23/30	31/39	46/55	62/73
Rated bypass input current		A	48	72	96	16	24	32	48	64
Inverter output current @ 230 V		A	43	65	87	14	22	29	43	58
Maximum air flow		m^3/h	240							360
Sound level		dBA	50							58
Power Dissipation in nominal conditions (1)		W	500	770	1050	500	770	1050	1600	2100
		kcal/h	430	662	903	430	662	903	1427	2003
		BTU/h	1706	2627	3583	1706	2627	3583	5664	7950
Power Dissipation (max) in worst conditions (2)		W	610	890	1220	610	890	1220	1780	2780
		kcal/h	524	765	1049	524	765	1049	1530	2390
		BTU/h	2081	3037	4163	2081	3037	4163	6074	9485
Dimensions (with standard back-up time)	Width	mm	442							
	Depth	mm	830							
	Height	mm	305							
Single unit Clearances	Operational	mm	Rear ≥ 200; Lateral 0							
	Maintenance	mm	Front ≥ 1500 Top ≥ 800							
Weight, without batteries		kg	71							77

(1) Considering nominal input current (400 V, battery charged) and rated output active power.
(2) Considering maximum input current (low input voltage) and rated output active power.

8.2. Electrical characteristics

ELECTRICAL CHARACTERISTICS - INPUT								
Rated power (kVA)	10	15	20	10	15	20	30	40
Phase in/out	3/1			3/3				
Rated mains supply voltage	400 V 3ph + N							
Voltage tolerance	3Ph+N 400 V -15% +20% (up to -40% @70% of nominal load)							
Rated frequency 50/60 Hz = nominal frequency	from 40 Hz to 70 Hz							
Frequency tolerance	±10%							
Power factor (input at full load and rated voltage)	≥ 0.99							
Total harmonic distortion (THDi)	≤ 4%	≤ 3%					≤ 2.5%	≤ 2%
Max inrush current at start-up	< In (no overcurrent)							
Power walk-in(from battery to normal mode)	4 seconds (settable parameters)							

ELECTRICAL CHARACTERISTICS - BYPASS								
Rated power (kVA)	10	15	20	10	15	20	30	40
Phase in/out	3/1			3/3				
Bypass frequency variation speed	1 Hz/s (settable up to 3 Hz/s)							
Bypass rated voltage	Nominal output voltage ±15%							
Bypass rated frequency	50/60 Hz (selectable)							
Bypass frequency tolerance	±8% in operation with generator							

ELECTRICAL CHARACTERISTICS - INVERTER									
Rated power (kVA)		10	15	20	10	15	20	30	40
Phase in/out		3/1			3/3				
Rated output voltage (selectable)		208/220/230/240 V			208/220/230/240 V				
Output voltage tolerance		Static: ±1% Dynamic: VFI-SS-11							
Rated output frequency		50/60 Hz (selectable)							
Output frequency tolerance		±0.01% (on mains power failure)							
Load crest factor		≥ 2.7							
Voltage harmonic distortion		< 1% with linear load							
Overload tolerated by the inverter kW	10 min	12.5	18.7	25	12.5	18.7	25	37.5	50
	1 min	15	22.5	30	15	22.5	30	45	60

ELECTRICAL CHARACTERISTICS - EFFICIENCY								
Rated power (kVA)	10	15	20	10	15	20	30	40
Phase in/out	3/1			3/3				
Double conversion efficiency (normal mode) - full load	Up to 95%							
Efficiency in Eco-Mode	99%							

ELECTRICAL CHARACTERISTICS - ENVIRONMENT								
Rated power (kVA)	10	15	20	10	15	20	30	40
Phase in/out	3/1			3/3				
Storage temperatures	-5 to +50 °C (15 to 25 °C for better battery life)							
Working temperature	0 to +35 °C (1) (15 to 25 °C for better battery life) Max +45°C @ 70% Sn for a limited time							
Maximum relative humidity (non-condensing)	95%							
Maximum altitude without derating	1000 m (3300 ft)							
Degree of protection	IP20 (IP21 as option)							
Portability	ASTM D999-08, ASTM D-880, AFNOR NF H 00-042							
Colour	RAL 7016 front E150HVF							

ELECTRICAL CHARACTERISTICS - BATTERY									
Rated power (kVA)		10	15	20	10	15	20	30	40
Phase in/out		3/1			3/3				
Standard max. current	A	5							
Battery connection in parallel configuration		UPS work with distributed battery							

(1) Condition apply.

socomec
Innovative Power Solutions

8.3. Recommended protections

RECOMMENDED PROTECTION DEVICES - RECTIFIER(1)								
Rated power (kVA)	10	15	20	10	15	20	30	40
Phase in/out	3/1			3/3				
C curve circuit breaker (A)	25	32	40	25	32	40	63	80
gG fuse (A)	25	32	40	25	32	40	63	80

RECOMMENDED PROTECTION DEVICES - GENERAL BYPASS(1)								
Rated power (kVA)	10	15	20	10	15	20	30	40
Phase in/out	3/1			3/3				
Max I^2t supported by the bypass (A^2s)	45000			8000			15000	
Max Ipk supported by the Bypass	2120			1200			1700	
C curve circuit breaker (A)	63	100	125	25	32	40	63	80
gG fuse (A)	63	100	125	25	32	40	63	80

RECOMMENDED PROTECTION DEVICES - INPUT RESIDUAL CURRENT CIRCUIT BREAKER(2)								
Rated power (kVA)	10	15	20	10	15	20	30	40
Phase in/out	3/1			3/3				
Input residual current circuit breaker	0.5 A Selective							

RECOMMENDED PROTECTION DEVICES - OUTPUT(3)									
Rated power (kVA)		10	15	20	10	15	20	30	40
Phase in/out		3/1			3/3				
Short-circuit inverter current (A) (when AUX MAINS is not present)	0 to 40 ms	120	177	237	40	59	79	117	156
	40 to 100 ms	99	147	198	33	49	66	98	130
C curve circuit breaker(3) (A)		≤ 8	≤ 10	≤ 16	≤ 3	≤ 4	≤ 6	≤ 8	≤ 10
B curve circuit breaker(3) (A)		≤ 16	≤ 25	≤ 32	≤ 6	≤ 8	≤ 10	≤ 16	≤ 20

CABLES - MAXIMUM CABLE SECTION								
Rated power (kVA)	10	15	20	10	15	20	30	40
Phase in/out	3/1			3/3				
Rectifier terminals	25	25	25	25	25	25	50	50
Bypass terminals	50	50	50	25	25	25	50	50
Battery terminals	25	25	25	25	25	25	50	50
Output terminals	50	50	50	25	25	25	50	50

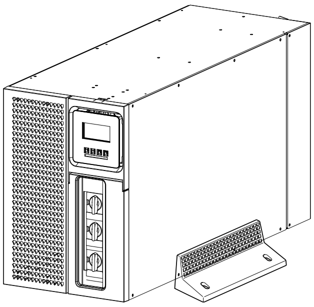
(1) Rectifier protection should only be considered in the event of separate inputs. The bypass protection is given by recommendation. When the bypass and rectifier inputs are combined (common input), the general input protection rating must be whichever is the highest (bypass or rectifier).
(2) Must be selective with residual current circuit breakers downstream of the UPS connected to the UPS output. If the bypass network is separate from the rectifier circuit, or in the event of parallel UPS configurations, use a single residual current circuit breaker upstream of the UPS.
(3) Selectivity of distribution after the UPS with inverter short-circuit current (short-circuit with AUX MAINS not present). The rating of the protection can be increased by "n" times downstream a parallel UPS system, with "n" equal to the number of parallel modules.

9. FLEX UPS

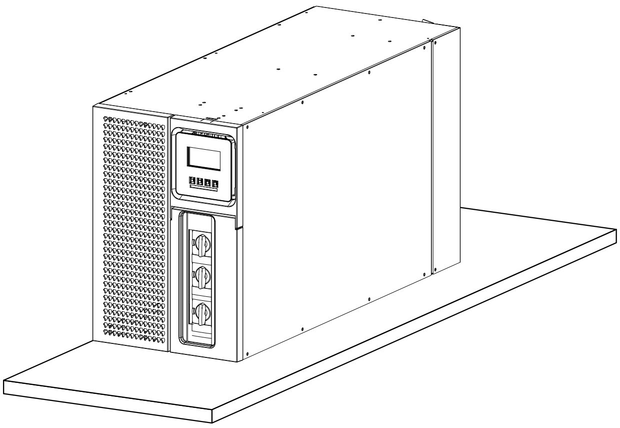
Choose the perfect configuration at the last minute - on-site - with Flex-UPS, the first device that adapts to the environment rather than

requiring the environment to adapt to the device. Three positioning choices are available depending upon the technical room space and the

type of battery frame. Flex-UPS delivers a unique freedom to get building UPS and battery solution.

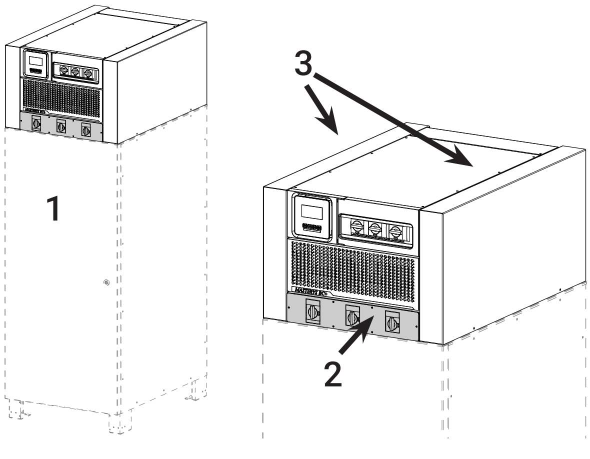


Free standing configuration:
the unit can be installed in vertical position and kept in place with lateral support.



Wall mounted configuration:
Masterys BC+ Flex can be installed vertically or horizontally on a shelf; the display can be rotated accordingly

Solution compatible with existing shelves



Installation on top of battery cabinets:
The UPS can be installed on top of battery cabinet (Socomec or not) selecting the compatible kit.

The UPS is supplied as stand alone, according to the needs you can add:

1: battery cabinets
2: external manual bypass
3: lateral covers

10. REFERENCE STANDARDS AND DIRECTIVES

10.1. Overview

The construction of the equipment and choice of materials and components comply with all laws, decrees, directives and standards currently in force.

In particular, the equipment is fully compliant with all European Directives concerning CE marking.

LVD 2014/35/EU

Directive of the European Parliament and of the council of 26 February 2014 on the harmonisation of the laws of the Member States relating to the making available on the market of electrical equipment designed for use within certain voltage limits.

EMC 2014/30/EU

Directive of the European Parliament and of the council of 26 February 2014 on the harmonisation of the laws of the Member States relating to electromagnetic compatibility.

RoHS 2011/65/EU

Directive 2011/65 of the European parliament and of the council of 8 June 2011 on the restriction of the use of certain hazardous substances in electrical and electronic equipment

10.2. Standards

10.2.1. Safety

EN 62040-1	Uninterruptible Power System (UPS) - Part 1: General and safety requirements
IEC 62040-1	Uninterruptible Power System (UPS) - Part 1: Safety requirements (CB scheme by TÜV)

10.2.2. Electromagnetic compatibility

EN 62040-2	Uninterruptible Power System (UPS) - Part 2: Electromagnetic compatibility (EMC) requirements (tested and verified by third party)
IEC 62040-2	Uninterruptible Power System (UPS) - Part 2: Electromagnetic compatibility (EMC) requirements

10.2.3. TEST and performance

EN 62040-3	Uninterruptible Power System (UPS) - Part 3: Method of specifying the performance and test requirements

10.2.4. ENVIRONMENTAL

IEC 62040-4	Uninterruptible Power System (UPS) - Part 4: Enviromental aspects - Requirements and reporting

10.3. SYSTEM AND INSTALLATION GUIDELINES

When carrying out electrical installation, all the above standards must be observed. All national and international standards (e.g IEC60364) applicable to the specific electrical installation including batteries must be observed. For further information refer to 'Technical specifications' chapter in the user manual.

EU CODE OF CONDUCT ELITE UPS Efficiency Commitment

ELITE UPS: a mark of efficiency

Socomec, as CEMEP UPS manufacturer member, has signed a Code of Conduct put forward by the Joint Research Centre of the European Commission (JRC), to ensure the protection of critical applications and processes ensuring 24/7 continuous high quality supply. The JRC commits to mitigating energy losses and gas emissions caused by UPS equipment, therefore maximising UPS efficiency.

TECHNICAL GUIDE

EN

MASTERYS BC+

60 to 160 kVA

PRIME

Trustworthy power

RoHS COMPLIANT

3 LEVEL TECHNOLOGY

95% EFFICIENCY

Safety tested · Production monitored · TÜV SÜD · tuv-sud.com/ps-cert

Socomec Resource Center
To download, brochures, catalogues and technical manuals

socomec
Innovative Power Solutions

1. OBJECTIVES

The aim of these specifications is to provide:

- The information required to choose the right uninterruptible power supply for a specific application.
- The information required to prepare the system and installation site.

The specifications are intended for:

- Installation engineers.
- Design engineers.
- Engineering consultants.

2. INSTALLATION REQUIREMENTS AND PROTECTION

Connection to the mains power supply and to the load(s) must be made using cables of suitable size, in accordance with current standards. If not already present, an electrical distribution panel which can isolate the network upstream of the UPS must be installed. This electrical distribution panel must be equipped with a protection device (or two, if there is a separate bypass line) of an appropriate rating for the power drawn at full load.

For detailed information, see the installation and operating manual.

3. ARCHITECTURE

3.1. Range

MASTERYS BC+ is a full range of high performing UPS system designed to:

- ensure 24/7/365 availability and business continuity for mission critical applications
- avoid data losses and downtime of company operations,
- reduce the electrical infrastructure's total cost of ownership,
- adopt a sustainable development approach.

MASTERYS BC+					
Rated power (kVA)	60	80	100	120	160
MASTERYS BC+ 3/3	•	•	•	•	•
Matrix table for model and kVA power rating					

MASTERYS BC+ has been specifically designed to meet the demands of loads in specific application contexts, in order to optimise the features of the product and facilitate its integration within the system.

4. FLEXIBILITY

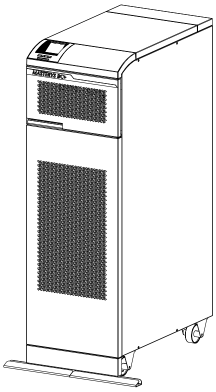
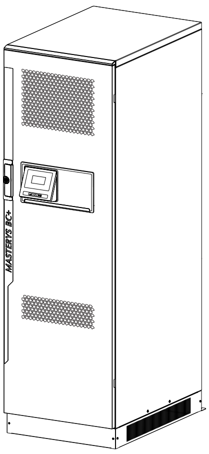
4.1. Power ratings from 60 to 160 kVA

The equipment has been designed with a minimum direct and indirect footprint (the actual space occupied by the unit and the space required around it for maintenance, ventilation and access to the operating mechanisms and communication devices).

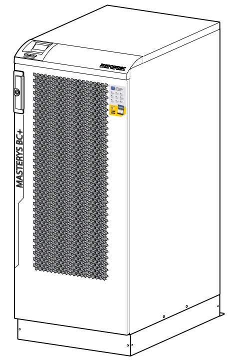
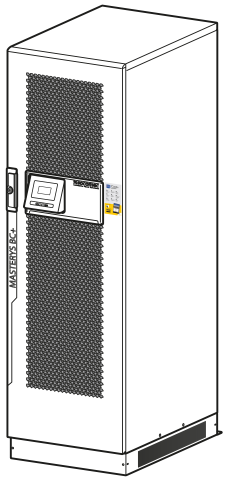
The detailed design also provides easy access for maintenance and installation.

All of the control mechanisms are located on the front at the bottom and communication interfaces are on the inside of the door.

The air inlet is on the front, with outflow from the rear side; this means other equipment or external battery enclosures can be placed alongside the UPS unit.

DIMENSIONS			
Masterys BC+	Width (W) [mm]	Depth (D) [mm]	Height (H) [mm]
MASTERYS BC+ 60 to 80 kVA 	444	800	1400
MASTERYS BC+ 60 to 80 kVA with internal battery 	600	855	1930

socomec
Innovative Power Solutions

DIMENSIONS			
Masterys BC+	Width (W) [mm]	Depth (D) [mm]	Height (H) [mm]
MASTERYS BC+ 100 to 120 kVA 	600	855	1400
MASTERYS BC4 160 kVA 	600	855	1930

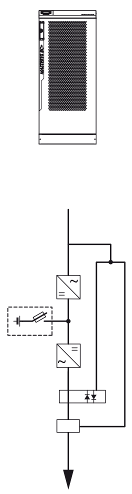
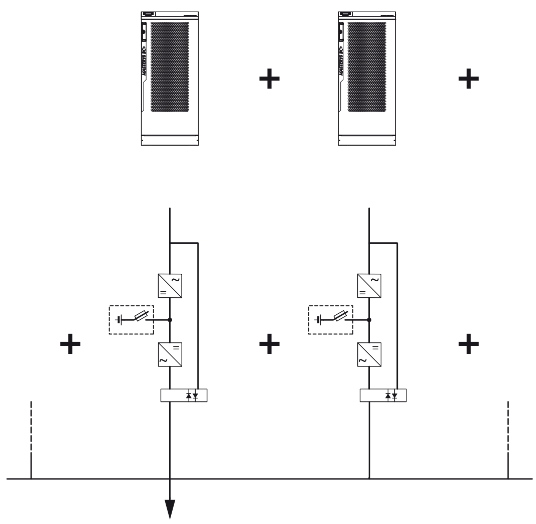
4.2. Flexible back-up time

Different extended back-up times are possible by using external battery cabinets, optionally with a enhanced battery charger

Selection of the back-up time is flexible thanks to the wide range of battery string voltages.

4.3. Horizontal parallel

MASTERYS BC+ offers 2 UPS configurations in the same range.

	
Single unit configuration	Parallel UPS

5. STANDARD FEATURES AND OPTIONS

AVAILABILITY	
●	Factory-installed option
○	Available as option (installation on site)
STD	Standard feature

MASTERYS BC+	60-80 KVA		100-120 KVA	160 KVA	NOTES
	EXTERNAL BATTERY	INTERNAL BATTERY			
BATTERY OPTION					
Additional charger	-	●○	●○	●○	⚠ ⃠ Kit for Rectifier Neutral creation
COMMUNICATION OPTION					
ACS card (Automatic Cross Synchronisation)	●○	●○	●○	●○	
ADC+SL card (Advanced Dry Contact + Serial Link)	○	○	○	○	
External temperature sensor	○	○	○	○	⚠ ❗ ADC+SL card
Remote touchscreen display	○	○	○	○	⚠ ❗ ADC+SL card
Modbus TCP interface card	○	○	○	○	
Net Vision card (professional WEB/SNMP interface for UPS monitoring)	○	○	○	○	
EMD (Environmental Monitoring Device: temperature, humidity, 2 dry contacts)	○	○	○	○	⚠ ❗ Net Vision card
ELECTRICAL OPTION					
Parallel card	●○	●○	●○	●○	
Kit for Parallel configuration (C7)	-	-	●○	●○	⚠ ❗ Parallel card
External isolation Transformer	-	-	○	-	
IMD (insulation monitoring device)	-	-	○	-	⚠ ❗ External isolation Transformer
External maintenance bypass	○	○	○	-	
Kit for TN-C / Neutral-Ground connection	○	○	●○	●○	⚠ ⃠ Kit for Rectifier Neutral creation
Internal Backfeed isolation device	●	●	●	●	
Kit For Common Mains	○	○	○	○	
Kit for Rectifier Neutral creation	●	●	●	●	⚠ ⃠ Kit for TN-C / Neutral-Ground connection ⃠ Kit For Common Mains ⃠ Additional charger
MECHANICAL OPTION					
Anti vermin protection	●	STD	●	●	
Kit for IP21	○	○	○	○	
Kit for Lateral Cover	○	○	-	-	

❗ Required option
⃠ Incompatible option

socomec
Innovative Power Solutions

6. SPECIFICATIONS

6.1. Installation parameters

INSTALLATION PARAMENTERS							
		Rated power (kVA)	60	80	100	120	160
		Phase in/out	3/3				
Active power		kW	60	72	90	108	144
Rated/maximum rectifier input current (EN 62040-3)		A	93/110	111/128	138/165	166/201	222/268
Rated bypass input current (1)		A	96	128	160	191	255
Inverter output current @ 400 V Pn		A	87	115	145	174	232
Recommended air flow capacity		m^3/h	480	600	720	960	1320
Acoustic noise @ 70% Pn		dBA	53 ext. batt. / 55 int. batt.		53		57
Power dissipation in nominal conditions (2)		W	3120	3800	4700	5600	7500
		kcal/h	2683	3267	4041	4815	6449
		BTU/h	10646	12965	16037	19108	25591
Power dissipation (max) in the worst conditions (3)		W	3540	4300	5200	6200	8300
		kcal/h	3044	3697	4471	5331	7137
		BTU/h	12079	14671	17743	21155	28321
Dimensions (for 60-80 Models: external/internal batteries)	Width	mm	444 / 600		600		
	Depth	mm	800 / 855		855		
	Height	mm	1400 / 1930		1400		1930
Single unit Clearances	Operational	mm	Rear ≥ 200				
	Maintenance	mm	Front ≥ 1500; Top ≥ 800				
Weight		kg	151	157	220	232	333
Weight with internal battery		kg	290-814		-		

(1) Considering nominal bypass current calculated @ 400 V, considering a continuos overload of 110%.
(2) Considering nominal input current (400 V, battery charged) and rated output active power.
(3) Considering maximum input current (low input voltage, battery charged) and rated output active power.

6.2. Electrical characteristics

ELECTRICAL CHARACTERISTICS - RECTIFIER INPUT					
Rated power (kVA)	60	80	100	120	160
Rated mains supply voltage	400 V 3ph + N				
Voltage tolerance	340 to 480 V (-15 +20%)				
Voltage tolerance at derated load	up to 240 V @ 70% of nominal active load				
Rated frequency	from 40 Hz to 70 Hz				
Frequency tolerance	±10%				
Power factor (at full load and rated voltage)	≥ 0.99				
Total harmonic distortion (THDi)	≤ 2%				
Max inrush current at start-up	< In				
Power walk-in (from battery to normal mode)	4 second (settable parameters)				

ELECTRICAL CHARACTERISTICS - BYPASS						
	Rated power (kVA)	60	80	100	120	160
Bypass frequency variation speed		1 Hz/s (settable up to 3 Hz/s)				
Bypass rated voltage		Nominal output voltage ±15% (selectable ±5-±20%)				
Bypass rated frequency		50/60 Hz (selectable)				
Bypass frequency tolerance		±2% (configurable from ±1% to ±10%)				
Bypass current overload (A)	10 min	109	145	181	218	290
	1 min	130	174	217	261	348

ELECTRICAL CHARACTERISTICS -INVERTER						
	Rated power (kVA)	60	80	100	120	160
Rated output voltage		360/380/400/415 V (selectable)				
Output voltage tolerance		Static: ±1% Dynamic: VFI-SS-11 (EN 62040-3 compliant)				
Rated output frequency		50/60 Hz (selectable)				
Output frequency tolerance		±0.01% on mains power failure				
Load crest factor		≥ 2.7				
Voltage total harmonic distortion THDV		< 1% with linear load				
Inverter overload (kW)	10 min	75	90	112.5	135	180
	5 min	79.2	95	118.8	142.6	190
	1 min	90	108	135	162	216
Short-circuit inverter current (A) (when AUX MAINS is not present)	0 to 40 ms	234	273	351	429	574
	40 to 100 ms	196	228	294	358	478

ELECTRICAL CHARACTERISTICS - EFFICIENCY						
	Rated power (kVA)	60	80	100	120	160
Double conversion efficiency		up to 95%				
EcoMode efficiency		99.4%				

ELECTRICAL CHARACTERISTICS - ENVIRONMENT						
	Rated power (kVA)	60	80	100	120	160
Storage temperatures		-5 to +50 °C (15 to 25 °C for better battery life)				
Working temperature		0 to +40 °C	0 to +40 °C (1) (15 to 25 °C for better battery life) Max +45°C @ 70% Sn for a limited time			
Maximum relative humidity (non-condensing)		95%				
Maximum altitude without derating		1000 m (3300 ft)				
Degree of protection		IP20 (IP21 as option)				
Colour		RAL 7016 (door metallized grey E150HVF)				

ELECTRICAL CHARACTERISTICS - BATTERY						
	Rated power (kVA)	60	80	100	120	160
Standard max. recharge current	A	10		16		32
Battery connection in parallel configuration		UPS work with distributed battery				

(1) Condition apply.

6.3. Recommended protections

RECOMMENDED PROTECTION DEVICES - RECTIFIER (1)						
Rated power (kVA)		60	80	100	120	160
C curve circuit breake	A	125	160	250	250	315
gG fuse	A	125	160	250	250	315

RECOMMENDED PROTECTION DEVICES - GENERAL BYPASS (2)						
Rated power (kVA)		60	80	100	120	160
Maximum I^2t supported by the bypass	A^2s	120000				400000
Max Ipk supported by the Bypass	A	5000				9000
Conditional short circuit current rating (Icc)	kA	10				
C curve circuit breaker	A	125	160	250		400
gG fuse	A	125	160	250		400

RECOMMENDED PROTECTION DEVICES - INPUT RESIDUAL CURRENT CIRCUIT (RCD) BREAKER (3)						
Rated power (kVA)		60	80	100	120	160
Input residual current circuit breaker	A	0.5 A Selective type B				

RECOMMENDED PROTECTION DEVICES - OUTPUT (4)						
Rated power (kVA)		60	80	100	120	160
C curve circuit breaker (3)	A	≤ 16	≤ 20	≤ 25	≤ 32	≤ 40
B curve circuit breaker (3)	A	≤ 32	≤ 40	≤ 50	≤ 63	≤ 80

<table>
<tr><th colspan="6">CABLES - MAXIMUM CABLE SECTION (5)</th></tr>
<tr><td>Rated power (kVA)</td><td>60 - 80
External battery</td><td>60 - 80
Internal battery</td><td>100</td><td>120</td><td>160</td></tr>
<tr><td>Rectifier terminals (4x)</td><td rowspan="3">50 mm^2</td><td rowspan="4">bus bar with holes ø 8 mm
70 mm^2
(flexible cable and rigid cable)</td><td colspan="2" rowspan="4">bus bar with holes ø 10 mm
2x120 mm^2 (flexible cable and rigid cable)</td><td rowspan="4">bus bar with holes ø 10 mm
2x150 mm^2
(flexible cable and rigid cable)</td></tr>
<tr><td>Bypass terminals (4x)</td></tr>
<tr><td>Output terminals (4x)</td></tr>
<tr><td>Battery terminals (3x)</td><td>95 mm^2 (6)</td></tr>
</table>

(1) Rectifier protection should only be considered in the event of separate inputs. Recommended values to avoid unwanted tripping with UPS at full power. When the bypass and rectifier inputs are combined (common input), the general input protection rating must be the highest of the two (bypass or rectifier).
(2) Recommended values to avoid unwanted tripping with UPS at full power. A current limiting device has to be used in case of maximum i^2t and Ipk of the SCR by-pass is exceeded. When the bypass and rectifier inputs are combined (common input), the general input protection rating must be the highest of the two (bypass or rectifier).
(3) RCD is not necessary when the UPS is installed in a TN-S system. RCD is not permitted on TN-C systems. If an RCD is required a B-type should be used. Must be coordinate with residual current circuit breakers downstream of the UPS connected to the UPS output. If the bypass network is separate from the rectifier circuit, or in the event of parallel UPSs, use a single residual current circuit breaker upstream of the UPS.
(4) Protection tripping downstream of the UPS with inverter short circuit current (Worst case = AUX MAINS not present). In the Normal case, with AUX MAINS present, fault clearing is determined by the Mains short-circuit capability. The rating of the protection can be increased “n” times downstream of a parallel UPS system, with “n” equal to the number of parallel UPS units.
(5) Use cable with tin-plated eyelets for the connection.
(6) Not available for internal battery version.

7. REFERENCE STANDARDS AND DIRECTIVES

7.1. Overview

The equipment, installed, used and serviced in accordance with its intended use, its regulations and standards, its manufacturer instructions and rules, is in compliance with the relevant Union harmonisation legislation:

LVD 2014 / 35 / EU

DIRECTIVE 2014/35/EU OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 26 February 2014, on the harmonisation of the laws of the Member States relating to the making available on the market of electrical equipment designed for use within certain voltage limits.

EMC 2014 / 30 / EU

DIRECTIVE 2014/30/EU OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 26 February 2014, on the harmonisation of the laws of the Member States relating to electromagnetic compatibility.

RoHS 2011/65/EU

Directive 2011/65 of the European parliament and of the council of 8 June 2011 on the restriction of the use of certain hazardous substances in electrical and electronic equipment

7.2. Standards

7.2.1. Safety

EN 62040-1	Uninterruptible Power System (UPS) - Part 1: General and safety requirements
IEC 62040-1	Uninterruptible Power System (UPS) - Part 1: Safety requirements (CB scheme by TÜV)

7.2.2. Electromagnetic compatibility

EN 62040-2	Uninterruptible Power System (UPS) - Part 2: Electromagnetic compatibility (EMC) requirements
IEC 62040-2	Uninterruptible Power System (UPS) - Part 2: Electromagnetic compatibility (EMC) requirements

7.2.3. TEST and performance

EN 62040-3	Uninterruptible Power System (UPS) - Part 3: Method of specifying the performance and test requirements

7.2.4. ENVIRONMENTAL

IEC 62040-4	Uninterruptible Power System (UPS) - Part 4: Enviromental aspects - Requirements and reporting

7.3. SYSTEM AND INSTALLATION GUIDELINES

When carrying out electrical installation, all the above standards must be observed. All national and international standards (e.g IEC60364) applicable to the specific electrical installation including batteries must be observed. For further information refer to 'Technical specifications' chapter in the user manual.

ELITE UPS: a mark of efficiency

Socomec, as CEMEP UPS manufacturer member, has signed a Code of Conduct put forward by the Joint Research Centre of the European Commission (JRC), to ensure the protection of critical applications and processes ensuring 24/7 continuous high quality supply. The JRC commits to mitigating energy losses and gas emissions caused by UPS equipment, therefore maximising UPS efficiency.

TECHNICAL GUIDE

EN

MASTERYS GP4

10 to 40 kVA/kW

SUPERIOR
Unrivalled power performance

RoHS COMPLIANT

3 LEVEL TECHNOLOGY

96.5% EFFICIENCY

kW = kVA

TÜV SÜD
Safety tested
Production monitored
tuv-sud.com/ps-cert

Socomec Resource Center
To download, brochures, catalogues and technical manuals

socomec
Innovative Power Solutions

1. OBJECTIVES

The aim of these specifications is to provide:

- the information required to choose the correct uninterruptible power supply for a specific application.
- the information required to prepare the system and installation site.

The specifications are intended for:

- installation engineers.
- design engineers.
- engineering consultants.

2. INSTALLATION REQUIREMENTS AND PROTECTION

Connection to the mains power supply and load(s) must be implemented using cables of suitable size, in accordance with current standards. If not already present, an electrical control station which can isolate the network upstream of the UPS must be installed. This electrical control station must be equipped with a circuit breaker (or two, if there is a separate bypass line) of an appropriate rating for the power drawn at full load.

If an external manual bypass is required, only the model supplied by the manufacturer must be installed.

We recommend fitting two metres of unanchored flexible cable between the UPS terminals and the cable anchor (wall or cabinet). This makes it possible to move and service the UPS.

For detailed information, see the installation and operating manual.

3. ARCHITECTURE

3.1. Range

MASTERYS GP4 is a full range of high performing UPS systems designed to:

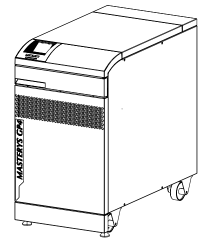
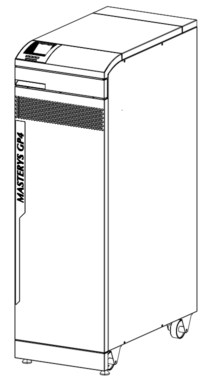
- ensure 24/7/365 availability and business continuity for datacentre infrastructure,
- avoid data losses and downtime of company operations,
- reduce the electrical infrastructure's total cost of ownership,
- adopt a sustainable development approach.

MODELS					
Rated power (kVA)	10	15	20	30	40
MASTERYS GP4 3/1	•	•	•		
MASTERYS GP4 3/3	•	•	•	•	•
Matrix table for model and kVA power rating					

Each family has been specifically designed to meet the demands of loads in specific application contexts, in order to optimise product features and facilitate integration within the system.

4. FLEXIBILITY

4.1. Power ratings from 10 to 40 kVA/kW

DIMENSIONS				
Cabinet type		Width (W) [mm]	Depth (D) [mm]	Height (H) [mm]
	**S4**	444	800	800
	**M4**	444	800	1400

The equipment has been designed with a minimum net and gross footprint (the actual space occupied by the unit and the space required around it for maintenance, ventilation and access to operating mechanisms and communication devices).

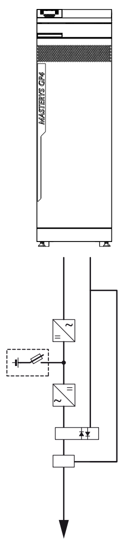
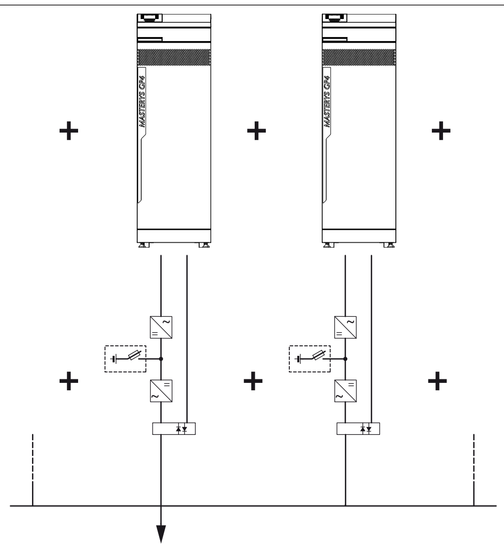
All of the control mechanisms and communication interfaces are located in the upper front section.

The intelligent design also provides easy access for maintenance and installation.

The air inlet is on the front, with outflow to the rear.

4.2. Parallel

MASTERYS GP4 enables 2 configurations of UPS systems in the same range.

	
Single unit configuration	Parallel UPS configuration (up to 6 units)

socomec
Innovative Power Solutions

4.3. Reliability

Reliability is the most critical factor for any UPS solution designed to protect and manage the continuity of activities and services.

MASTERYS GP4 MTBF exceeds the market standard, and Socomec officially declares its MTBF data.

4.4. Seismic resistant

The 4th generation MASTERYS units (with SEISMIC option installed) have successfully passed extensive tests to verify resistance to withstand seismic events.

Tests have been performed by accredited laboratories according to the standards covering zones with the highest level of seismic activity: Zone 4.

The test requires that the UPS system, working at full load and provided with floor fixing devices, must resist the stresses and accelerations defined by the test protocol. When the test has been completed, the UPS must be intact and working perfectly.

4.5. Flexible back-up time

Different back-up times are possible by using models with internal battery or external battery cabinets.

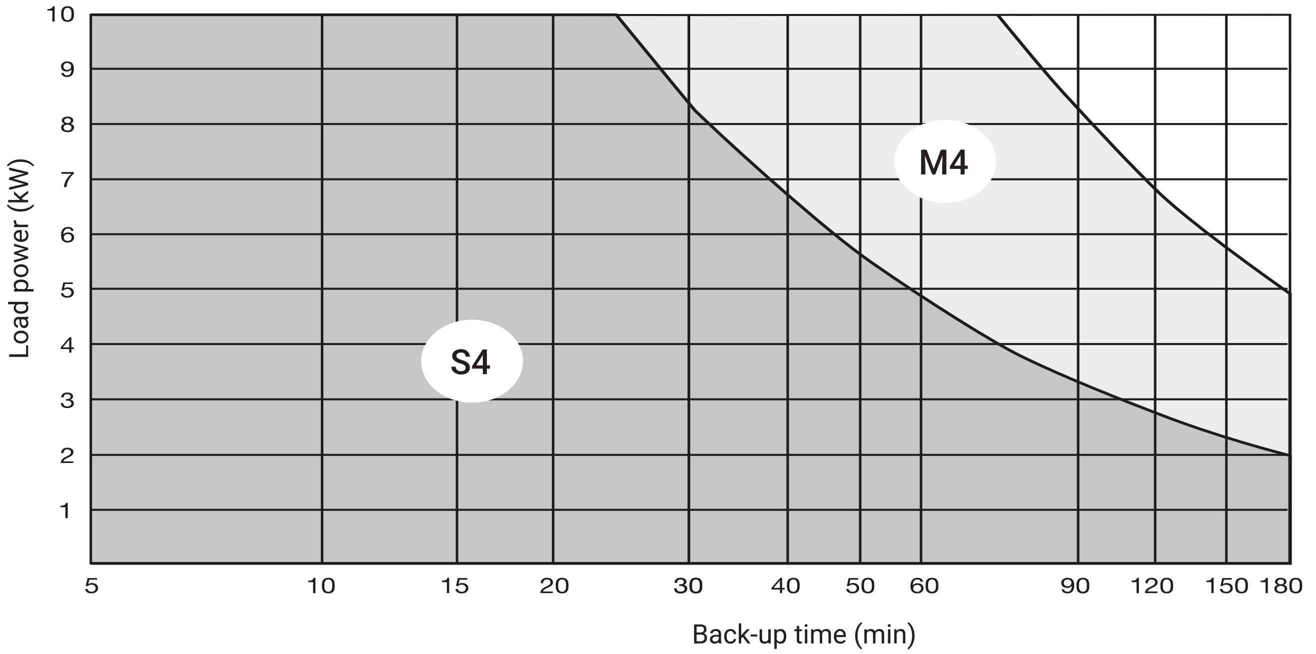
Batteries are installed on acid-proof trays and connected by means of polarised connectors to facilitate their maintenance.

To guarantee maximum back-up time availability and battery life, the MASTERYS GP4 series is equipped with an EBS (Expert Battery System).

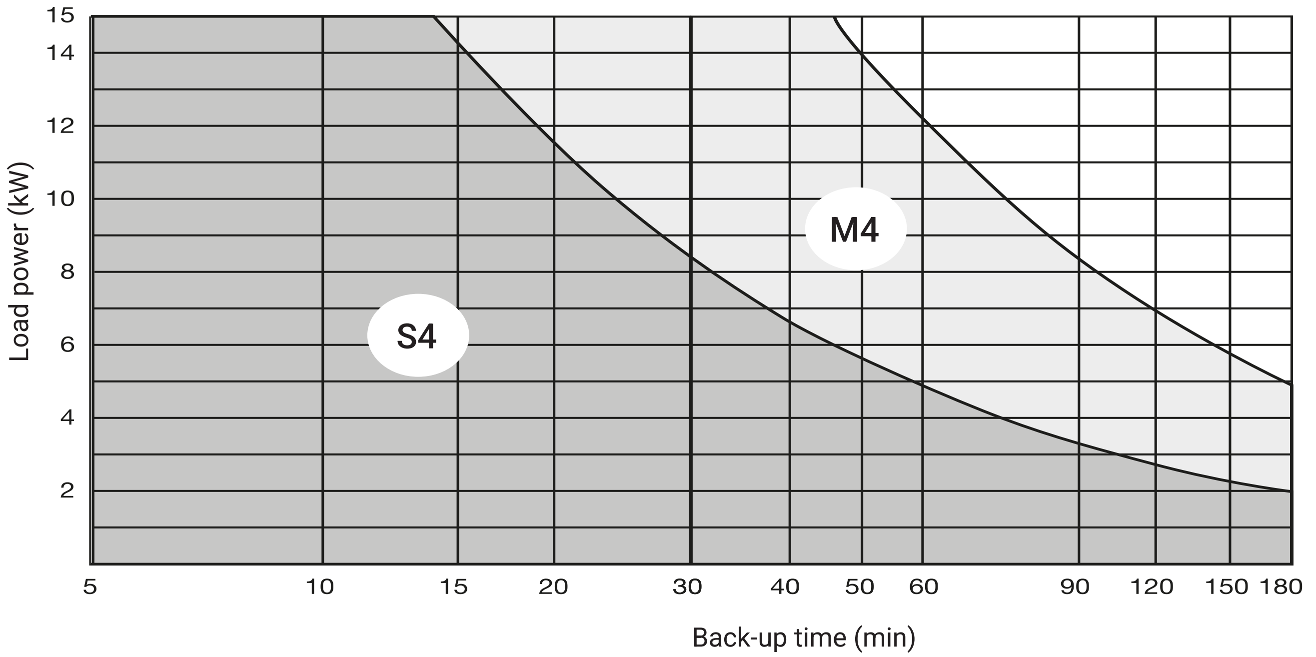
For external battery cabinets use size **S4**.

For internal batteries, use the following charts to select the model (**S4/M4**) in relation to power and back-up time.

10 kVA

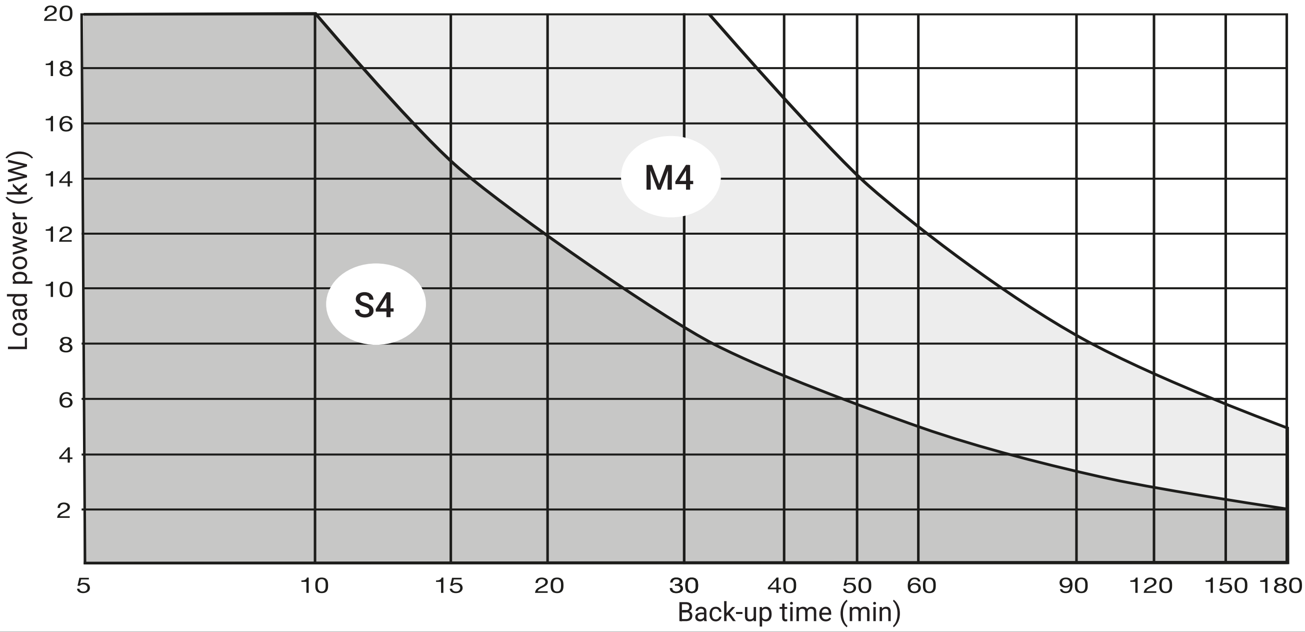


15 kVA

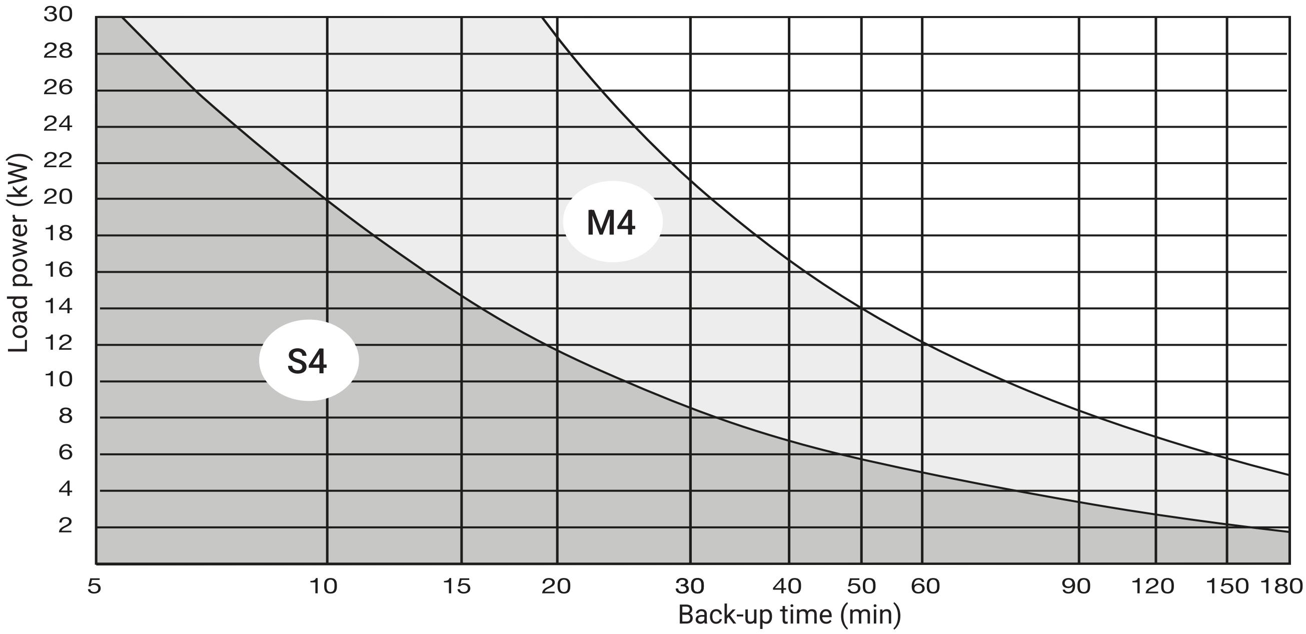


socomec
Innovative Power Solutions

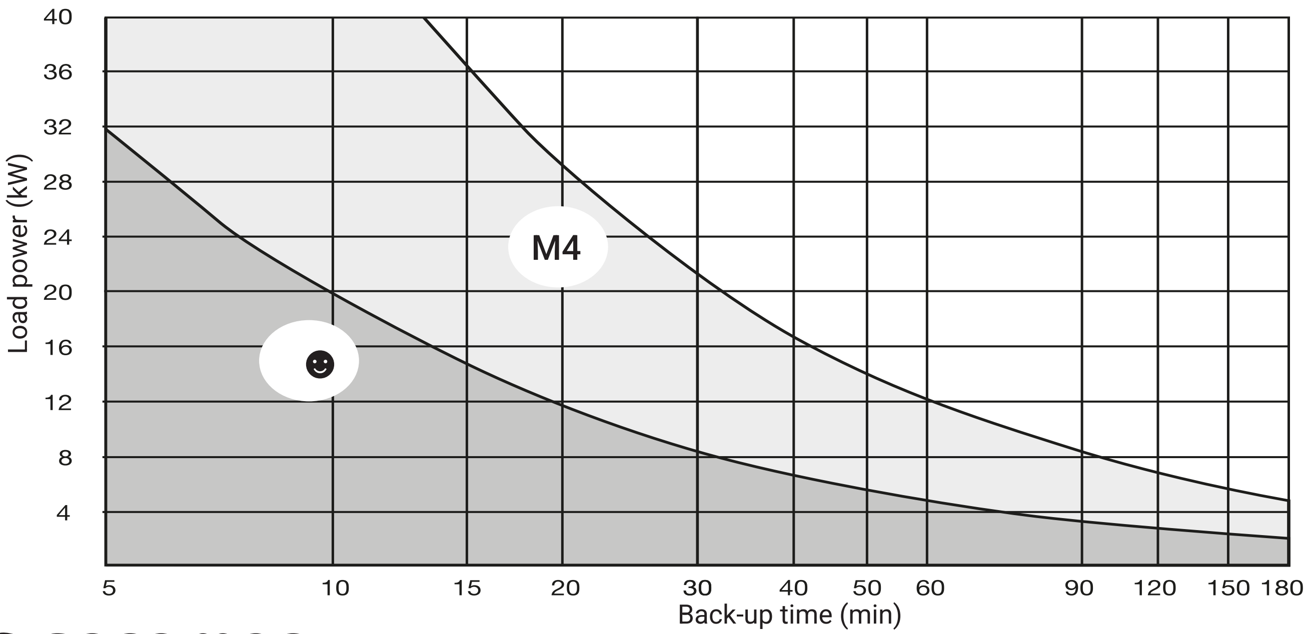
20 kVA



30 kVA



40 kVA



5. STANDARD FEATURES AND OPTIONS

AVAILABILITY	
●	Factory-installed option
○	Available as option

Features	MASTERYS GP4		Notes
	10-15-20 kVA	30-40 kVA	
BATTERY OPTION			
Additional charger	●○	●○	⚠ 🚫 Kit for Rectifier Neutral creation
COMMUNICATION OPTION			
ACS card (Automatic Cross Synchronisation)	●○	●○	
ADC+SL card (Advanced Dry Contact + Serial Link)	○	○	
External temperature sensor	○	○	⚠ ❗ ADC+SL card
7' touch-screen colour graphic display	●	●	
Remote touchscreen display	○	○	⚠ ❗ ADC+SL card
Modbus TCP interface card	○	○	
Net Vision card (professional WEB/SNMP interface for UPS monitoring)	○	○	
EMD (Environmental Monitoring Device: temperature, humidity, 2 dry contacts)	○	○	⚠ ❗ Net Vision card
ELECTRICAL OPTION			
Parallel card	●○	●○	
External maintenance bypass	○	○	
Kit for TN-C / Neutral-Ground connection	○	○	
Internal Backfeed isolation device	●	●	
Kit For Common Mains	○ (3/3)	○	
Kit for Rectifier Neutral creation	●	●	⚠ 🚫 Kit for TN-C / Neutral-Ground connection 🚫 Kit For Common Mains 🚫 Additional charger
Redundant Bypass Ventilation	●	●	
Cold Start	●	●	
MECHANICAL OPTION			
Ramp for unloading UPS	○	○	
Kit for Front and Lateral Cover	○	○	
Kit for IP21	○	○	
Seismic adaptation	●	●	

❗ Required option
🚫 Incompatible option

socomec Innovative Power Solutions

6. SPECIFICATIONS - MASTERYS GP4

6.1. Installation parameters

INSTALLATION PARAMETERS										
Rated power (kVA)			10	15	20	10	15	20	30	40
Phase in/out			3/1			3/3				
Active power		kW	10	15	20	10	15	20	30	40
Rated/maximum rectifier input current (EN 62040-3)		A	15/22	23/30	31/39	15/22	23/30	31/39	46/55	62/73
Rated bypass input current		A	48	72	96	16	24	32	48	64
Inverter output current @ 230 V		A	43	65	87	14	22	29	43	58
Maximum air flow		m3/h	240							360
Sound level		dBA	< 50							< 58
Power dissipation in nominal conditions(1)		W	440	665	905	440	665	905	1485	2090
		kcal/h	378	572	778	378	572	778	1277	1797
		BTU/h	1501	2269	3088	1501	2269	3088	5067	7131
Power dissipation (max) in the worst conditions(2)		W	490	750	1050	490	750	1050	1550	2445
		kcal/h	421	645	903	421	645	903	1333	2102
		BTU/h	1672	2559	3582	1672	2559	3582	5288	8342
Dimensions **S4 / M4**	Width	mm	444 / 444							
	Depth	mm	800 / 800							
	Height	mm	800 / 1400							
Single unit Clea-rances	Operational	mm	Rear ≥ 200; Lateral 0							
	Maintenance	mm	Front ≥ 1500 Top ≥ 800							
Weight without batteries **S4 / M4**		kg	89 / 116							95 / 122
Weight with batteries **S4** (depending on number of batteries)		kg	191 / 288							197 / 294
Weight with batteries **M4** (depending on number of batteries)		kg	430 / 527 / 624							436 / 533 / 630

(1) Considering nominal input current (400 V, battery charged) and rated output active power.
(2) Considering maximum input current (low input voltage) and rated output active power.

6.2. Electrical characteristics

ELECTRICAL CHARACTERISTICS - RECTIFIER INPUT								
Rated power (kVA)	10	15	20	10	15	20	30	40
Phase in/out	3/1			3/3				
Rated mains supply voltage	400 V 3ph + N							
Voltage tolerance	480 V to 340 V (up to 240 V with load linear decrease from 100% Pn to 70% Pn)							
Rated frequency	from 40 Hz to 70 Hz							
Power factor (input at full load and rated voltage)	≥ 0.99							
Total harmonic distortion (THDi)	< 3%	< 2.5%		< 3%	< 2.5%		< 2%	
Max inrush current at start-up	< In (no overcurrent)							
Power walk-in(from battery to normal mode)	4 seconds (settable parameters)							

ELECTRICAL CHARACTERISTICS - BYPASS								
Rated power (kVA)	10	15	20	10	15	20	30	40
Phase in/out	3/1			3/3				
Bypass frequency variation speed	1 Hz/s (settable up to 3 Hz/s)							
Bypass rated voltage	Nominal output voltage ±15%							
Bypass rated frequency	50/60 Hz (selectable)							
Bypass frequency tolerance	±2% (configurable from 1% to 10%)							

ELECTRICAL CHARACTERISTICS - INVERTER										
Rated power (kVA)			10	15	20	10	15	20	30	40
Phase in/out			3/1			3/3				
Rated output voltage phase neutral (selectable)			220/230/240 V 208 V (@ 95% Pn)							
Output voltage tolerance			Static: ±1% Dynamic: VFI-SS-111 (EN62040-3) compliant							
Rated output frequency			50/60 Hz (selectable)							
Output frequency tolerance			±0.01%							
Load crest factor			≥ 2.7							
Voltage harmonic distortion			±1% with linear load							
Overload tolerated by the inverter	10 min	kW	12.5	18.75	25.0	12.5	18.75	25.0	37.5	50.0
	1 min	kW	15	22.5	30	15	22.5	30	45	60

ELECTRICAL CHARACTERISTICS - EFFICIENCY								
Rated power (kVA)	10	15	20	10	15	20	30	40
Phase in/out	3/1			3/3				
Double conversion efficiency (normal mode - @ full load)	up to 96.2%							
Efficiency in EcoMode	up to 99.3%							

ELECTRICAL CHARACTERISTICS - ENVIRONMENT								
Rated power (kVA)	10	15	20	10	15	20	30	40
Phase in/out	3/1			3/3				
Storage temperatures	-5 to +50 °C (15 to 25 °C for better battery life)							
Working temperature	0 to +40 °C (15 to 25 °C for better battery life) Max +50°C @ 70% Sn for a limited time							
Maximum relative humidity (non-condensing)	95%							
Maximum altitude without derating	1000 m (3300 ft)							
Degree of protection	IP20 (IP21 as option)							
Portability	ASTM D999-08, ASTM D-880, AFNOR NF H 00-042							
Colour	RAL 7016							

ELECTRICAL CHARACTERISTICS - BATTERY									
Rated power (kVA)		10	15	20	10	15	20	30	40
Phase in/out		3/1			3/3				
Maximum recharge current	A	5							
Battery connection (UPS in parallel)		Distributed or shared battery							

6.3. Recommended protection

RECOMMENDED PROTECTION DEVICES - RECTIFIER[1]								
Rated power (kVA)	10	15	20	10	15	20	30	40
Phase in/out	3/1			3/3				
C curve circuit breaker (A)	25	32	40	25	32	40	63	80
gG fuse (A)	25	32	40	25	32	40	63	80

RECOMMENDED PROTECTION DEVICES - GENERAL BYPASS[1]								
Rated power (kVA)	10	15	20	10	15	20	30	40
Phase in/out	3/1			3/3				
Maximum I^2t supported by the bypass (A^2s)	16000			8000			15000	
Max Ipk supported by the Bypass	2400			1200			1700	
C curve circuit breaker (A)	63	100	125	25	32	40	63	80
gG fuse (A)	63	100	125	25	32	40	63	80

RECOMMENDED PROTECTION DEVICES - INPUT RESIDUAL CURRENT CIRCUIT BREAKER[2]								
Rated power (kVA)	10	15	20	10	15	20	30	40
Phase in/out	3/1			3/3				
Input residual current circuit breaker	0.5 A Selective							

RECOMMENDED PROTECTION DEVICES - OUTPUT[3]									
Model		10	15	20	10	15	20	30	40
Phase in/out		3/1			3/3				
Short-circuit inverter current (A) (when AUX MAINS is not present)	0 to 40 ms	120	177	237	40	59	79	117	156
	40 to 100 ms	99	147	198	33	49	66	98	130
C curve circuit breaker[3] (A)		≤ 10	≤ 16	≤ 20	≤ 4	≤ 4	≤ 6	≤ 10	≤ 13
B curve circuit breaker[3] (A)		≤ 20	≤ 32	≤ 40	≤ 6	≤ 10	≤ 16	≤ 20	≤ 25

CABLES - MAXIMUM CABLE SECTION								
Model	10	15	20	10	15	20	30	40
Phase in/out	3/1			3/3				
Rectifier terminals (flexible cable)/(rigid cable) mm^2	25						50	
Bypass terminals (flexible cable)/(rigid cable) mm^2	50			25			50	
Battery terminals (flexible cable)/(rigid cable) mm^2	25						50	
Output terminals (flexible cable)/(rigid cable) mm^2	50			25			50	

(1) Rectifier protection should only be considered in the event of separate inputs. The bypass protection is given by recommendation. When the bypass and rectifier inputs are combined (common input), the general input protection rating must be whichever is the highest (bypass or rectifier).
(2) Must be selective with residual current circuit breakers downstream of the UPS connected to the UPS output. If the bypass network is separate from the rectifier circuit, or in the event of a parallel UPS configuration, use a single residual current circuit breaker upstream of the UPS.
(3) Selectivity of distribution after the UPS with inverter short-circuit current (short-circuit with AUX MAINS not present). The rating of the protection can be increased by “n” times downstream of a parallel UPS system, with “n” equal to the number of parallel modules.

6.4. AVAILABILITY

The primary goal of every UPS system is to ensure power availability.

Availability is defined for all repairable systems as

Availability = 1 - MTTR / MTBF

To achieve maximum system availability, it is necessary to deliver high reliability (high MTBF) and reduce repair times (short MTTR) as much as possible.

MTBF (Mean Time Between Failure) is a measure of UPS Reliability, being the reciprocal of Failure Rate:

MTBF = 1 / Failure Rate

Reliability is the most critical factor in the design and manufacture of any UPS.

The end result is a combination of know-how, quality material, and a design created with expertise throughout the production process.

The higher the MTBF, the lower the failure rate, making the UPS more reliable.

MEAN TIME BETWEEN FAILURE		
MTBFVFI(1)	> 350 000 h	Failure inside the UPS, but application still supplied in Bypass Mode
MTBFUPS	> 10 000 000 h	Critical failure inside the UPS, causing a load cut

(1) VFI (Voltage and Frequency Independent) also called Normal Mode or Double Conversion Mode is the only UPS working-mode that ensures total load protection against all possible mains quality problems.

Even though high reliability limits the likelihood of failure, it is essential to respond quickly to unforeseen events in order to guarantee continuity and minimise the risk of downtime.

MTTR is the Mean Time To Restore the UPS after a failure i.e. the sum of Intervention Time and Repair Time:

MTTR = Intervention Time + Repair Time

The proximity of a service technician is vital to ensure rapid repair.

Furthermore, both UPS design and construction are critical success factors when it comes to serviceability and performance.

MASTERYS GP4 has been specifically engineered for safe and fast maintenance by front access advanced brick replacement - with on-site repair time 5x faster than standard UPS systems and enhanced First Time Fix Rate.

7. REFERENCE STANDARDS AND DIRECTIVES

7.1. Overview

The equipment, installed, used and serviced in accordance with its intended use, its regulations and standards, its manufacturer instructions and rules, is in compliance with the relevant Union harmonisation legislation:

LVD 2014 / 35 / EU

DIRECTIVE 2014/35/EU OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 26 February 2014, on the harmonisation of the laws of the Member States relating to the making available on the market of electrical equipment designed for use within certain voltage limits.

EMC 2014 / 30 / EU

DIRECTIVE 2014/30/EU OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 26 February 2014, on the harmonisation of the laws of the Member States relating to electromagnetic compatibility.

RoHS 2011/65/EU

Directive 2011/65 of the European parliament and of the council of 8 June 2011 on the restriction of the use of certain hazardous substances in electrical and electronic equipment

7.2. Standards

7.2.1. Safety

EN 62040-1	Uninterruptible Power System (UPS) - Part 1: General and safety requirements
IEC 62040-1	Uninterruptible Power System (UPS) - Part 1: Safety requirements (CB scheme by TÜV)

7.2.2. Electromagnetic compatibility

EN 62040-2	Uninterruptible Power System (UPS) - Part 2: Electromagnetic compatibility (EMC) requirements (tested and verified by third party)
IEC 62040-2	Uninterruptible Power System (UPS) - Part 2: Electromagnetic compatibility (EMC) requirements

7.2.3. Test and performance

EN 62040-3	Uninterruptible power systems (UPS). Methods of specifying the performance and test requirements

7.2.4. ENVIRONMENTAL

IEC 62040-4	Uninterruptible Power System (UPS) - Part 4: Enviromental aspects - Requirements and reporting

7.3. System and installation guidelines

When carrying out electrical installation, all the above standards must be observed. All national and international standards (e.g IEC60364) applicable to the specific electrical installation including batteries must be observed. For further information refer to 'Technical specifications' chapter in the user manual.

ELITE UPS: a mark of efficiency

Socomec, as CEMEP UPS manufacturer member, has signed a Code of Conduct put forward by the Joint Research Centre of the European Commission (JRC), to ensure the protection of critical applications and processes ensuring 24/7 continuous high quality supply. The JRC commits to mitigating energy losses and gas emissions caused by UPS equipment, therefore maximising UPS efficiency.

TECHNICAL GUIDE

EN

MASTERYS GP4 RK

10 to 40 kVA/kW

SUPERIOR

Unrivalled power performance

RoHS COMPLIANT

3 LEVEL TECHNOLOGY

96.5% EFFICIENCY

kW = kVA

Socomec Resource Center
To download, brochures, catalogues and technical manuals

socomec
Innovative Power Solutions

1. OBJECTIVES

The aim of these specifications is to provide:

- the information required to choose the correct uninterruptible power supply for a specific application,
- the information required to prepare the system and installation site.

The specifications are intended for:

- installation engineers,
- design engineers,
- engineering consultants.

2. INSTALLATION REQUIREMENTS AND PROTECTION

Connection to the mains power supply and load(s) must be implemented using cables of suitable size, in accordance with current standards. If not already present, an electrical control station which can isolate the network upstream of the UPS must be installed. This electrical control station must be equipped with a circuit breaker (or two, if there is a separate bypass line) of an appropriate rating for the power drawn at full load.

If an external manual bypass is required, only the model supplied by the manufacturer must be installed.

For detailed information, see the installation and operating manual.

3. ARCHITECTURE

3.1. Range

MASTERYS GP4 is a full range of high performing UPS designed to:

- ensure 24/7/365 availability and business continuity for datacentre infrastructure,
- avoid data losses and downtime of company operations,
- reduce the electrical infrastructure's total cost of ownership,
- adopt a sustainable development approach.

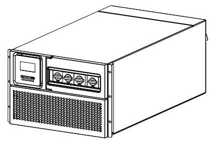
MODELS					
Rated power (kVA)	10	15	20	30	40
MASTERYS GP4 RK 3/1	•	•	•		
MASTERYS GP4 RK 3/3	•	•	•	•	•

Matrix table for model and kVA power rating

Each family has been specifically designed to meet the demands of loads in specific application contexts, in order to optimise product features and facilitate its integration within the system.

4. FLEXIBILITY

4.1. Power ratings from 10 to 40 kVA/kW

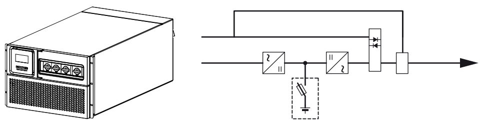
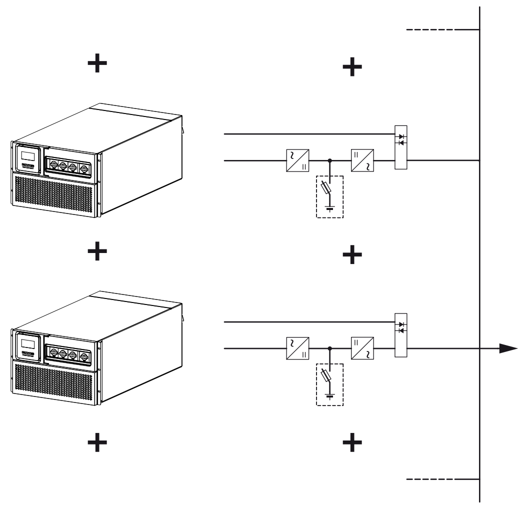
DIMENSIONS				
Cabinet type		Width (W) [mm]	Depth (D) [mm]	Height (H) [mm]
	RK	442 (Suitable for 19” rack cabinet)	820	305 (7U)

All of the control mechanisms and communication interfaces are located in the upper front section.

The intelligent design also provides easy access for maintenance and installation.

The air inlet is on the front, with outflow to the rear.

4.2. parallel

	
Single unit configuration	Parallel UPS configuration (up to 6 units)

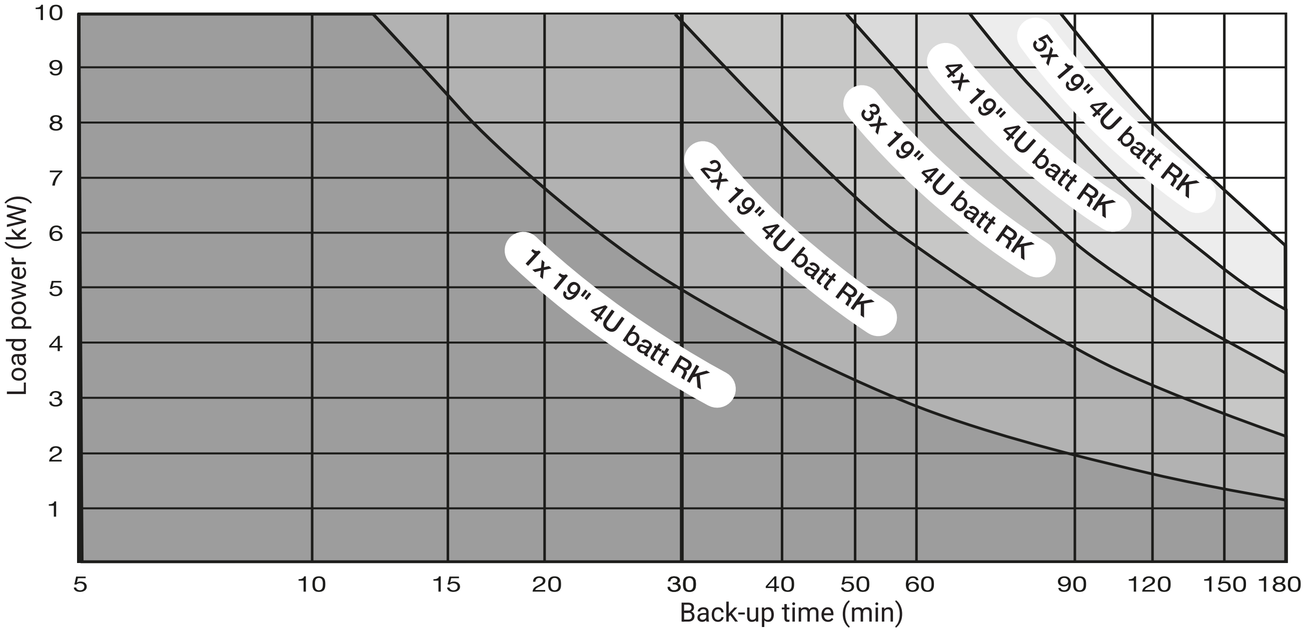
4.3. Flexible back-up time

Different extended back-up times are possible by using the standard 19" battery rack or an external battery cabinet.

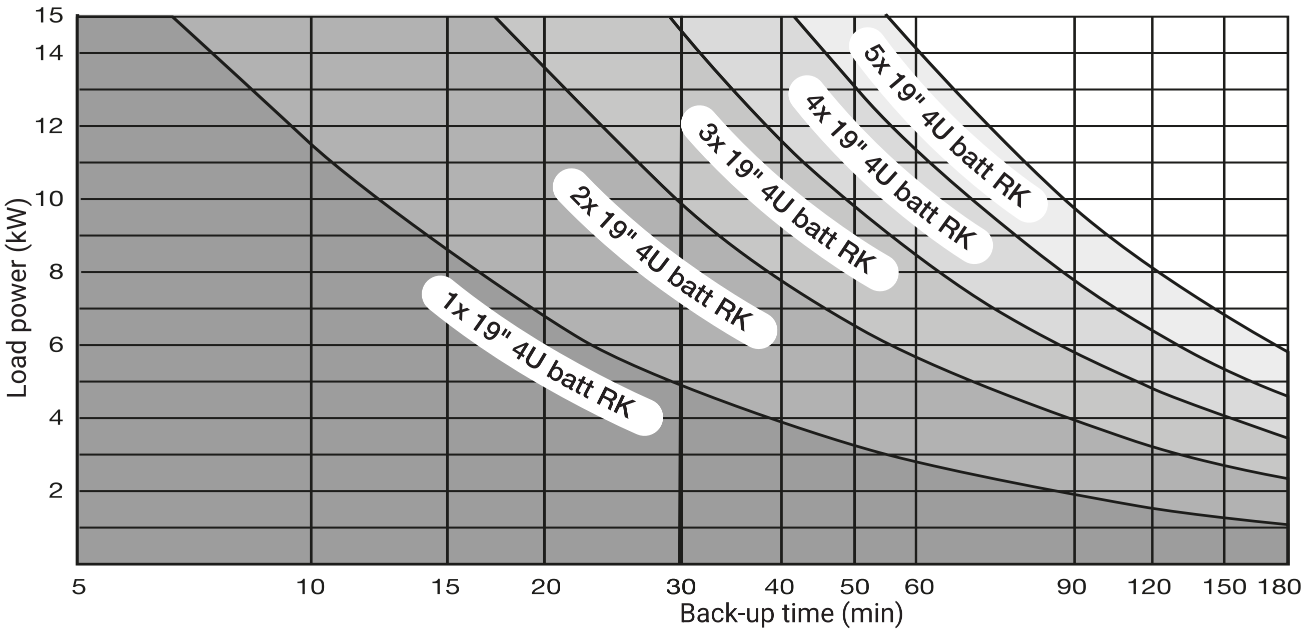
Batteries are installed on acid-proof trays and connected by means of polarised connectors to facilitate their maintenance.

To guarantee maximum back-up time availability and battery life, the MASTERYS GP4 series is equipped with an EBS (Expert Battery System).

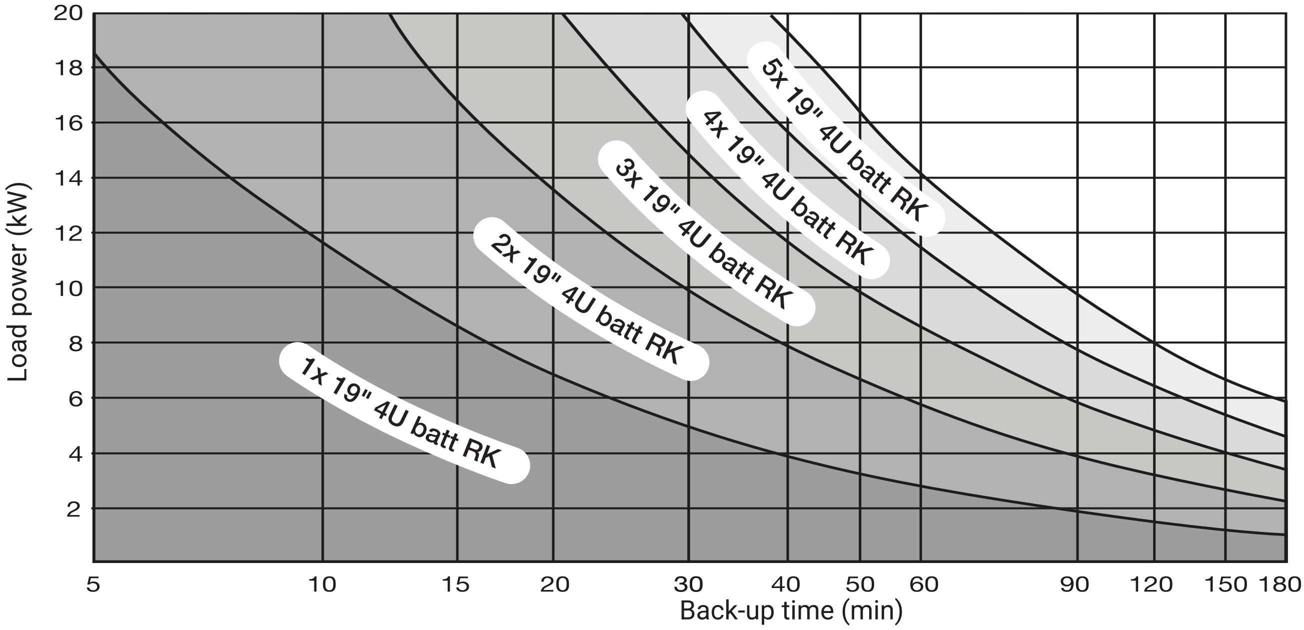
10 kVA



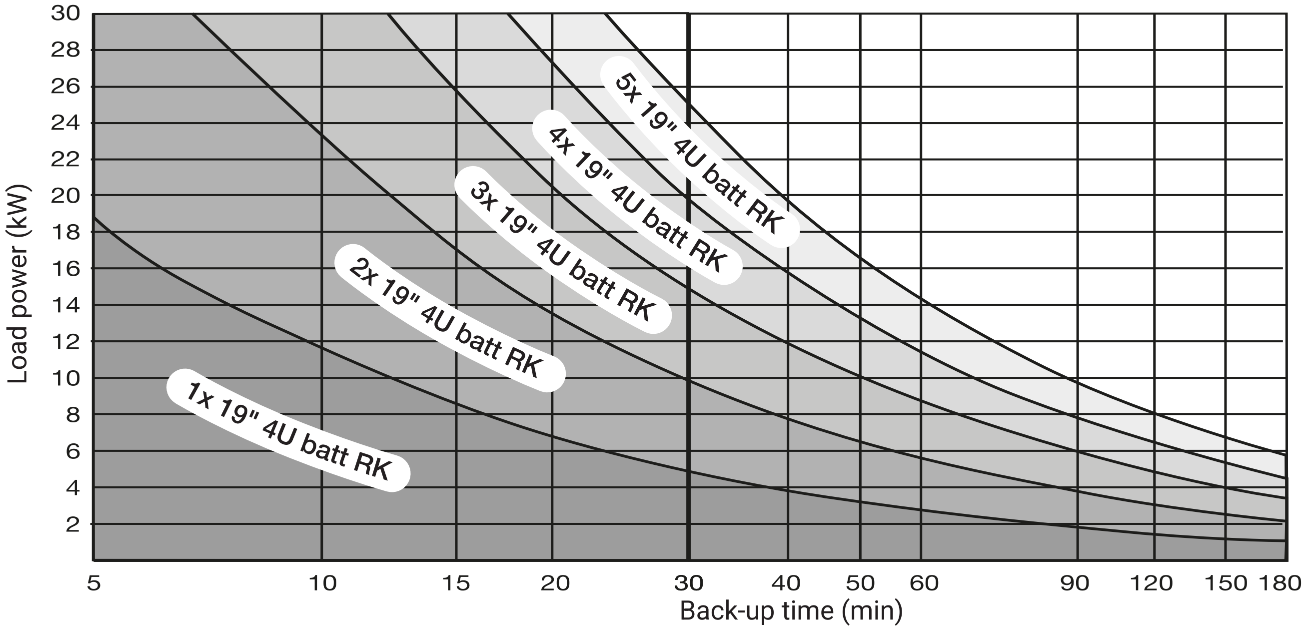
15 kVA



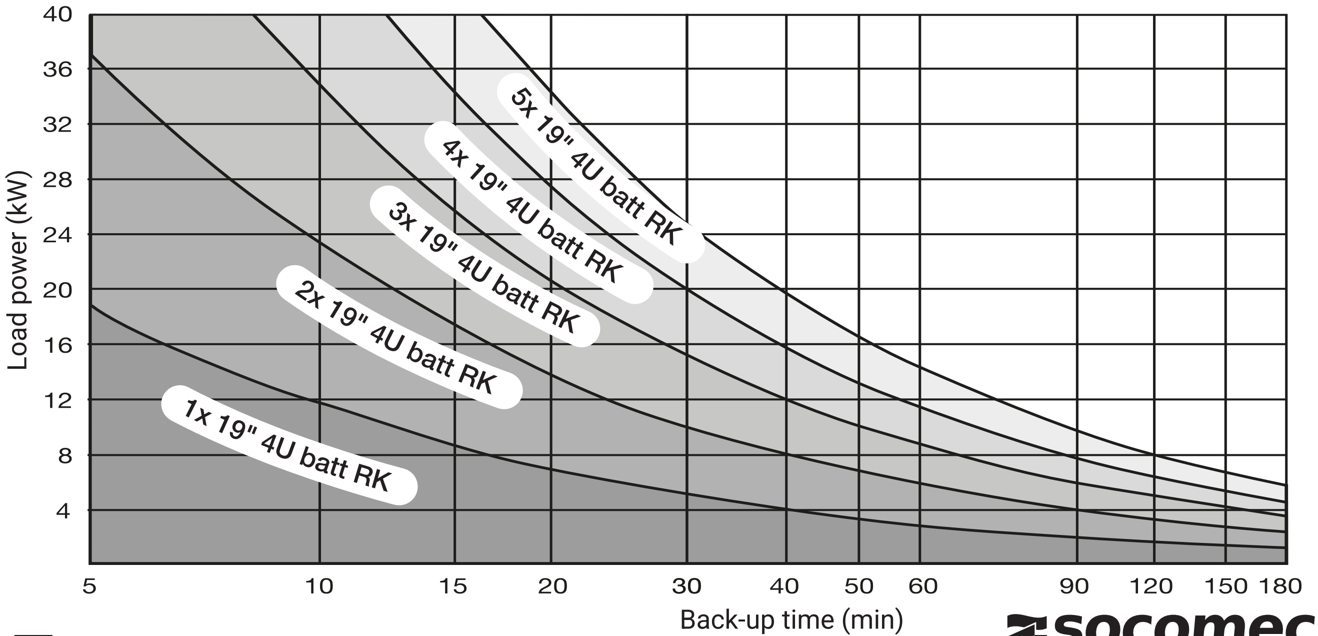
20 kVA



30 kVA



40 kVA



5. STANDARD FEATURES AND OPTIONS

AVAILABILITY	
●	Factory-installed option
○	On site installed option

Features	MASTERYS GP4 RACK		Notes
	10-15-20 kVA	30-40 kVA	
Battery Option			
Additional charger	●○	●○	
19" 4U Battery Rack	○	○	
Communication Option			
ACS card (Automatic Cross Synchronisation)	●○	●○	
ADC+SL card (Advanced Dry Contact + Serial Link)	○	○	
External temperature sensor	○	○	⚠ ❗ "ADC+SL card"
Remote touchscreen display	○	○	⚠ ❗ "ADC+SL card"
Modbus TCP interface card	○	○	
Net Vision card (professional WEB/SNMP interface for UPS monitoring)	○	○	
EMD (Environmental Monitoring Device: temperature, humidity, 2 dry contacts)	○	○	⚠ ❗ "Net Vision card"
Electrical Option			
19" 2U External Maintenance Bypass	○	○	
Parallel card	●○	●○	
Kit for TN-C / Neutral-Ground connection	○	○	
Internal Backfeed isolation device	●	●	
Kit For Common Mains	○ (3/3)	○	
Redundant Bypass Ventilation	●	●	
Cold Start	●	●	

❗ Required option

6. SPECIFICATIONS - MASTERYS GP4 RK

6.1. Installation parameters

INSTALLATION PARAMETERS											
Rated power (kVA)			10	15	20	10	15	20	30	40
Phase in/out			3/1			3/3				
Active power		kW	10	15	20	10	15	20	30	40
Rated/maximum rectifier input current (EN 62040-3)		A	15/22	23/30	31/39	15/22	23/30	31/39	46/55	62/73
Rated bypass input current		A	48	72	96	16	24	32	48	64
Inverter output current @ 230 V		A	43	65	87	14	22	29	43	58
Maximum air flow		m3/h	240							360
Sound level		dBA	< 50							< 58
Power dissipation in nominal conditions(1)		W	440	665	905	440	665	905	1485	2090
		kcal/h	378	572	778	378	572	778	1277	1797
		BTU/h	1501	2269	3088	1501	2269	3088	5067	7131
Power dissipation (max) in the worst conditions(2)		W	490	750	1050	490	750	1050	1550	2445
		kcal/h	421	645	903	421	645	903	1333	2102
		BTU/h	1672	2559	3582	1672	2559	3582	5288	8342
Dimensions (with standard back-up time)	Width	mm	442							
	Depth	mm	820							
	Height	mm	305							
Weight without batteries		kg	72							78

(1) Considering nominal input current (400 V, battery charged) and rated output active power (PF1).
(2) Considering maximum input current (low input voltage) and rated output active power (PF1).

6.2. Electrical characteristics

ELECTRICAL CHARACTERISTICS - RECTIFIER INPUT								
Rated power (kVA)	10	15	20	10	15	20	30	40
Phase in/out	3/1			3/3				
Rated mains supply voltage	400 V 3ph + N							
Voltage tolerance	480V to 340 V (up to 240 V with load linear decrease from 100% Pn to 70% Pn)							
Rated frequency	50/60 Hz (selectable)							
Frequency tolerance	±10%							
Power factor (input at full load and rated voltage)	≥ 0.99							
Total harmonic distortion (THDi)	< 3%	< 2.5%		< 3%	< 2.5%		< 2%	
Max inrush current at start-up	< In (no overcurrent)							
Power walk-in(from battery to normal mode)	4 seconds (settable parameters)							

ELECTRICAL CHARACTERISTICS - BYPASS								
Rated power (kVA)	10	15	20	10	15	20	30	40
Phase in/out	3/1			3/3				
Bypass frequency variation speed	1 Hz/s (settable up to 3 Hz/s)							
Bypass rated voltage	Nominal output voltage ±15%							
Bypass rated frequency	50/60 Hz (selectable)							
Bypass frequency tolerance	±2% (configurable from 1% to 10%)							

ELECTRICAL CHARACTERISTICS - INVERTER										
Rated power (kVA)			10	15	20	10	15	20	30	40
Phase in/out			3/1			3/3				
Rated output voltage phase neutral (selectable)			220/230/240 V 208 V (@ 95% Pn)							
Output voltage tolerance			Static: ±1% Dynamic: VFI-SS-111 (EN62040-3) compliant							
Rated output frequency			50/60 Hz (selectable)							
Output frequency tolerance			±0.01%							
Load crest factor			≥ 2.7							
Voltage harmonic distortion			±1% with linear load							
Overload tolerated by the inverter	10 min	kW	12.5	18.75	25.0	12.5	18.75	25.0	37.5	50.0
	1 min	kW	15	22.5	30	15	22.5	30	45	60

ELECTRICAL CHARACTERISTICS - EFFICIENCY								
Rated power (kVA)	10	15	20	10	15	20	30	40
Phase in/out	3/1			3/3				
Double conversion efficiency (normal mode - @ full load)	up to 96.2%							
Efficiency in EcoMode	up to 99.3%							

ELECTRICAL CHARACTERISTICS - ENVIRONMENT								
Rated power (kVA)	10	15	20	10	15	20	30	40
Phase in/out	3/1			3/3				
Storage temperatures	-5 to +50 °C (15 to 25 °C for better battery life)							
Working temperature	0 to +40 °C (15 to 25 °C for better battery life) Max +50°C @ 70% Sn for a limited time							
Maximum relative humidity (non-condensing)	95%							
Maximum altitude without derating	1000 m (3300 ft)							
Degree of protection	IP20 (IP21 as option)							
Portability	ASTM D999-08, ASTM D-880, AFNOR NF H 00-042							
Colour	RAL 7016							

ELECTRICAL CHARACTERISTICS - BATTERY									
Rated power (kVA)		10	15	20	10	15	20	30	40
Phase in/out		3/1			3/3				
Maximum recharge current	A	5							
Battery connection (UPS in parallel)		Distributed or shared battery							

6.3. Recommended protection

RECOMMENDED PROTECTION DEVICES - RECTIFIER[1]								
Rated power (kVA)	10	15	20	10	15	20	30	40
Phase in/out	3/1			3/3				
C curve circuit breaker (A)	25	32	40	25	32	40	63	80
gG fuse (A)	25	32	40	25	32	40	63	80

RECOMMENDED PROTECTION DEVICES - GENERAL BYPASS[1]								
Rated power (kVA)	10	15	20	10	15	20	30	40
Phase in/out	3/1			3/3				
Maximum I^2t supported by the bypass (A^2s)	16000			8000			15000	
Max Ipk supported by the Bypass (A)	2400			1200			1700	
C curve circuit breaker (A)	63	100	125	25	32	40	63	80
gG fuse (A)	63	100	125	25	32	40	63	80

RECOMMENDED PROTECTION DEVICES - INPUT RESIDUAL CURRENT CIRCUIT BREAKER[2]								
Rated power (kVA)	10	15	20	10	15	20	30	40
Phase in/out	3/1			3/3				
Input residual current circuit breaker	0.5 A Selective							

RECOMMENDED PROTECTION DEVICES - OUTPUT[3]									
	Model	10	15	20	10	15	20	30	40
	Phase in/out	3/1			3/3				
Short-circuit inverter current (A) (when AUX MAINS is not present)	0 to 40 ms	120	177	237	40	59	79	117	156
	40 to 100 ms	99	147	198	33	49	66	98	130
C curve circuit breaker[3] (A)		≤ 10	≤ 16	≤ 20	≤ 4	≤ 4	≤ 6	≤ 10	≤ 13
B curve circuit breaker[3] (A)		≤ 20	≤ 32	≤ 40	≤ 6	≤ 10	≤ 16	≤ 20	≤ 25

CABLES - MAXIMUM CABLE SECTION								
Model	10	15	20	10	15	20	30	40
Phase in/out	3/1			3/3				
Rectifier terminals (flexible cable)/(rigid cable) mm^2	25						50	
Bypass terminals (flexible cable)/(rigid cable) mm^2	50			25			50	
Battery terminals (flexible cable)/(rigid cable) mm^2	25						50	
Output terminals (flexible cable)/(rigid cable) mm^2	50			25			50	

(1) Rectifier protection should only be considered in the event of separate inputs. The bypass protection is given by recommendation. When the bypass and rectifier inputs are combined (common input), the general input protection rating must be whichever is the highest (bypass or rectifier).
(2) Must be selective with residual current circuit breakers downstream of the UPS connected to the UPS output. If the bypass network is separate from the rectifier circuit, or in the event of parallel UPS configurations, use a single residual current circuit breaker upstream of the UPS.
(3) Selectivity of distribution after the UPS with inverter short-circuit current (short-circuit with AUX MAINS not present). The rating of the protection can be increased by “n” times downstream a parallel UPS system, with “n” equal to the number of parallel modules.

socomec
Innovative Power Solutions

6.4. AVAILABILITY

The primary goal of every UPS system is to ensure power availability.

Availability is defined for all repairable systems as

Availability = 1 - MTTR / MTBF

To achieve maximum system availability, it is necessary to deliver high reliability (high MTBF) and reduce repair times (short MTTR) as much as possible.

MTBF (Mean Time Between Failure) is a measure of UPS Reliability being the reciprocal of Failure Rate:

MTBF = 1 / Failure Rate

Reliability is the most critical factor in the design and manufacture of any UPS.

The end result is a combination of know-how, quality material, and a design created with expertise throughout the production process.

The higher the MTBF, the lower the failure rate, making the UPS more reliable.

MEAN TIME BETWEEN FAILURE		
MTBFVFI(1)	> 500,000 h	Failure inside the UPS, but application still supplied in Bypass Mode
MTBFUPS	> 12,000,000 h	Critical failure inside the UPS, causing a load cut

(1) VFI (Voltage and Frequency Independent) also called Normal Mode or Double Conversion Mode is the only UPS working-mode that ensures total load protection against all possible mains quality problems.

Even though high reliability limits the likelihood of failure, it is essential to respond quickly to unforeseen events in order to guarantee continuity and minimise the risk of downtime.

MTTR is the Mean Time To Restore the UPS after a failure i.e. the sum of Intervention Time and Repair Time:

MTTR = Intervention Time + Repair Time

The proximity of a service technician is vital to ensure rapid repair.

Furthermore, both UPS design and construction are critical success factors when it comes to serviceability and performance.

MASTERYS GP4 RK has been specifically engineered for safe and fast maintenance by front access advanced brick replacement – with on-site repair time 5x faster than standard UPS systems and an enhanced First Time Fix Rate.

7. REFERENCE STANDARDS AND DIRECTIVES

7.1. Overview

The construction of the equipment and choice of materials and components comply with all laws, decrees, directives and standards currently in force.

In particular, the equipment is fully compliant with all European Directives concerning CE marking.

LVD 2014/35/EU

Directive of the European Parliament and of the council of 26 February 2014 on the harmonisation of the laws of the Member States relating to the making available on the market of electrical equipment designed for use within certain voltage limits.

EMC 2014/30/EU

Directive of the European Parliament and of the council of 26 February 2014 on the harmonisation of the laws of the Member States relating to electromagnetic compatibility.

RoHS 2011/65/EU

Directive 2011/65 of the European parliament and of the council of 8 June 2011 on the restriction of the use of certain hazardous substances in electrical and electronic equipment

7.2. Standards

7.2.1. Safety

EN 62040-1	Uninterruptible Power System (UPS) - Part 1: General and safety requirements
IEC 62040-1	Uninterruptible Power System (UPS) - Part 1: Safety requirements (CB scheme by TÜV)

7.2.2. Electromagnetic compatibility

EN 62040-2	Uninterruptible Power System (UPS) - Part 2: Electromagnetic compatibility (EMC) requirements (tested and verified by third party)
IEC 62040-2	Uninterruptible Power System (UPS) - Part 2: Electromagnetic compatibility (EMC) requirements

7.2.3. Test and performance

EN 62040-3	Uninterruptible Power System (UPS) - Part 3: Method of specifying the performance and test requirements

7.2.4. ENVIRONMENTAL

IEC 62040-4	Uninterruptible Power System (UPS) - Part 4: Enviromental aspects - Requirements and reporting

7.3. System and installation guidelines

When carrying out electrical installation, all the above standards must be observed. All national and international standards (e.g IEC60364) applicable to the specific electrical installation including batteries must be observed. For further information refer to 'Technical specifications' chapter in the user manual.

ELITE UPS: a mark of efficiency

Socomec, as CEMEP UPS manufacturer member, has signed a Code of Conduct put forward by the Joint Research Centre of the European Commission (JRC), to ensure the protection of critical applications and processes ensuring 24/7 continuous high quality supply. The JRC commits to mitigating energy losses and gas emissions caused by UPS equipment, therefore maximising UPS efficiency.

TECHNICAL GUIDE

EN

MASTERYS GP4

60 to 250 kVA/kW

SUPERIOR

Unrivalled power performance

RoHS COMPLIANT

3 LEVEL TECHNOLOGY

97.5% EFFICIENCY

96.5% EFFICIENCY

kW = kVA

TÜV SÜD Safety tested Production monitored tuv-sud.com/ps-cert

Socomec Resource Center
To download, brochures, catalogues and technical manuals

socomec
Innovative Power Solutions

1. OBJECTIVES

The aim of these specifications is to provide:

- the information required to choose the right uninterruptible power supply for a specific application.
- the information required to prepare the system and installation site.

The specifications are intended for:

- installation engineers.
- design engineers.
- engineering consultants.

2. INSTALLATION REQUIREMENTS AND PROTECTION

Connection to the mains power supply and to the load(s) must be made using cables of suitable size, in accordance with current standards. If not already present, an electrical distribution panel which can isolate the network upstream of the UPS must be installed. This electrical distribution panel must be equipped with a protection device (or two, if there is a separate bypass line) of an appropriate rating for the power drawn at full load.

For detailed information, see the installation and operating manual.

3. ARCHITECTURE

3.1. Range

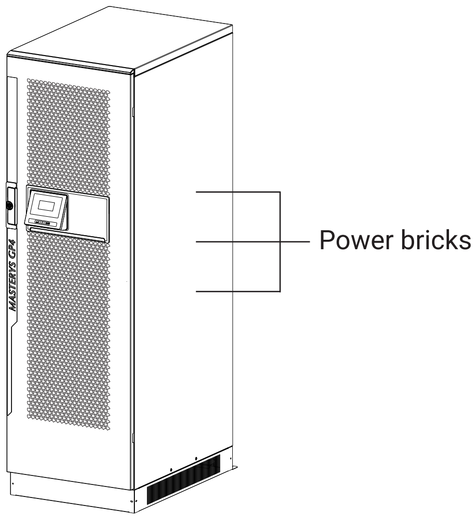
MASTERYS GP4 is a full range of high performing UPS systems designed to:

- ensure 24/7/365 availability and business continuity for mission critical applications,
- avoid data losses and downtime of company operations,
- reduce the electrical infrastructure's total cost of ownership,
- adopt a sustainable development approach.

MASTERYS GP4							
Rated power (kVA)	60	80	100	120	160	200	250
MASTERYS GP4 3/3	•	•	•	•	•	•	•
Matrix table for model and kVA power rating							

MASTERYS GP4 has been specifically designed to meet the demands of loads in specific application contexts, in order to optimise the features of the product and facilitate its integration within the system.

Masterys GP4 60-250 kVA feature in standard the intrinsic redundancy



Any potential fault should be isolated inside the affected sub-assemblies, keeping the critical load protected in double conversion mode thanks to the remaining power converters to maximize the Mean Time Between Critical Failure.

The UPS is designed to provide intrinsic double conversion mode redundancy in case of a single power brick is no longer available, to grant a minimum of:

- 50% load for 60 and 80 UPS in double conversion, even in case of a single brick failure;
- 66% load for 100, 120 and 200 UPS in double conversion, even in case of a single brick failure;
- 75% load for 160, 250 and 200HE (high efficiency) UPS in double conversion, even in case of a single brick failure;
- 80% load for 250HE (high efficency) UPS in double conversion, even in case of a single brick failure.

4. FLEXIBILITY

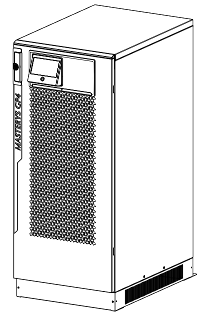
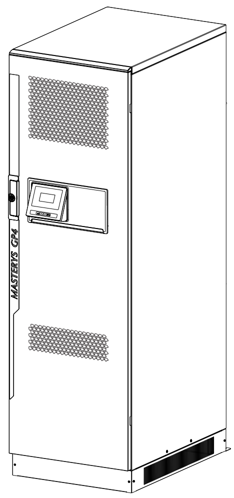
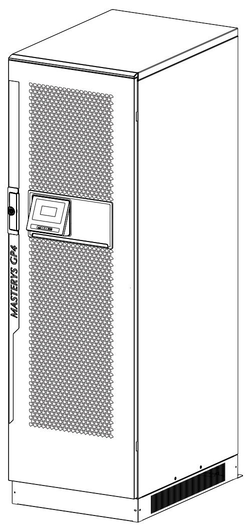
4.1. Power ratings from 60 to 250 kVA/kW

The equipment has been designed with a minimum direct and indirect footprint (the actual space occupied by the unit and the space required around it for maintenance, ventilation and access to the operating mechanisms and communication devices).

The detailed design also provides easy access for maintenance and installation.

All of the control mechanisms are located on the front at the bottom and communication interfaces are on the inside of the door.

The air inlet is on the front, with outflow from the rear side; this means other equipment or external battery enclosures can be placed alongside the UPS unit.With specific cabinets it is possible to have solution with a top air outlet

DIMENSIONS			
MASTERYS GP4	Width [mm]	Depth [mm]	Height [mm]
MASTERYS GP4 60 to 120 kVA/kW 	600	855	1400 (100/120 kVA 1930 as option)
MASTERYS GP4 60 to 80 kVA/kW with battery 	600	855	1930
MASTERYS GP4 160 to 250 kVA/kW 	600	855	1930

4.2. Flexible back-up time

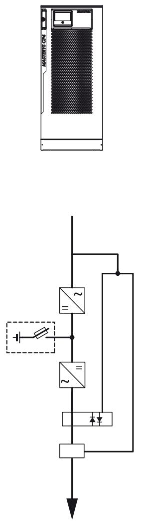
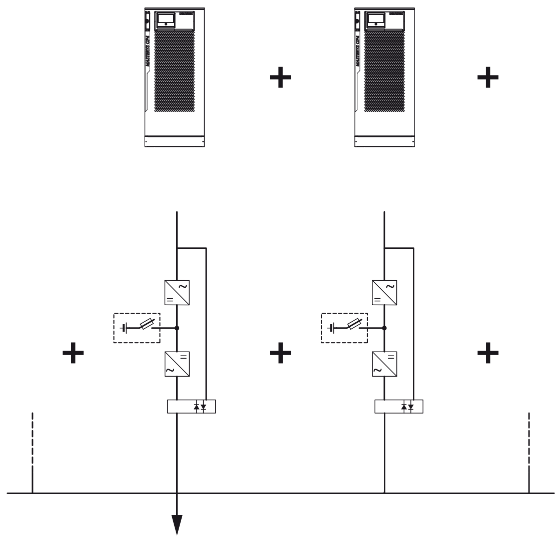
Different extended back-up times are possible by using external battery cabinets, optionally with a enhanced battery charger.

Selection of the back-up time is flexible thanks to the wide range of battery string voltages.

MASTERYS GP4 is setup for Lithium Battery

4.3. Horizontal parallel

MASTERYS GP4 offers 2 UPS configurations in the same range.

	
Single unit configuration	Parallel UPS

4.4. Reliability

Reliability is the most critical factor for any UPS solution designed to protect and manage the continuity of activities and services.

MASTERYS GP4 MTBF exceeds the market standard, and Socomec officially declares its MTBF data.

4.5. Seismic resistant

The 4th generation MASTERYS units (with SEISMIC option installed) have successfully passed extensive tests to verify resistance to withstand seismic events.

Tests have been performed by accredited laboratories according to the standards covering zones with the highest level of seismic activity: Zone 4.

The test requires that the UPS system, working at full load and provided with floor fixing devices, must resist the stresses and accelerations defined by the test protocol. When the test has been completed, the UPS must be intact and working perfectly.

5. STANDARD AND OPTIONS

AVAILABILITY	
●	Factory-installed option
○	Available as option
–	Not available
STD	Standard feature

Features	MASTERYS GP4 (kVA)					Note
	60-80		100-120	160	200-250	
	External batteries	Internal batteries	External batteries	External batteries	External batteries	
BATTERY OPTION						
Additional charger	●○	-	●○	●○	●○	⚠ 🚫 Kit for Rectifier Neutral creation
COMMUNICATION OPTION						
ACS card (Automatic Cross Synchronisation)	●○	●○	●○	●○	●○	
ADC+SL card (Advanced Dry Contact + Serial Link)	○	○	○	○	○	
LIB-ADC (Lithium Ion Battery interface)	○	○	○	○	○	
Temperature sensor	○	○	○	○	○	⚠ ❗ ADC+SL card
Remote touchscreen display	○	○	○	○	○	⚠ ❗ ADC+SL card
Modbus TCP card	○	○	○	○	○	
Net Vision card	○	○	○	○	○	
EMD (Environmental Monitoring Device)	○	○	○	○	○	⚠ ❗ Net Vision card
ELECTRICAL OPTION						
Parallel card	●○	●○	●○	●○	●○	⚠ 🚫 Cold start
Kit for Parallel Configuration (C7)	-	-	●○	●○	●○	⚠ ❗ Parallel card
External Isolation Transformer	-	-	○	-	-	
IMD (Insulation Monitoring Device)	-	-	○	-	-	⚠ ❗ External Isolation Transformer
External Maintenance Bypass	○	○	○	-	-	
Kit for TN-C / Neutral-Ground connection	●○	●○	●○	●○	●○	⚠ 🚫 Kit for Rectifier Neutral creation
Internal Backfeed Protection	●	●	●	●	-	
Kit For Common Mains	○	○	○	○	○	⚠ 🚫 Kit for Rectifier Neutral creation

Features	MASTERYS GP4 (kVA)					Note
	60-80		100-120	160	200-250	
	External batteries	Internal batteries	External batteries	External batteries	External batteries	
Kit for Rectifier Neutral creation	●	-	●	●	-	⚠ 🚫 Kit for TN-C / Neutral-Ground connection 🚫 Kit For Common Mains 🚫 Additional charger
Redundant Bypass Ventilation	●	●	●	●	STD	
MECHANICAL OPTION						
Option slots 3	●	-	●	STD	STD	
Anti-vermin protection	●	●	●	●	●	
Kit for IP21	○	○	○	○	○	⚠ 🚫 Top air exhaust kit 🚫 Top entry cables
Seismic kit	●	-	●	●	●	⚠ 🚫 Top entry cables
"T" cabinet	-	STD	●	STD	STD	
Top air exhaust kit	-	-	●	●	○	⚠ ❗ "T" cabinet 🚫 Kit for IP21 🚫 Top entry cables
Top entry cables	-	-	○	○	○	⚠ ❗ "T" cabinet 🚫 Seismic kit 🚫 Kit for IP21 🚫 Top air exhaust kit
OTHER						
Cold start	●○	●○	●○	●○	●○	⚠ 🚫 Parallel card

❗ Required option
🚫 Incompatible option

6. SPECIFICATIONS

6.1. Installation parameters

<table>
<tr><th colspan="12">INSTALLATION PARAMETERS</th></tr>
<tr><td colspan="3">Range</td><td>60</td><td>80</td><td>100</td><td>120</td><td>160</td><td>200STD</td><td>200HE</td><td>250STD</td><td>250HE</td></tr>
<tr><td colspan="3">Rated power (kVA)</td><td>60</td><td>80</td><td>100</td><td>120</td><td>160</td><td>200</td><td>200</td><td>250</td><td>250</td></tr>
<tr><td colspan="3">Phase in/out</td><td colspan="9">3/3</td></tr>
<tr><td colspan="2">Active power</td><td>kW</td><td>60</td><td>80</td><td>100</td><td>120</td><td>160</td><td>200</td><td>200</td><td>250</td><td>250</td></tr>
<tr><td colspan="2">Rated/maximum rectifier input current (EN 62040-3)</td><td>A</td><td>93/110</td><td>123/146</td><td>154/183</td><td>185/219</td><td>247/292</td><td>304/360</td><td>300/356</td><td>379/450</td><td>375/445</td></tr>
<tr><td colspan="2">Rated bypass input current (1)</td><td>A</td><td>96</td><td>128</td><td>160</td><td>191</td><td>255</td><td>319</td><td>319</td><td>398</td><td>398</td></tr>
<tr><td colspan="2">Inverter output current @ 400 V Pn</td><td>A</td><td>87</td><td>116</td><td>145</td><td>174</td><td>232</td><td>290</td><td>290</td><td>362</td><td>362</td></tr>
<tr><td colspan="2">Recommended air flow capacity</td><td>m3/h</td><td>480</td><td>720</td><td>840</td><td>1080</td><td>1440</td><td>2100</td><td>2400</td><td>2800</td><td>3000</td></tr>
<tr><td colspan="2" rowspan="2">Acoustic Noise @ 70% Pn</td><td rowspan="2">dBA</td><td colspan="2" rowspan="2">53 ext. batt.
55 int. batt.</td><td colspan="2" rowspan="2">55</td><td rowspan="2">57</td><td>63</td><td>55</td><td>65</td><td>57</td></tr>
<tr><td colspan="4">69 with top ventilation</td></tr>
<tr><td colspan="2" rowspan="3">Power dissipation in nominal conditions (2)</td><td>W</td><td>2880</td><td>3950</td><td>4800</td><td>5940</td><td>8000</td><td>9400</td><td>7250</td><td>11800</td><td>9050</td></tr>
<tr><td>kcal/h</td><td>2476</td><td>3396</td><td>4127</td><td>5107</td><td>6879</td><td>8083</td><td>6234</td><td>10147</td><td>7782</td></tr>
<tr><td>BTU/h</td><td>9833</td><td>13486</td><td>16388</td><td>20280</td><td>27297</td><td>32074</td><td>24738</td><td>40263</td><td>30880</td></tr>
<tr><td colspan="2" rowspan="3">Power dissipation (max) in the worst conditions (3)</td><td>W</td><td>3360</td><td>4630</td><td>5500</td><td>6560</td><td>9350</td><td>11600</td><td>9400</td><td>14550</td><td>11800</td></tr>
<tr><td>kcal/h</td><td>2889</td><td>3981</td><td>4729</td><td>5641</td><td>8040</td><td>9975</td><td>8083</td><td>12511</td><td>10147</td></tr>
<tr><td>BTU/h</td><td>11471</td><td>15807</td><td>18778</td><td>22397</td><td>31904</td><td>39581</td><td>32074</td><td>49646</td><td>40263</td></tr>
<tr><td rowspan="3">Dimensions

for 60-80 Models (external/internal batteries)</td><td>Width</td><td>mm</td><td colspan="9">600</td></tr>
<tr><td>Depth</td><td>mm</td><td colspan="9">855</td></tr>
<tr><td>Height</td><td>mm</td><td colspan="2">1400</td><td colspan="2">1400
(1930 optional)</td><td colspan="5">1930</td></tr>
<tr><td colspan="2">Weight</td><td>kg</td><td>174</td><td>186</td><td>228</td><td>240</td><td>338</td><td>310</td><td>345</td><td>345</td><td>380</td></tr>
<tr><td colspan="2">Weight with internal battery</td><td>kg</td><td colspan="2">680-820</td><td colspan="7">-</td></tr>
</table>

(1) Considering nominal bypass current calculated @ 400 V, considering a continous overload of 110%.
(2) Considering nominal input current (400 V, battery charged) and rated output active power (PF1).
(3) Considering maximum input current (low input voltage, battery charged) and rated output active power (PF1).

6.2. Electrical characteristics

<table>
<tr><th colspan="10">ELECTRICAL CHARACTERISTICS - RECTIFIER INPUT</th></tr>
<tr><td>Range</td><td>60</td><td>80</td><td>100</td><td>120</td><td>160</td><td>200STD</td><td>200HE</td><td>250STD</td><td>250HE</td></tr>
<tr><td>Rated power (kVA)</td><td>60</td><td>80</td><td>100</td><td>120</td><td>160</td><td>200</td><td>200</td><td>250</td><td>250</td></tr>
<tr><td>Rated mains supply voltage</td><td colspan="9">400 V 3ph + N</td></tr>
<tr><td>Voltage tolerance</td><td colspan="9">340 to 480 V (-15 +20%)</td></tr>
<tr><td>Voltage tolerance at derated load</td><td colspan="9">up to 240 V @ 70% of nominal active load</td></tr>
<tr><td>Rated frequency</td><td colspan="9">from 40 Hz to 70 Hz</td></tr>
<tr><td>Power factor (at full load and rated voltage)</td><td colspan="9">≥ 0.99</td></tr>
<tr><td>Current Total harmonic distortion (THDi)</td><td colspan="9">≤ 2%</td></tr>
<tr><td>Max inrush current at start-up</td><td colspan="9"><In</td></tr>
<tr><td>Power walk-in (from battery to normal mode)</td><td colspan="9">4 second (settable parameters)</td></tr>
</table>

socomec
Innovative Power Solutions

ELECTRICAL CHARACTERISTICS - BYPASS										
	Range	60	80	100	120	160	200STD	200HE	250STD	250HE
	Rated power (kVA)	60	80	100	120	160	200	200	250	250
Bypass frequency variation speed		1 Hz/s (settable up to 3 Hz/s)								
Bypass rated voltage		Nominal output voltage ±15% (selectable ±5-±20%)								
Bypass rated frequency		50/60 Hz (selectable)								
Bypass frequency tolerance		±2% (configurable from ±1% to ±10%)								
Bypass current overload (A)	10 min	109	145	181	218	290	362	362	435	435
	1 min	130	174	217	261	348	453	453	543	543

ELECTRICAL CHARACTERISTICS - INVERTER										
	Range	60	80	100	120	160	200STD	200HE	250STD	250HE
	Rated power (kVA)	60	80	100	120	160	200	200	250	250
Rated output voltage (selectable)		380/400/415 V (selectable)					380/400/415 V (selectable) (380V with possible derating)			
Output voltage tolerance		Static: ±1% Dynamic: VFI-SS-11 (EN 62040-3 compliant)								
Rated output frequency (selectable)		50/60 Hz (selectable)								
Output frequency tolerance		±0.01% on mains power failure								
Load crest factor		≥ 2.7					≥ 2	≥ 2.25	≥ 2	≥ 2.25
Voltage total harmonic distortion THDV		< 1% with linear load								
Inverter overload (kW)	10 min	75	100	125	150	200	250	250	312	312
	5 min	79	106	132	158	211	264	264	330	330
	1 min	90	120	150	180	240	300	300	375	375
Short-circuit inverter current (A) (when AUX MAINS is not present)	0 to 40 ms	234	312	390	468	624	585	652	780	815
	40 to 100 ms	196	260	326	390	520	486	520	648	650

ELECTRICAL CHARACTERISTICS - EFFICIENCY										
	Range	60	80	100	120	160	200STD	200HE	250STD	250HE
	Rated power (kVA)	60	80	100	120	160	200	200	250	250
Double conversion efficiency		up to 96.5%					up to 96.5%	up to 97.5%	up to 96.5%	up to 97.5%
EcoMode efficiency		99.4%								

ELECTRICAL CHARACTERISTICS - ENVIRONMENT										
	Range	60	80	100	120	160	200STD	200HE	250STD	250HE
	Rated power (kVA)	60	80	100	120	160	200	200	250	250
Storage temperatures		-5 to +50 °C (23 to 122 °F) (15 to 25 °C for better battery life)								
Working temperature		0 to +40 °C (32 to 104 °F) (15 to 25 °C for better battery life) Up to 50 °C @70% Pn for a limited time								
Maximum relative humidity (non-condensing)		95%								
Maximum altitude without derating		1000 m (3300 ft)								
Degree of protection		IP20 (IP21 as option)								
Colour		RAL 7016								

6.3. Recommended protections

RECOMMENDED PROTECTION DEVICES - RECTIFIER (1)									
Range	60	80	100	120	160	200STD	200HE	250STD	250HE
Rated power (kVA)	60	80	100	120	160	200	200	250	250
C curve circuit breaker (A)	125	160	250		315	400	400	450	450
gG fuse (A)	125	160	250		315	400	400	450	450

RECOMMENDED PROTECTION DEVICES - GENERAL BYPASS (2)									
Range	60	80	100	120	160	200STD	200HE	250STD	250HE
Rated power (kVA)	60	80	100	120	160	200	200	250	250
Max I2t supported by the bypass (A2s)	120000		400000						
Max Ipk supported by the Bypass(A)	5000		9000						
Conditional short circuit current rating (Icc)	10 kA								
C curve circuit breaker (A)	160	200	250	250	400	400	400	450	450
gG fuse (A)	160	200	250	250	400	400	400	450	450

RECOMMENDED PROTECTION DEVICES - INPUT RESIDUAL CURRENT CIRCUIT BREAKER (3)									
Range	60	80	100	120	160	200STD	200HE	250STD	250HE
Rated power (kVA)	60	80	100	120	160	200	200	250	250
Input residual current circuit breaker	0.5 A Selective type B					1 A Selective type B			

RECOMMENDED PROTECTION DEVICES - OUTPUT (4)									
Range	60	80	100	120	160	200STD	200HE	250STD	250HE
Rated power (kVA)	60	80	100	120	160	200	200	250	250
B curve circuit breaker (4) (A)	≤ 32	≤ 40	≤ 50	≤ 63	≤ 80	≤ 80	≤ 100	≤ 100	≤ 125
C curve circuit breaker (4) (A)	≤ 16	≤ 20	≤ 25	≤ 32	≤ 40	≤ 40	≤ 50	≤ 50	≤ 63

<table>
<tr><th colspan="10">CABLES - MAXIMUM CABLE SECTION (5)</th></tr>
<tr><td>Range</td><td>60</td><td>80</td><td>100</td><td>120</td><td>160</td><td>200STD</td><td>200HE</td><td>250STD</td><td>250HE</td></tr>
<tr><td>Rated power (kVA)</td><td>60</td><td>80</td><td>100</td><td>120</td><td>160</td><td>200</td><td>200</td><td>250</td><td>250</td></tr>
<tr><td>Rectifier terminals (4x)</td><td colspan="2" rowspan="4">bus bar with holes ø 8 mm 70 mm2 (flexible cable and rigid cable)</td><td colspan="2" rowspan="4">bus bar with holes ø 10 mm 2 x 120 mm2 (flexible cable and rigid cable)</td><td colspan="5" rowspan="4">bus bar with holes ø 10 mm 2 x 150 mm2 (flexible cable and rigid cable)</td></tr>
<tr><td>Bypass terminals (4x)</td></tr>
<tr><td>Battery terminals (3x)</td></tr>
<tr><td>Output terminals (4x)</td></tr>
</table>

(1) Rectifier protection should only be considered in the event of separate inputs. Recommended values to avoid unwanted tripping with UPS at full power. When the bypass and rectifier inputs are combined (common input), the general input protection rating must be the highest of the two (bypass or rectifier).
(2) Recommended values to avoid unwanted tripping with UPS at full power. A current limiting device has to be used in case of maximum i2t and Ipk of the SCR by-pass is exceeded. When the bypass and rectifier inputs are combined (common input), the general input protection rating must be the highest of the two (bypass or rectifier).
(3) RCD is not necessary when the UPS is installed in a TN-S system. RCD is not permitted on TN-C systems. If a RCD is required a B-type should be used. RCD must be coordinate with residual current circuit breakers downstream of the UPS connected to the UPS output. If the bypass network is separate from the rectifier circuit, or in the event of parallel UPS, use a single residual current circuit breaker upstream of the UPS.
(4) Protection tripping downstream of the UPS with inverter short circuit current (Worst case = AUX MAINS not present). In the Normal case, with AUX MAINS present, fault clearing is determined by the Mains short-circuit capability. The rating of the protection can be increased "n" times downstream of a parallel UPS system, with "n" equal to the number of parallel UPS units.
(5) Use cable with tin-plated eyelets for the connection.

7. REFERENCE STANDARDS AND DIRECTIVES

7.1. Overview

The construction of the equipment and choice of materials and components comply with all laws, decrees, directives and standards currently in force.

In particular, the equipment is fully compliant with all European Directives concerning CE marking.

LVD 2014/35/EU

Directive of the European Parliament and of the council of 26 February 2014 on the harmonisation of the laws of the Member States relating to the making available on the market of electrical equipment designed for use within certain voltage limits.

EMC 2014/30/EU

Directive of the European Parliament and of the council of 26 February 2014 on the harmonisation of the laws of the Member States relating to electromagnetic compatibility.

RoHS 2011/65/EU

Directive 2011/65 of the European parliament and of the council of 8 June 2011 on the restriction of the use of certain hazardous substances in electrical and electronic equipment

7.2. Standards

SAFETY

EN 62040-1	Uninterruptible Power System (UPS) - Part 1: General and safety requirements
IEC 62040-1	Uninterruptible Power System (UPS) - Part 1: Safety requirements (CB scheme by TÜV)

ELECTROMAGNETIC COMPATIBILITY

EN 62040-2	Uninterruptible Power System (UPS) - Part 2: Electromagnetic compatibility (EMC) requirements (tested and verified by third party)
IEC 62040-2	Uninterruptible Power System (UPS) - Part 2: Electromagnetic compatibility (EMC) requirements

TEST AND PERFORMANCE

EN 62040-3	Uninterruptible Power System (UPS) - Part 3: Method of specifying the performance and test requirements

ENVIRONMENTAL

IEC 62040-4	Uninterruptible Power System (UPS) - Part 4: Enviromental aspects - Requirements and reporting

7.3. System and installation guidelines

When carrying out electrical installation, all the above standards must be observed. All national and international standards (e.g IEC60364) applicable to the specific electrical installation including batteries must be observed. For further information refer to ‘Technical specifications’ chapter in the user manual.

EU CODE OF CONDUCT ELITE UPS Efficiency Commitment

ELITE UPS: a mark of efficiency

Socomec, as CEMEP UPS manufacturer member, has signed a Code of Conduct put forward by the Joint Research Centre of the European Commission (JRC), to ensure the protection of critical applications and processes ensuring 24/7 continuous high quality supply. The JRC commits to mitigating energy losses and gas emissions caused by UPS equipment, therefore maximising UPS efficiency.

TECHNICAL GUIDE

EN

DELPHYS XM

300 to 800 kVA/kW

SUPERIOR

Unrivalled power performance

Socomec Resource Center
To download, brochures, catalogues and technical manuals

socomec
Innovative Power Solutions

1. OBJECTIVES

The aim of these specifications is to provide:

- the information required to choose the right uninterruptible power supply for a specific application.
- the information required to prepare the system and installation site.

The specifications are intended for:

- installation engineers.
- design engineers.
- engineering consultants.

2. INSTALLATION REQUIREMENTS AND PROTECTION

Connection to the mains power supply and to the load(s) must be made using cables of suitable size, in accordance with current standards. If not already present, an electrical control station which can isolate the network upstream of the UPS must be installed. This electrical control station must be equipped with a circuit breaker (or two, if there is a separate bypass line) of an appropriate rating for the power draw at full load.

For detailed information, see the installation and operating manual.

3. ARCHITECTURE

3.1. Range

DELPHYS XM is a full range of high performing UPS (Uninterruptible Power Supply) designed to secure highly critical applications and therefore to ensure business continuity by means of a fully resilient architecture. It has been specifically designed to meet the stringent demands of loads in particular application contexts, in order to optimize the features of the product and to facilitate its integration within the system.

The DELPHYS XM can deliver many more benefits than standard systems, packing into an overall space-saving design, providing:

- Fault tolerant architecture, and possibility to set N+1 internal redundancy,
- Minimize the footprint thanks to high power density,
- Easy and fast maintenance,
- Reduce the electrical infrastructure's total cost of ownership,
- Fast deployment time / Flexible installation.

RATED POWER (KVA)	300	400	500	600	800
DELPHYS XM	•	•	•	•	•

DELPHYS XM is designed by 100 kW power conversion modules combined with a common static bypass rated for permanent operation at the rated power of the UPS. The UPS is designed with mechanical and electrical segregation solution, so that any abnormal event will be contained to the related brick and not propagated to the rest of the unit.

To increase the system power, DELPHYS XM can be parallelized up to 6 units, for a maximum of 3,6 MW (6x600 kW). The 800 kW size can be parallelized up to 4 units, for a maximum of 3,2 MW.

3.2. Intrinsic redundancy

The UPS is designed to provide intrinsic double conversion mode redundancy in case of a single power module is no longer available, to grant a minimum of capability to supply the connected load.

Any potential module fault should be isolated, keeping the critical load protected in double conversion mode thanks to the remaining power converters to maximize the Mean Time Between Critical Failure.

<table>
<tr><th colspan="2">UPS RATING</th><th>300</th><th>400</th><th>500</th><th>600</th><th>800</th></tr>
<tr><td colspan="2">Number of 100 kW modules</td><td>3</td><td>4</td><td>5</td><td>6</td><td>8</td></tr>
<tr><td rowspan="2">N configuration</td><td>Rated power kVA</td><td>300</td><td>400</td><td>500</td><td>600</td><td>800</td></tr>
<tr><td>Intrinsic redundancy up to % of rated power</td><td>66%</td><td>75%</td><td>80%</td><td>83%</td><td>87%</td></tr>
<tr><td rowspan="2">N+1 configuration</td><td>Rated power kVA</td><td>200</td><td>300</td><td>400</td><td>500</td><td>700</td></tr>
<tr><td>Intrinsic redundancy up to % of rated power</td><td colspan="5">100%</td></tr>
</table>

N+1 configuration setting available on HMI.

3.3. Energy efficiency

DELPHYS XM solution allow reducing energy consumption to minimize GHD emission and operation bill, thanks to:

- High efficiency in double conversion mode, under wide load rate range,
- Energy saver mode to maximize the online double conversion efficiency under low load condition, by switching automatically into hot-standby the modules which are not required to supply the load.
- Line interactive mode allowing to automatically select the most optimized working mode : double conversion or line interactive mode according to the input network conditions. In this mode, a specific algorithm monitors in real time the network quality and selects the optimum working mode between Double Conversion (VFI) and Line Interactive (LI).

3.4. Maintainability

The equipment is designed to minimize MTTR trough:

- Full front access to easier maintenance activities,
- Possibility for Socomec service engineers to extract online a power conversion module (conditioned by the load rate and redundancy level) in order to maintain the concerned modules without the need to move the load on maintenance bypass,
- Withdrawable static bypass subassembly to easier access and avoid cabling operation when required to maintain the bypass line static switch subassembly.
- UPS heat run test - without the need of dummy load bench - allowing to certify the commissioning and advanced maintenance operations performed by Socomec service engineers.

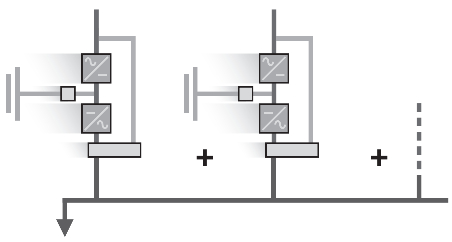
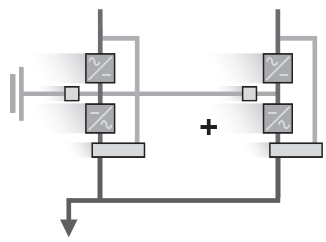
3.5. Integrated Switches

RATED POWER (KVA)	300	400	500	600	800
Number of 100 kW modules	3	4	5	6	8
Input rectifier switch	•	•	•	•	- (1)
Input bypass switch	•	•	•	•	- (1)
Output switch	•	•	•	•	- (1)
Maintenance bypass switch	• (Single unit only)				- (2)

(1) Available only for bottom connection variant.
(2) Available only for bottom connection variant and single unit (not parallel version).

3.6. Battery management

Available with distributed batteries when paralleling units, DELPHYS XM allows to optimize the batteries size thanks to a shared battery operation, this can be set by HMI up to 2 units. This reduces the overall system footprint, the weight of the required batteries, the battery monitoring system, the amount of wiring needed and the amount of lead. This function is supported with Lib batteries and direct communication, but not when using dry contacts.

	
Distributed battery (1 battery set per UPS unit)	Shared battery (1 battery set for 2 units)

socomec
Innovative Power Solutions

3.7. FLEXIBILITY

The equipment has been designed with the aim to reach the best power density to reduce at minimum the footprint (the actual space occupied by the unit and the space required around it for maintenance, ventilation and access to the operating mechanisms and communication devices).

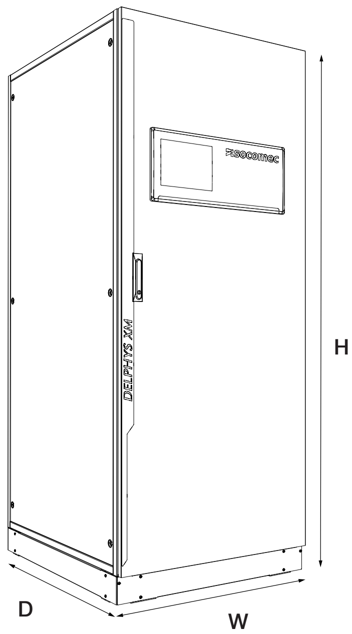
The careful design also provides easy access for maintenance and installation.

For maximum flexibility, the UPS can adapted to be installed against a wall or back to back, without impacting its footprint, thanks to a specific option (currently available up to 600 kVA).

All of the control mechanisms and communication interfaces are located in the front side and can be accessed from a door provided with handle.

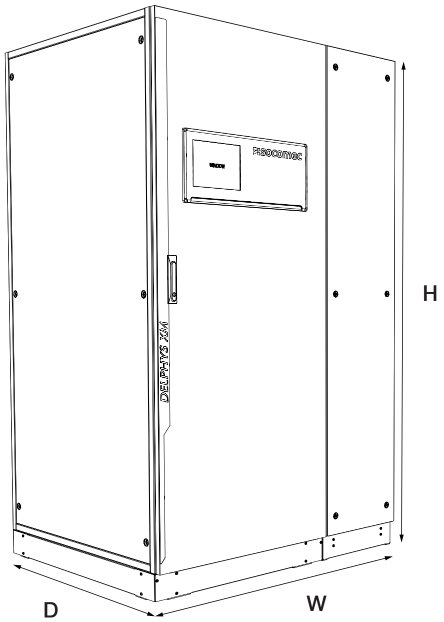
DELPHYS XM TOP CONNECTION						
UPS rating [kVA/kW]		300	400	500	600	800
Number of 100 kW modules		3	4	5	6	8
Width [W]	(mm)	800				
Depth [D]	(mm)	1000				
Height [H]	(mm)	2000				
Weight	(kg)	525	568	660	757	864
Single unit clearances		Rear = 500 mm at 40 °C or 300 mm at 35 °C Lateral = 0 mm Top = 500 mm				
Access for maintenance and operation		Front only				
Installation		Back-to-back installation: 1 m, 0 m with the wall installation kit* Against a wall: with the wall installation kit*				

* not available for the 800 version



DELPHYS XM BOTTOM CONNECTION						
UPS rating [kVA/kW]		300	400	500	600	800
Number of 100 kW modules		3	4	5	6	8
Width [W]	(mm)	1200				1600
Depth [D]	(mm)	1000				
Height [H]	(mm)	2000				
Weight	(kg)	580	623	715	899	1251
Single unit clearances		Rear = 500 mm at 40 °C or 300 mm at 35 °C Lateral = 0 mm Top = 500 mm				
Access for maintenance and operation		Front only				
Installation		Back-to-back installation: 1 m, 0 m with the wall installation kit* Against a wall: with the wall installation kit*				

* not available for 800 version



socomec
Innovative Power Solutions

4. STANDARD AND OPTIONS

4.1. STANDARD ELECTRICAL FEATURES

- Separated or common input mains
- Top entry connection
- Compatible with VRLA and Li-Ion energy storage technologies
- Inputs and output switches for single and parallel units (300-600 kVA and 800 kW switch version)
- Maintenance bypass switch for single unit (300-600 kVA and 800 kW switch version)
- High battery charging capacity (up to 100 A)
- TNS grounding system
- Backfeed protection: detection circuit
- Hot-swappable Power Modules
- Withdrawable static bypass
- Smart conversion Mode (LINE INTERACTIVE)
- Energy saver mode
- Cold start
- Conformal coated PCBs

4.2. ELECTRICAL OPTIONS

- Bottom entry connection (side cabinet up to 500kW, specific product variant for 600 kVA and 800 kVA)
- Full switch version for 800 kW rating
- Kit for top air outlet (300-600 kW)
- PEN kit for TN-C grounding system
- ACS (LBS) synchronization between two DELPHYS XM systems
- Battery temperature sensor for lead batteries
- Parallel cable kit (15 m)

4.3. ELECTRICAL OPTIONS

- Up to IP3X.

4.4. STANDARD COMMUNICATION FEATURES

- User-friendly 10” touch-screen multilingual color graphic display
- 3 Com-Slots(1) for communication optional card
- Ethernet and USB ports for service purpose
- Embedded contacts: 4 inputs and 6 outputs (programmable) available in the monitor unit

(1) in case of parallel system, 3 slots will be available for the whole system

4.5. COMMUNICATION OPTIONS

- Com-slots extension (ready for 3 additional plug-in card)
- Dry-contact interface (configurable voltage-free contacts)
- MODBUS RTU RS485 or TCP
- NET VISION: professional WEB/SNMP Ethernet interface for secure UPS monitoring and remote automatic shut- down
- NET VISION EMD: Environment Temperature and Humidity sensor with 2 inputs
- Remote View Pro supervision software.

4.6. REMOTE MONITORING AND CLOUD SERVICES

- SoLive (2): Real-time cloud monitoring app to supervise any Socomec UPS via smartphone
- SoLink (2): 24/7 cloud remote surveillance service by manufacturer specialists for any Socomec UPS
- Remote operations (1): on-demand remote connection by Socomec experts to perform diagnosis and troubleshooting directly on UPS.

(2) Please check the service availability in your Country.

4.7. Electrical options.

RATED POWER (KVA)		300	400	500	600	800
Phase in/out		3/3				
Active power (kW) – N configuration		300	400	500	600	800
Rated / maximum rectifier input current (A)		451/ 593	601 / 791	752 / 989	902 / 1187	1202 / 1583
Rated bypass input current (A)		437	583	729	875	1166
Inverter output current @ 400V (A)		433	577	722	866	1155
Maximum air flow (m3/h)		4084	5445	6806	8168	10890
Sound level (dBA)		≤ 73 dBA				
Power dissipation in nominal conditions (1)	W	10.58	13.66	18.35	20.70	27.36
	kcal/h	9098	11748	15777	17798	23524
	BTU/h	36102	46622	62610	70628	93352
Power dissipation (max) in the worst conditions (2)	W	13.81	18.41	23.01	27.62	36.82
	kcal/h	11872	15829	19786	23743	31658
	BTU/h	47111	62815	78519	94223	125630

(1) Considering nominal input current (400 V, battery charged) and rated output active power (PF1).
(2) Considering maximum input current (low input voltage, battery recharge) and rated output active power (PF1).

4.8. ELECTRICAL CHARACTERISTICS

ELECTRICAL CHARACTERISTICS – RECTIFIER INPUT						
Rated power (kVA)		300	400	500	600	800
Rated mains supply voltage (V)		380/400/415 V (3ph + N)				
Voltage tolerance at full load	30 °C	304 V to 485 V				
	40 °C	323 V to 485 V				
Voltage tolerance with power derating (1)		240 V to 485 V				
Rated frequency		50/60 Hz				
Frequency tolerance		40 to 70 Hz				
Power factor		> 0.99				
Total harmonic distortion (THDi) (2)		≤ 3%				
Max inrush current at start-up		< In (no overcurrent)				
Soft start (rectifier power walk-in)		Yes				

(1) Conditions apply.
(2) At full load and rated input voltage (THDV < 1%).

ELECTRICAL CHARACTERISTICS – BATTERY					
Rated power (kVA)	300	400	500	600	800
Number of poles	2 wires (+ / -)				
Min/Max number of battery lead battery cells with load PF=1	240/300				
Min/Max number of battery lead battery cells with load PF ≤ 0,9	216/300				
Min/Max number of battery lead battery cells with load PF ≤ 0,8	192/300				
Recharging current at 100% load	Up to 90 A	Up to 120 A	Up to 150 A	Up to 180 A	Up to 240 A
Recharging current at 50% load	Up to 300 A	Up to 400A	Up to 500 A	Up to 600 A	Up to 800 A

<table>
<tr><th colspan="2">ELECTRICAL CHARACTERISTICS - BYPASS</th><th></th><th></th><th></th><th></th><th></th></tr>
<tr><td colspan="2">Rated power (kVA)</td><td>300</td><td>400</td><td>500</td><td>600</td><td>800</td></tr>
<tr><td colspan="2">Bypass rated voltage</td><td colspan="5">380/400/415 V configurable / (3ph + N)</td></tr>
<tr><td colspan="2">Bypass voltage tolerance</td><td colspan="5">Nominal output voltage ±10% (settable up to ±20%)</td></tr>
<tr><td colspan="2">Bypass frequency variation speed</td><td colspan="5">1.5 Hz/s settable from 1 to 3 Hz/s</td></tr>
<tr><td colspan="2">Bypass rated frequency</td><td colspan="5">50/60 Hz (selectable)</td></tr>
<tr><td colspan="2">Bypass frequency tolerance</td><td colspan="5">±10% fixed</td></tr>
<tr><td rowspan="2">Bypass line overload</td><td>Permanent</td><td colspan="5">110%</td></tr>
<tr><td>10 min</td><td colspan="5">125%</td></tr>
<tr><td rowspan="2">Semiconductors characteristics</td><td>I²t (A² s)</td><td>1 361 000</td><td>1 361 000</td><td>2 205 000</td><td>3 075 000</td><td>TBC</td></tr>
<tr><td>Is/c (A peak)</td><td>16 500</td><td>16 500</td><td>21 000</td><td>24 800</td><td>TBC</td></tr>
</table>

<table>
<tr><th colspan="2">ELECTRICAL CHARACTERISTICS - INVERTER</th><th></th><th></th><th></th><th></th><th></th></tr>
<tr><td colspan="2">Rated power (kVA)</td><td>300</td><td>400</td><td>500</td><td>600</td><td>800</td></tr>
<tr><td colspan="2">Rated output voltage (selectable) (V)</td><td colspan="5">380/400/415 V configurable / (3ph + N)</td></tr>
<tr><td colspan="2">Output voltage tolerance</td><td colspan="5">Static load ±1%, dynamic load VFI-SS-11 compliant</td></tr>
<tr><td colspan="2">Rated output frequency (Hz)</td><td colspan="5">50/60 Hz (selectable)</td></tr>
<tr><td colspan="2">Autonomous frequency tolerance</td><td colspan="5">±0.02 Hz on mains power failure</td></tr>
<tr><td colspan="2">Load crest factor</td><td colspan="5">2,67:1</td></tr>
<tr><td colspan="2">Total voltage distortion across 100% linear load</td><td colspan="5">ThdV ≤ 1%</td></tr>
<tr><td rowspan="3">Overload tolerated by the inverter [kVA/kW] (1)</td><td>60 min</td><td>330</td><td>440</td><td>550</td><td>660</td><td>880</td></tr>
<tr><td>10 min</td><td>375</td><td>500</td><td>625</td><td>750</td><td>1000</td></tr>
<tr><td>1 min</td><td>450</td><td>600</td><td>750</td><td>900</td><td>1200</td></tr>
</table>

(1) The tolerated output overload corresponds to the inverter capability under defined conditions. The output overload performance is incremented by the static bypass capability (when available).

<table>
<tr><th>ELECTRICAL CHARACTERISTICS - EFFICIENCY</th><th></th><th></th><th></th><th></th><th></th></tr>
<tr><td>Rated power (kVA)</td><td>300</td><td>400</td><td>500</td><td>600</td><td>800</td></tr>
<tr><td>Double conversion efficiency</td><td colspan="5">Up to 97.1%</td></tr>
<tr><td>Smart conversion mode (Line interactive)</td><td colspan="5">Up to 99%</td></tr>
</table>

<table>
<tr><th colspan="2">ENVIRONMENTAL CHARACTERISTICS</th><th></th><th></th><th></th><th></th><th></th></tr>
<tr><td colspan="2">Rated power (kVA)</td><td>300</td><td>400</td><td>500</td><td>600</td><td>800</td></tr>
<tr><td colspan="2">Storage temperatures</td><td colspan="5">-25 to +55 °C</td></tr>
<tr><td colspan="2">Start-up and working temperature</td><td colspan="5">0 to +40 °C</td></tr>
<tr><td colspan="2">Maximum relative humidity</td><td colspan="5">≤ 95% (non-condensing)</td></tr>
<tr><td colspan="2">Cooling air inlet</td><td colspan="5">Frontal</td></tr>
<tr><td rowspan="2">Cooling air flow</td><td>Standard</td><td colspan="5">Rear outlet - requires 500 mm rear space at 40 °C
or 300 mm rear space at 35 °C</td></tr>
<tr><td>Optional</td><td colspan="5">Top air extraction (without impacting the footprint - no rear space)
up to 600kVA rating</td></tr>
<tr><td colspan="2">Maximum altitude without derating</td><td colspan="5">1500 m</td></tr>
<tr><td colspan="2">Degree of protection - Standard</td><td colspan="5">IP20</td></tr>
<tr><td colspan="2">Color</td><td colspan="5">RAL 7016</td></tr>
</table>

4.9. RECOMMENDED PROTECTIONS

RECOMMENDED PROTECTION DEVICES - INPUTS					
Rated power (kVA)	300	400	500	600	800
Rectifier input mains (A) (1)	630	800	1000	1250	1600
Bypass input mains fuse (A) (1)	500	630	800	1000	1250

RECOMMENDED PROTECTION DEVICES - OUTPUT					
Rated power (kVA)	300	400	500	600	800
Inverter Short-circuit Current limitation (2)	200% of the rated current				
Circuit breaker (A)	≤ 80	≤ 100	≤ 125	≤ 160	≤ 200

CABLES CONNECTION - MAXIMUM CAPABILITY PER POLE					
Rated power (kVA)	300	400	500	600	800
Rectifier terminals (mm^2)	185x2	240x2	185x3	240x3	240x4
Bypass terminals (mm^2)	150x2	185x2	240x2	185x3	240x3
Battery terminals (mm^2)	240x2	240x2	240x3	240x4	240x5
Output terminals (mm^2)	150x2	185x2	240x2	185x3	240x3

(1) Rectifier protection should only be considered in case of separate inputs. The bypass protection is given by recommendation. When the bypass and rectifier inputs are combined (common input), the general input protection rating must be the highest of both (bypass or rectifier).
(2) Selectivity of distribution after the UPS with inverter short-circuit current (short-circuit with AUX MAINS not present). The rating of the protection can be increased by “n” times downstream a parallel UPS system, with “n” equal to the number of parallel modules. Ik1: phase to neutral, Ik2: phase to phase, Ik3: three-phase to neutral.

⚠ 600 kVA bottom version with common inputs: the input must be shared between V_{in} and Bps due to copper bar link for common inputs.

⚠ 800 kVA switches version with common inputs: the input must ONLY be connected on V_{in} due to copper bar link for common inputs.

5. REFERENCE STANDARDS AND DIRECTIVES

5.1. OVERVIEW

The equipment, installed, used and serviced in accordance with its intended use, its regulations and standards, its manufacturer instructions and rules, is in compliance with the relevant Union harmonization legislation:

LVD 2014 / 35 / EU

DIRECTIVE 2014/35/EU OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 26 February 2014, on the harmonization of the laws of the Member States relating to the making available on the market of electrical equipment designed for use within certain voltage limits.

EMC 2014 / 30 / EU

DIRECTIVE 2014/30/EU OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 26 February 2014, on the harmonization of the laws of the Member States relating to electromagnetic compatibility.

RoHS 2011/65/EU

Directive 2011/65 of the European parliament and of the council of 8 June 2011 on the restriction of the use of certain hazardous substances in electrical and electronic equipment.

5.2. STANDARDS

SAFETY

EN 62040-1 Uninterruptible Power System (UPS) - Part 1: General and safety requirements

IEC 62040-1 Uninterruptible Power System (UPS) - Part 1: Safety requirements.

ELECTROMAGNETIC COMPATIBILITY

EN 62040-2 Uninterruptible Power System (UPS) - Part 2: Electromagnetic compatibility (EMC) requirements

IEC 62040-2 Uninterruptible Power System (UPS) - Part 2: Electromagnetic compatibility (EMC) requirements.

ENVIRONMENTAL

IEC 62040-4 Uninterruptible Power System (UPS) - Part 4: Environmental aspects - Requirements and reporting.

5.3. SYSTEM AND INSTALLATION GUIDELINES

When carrying out electrical installation, all the above standards must be observed. All national and international standards (e.g IEC60364) applicable to the specific electrical installation including batteries must be observed.

For further information refer to ‘Technical specifications’ chapter in the user manual.

TECHNICAL GUIDE

EN

MASTERYS IP+

10 to 40 kVA

SUPERIOR
Unrivalled power
performance

Socomec Resource Center
To download, brochures, catalogues
and technical manuals

socomec
Innovative Power Solutions

1. OBJECTIVES

The aim of these specifications is to provide:

- the information required to choose the right uninterruptible power supply for a specific application.
- the information required to prepare the system and installation site.

The specifications are intended for:

- installation engineers.
- design engineers.
- engineering consultants.

2. INSTALLATION REQUIREMENTS AND PROTECTION

Connection to the mains power supply and to the load(s) must be made using cables of suitable size, in accordance with current standards. If not already present, an electrical control station which can isolate the network upstream of the UPS must be installed. This electrical control station must be equipped with a circuit breaker (or two, if there is a separate bypass line) of an appropriate rating for the power draw at full load.

If an external manual bypass is required, only the model supplied by the manufacturer must be installed.

We recommend fitting two metres of unanchored flexible cable between the UPS output terminals and the cable anchor (wall or cabinet). This makes it possible to move and service the UPS.

For detailed information, see the installation and operating manual.

3. ARCHITECTURE

3.1. Range

MASTERYS IP+ is a full range of high performing UPS designed to provide reliable power supply in harsh operating environments.

MODELS					
Rated power (kVA)	10	15	20	30	40
MASTERYS IP+ 3/1	•	•	•	•	–
MASTERYS IP+ 3/3	•	•	•	•	•

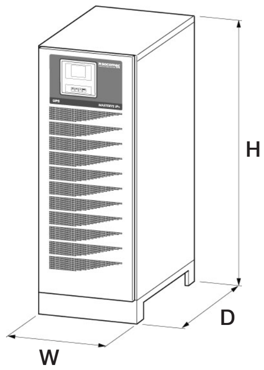
Matrix table for model and kVA power rating

Each range has been specifically designed to meet the demands of loads in specific application contexts, in order to optimise the features of the product and to facilitate its integration within the system.

4. FLEXIBILITY

4.1. Power ratings from 10 to 40 kVA

The entire range (13 basic products) are compatible with 2 cabinets.

DIMENSIONS				
Model	Cabinet type	Width (W) [mm]	Depth (D) [mm]	Height (H) [mm]
MASTERYS IP+ 10 kVA 3/1-3/3		600	800	1400
MASTERYS IP+ 15 kVA 3/1-3/3				
MASTERYS IP+ 20 kVA 3/1-3/3				
MASTERYS IP+ 30 kVA 3/1-3/3				
MASTERYS IP+ 40 kVA 3/3				

The equipment has been designed with a minimum direct and indirect footprint (the actual space occupied by the unit and the space required around it for maintenance, ventilation and access to the operating mechanisms and communication devices).

The careful design also provides easy access for maintenance and installation.

All of the control mechanisms and communication interfaces are located in the front part inside to metal door.

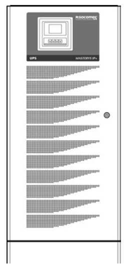
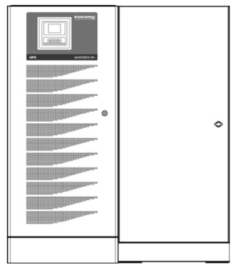
The air inlet is on the front, with outflow to the rear only; this means other equipment or external battery enclosures can be placed alongside the UPS unit.

socomec Innovative Power Solutions

4.2. Flexible back-up time

Different extended back-up times are possible by using voth UPS cabinet, both of which occupy minimum floor space.

For powers greater than or equal to 40 kVA, or long back-up power periods, an additional cabinet should be used, optionally with a supplementary battery charger.

BACK-UP TIMES IN MINUTES (MAX @ 70% OF LOAD)		
		
	Masterys IP+ 10 to 40 kVA	UPS with battery cabinet
MASTERYS IP+ 10 3/1	19	•
MASTERYS IP+ 15 3/1	11	•
MASTERYS IP+ 20 3/1	7	•
MASTERYS IP+ 30 3/1	4	•
MASTERYS IP+ 10 3/3	19	•
MASTERYS IP+ 15 3/3	11	•
MASTERYS IP+ 20 3/3	7	•
MASTERYS IP+ 30 3/3	4	•
MASTERYS IP+ 40 3/3	-	•

Selection of the back-up time is flexible thanks to the wide range of DC bus voltages.

The batteries are organised internally into racks based on their relative sizes, so as to ensure a compact unit while still guaranteeing substantial back-up times.

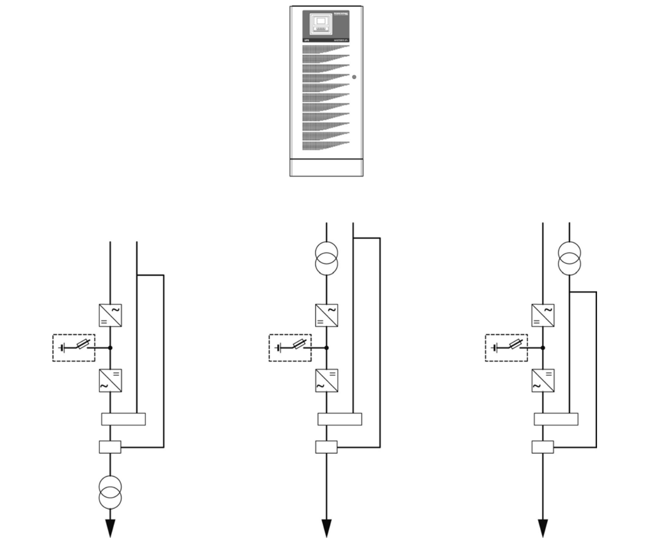
The UPS system's internal batteries consist of distinct strings of battery packs connected in series; each individual pack is connected using polarised connectors to facilitate battery configuration and maintenance.

Each pack is sealed in an acid-proof container which is designed to prevent damage in the case of acid leakage.

To guarantee maximum back-up time availability and battery life, the Masterys series is equipped with EBS systems, depending on the model.

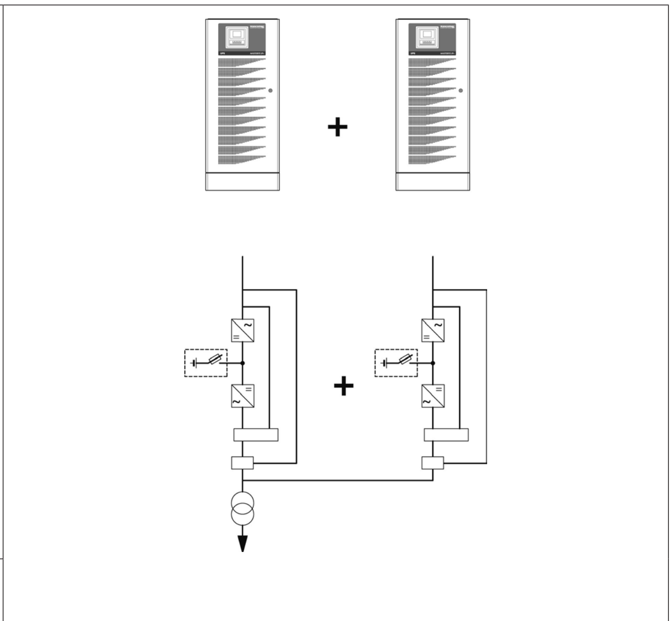
4.3. Parallel configuration.

MASTERYS IP+ offers various configurations.

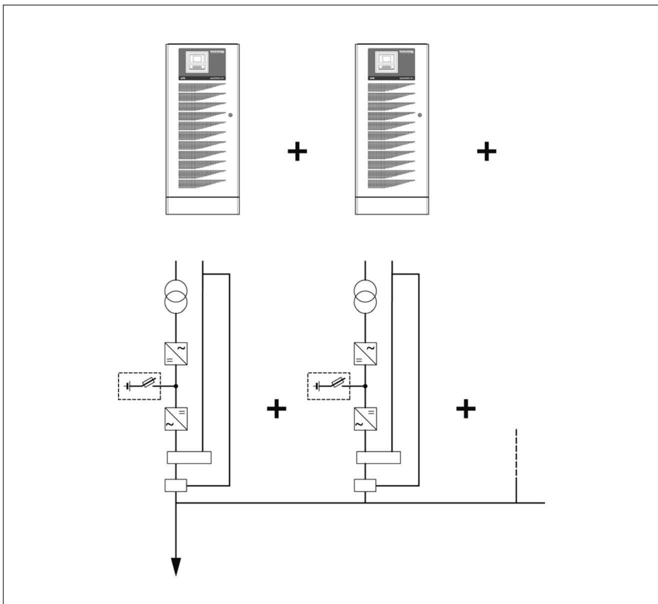


Transformer on OUTPUT	Transformer on MAINS	Transformer on AUX MAINS

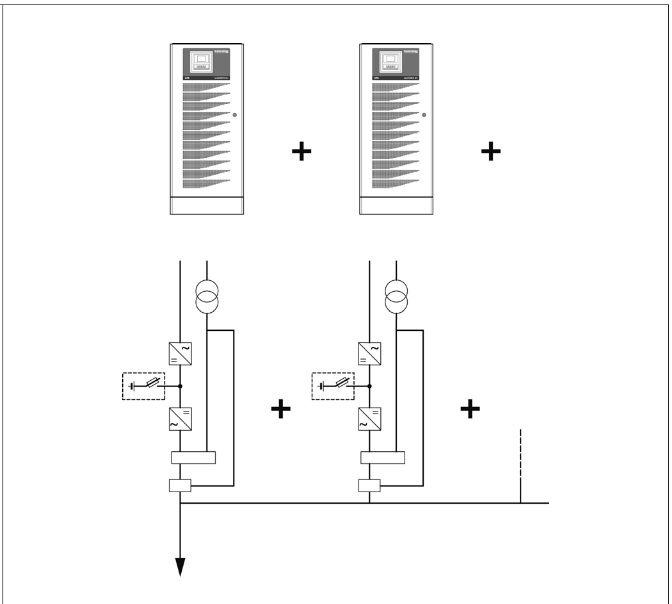
Stand-alone UPS configuration



Parallel 1+1 redundant configuration



Parallel N+1 power configuration (up to 6 UPS) transformer on MAINS



Parallel N+1 power configuration (up to 6 UPS) transformer on AUX MAINS

4.4. Availability, redundancy and efficiency

To increase the availability of the power supply, redundant parallel configurations are becoming increasingly common. Consequently, the overall efficiency of the UPS system risks being reduced due to the low load on each individual machine.

5. STANDARD AND OPTIONS

5.1. For industrial loads

- 100 % non-linear loads.
- 100 % unbalanced loads.
- 100 % “6-pulse” loads (motor speed drivers, welding equipment, power supplies…).
- Motors, lamps, capacitive loads.

5.2. Standard electrical features

- Dual input mains.
- Internal maintenance bypass.
- Backfeed protection: detection circuit.
- EBS (Expert Battery System) for battery management.

5.3. Electrical options.

- Long-life batteries.
- External battery cabinet (degree of protection up to IP32).
- External temperature sensor.
- Additional battery chargers.
- Additional transformer.
- Parallel kit.
- Cold start.
- ACS synchronization system.
- Neutral creation kit for mains without neutral.
- Tropicalization and anti-corrosion protection for electrical boards.

5.4. Standard communication features.

- Multilanguage graphic display.
- Dry contact interface.
- MODBUS RTU.
- Embedded LAN interface (web pages, email).
- 2 slots for communication options.

5.5. Communication options.

- MODBUS TCP.
- NET VISION: professional WEB/SNMP interface for UPS monitoring and shutdown management of several operating systems.

5.6. Remote monitoring service.

- SoLink, remote monitoring service that connects your UPS to your Critical Power specialist 24/7.

6. SPECIFICATIONS

6.1. Installation parameters

INSTALLATION PARAMENTERS										
Rated power (kVA)		10	15	20	30	10	15	20	30	40
Phase in/out		3/1				3/3				
Active power (kW)		9	13.5	18	27	9	13.5	18	27	36
Rated/maximum rectifier input current (EN 62040-3) (A)		14/ 17[1]	21/ 25[1]	28/ 34[1]	42/ 50[1]	14/ 17	21/ 25	28/ 34	42/ 50	56/ 67
Rated bypass input current (A)		44[1]	65[1]	87[1]	131[1]	15[2]	22[2]	29[2]	44[2]	58[2]
Inverter output current @230 V (A) P/N		44	65	87	131	15	22	29	44	58
Maximum air flow (m3/h)		440								
Sound level (dB)		50							55	
Dissipation at rated load (minimum mains power present and batteries charged)	(W)	890	1335	1780	2670	890	1335	1780	2670	3560
	(kcal/h)	765	1148	1531	2296	765	1148	1531	2296	3062
	(BTU/h)	3035	4553	6071	9106	3035	4553	6071	9106	12141
Dimensions (with standard back-up time)	W (mm)	600								
	D (mm)	800								
	H (mm)	1400								
Weight (kg)		230	250	270	330	230	250	270	320	370

(1) Input current in bypass mode is single-phase. Consequently, the rated current of the neutral and of the phase common to the bypass is three times higher than the current drawn during normal operation by the rectifier.
(2) In the case of single-phase distorting loads downstream of the UPS, when the bypass is in operation the neutral current can be 1.5-2 times higher than the phase current; this is due to the harmonic current distortion produced by the load itself, which is no longer corrected by the UPS rectifier as occurs in normal operation.

6.2. Electrical characteristics

ELECTRICAL CHARACTERISTICS - INPUT									
Rated power (kVA)	10	15	20	30	10	15	20	30	40
Phase in/out	3/1				3/3				
Rated mains supply voltage	400 V 3ph + N								
Voltage tolerance	-15% to +20% (pf 0.9) -20% to +20% (pf 0.8) Up to -40% to 50% of rated power (pf 0.9)								
Rated frequency	50/60 Hz (selectable)								
Frequency tolerance	±10%								
Power factor (input at full load and rated voltage)	≥ 0.99								
Total harmonic distortion (THDi)	< 3%								
Max inrush current at start-up	< In (no overcurrent)								

ELECTRICAL CHARACTERISTICS - BYPASS									
Rated power (kVA)	10	15	20	30	10	15	20	30	40
Phase in/out	3/1				3/3				
Bypass frequency variation speed	1 Hz/s - 3 Hz/s								
Bypass rated voltage	Nominal output voltage ±15%								
Bypass rated frequency (selectable)	50/60 Hz								
Bypass frequency tolerance	±2% (from ±1% to ±8% (operation with generator unit))								

ELECTRICAL CHARACTERISTICS - INVERTER										
Rated power (kVA)		10	15	20	30	10	15	20	30	40
Phase in/out		3/1				3/3				
Rated output voltage (selectable)		208[1]/220/230/240 V (1ph) 380/400/415 V (3ph)								
Output voltage tolerance		Static: ±1%								
Rated output frequency (selectable)		50/60 Hz								
Output frequency tolerance		±0.01% (on mains power failure)								
Load crest factor		3:1								
Voltage harmonic distortion		< 1% with linear load								
Overload tolerated by the inverter[2]	10 min	10 kW	15 kW	20 kW	30 kW	10 kW	15 kW	20 kW	30 kW	40 kW
	1 min	12 kW	18 kW	24 kW	36 kW	12 kW	18 kW	24 kW	36 kW	48 kW

(1) @ 208 V Pout = 90% Pnom
(2) @ pf 0.9

ELECTRICAL CHARACTERISTICS - EFFICIENCY									
Rated power (kVA)	10	15	20	30	10	15	20	30	40
Phase in/out	3/1				3/3				
Double conversion efficiency (normal mode) at rated load, transfo on the output	91%								
Double conversion efficiency (normal mode) at rated load, transfo on bypass	95%				94%				

ELECTRICAL CHARACTERISTICS - EFFICIENCY									
Rated power (kVA)	10	15	20	30	10	15	20	30	40
Phase in/out	3/1				3/3				
Storage temperatures	-5 to +45 °C (23 to 113 °F) (15 to 25 °C for better battery life)								
Working temperature	0 to +50[1] °C (32 to 122 °F) (15 to 25 °C for better battery life)								
Maximum relative humidity (non-condensing)	95%								
Maximum altitude without derating	1000 m (3300 ft)								
Degree of protection	IP31 and IP52								IP31
Portability	ASTM D999-08, ASTM D-880, AFNOR NF H 00-042								
Colour	RAL 7012								

(1) Conditions apply.

6.3. Recommended protection devices

RECOMMENDED PROTECTION DEVICES - RECTIFIER(1)									
Model IP+	10	15	20	30	10	15	20	30	40
Phase in/out	3/1				3/3				
D curve circuit breaker (A)	32		40	63	32		40	63	80
gG fuse (A)	32		40	63	32		40	63	80

RECOMMENDED PROTECTION DEVICES - GENERAL BYPASS(1)									
Model IP+	10	15	20	30	10	15	20	30	40
Phase in/out	3/1				3/3				
Maximum I^2t supported by the bypass (A^2s)	80000			125000	8000			15000	
Icc max (A)	4000			5000	1200			1700	

RECOMMENDED PROTECTION DEVICES - INPUT RESIDUAL CURRENT CIRCUIT BREAKER(2)									
Model IP+	10	15	20	30	10	15	20	30	40
Phase in/out	3/1	3/1	3/1	3/1	3/3	3/3	3/3	3/3	3/3
Input residual current circuit breaker	> 0.5 A Selective								

RECOMMENDED PROTECTION DEVICES - OUTPUT									
Model IP+	10	15	20	30	10	15	20	30	40
Phase in/out	3/1				3/3				
C curve circuit breaker(3) (A)	< 10	< 16	< 20	< 32	< 4		< 6	< 10	< 13
B curve circuit breaker(3) (A)	< 20	< 32	< 40	< 63	< 8		< 12	< 20	< 25
High-speed fuse(3) (A)	< 12	< 18	< 24	< 36	< 6		< 10	< 12	< 16

<table>
<tr><th colspan="10">CABLES - MAXIMUM CABLE SECTION</th></tr>
<tr><td>Model IP+</td><td>10</td><td>15</td><td>20</td><td>30</td><td>10</td><td>15</td><td>20</td><td>30</td><td>40</td></tr>
<tr><td>Phase in/out</td><td colspan="4">3/1</td><td colspan="5">3/3</td></tr>
<tr><td>Rectifier terminals</td><td colspan="4">4x CBD 35
35 mm2 (flexible cable)
50 mm2 (rigid cable)</td><td colspan="5" rowspan="4">4x CBD 35
35 mm2 (flexible cable)
50 mm2 (rigid cable)</td></tr>
<tr><td>Bypass terminals</td><td colspan="4">2x CBD 35
35 mm2 (flexible cable)
50 mm2 (rigid cable)
2x CBD 50
50 mm2 (flexible cable)
70 mm2 (rigid cable)</td></tr>
<tr><td>Battery terminals</td><td colspan="4">4x CBD 35
35 mm2 (flexible cable)
50 mm2 (rigid cable)</td></tr>
<tr><td>Output terminals</td><td colspan="4">2x CBD 50
50 mm2 (flexible cable)
70 mm2 (rigid cable)</td></tr>
</table>

(1) Rectifier protection should only be considered in the event of separate inputs. The bypass protection is given by recommendation. When the bypass and rectifier inputs are combined (common input), the general input protection rating must be the highest of both (bypass or rectifier).
(2) Must be selective with residual current circuit breakers downstream of the UPS connected to the UPS output. If the bypass network is separate from the rectifier circuit, or in the event of parallel UPS, use a single residual current circuit breaker upstream of the UPS.
(3) Selectivity of distribution after the UPS with inverter short-circuit current (short-circuit with AUX MAINS not present). The rating of the protection can be increased by "n" times downstream a parallel UPS system, with "n" equal to the number of parallel modules.

7. REFERENCE STANDARDS AND DIRECTIVES

7.1. Overview

The equipment, installed, used and serviced in accordance with its intended use, its regulations and standards, its manufacturer instructions and rules, is in compliance with the relevant Union harmonisation legislation:

LVD 2014 / 35 / EU

DIRECTIVE 2014/35/EU OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 26 February 2014, on the harmonisation of the laws of the Member States relating to the making available on the market of electrical equipment designed for use within certain voltage limits.

EMC 2014 / 30 / EU

DIRECTIVE 2014/30/EU OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 26 February 2014, on the harmonisation of the laws of the Member States relating to electromagnetic compatibility.

RoHS 2011/65/EU

Directive 2011/65 of the European parliament and of the council of 8 June 2011 on the restriction of the use of certain hazardous substances in electrical and electronic equipment

7.2. Standards

7.2.1. Safety

EN 62040-1	Uninterruptible Power System (UPS) - Part 1: General and safety requirements (certified by TÜV SÜD)
IEC 62040-1	Uninterruptible Power System (UPS) - Part 1: Safety requirements

7.2.2. Electromagnetic compatibility

EN 62040-2	Uninterruptible Power System (UPS) - Part 2: Electromagnetic compatibility (EMC) requirements (C3 category)
IEC 62040-2	Uninterruptible Power System (UPS) - Part 2: Electromagnetic compatibility (EMC) requirements

7.2.3. Test and performance

EN 62040-3	Uninterruptible power systems (UPS). Methods of specifying the performance and test requirements

7.2.4. Degrees of protection

EN 60529	Degrees of protection provided by enclosures

7.3. System and installation guidelines

When carrying out electrical installation, all the above standards must be observed. All national and international standards (e.g IEC60364) applicable to the specific electrical installation including batteries must be observed. For further information refer to ‘Technical specifications’ chapter in the user manual.

TECHNICAL GUIDE

EN

DELPHYS MX Elite+

60 to 120 kVA

SUPERIOR

Unrivalled power performance

Socomec Resource Center
To download, brochures, catalogues and technical manuals

socomec
Innovative Power Solutions

1. OBJECTIVES

The aim of these specifications is to provide:

- the information required to choose the right uninterruptible power supply for a specific application.
- the information required to prepare the system and installation site.

The specifications are intended for:

- installation engineers.
- design engineers.
- engineering consultants.

2. INSTALLATION REQUIREMENTS AND PROTECTION

Connection to the mains power supply and to the load(s) must be made using cables of suitable size, in accordance with current standards. If not already present, an electrical control station which can isolate the network upstream of the UPS must be installed. This electrical control station must be equipped with a circuit breaker (or two, if there is a separate bypass line) of an appropriate rating for the power draw at full load.

If an external manual bypass is required, only the model supplied by the manufacturer must be installed.

We recommend fitting two meters of unanchored flexible cable between the UPS output terminals and the cable anchor (wall or cabinet). This makes it possible to move and service the UPS.

For detailed information, see the installation and operating manual.

3. ARCHITECTURE

3.1. Range

DELPHYS MX Elite+ is a high performing transformer based UPS designed to secure power supply to critical industrial applications.

The isolation transformer installed on the inverter output ensures complete galvanic isolation between DC circuit and load output.

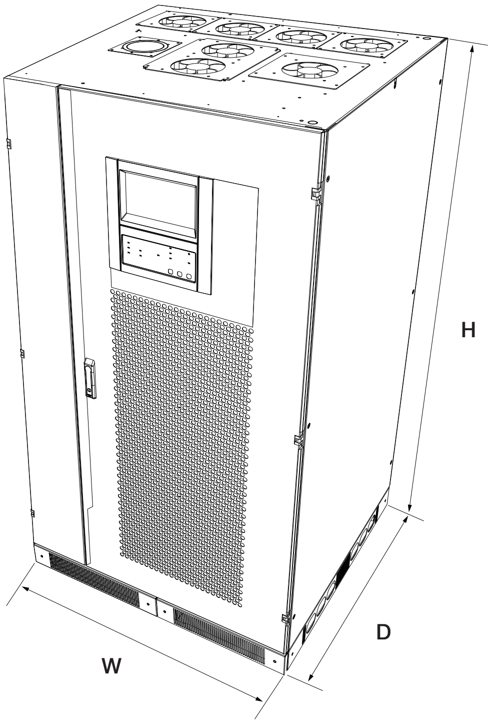
MODELS				
Rated power (kVA)	60	80	100	120
DELPHYS MX Elite+ 3/3	•	•	•	•

Matrix table for model and kVA power rating

DELPHYS MX Elite+ has been specifically designed to meet the demands of loads in specific application contexts, in order to optimise the features of the product and to facilitate its integration within the system.

4. FLEXIBILITY

4.1. Power ratings from 60 to 120 kVA

DIMENSIONS			
Range	Width (W) [mm]	Depth (D) [mm]	Height (H) [mm]
 DELPHYS MX Elite+ 60 to 120 kVA	800	850	1900

The equipment has been designed with a minimum direct and indirect footprint (the actual space occupied by the unit and the space required around it for maintenance, ventilation and access to the operating mechanisms and communication devices).

The careful design also provides easy access for maintenance and installation:

- all of the control mechanisms and communication interfaces are located and can be accessed in the front part,
- the air inlet is on the front, with outflow from the upper side; this means other equipment or external battery enclosures can be placed alongside the UPS unit.

4.2. Flexible backup time

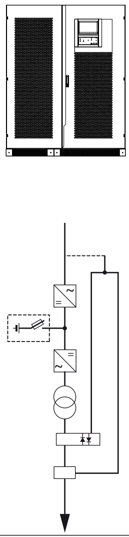
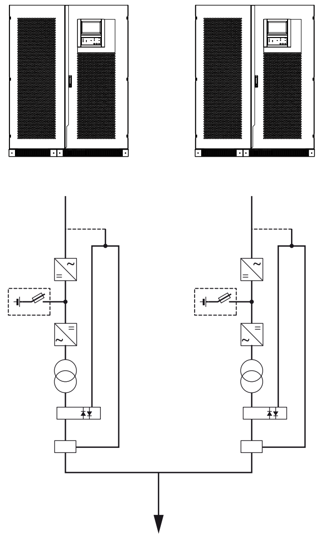
Selection of the back-up time is flexible thanks to the wide range of DC bus voltages. The batteries are organised internally into racks based on their relative sizes, so as to ensure a compact unit while still guaranteeing substantial backup times.

To guarantee maximum back-up time availability and battery life, the DELPHYS MX Elite+ includes smart battery charging management.

4.3. Parallel

DELPHYS MX Elite+ UPS units (rectifier, battery, inverter and bypass) can be connected in parallel (up to 6 units) with distributed bypass. This solution, which is ideally suited for 1+1 redundancy, offers flexible power upgrading and enables stand-alone UPS units to be expanded. Each single UPS unit has a built-in maintenance bypass (single unit or distributed bypass).

It is possible to add an external maintenance bypass, common to all of the UPS units, for maintenance access.

	
Single unit configuration	1+1 redundant configuration

5. STANDARD AND OPTIONS

5.1. Standard electrical features.

- Backfeed protection: detection circuit.
- Standard interface:
  - 8 NO/NC contact outputs.
  - Abnormal Rectifier, Battery Running, The Bypass operation, Abnormal input, Overload alarm, Abnormal cells, Abnormal Inverter, Integrated alarm.

5.2. Mechanical options.

- Reinforced IP protection degree.
- Extended top entry outlet solution.

5.3. Standard communication features.

- 10 inches touch screen display.
- RS485/Modbus RTU, RS232.
- Dry contact with 8 NO/NC contacts.

5.4. Communication options.

- NET VISION: professional WEB/SNMP Ethernet interface for secure UPS monitoring and remote automatic shutdown.
- Modbus TCP.
- 8 Dry contact with extended function.

5.5. Remote monitoring service.

- SoLink: Socomec 27/4 Remote Monitoring Service connecting your installation to the nearest Socomec Service Centre.
- SoLive: Mobile app taking the surveillance of all your UPS systems into your smartphone.

6. SPECIFICATIONS

6.1. Installation parameters

INSTALLATION PARAMETERS					
Rated power (kVA)		60	80	100	120
Phase in/out		3/3			
Active power (kW)		54	72	90	108
Rated/maximum rectifier input current (A)		104	149	178	218
Rated bypass input current (A)		87	115	144	173
Inverter output current @230V (A) P/N		87	115	144	173
Maximum air flow (m^3/h)		1560	1950	1950	1950
Sound level (dBA)		71	71	71	71
Dissipation at rated load (minimum mains power present and batteries charged)	kW	3,78	5,42	6,77	7,6
	kcal/h	3251	4661	5826	6536
	BTU/h	12,9	18,5	23,12	25,94
Dimensions	W (mm)	800	800	800	800
	D (mm)	850	850	850	850
	H (mm)	1900	1900	1900	1900
Weight	kg	800	800	900	1000

6.2. Electrical characteristics

ELECTRICAL CHARACTERISTICS - INPUT				
Rated power (kVA)	60	80	100	120
Phase in/out	3/3			
Rated mains supply voltage	380/400/415 V (adjustable)			
Voltage tolerance (ensuring battery recharge)	304 ~ 460 VAC (+/-20% @ 380 V) 400 V (-10% ~ 15%) @full load PF0.9 400 V (-20% ~ 15%) @80% load PF0.9			
Rated frequency	50/60 Hz			
Frequency tolerance	± 10%			
Power factor (input at full load and rated voltage)	0.99			
Total harmonic distortion (THDi)	< 3%			
Max inrush current at start-up	<In (no overcurrent)			
Soft start	-			

ELECTRICAL CHARACTERISTICS - BYPASS				
Rated power (kVA)	60	80	100	120
Bypass frequency variation speed	-			
Bypass rated voltage	Rated output voltage ±10%			
Bypass rated frequency	50/60 Hz selectable			
Bypass frequency tolerance	±5 Hz (1% to 10% settable)			

ELECTRICAL CHARACTERISTICS - INVERTER					
Rated power (kVA)		60	80	100	120
Rated output voltage (selectable)		380/400/415 V			
Output voltage tolerance		Static: < 1% Dynamic: (0-100% Pn) ±2%			
Rated output frequency		50/60 Hz (selectable)			
Output frequency tolerance		± 0.02% internal frequency			
Load crest factor		3:1			
Voltage harmonic distortion (ThdU)	on linear load	< 1%			
	on non-linear load	< 5%			
Overload tolerated by the inverter (with mains power present)		110 % 1 hour, 125 % 10 minutes 150 % 1 minute (all with battery)			

ELECTRICAL CHARACTERISTICS - EFFICIENCY				
Rated power (kVA)	60	80	100	120
Double conversion efficiency (normal mode)	Up to 94% at full load			
Efficiency in Eco Mode	99%			

ELECTRICAL CHARACTERISTICS - ENVIRONMENT				
Rated power (kVA)	60	80	100	120
Storage temperatures	-20 to +70 °C (-4 to 158 °F) (15 to 25 °C for better battery life)			
Working temperature	0 to +35 °C (32 to 95 °F)			
Maximum relative humidity (non-condensing)	95%			
Maximum altitude without derating	1000 m (3300 ft)			
Degree of protection	IP20 (up to IP21 / IP31optional)			
Colour	Grey TOYO (RAL9006)			

(1) Conditions apply.

6.3. Recommended protection devices

RECOMMENDED PROTECTION DEVICES - RECTIFIER(1)				
Rated power (kVA)	60	80	100	120
C curve circuit breaker (A)	250	250	250	320

RECOMMENDED PROTECTION DEVICES - GENERAL BYPASS(1)					
Rated power (kVA)		60	80	100	120
Semiconductors characteristics	I2t (A2s)	110000	110000	110000	110000
	Is/c (A peak)	4680	4680	4680	4680
C curve circuit breaker (A)		250	250	250	320

RECOMMENDED PROTECTION DEVICES - INPUT RESIDUAL CURRENT CIRCUIT BREAKER(2)				
Rated power (kVA)	60	80	100	120
Input residual current circuit breaker	300 mA			

RECOMMENDED PROTECTION DEVICES - OUTPUT(2)				
Rated power (kVA)	60	80	100	120
Short-circuit inverter current (A) - (0 to 100 ms) (when AUX MAINS is not present)	370	488	611	734
C curve circuit breaker(3) (A)	250	250	250	320

CABLES - MAXIMUM CABLE SECTION				
Rated power (kVA)	60	80	100	120
Rectifier terminals	1 hole of ∅12 for screw M12 1 cable for each bar x 150 mm² -M12			
Bypass terminals				
Battery terminals				
Output terminals				

(1) Rectifier protection should only be considered in the event of separate inputs. The bypass protection is given by recommendation. When the bypass and rectifier inputs are combined (common input), the general input protection rating must be the highest of both (bypass or rectifier).
(2) Must be selective with residual current circuit breakers downstream of the UPS connected to the UPS output. If the bypass network is separate from the rectifier circuit, or in the event of parallel UPS, use a single residual current circuit breaker upstream of the UPS.
(3) Selectivity of distribution after the UPS with inverter short-circuit current (short-circuit with AUX MAINS not present). The rating of the protection can be increased by “n” times downstream a parallel UPS system, with “n” equal to the number of parallel modules.

7. REFERENCE STANDARDS AND DIRECTIVES

7.1. Overview

The equipment, installed, used and serviced in accordance with its intended use, its regulations and standards, its manufacturer instructions and rules, is in compliance with the relevant Union harmonisation legislation:

LVD 2014 / 35 / EU

DIRECTIVE 2014/35/EU OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 26 February 2014, on the harmonisation of the laws of the Member States relating to the making available on the market of electrical equipment designed for use within certain voltage limits.

EMC 2014 / 30 / EU

DIRECTIVE 2014/30/EU OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 26 February 2014, on the harmonisation of the laws of the Member States relating to electromagnetic compatibility.

RoHS 2011/65/EU

Directive 2011/65 of the European parliament and of the council of 8 June 2011 on the restriction of the use of certain hazardous substances in electrical and electronic equipment.

7.2. Standards

7.2.1. Safety

EN 62040-1	Uninterruptible Power System (UPS) - Part 1: General and safety requirements.
IEC 62040-1	Uninterruptible Power System (UPS) - Part 1: Safety requirements.

7.2.2. Electromagnetic compatibility

EN 62040-2	Uninterruptible Power System (UPS) - Part 2: Electromagnetic compatibility (EMC) requirements.
IEC 62040-2	Uninterruptible Power System (UPS) - Part 2: Electromagnetic compatibility (EMC) requirements.

7.3. System and installation guidelines

When carrying out electrical installation, all the above standards must be observed. All national and international standards (e.g IEC60364) applicable to the specific electrical installation including batteries must be observed. For further information refer to 'Technical specifications' chapter in the user manual.

TECHNICAL GUIDE

EN

DELPHYS MX Elite+

160 to 600 kVA

SUPERIOR

Unrivalled power performance

Socomec Resource Center
To download, brochures, catalogues and technical manuals

socomec
Innovative Power Solutions

1. OBJECTIVES

The aim of these specifications is to provide:

- the information required to choose the right uninterruptible power supply for a specific application.
- the information required to prepare the system and installation site.

The specifications are intended for:

- installation engineers.
- design engineers.
- engineering consultants.

2. INSTALLATION REQUIREMENTS AND PROTECTION

Connection to the mains power supply and to the load(s) must be made using cables of suitable size, in accordance with current standards. If not already present, an electrical control station which can isolate the network upstream of the UPS must be installed. This electrical control station must be equipped with a circuit breaker (or two, if there is a separate bypass line) of an appropriate rating for the power draw at full load.

If an external manual bypass is required, only the model supplied by the manufacturer must be installed.

We recommend fitting two meters of unanchored flexible cable between the UPS output terminals and the cable anchor (wall or cabinet). This makes it possible to move and service the UPS.

For detailed information, see the installation and operating manual.

3. ARCHITECTURE

3.1. Range

DELPHYS MX Elite+ is a high performing transformer based UPS designed to secure power supply to critical industrial applications.

The isolation transformer installed on the inverter output ensures complete galvanic isolation between DC circuit and load output.

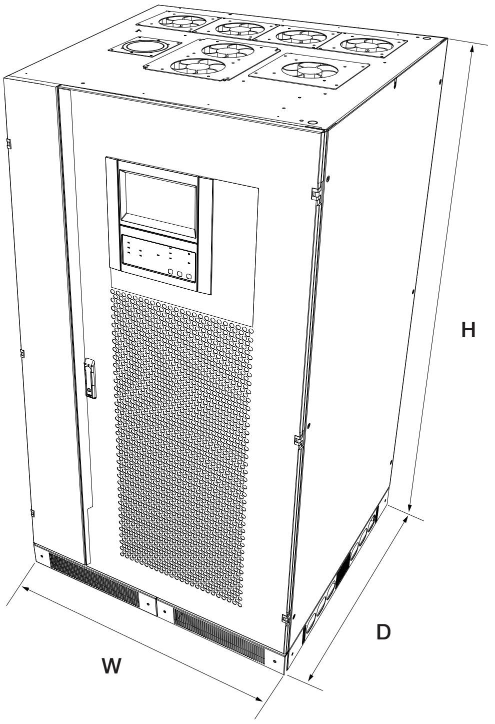
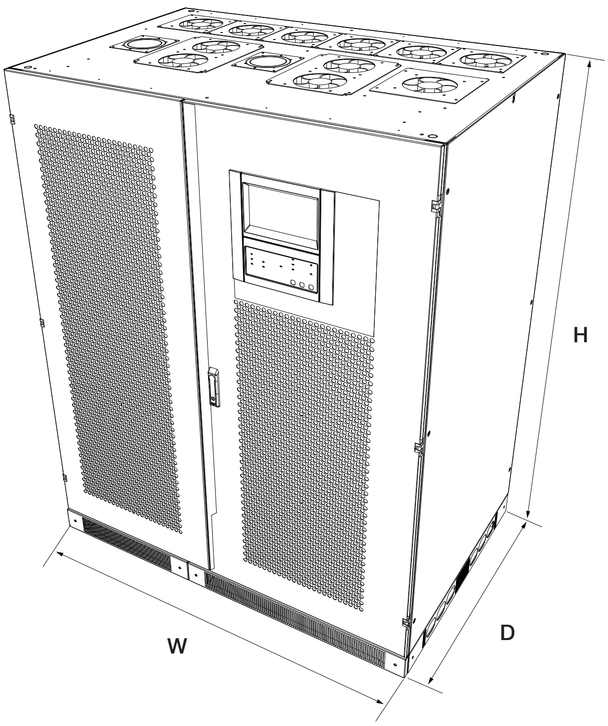
MODELS						
Rated power (kVA)	160	200	250	300	400	600
DELPHYS MX Elite+ 3/3	•	•	•	•	•	•

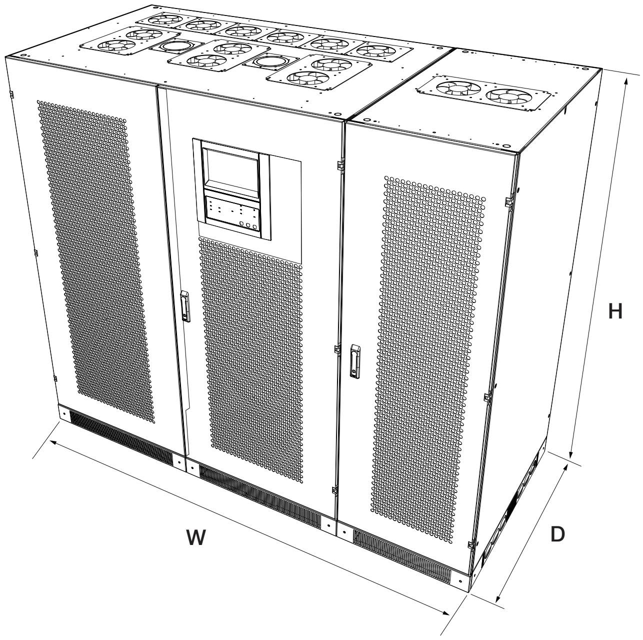
Matrix table for model and kVA power rating

DELPHYS MX Elite+ has been specifically designed to meet the demands of loads in specific application contexts, in order to optimise the features of the product and to facilitate its integration within the system.

4. FLEXIBILITY

4.1. Power ratings from 160 to 600 kVA

DIMENSIONS			
Range	Width (W) [mm]	Depth (D) [mm]	Height (H) [mm]
 DELPHYS MX Elite+ 160 to 250 kVA	1000	850	1900
 DELPHYS MX Elite+ 300 and 400 kVA	1500	1000	1900

	2200	1000	1900
DELPHYS MX Elite+ 500 and 600 kVA			

The equipment has been designed with a minimum direct and indirect footprint (the actual space occupied by the unit and the space required around it for maintenance, ventilation and access to the operating mechanisms and communication devices).

The careful design also provides easy access for maintenance and installation:

- all of the control mechanisms and communication interfaces are located and can be accessed in the front part,
- the air inlet is on the front, with outflow from the upper side; this means other equipment or external battery enclosures can be placed alongside the UPS unit.

4.2. Flexible backup time

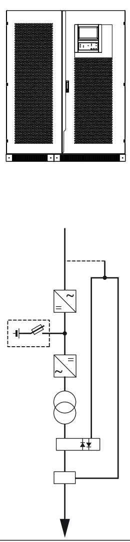
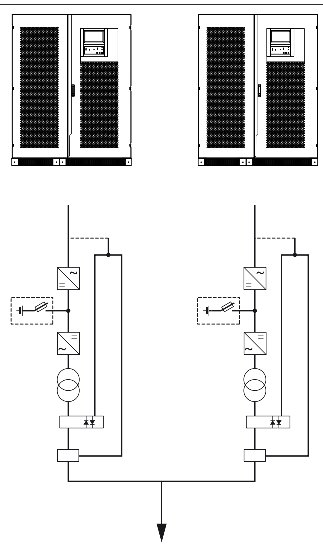
Selection of the back-up time is flexible thanks to the wide range of DC bus voltages. The batteries are organised internally into racks based on their relative sizes, so as to ensure a compact unit while still guaranteeing substantial backup times.

To guarantee maximum back-up time availability and battery life, the DELPHYS MX Elite+ includes smart battery charging management.

4.3. Parallel

DELPHYS MX Elite+ UPS units (rectifier, battery, inverter and bypass) can be connected in parallel (up to 6 units) with distributed bypass. This solution, which is ideally suited for 1+1 redundancy, offers flexible power upgrading and enables stand-alone UPS units to be expanded. Each single UPS unit has a built-in maintenance bypass (single unit or distributed bypass).

It is possible to add an external maintenance bypass, common to all of the UPS units, for maintenance access.

	
Single unit configuration	1+1 redundant configuration

5. STANDARD AND OPTIONS

5.1. Standard electrical features.

- Backfeed protection: detection circuit.
- Standard interface:
  - 8 NO/NC contact outputs.
  - Abnormal Rectifier, Battery Running, The Bypass operation, Abnormal input, Overload alarm, Abnormal cells, Abnormal Inverter, Integrated alarm.

5.2. Mechanical options.

- Reinforced IP protection degree.
- Extended top entry outlet solution.

5.3. Standard communication features.

- 10 inches touch screen display.
- RS485/Modbus RTU, RS232.
- Dry contact with 8 nos NO/NC contacts.

5.4. Communication options.

- NET VISION: professional WEB/SNMP Ethernet interface for secure UPS monitoring and remote automatic shutdown.
- Modbus TCP.
- 8 nos Dry contact with extended function.

5.5. Remote monitoring service.

- SoLink: Socomec 27/4 Remote Monitoring Service connecting your installation to the nearest Socomec Service Centre.
- SoLive: Mobile app taking the surveillance of all your UPS systems into your smartphone.

6. SPECIFICATIONS

6.1. Installation parameters

INSTALLATION PARAMETERS								
Rated power (kVA)		160	200	250	300	400	500	600
Phase in/out		3/3						
Active power (kW)		144	180	225	270	360	450	540
Rated/maximum rectifier input current (A)		261	327	408	490	653	816	979
Rated bypass input current (A)		243	303	379	455	607	758	910
Inverter output current @230V (A) P/N		243	303	379	455	607	758	910
Maximum air flow (m^3/h)		3960			7260		9240	
Sound level (dBA)		≤ 68			≤ 75			
Dissipation at rated load (minimum mains power present and batteries charged)	kW	11.2	14	17.5	21	28	35	42
	kcal/h	9630	12040	15050	18060	24080	30100	36120
	BTU/h	38214	47777	59722	71666	95555	119444	143333
Dimensions	W (mm)	1000	1000	1000	1500	1500	2200	2200
	D (mm)	850	850	850	1000	1000	1000	1000
	H (mm)	1900	1900	1900	1900	1900	1900	1900
Weight	kg	1150	1250	1350	1800	2000	2800	3000

6.2. Electrical characteristics

ELECTRICAL CHARACTERISTICS - INPUT							
Rated power (kVA)	160	200	250	300	400	500	600
Phase in/out	3/3						
Rated mains supply voltage	380/400/415 V (adjustable)						
Voltage tolerance (ensuring battery recharge)	304 ~ 460 VAC (+/-20% @ 380 V) 400 V (-10% ~ 15%) @full load PF0.9 400 V (-20% ~ 15%) @80% load PF0.9						
Rated frequency	50/60 Hz						
Frequency tolerance	± 10%						
Power factor (input at full load and rated voltage)	0.99						
Total harmonic distortion (THDi)	< 3%						
Max inrush current at start-up	<In (no overcurrent)						
Soft start	-						

ELECTRICAL CHARACTERISTICS - BYPASS							
Rated power (kVA)	160	200	250	300	400	500	600
Bypass frequency variation speed	-						
Bypass rated voltage	Rated output voltage ±10%						
Bypass rated frequency	50/60 Hz selectable						
Bypass frequency tolerance	±5 Hz (1% to 10% settable)						

ELECTRICAL CHARACTERISTICS - INVERTER								
Rated power (kVA)		160	200	250	300	400	500	600
Rated output voltage (selectable)		380/400/415 V						
Output voltage tolerance		Static: < 1% Dynamic: (0-100% Pn) ±2%						
Rated output frequency		50/60 Hz (selectable)						
Output frequency tolerance		± 0.02% internal frequency						
Load crest factor		3:1						
Voltage harmonic distortion (ThdU)	on linear load	< 1%						
	on non-linear load	< 5%		< 2.5%				
Overload tolerated by the inverter (with mains power present)		110 % 1 hour, 125 % 10 minutes 150 % 1 minute (all with battery)						

ELECTRICAL CHARACTERISTICS - EFFICIENCY							
Rated power (kVA)	160	200	250	300	400	500	600
Double conversion efficiency (normal mode)	Up to 94% at full load						
Efficiency in Eco Mode	99%						

ELECTRICAL CHARACTERISTICS - ENVIRONMENT							
Rated power (kVA)	160	200	250	300	400	500	600
Storage temperatures	-20 to +70 °C (-4 to 158 °F) (15 to 25 °C for better battery life)						
Working temperature	0 to +35 °C (32 to 95 °F)						
Maximum relative humidity (non-condensing)	95%						
Maximum altitude without derating	1000 m (3300 ft)						
Degree of protection	IP20 (up to IP21 optional)						
Colour	Grey TOYO (RAL9006)						

(1) Conditions apply.

6.3. Recommended protection devices

RECOMMENDED PROTECTION DEVICES - RECTIFIER(1)							
Rated power (kVA)	160	200	250	300	400	500	600
D curve circuit breaker (A)	400			630	800	1250	

RECOMMENDED PROTECTION DEVICES - GENERAL BYPASS(1)								
Rated power (kVA)		160	200	250	300	400	500	600
Semiconductors characteristics	I2t (A2s)	414000			1125000			
	Is/c (A peak)	9100			15000			
D curve circuit breaker (A)		400		500	630	800	1250	

RECOMMENDED PROTECTION DEVICES - INPUT RESIDUAL CURRENT CIRCUIT BREAKER(2)							
Rated power (kVA)	160	200	250	300	400	500	600
Input residual current circuit breaker	300 mA						

RECOMMENDED PROTECTION DEVICES - OUTPUT(2)							
Rated power (kVA)	160	200	250	300	400	500	600
Short-circuit inverter current (A) - (0 to 100 ms) (when AUX MAINS is not present)	-	-	1720	-	2500	-	4380
C curve circuit breaker(3) (A)	400		500	630	800	1250	
High-speed fuse(3) (A)	-	-	-	-	-	-	-

CABLES - MAXIMUM CABLE SECTION							
Rated power (kVA)	160	200	250	300	400	500	600
Rectifier terminals	1 hole of Φ12 for screw M10			3 holes of Φ13 for screw M10		2 holes of Φ11 for screw M10	
Bypass terminals	1 hole of Φ12 for screw M10			3 holes of Φ13 for screw M10		3 holes of Φ14 for screw M10	
Battery terminals	1 hole of Φ12 for screw M10			2 holes of Φ14 for screw M10		2 holes of Φ14 for screw M10	
Output terminals	1 hole of Φ12 for screw M10			3 holes of Φ13 for screw M10		3 holes of Φ14 for screw M10	

(1) Rectifier protection should only be considered in the event of separate inputs. The bypass protection is given by recommendation. When the bypass and rectifier inputs are combined (common input), the general input protection rating must be the highest of both (bypass or rectifier).
(2) Must be selective with residual current circuit breakers downstream of the UPS connected to the UPS output. If the bypass network is separate from the rectifier circuit, or in the event of parallel UPS, use a single residual current circuit breaker upstream of the UPS.
(3) Selectivity of distribution after the UPS with inverter short-circuit current (short-circuit with AUX MAINS not present). The rating of the protection can be increased by “n” times downstream a parallel UPS system, with “n” equal to the number of parallel modules.

7. REFERENCE STANDARDS AND DIRECTIVES

7.1. Overview

The equipment, installed, used and serviced in accordance with its intended use, its regulations and standards, its manufacturer instructions and rules, is in compliance with the relevant Union harmonisation legislation:

LVD 2014 / 35 / EU

DIRECTIVE 2014/35/EU OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 26 February 2014, on the harmonisation of the laws of the Member States relating to the making available on the market of electrical equipment designed for use within certain voltage limits.

EMC 2014 / 30 / EU

DIRECTIVE 2014/30/EU OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 26 February 2014, on the harmonisation of the laws of the Member States relating to electromagnetic compatibility.

RoHS 2011/65/EU

Directive 2011/65 of the European parliament and of the council of 8 June 2011 on the restriction of the use of certain hazardous substances in electrical and electronic equipment.

7.2. Standards

7.2.1. Safety

EN 62040-1	Uninterruptible Power System (UPS) - Part 1: General and safety requirements.
IEC 62040-1	Uninterruptible Power System (UPS) - Part 1: Safety requirements.

7.2.2. Electromagnetic compatibility

EN 62040-2	Uninterruptible Power System (UPS) - Part 2: Electromagnetic compatibility (EMC) requirements.
IEC 62040-2	Uninterruptible Power System (UPS) - Part 2: Electromagnetic compatibility (EMC) requirements.

7.3. System and installation guidelines

When carrying out electrical installation, all the above standards must be observed. All national and international standards (e.g IEC60364) applicable to the specific electrical installation including batteries must be observed. For further information refer to ‘Technical specifications’ chapter in the user manual.

TECHNICAL GUIDE

EN

DELPHYS XL

from 1 to 4 MW and 1.2 to 4.8 MW
High Power UPS

SUPERIOR

Unrivalled power performance

Socomec Resource Center
To download, brochures, catalogues and technical manuals

socomec
Innovative Power Solutions

1. OBJECTIVES

The aim of these specifications is to provide the information required to prepare the system and installation site.

The specifications are intended for:

- installation engineers,
- design engineers,
- engineering consultants.

2. INSTALLATION REQUIREMENTS AND PROTECTION

Connections to the mains power supply and to the load(s) must be implemented using cables of suitable size, in accordance with current standards. If there is no electrical control station present that can isolate the network upstream of the UPS, one must be installed. This electrical control station must be equipped with a protective device (or two, if there is a separate bypass line) with an appropriate rating for the power draw at full load.

For detailed information, see the installation and operating manual.

3. ARCHITECTURE

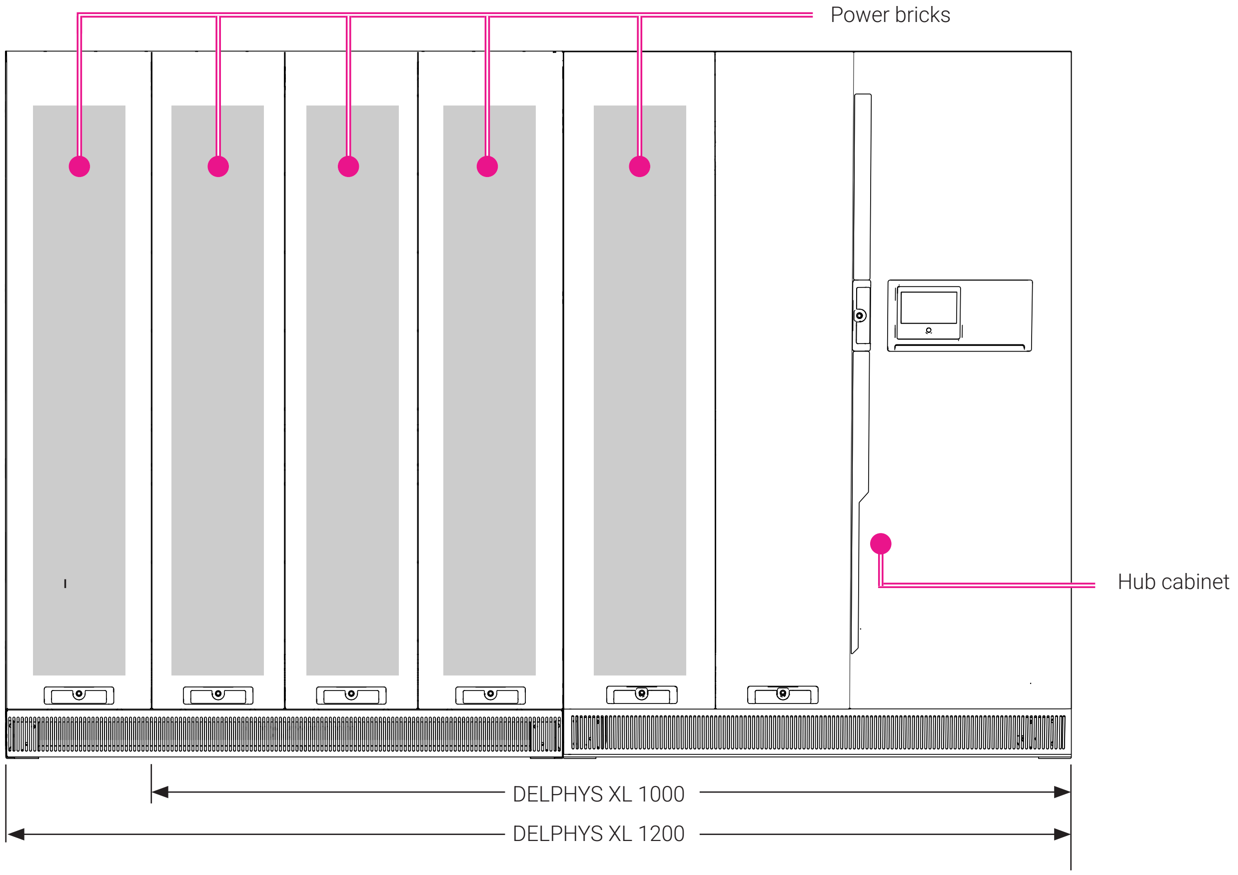
3.1. Range

Delphys XL is a high performance UPS designed to secure highly critical applications and therefore to ensure business continuity by means of a fully resilient architecture.

The DELPHYS XL can deliver many more benefits than standard monolithic systems, packing 1000/1200 kW into an overall space-saving design, which can be integrated into your environment simply and flexibly.

- Fault tolerant architecture,
- Easy and safe maintenance,
- TCO optimization (best in class efficiency levels),
- Optimized footprint,
- Fast deployment time / Flexible installation.

Delphys XL can sustain these values thanks to its unique architecture and design:



Hub cabinet for the UPS Unit:

- All input(s) – outputs and battery connections to the UPS units,
- 1 MW or 1.2 MW centralized static switch on bypass line,
- Local users interface (HMI),
- Remote communications interfaces.

Power bricks rated for 1000 or 1200 kW/kVA continuous operation:

- Single and full rated Rectifier, Inverter and Battery charger per power brick,
- Highly efficient & reliable power bricks,
- Selective disconnection to allow electrical isolation of brick when required.

The development and production sites are certified according to ISO 14001 (Environmental management system) and ISO 9001 (Quality management system).

3.2. RATED POWER

RATED POWER PER UPS UNIT		
UPS power rating	1000 kVA	1200 kVA
Power (kW)	1000 kW (30°C)	1200 kW (35°C)
Parallel units	up to 4 units in parallel	

3.3. System architecture

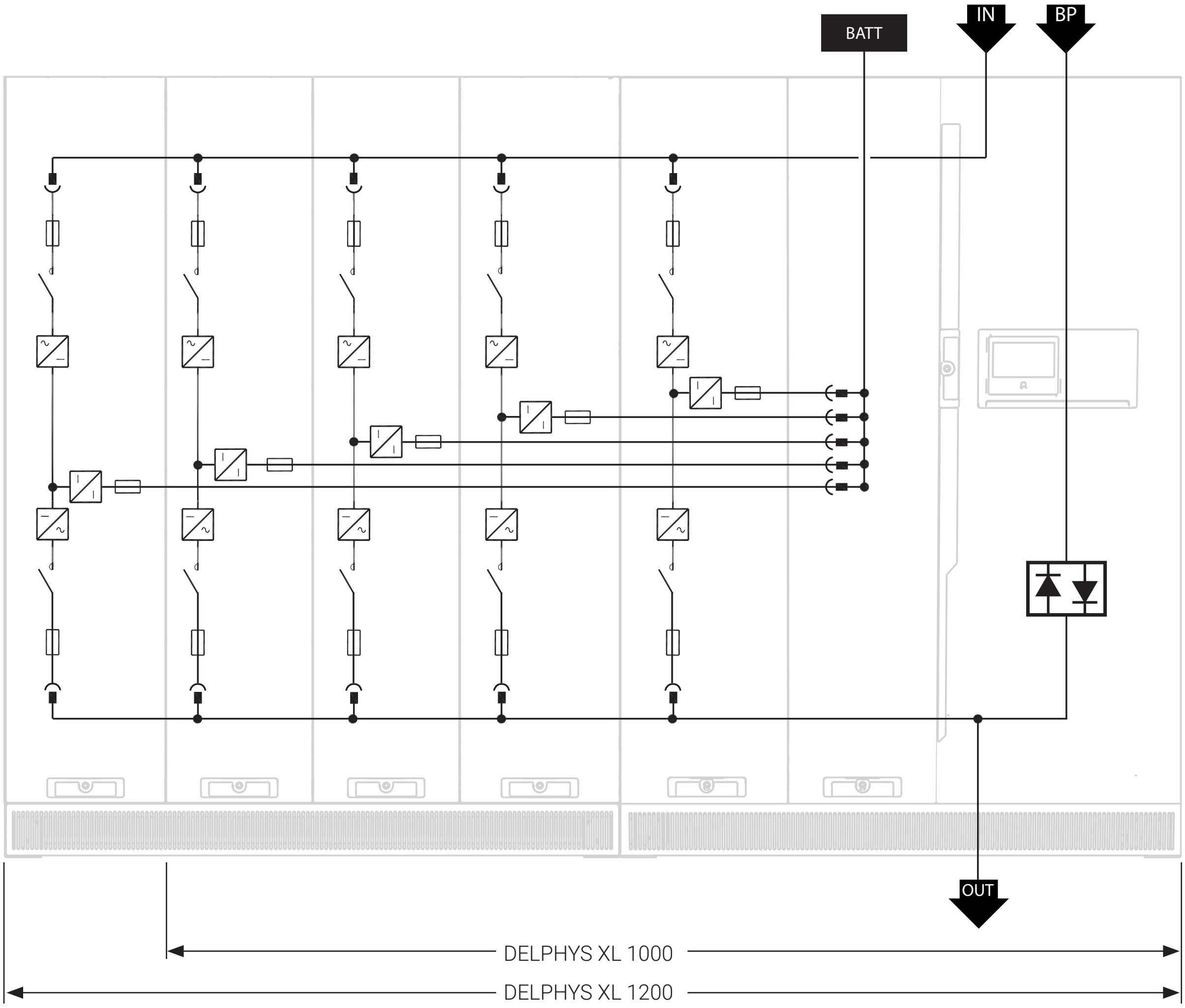
DELPHYS XL is a highly reliable UPS solution based on our field-proven high power XL platform, integrated into a fully redundant architecture that guaranties service continuity for the most critical applications.

The system is composed of several autonomous Power Bricks with advanced selective disconnection and a robust static bypass; Complete mechanical and electrical segregation between the power converters avoids any default propagation inside the system to give the best possible availability.

All the Power conversion bricks and the static switch operate intelligently on a peer-to-peer basis providing a resilient solution with no single point of failure.

Any potential fault is isolated inside the affected sub-assemblies, keeping the critical load protected in double conversion mode by means of the remaining power converters.

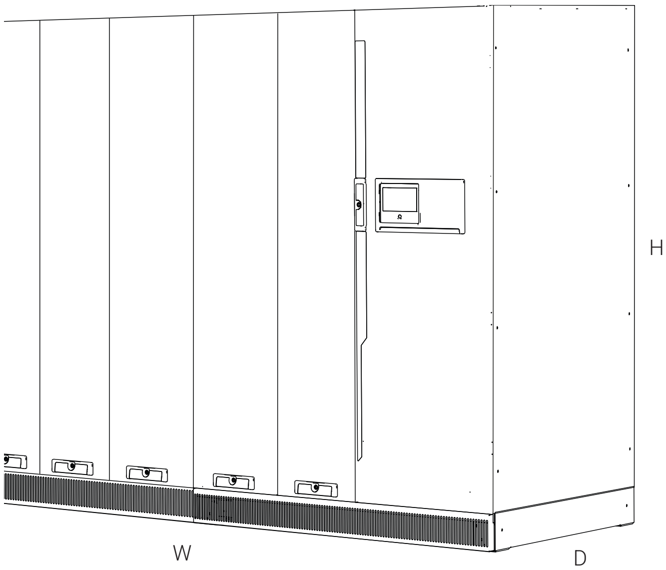
Therefore, DELPHYS XL is a fault tolerant UPS system assuming a complete redundancy up to 75% (Delphys XL 1000) and 80% (Delphys XL 1200) of load rate. This intrinsic redundancy reinforces inherent reliability and eliminates all single points of failure associated with traditional UPS to maximize the Mean Time Between Critical Failure.



The above schematic shows an example of Delphys XL with separated inputs (Rectifier / Bypass).

3.4. Footprint

Delivering far greater benefits than standard monolithic systems, DELPHYS XL packs 1000/1200 kW into an overall space-saving design which can be integrated into your existing architecture simply and flexibly.



			DIMENSIONS (INSTALLATION)			
			Unit	Hub cabinet	Bricks cabinet	Brick
Width [W]	Delphys XL 1000	(mm)	2625	1405	1220	378
	Delphys XL 1200		3003	1405	1605	
Depth [D][1]	Delphys XL 1000	(mm)	1000	1000	1000	949
	Delphys XL 1200		1000	1000	1000	
Height [H]	Delphys XL 1000	(mm)	2005	2005	2005	1731
	Delphys XL 1200		2005	2005	2005	
Weight	Delphys XL 1000	(kg)	2600	767 + 1 x 363	366 + 3 x 363	363
	Delphys XL 1200		3200	937 + 1 x 363	448 + 4 x 363	
Single unit clearances			No rear or lateral clearance, Top = 400 mm			
Access for maintenance and operation			Front only (≥ 1200 mm free space for brick extraction)			
Installation			Back to back installation / Against a wall			

(1) Depth not including door handles (+30 mm).

4. STANDARD AND OPTIONAL EQUIPMENT

4.1. FLEXIBLE UPS UNIT ARCHITECTURE

- Common or Separated rectifier and bypass mains
- Top and Bottom cable entry or Bus bar flanges
- Up to 10 strings DC connection capability without extra coupling cabinet
- Compatible with different energy storage technologies (e.g. VLRA, Li-Ion, Ni-Cd…)

4.2. Standard features

- Intrinsic redundancy with selective fault disconnection
- Redundant cooling
- Full system heat run tests
- External breakers position management
- Energy Saver mode
- Backfeed protection: detection circuit
- Battery temperature sensor
- Rails for power brick extraction
- Trolley for power brick cold swap

4.3. Electrical options

- Input, output and maintenance bypass switches
- PEN kit for TN-C grounding system
- Reinforced battery charger
- battery protection tripping kit
- Smart conversion Mode
- BCR (Battery Capacity Re-injection)
- ACS synchronization system
- Cold start
- Maintenance Station with spare Power conversion brick
- Advanced GenSet management

4.4. Standard communication features

- User-friendly 7’ touch-screen with multilingual color graphic display (Hub cabinet).
- 4 Com-Slots for communication options.
- USB port to download UPS report and log file.
- Ethernet port for service purpose.

4.5. Communication options

- Dry-contact interface (configurable voltage-free contacts).
- MODBUS RTU RS485 or TCP
- NET VISION: professional WEB/SNMP Ethernet interface for secure UPS monitoring and remote automatic shutdown.
- NET VISION EMD: Environment Temperature and Humidity sensor with 2 inputs
- Remote View Pro supervision software.
- IoT Gateway for Socomec cloud services and SoLive mobile app.
- Remote touch-screen panel.

4.6. REMOTE MONITORING AND CLOUD SERVICES*

- SoLive: Real-time cloud monitoring app to supervise any Socomec UPS via smartphone
- SoLink: 24/7 cloud remote surveillance service by manufacturer specialists for any Socomec UPS
- Remote operations: on-demand remote connection by Socomec experts to perform diagnosis and troubleshooting directly on UPS

* Please check the service availability in your Country.

5. SPECIFICATIONS

5.1. Installation parameters

SYSTEM INSTALLATION			
	Unit Rated power (kVA)	1000	1200
Active power	(kW)	1000	1200
Rated rectifier input current @ 400V	(A)	1510	1812
Maximum rectifier input current	(A)	1560	1950
Rated bypass input current @ 400V	(A)	1443	1732
Rated output current @ 400 V	(A)	1443	1732
Maximum air flow	(m^3/h)	8000	10000
Power dissipation in nominal conditions(1)	(kW)	46	55
	(kcal/h) x1000	39.6	47
	BTU/h x1000	157	188
Power dissipation (max) under the worst conditions(2)	(kW)	50.5	62.5
	(kcal/h) x1000	43.4	53.7
	BTU/h x1000	172	213

5.2. Electrical characteristics

ELECTRICAL CHARACTERISTICS - RECTIFIER INPUT(3)		
Rated mains supply voltage		380/400/415 V 3ph
Voltage tolerance		200 V to 480 V(4)
Rated frequency		50/60 Hz
Frequency tolerance		45 to 65 Hz
Power factor		> 0.99(5)
Total harmonic distortion (THDi)		< 2.5%(5)
Max inrush current at start-up		< In (no overcurrent)
Genset compatibility	Soft start (Power walk-in)	Configurable from 5A/sec to immediate (no ramp)
	Advanced Genset Management	Smart power sharing between GenSet/battery upon load steps

ELECTRICAL CHARACTERISTICS - BATTERY		1000	1200
Battery Type		VRLA – Lithium Ion - Ni-Cd	
Number of poles		2 wires (+/-)	
Lithium Ion communication with UPS		Basic (dry contact) / Smart (Modbus)	
Number of VRLA battery cells with load PF=1(6)		258 to 300	252 to 300
Number of VRLA battery cells with load PF ≤ 0.9		246 to 300	228 to 300
Voltage range for LIB batteries		Up to 705V	
Battery AC ripple current		< 3% Nominal Capacity (at C10 discharge)	
Battery AC ripple voltage		< 1% on the battery block	
Maximum recharge current	standard	160 A	200 A
	optional	480 A	600 A

(1) Nominal input current and rated output active power (PF1).
(2) Dissipation that may be generated temporarily, considering: Low input voltage, battery recharge and rated output active power (PF1).
(3) IGBT rectifier.
(4) Conditions apply.
(5) At full load and rated input voltage (THDV < 1%).
(6) Batteries configurations should be selected according to the back up time and the UPS ambient temperature - please consult us for validation

ELECTRICAL CHARACTERISTICS - STATIC BYPASS		1000	1200
Bypass rated voltage		380/400/415 V 3ph	
Bypass voltage tolerance		±15% (adjustable)	
Bypass rated frequency		50/60 Hz (selectable)	
Bypass frequency tolerance		±2% (from ±1% to ±5% (operation with generator unit))	
Bypass frequency variation speed follow up		1 Hz/s adjustable from 1 to 3 Hz/s	
Semiconductors characteristics	I^2t (A^2s)	Up to 5,615,000	Up to 10,400,000
	Is/c (A peak)	Up to 33,500	Up to 45,500
Overload tolerated on the bypass	Permanent	110% of the rated apparent power	
	10 min	125% of the rated apparent power	
	1 min	150% of the rated apparent power	
Short-circuit withstanding (Icw)	kA	65 / 100 (optional)	

ELECTRICAL CHARACTERISTICS - INVERTER		1000	1200
Rated output voltage (selectable)		380/400/415 V 3ph	
Output voltage tolerance		static load <1%, dynamic load VFI-SS-111 compliant	
Rated output frequency		50/60 Hz (selectable)	
Autonomous frequency tolerance		±0.01 Hz on mains power failure	
Harmonic voltage distortion		ThdU ≤ 1 % with rated linear load	
Overload tolerated by the inverter[7]	1 h	1100 kW	1320 kW
	10 min	1250 kW	1500 kW
	1 min	1440 kW	1800 kW

ENVIRONMENT CHARACTERISTICS	
UPS Storage conditions	-20 to +70 °C under ≤70% condensation free RH
UPS Start-up and working conditions	0 to +50 °C under ≤95% condensation free RH
Air inlet	Front
Air outlet	Top
Efficiency in double conversion (VFI)	up to 97%
Efficiency in Smart conversion mode	up to 99%
Acoustic noise	< 83 dBA
Maximum altitude without derating	1000 m (3,300 ft)
Degree of protection	IP 20 (IP30 top grids)
Color	RAL 7016

(1) The tolerated output overload corresponds to the inverter capability under defined conditions. The output overload performance is incremented by the static bypass capability (when available).

5.3. Recommended protection devices

5.3.1. Inputs protections for single unit configuration

RECOMMENDED PROTECTION DEVICES	1000	1200
Unit Rated power (kVA)	1000	1200
Rectifier input(8) (A)	1600	2000
Bypass input main(8) (A)	1600	2000

5.3.2. Output protections

RECOMMENDED PROTECTION DEVICES – OUTPUT(9)		1000	1200
Unit Rated power (kVA)		1000	1200
Inverter short-circuit current(10) (A) (when AUX MAINS is not present)	0 to 20 ms	3230	4100
	20 to 100 ms	2390	3250
Output protection rating (A)		≤ 160	≤ 250

5.3.3. Connecting cables

CABLES CONNECTION – HUB CABINET (11)			
	Maximum number of cables according to size (Others on demand)		
Rectifier terminals 3PH (12)	6 x 240 mm² per pole	5 x 300 mm² per pole	4 x 400 mm² per pole
Bypass terminals 3PH+N (13)	6 x 240 mm² per pole	5 x 300 mm² per pole	4 x 400 mm² per pole
Output terminals 3PH+N (13)	6 x 240 mm² per pole	5 x 300 mm² per pole	4 x 400 mm² per pole
Battery terminals	up to 10 x 240mm² per pole (+/-)		

(1) Applicable by respecting the installation rules regarding cable lengths. The bypass protection is given as a recommendation (trip curves setting and distribution sizing shall be defined according to the rated load current and the UPS overload capability).
(2) Selectivity of distribution after the UPS with inverter short-circuit current (short-circuit with AUX MAINS not present). This must be selective with residual current circuit breakers connected downstream of the UPS.
(3) Average Peak Current.
(4) Based on 90° HO7 RNF or R2V cable type; for other please consult us.
(5) Neutral is not required at the rectifier input. If distributed, however, consult us to ensure it is allowed by installation standards.
(6) On demand, the Unit can supply a 3 wires distribution (without input and output neutral).

6. REFERENCE STANDARDS AND DIRECTIVES

6.1. Overview

The equipment installed, used and serviced in accordance with its intended use, its regulations and standards, its manufacturer instructions and rules, complies with the relevant Union harmonization legislation:

LVD 2014 / 35 / EU

DIRECTIVE 2014/35/EU OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 26 February 2014, on the harmonization of the laws of the Member States relating to electrical equipment designed for use within certain voltage limits being made available on the market.

EMC 2014 / 30 / EU

DIRECTIVE 2014/30/EU OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 26 February 2014, on the harmonization of the laws of the Member States relating to electromagnetic compatibility.

RoHS 2011/65/EU

Directive 2011/65 of the European parliament and of the council of 8 June 2011 on the restriction of the use of certain hazardous substances in electrical and electronic equipment

6.2. Standards

6.2.1. Safety

EN 62040-1	Uninterruptible Power System (UPS) - Part 1: General and safety requirements
IEC 62040-1	Uninterruptible Power System (UPS) - Part 1: Safety requirements

6.2.2. Electromagnetic compatibility

EN 62040-2	Uninterruptible Power System (UPS) - Part 2: Electromagnetic compatibility (EMC) requirements
IEC 62040-2	Uninterruptible Power System (UPS) - Part 2: Electromagnetic compatibility (EMC) requirements

6.2.3. Test and performance

EN 62040-3	Uninterruptible Power System (UPS) - Part 3: Method of specifying the performance and test requirements

6.2.4. Environmental

IEC 62040-4	Uninterruptible Power System (UPS) - Part 4: Environmental aspects - Requirements and reporting

6.3. System and installation guidelines

When carrying out electrical installation, all the above standards must be observed. All national and international standards (e.g IEC60364) applicable to the specific electrical installation including batteries must be observed.

ELITE UPS: a mark of efficiency

Socomec, as CEMEP UPS manufacturer member, has signed a Code of Conduct put forward by the Joint Research Centre of the European Commission (JRC), to ensure the protection of critical applications and processes ensuring 24/7 continuous high quality supply. The JRC commits to mitigating energy losses and gas emissions caused by UPS equipment, therefore maximising UPS efficiency.

TECHNICAL GUIDE

EN

MODULYS XS

2.5 to 20 kVA

ULTIMATE
Fault tolerant power
without compromise

RoHS COMPLIANT

1 000 000 HOURS MTBF

kW = kVA

PF 1 @ VFI-S-111

Socomec Resource Center
To download, brochures, catalogues
and technical manuals

socomec
Innovative Power Solutions

1. OBJECTIVES

The aim of these specifications is to provide:

- The information required to choose the right uninterruptible power supply for a specific application.
- The information required to prepare the system and installation site.

The specifications are intended for:

- Installation engineers.
- Design engineers.
- Engineering consultants.

2. INSTALLATION REQUIREMENTS AND PROTECTION

Connection to the mains power supply and to the load(s) must be made using cables of suitable size, in accordance with current standards. If not already present, an electrical distribution panel which can isolate the network upstream of the UPS must be installed. This electrical distribution panel must be equipped with a protection device (or two, if there is a separate bypass line) of an appropriate rating for the power drawn at full load.

For detailed information, see the installation and operating manual.

3. ARCHITECTURE

3.1. Range

MODULYS XS is a full range of high performing UPS system designed to:

- ensure 24/7/365 availability and business continuity for mission critical applications
- avoid data losses and downtime of company operations,
- reduce the electrical infrastructure's total cost of ownership,
- adopt a sustainable development approach.

MODULYS XS								
Module power	2.5 (kVA/kW)				5.0 (kVA/kW)			
Phase in / phase out	1/1				1/1 and 3/1			
Number of power modules	1	2	3	4	1	2	3	4
System Rated power (kVA/kW)	2.5	5	7.5	10	5	10	15	20
MC6	•	•	•	•	•	•	•	•
MC9	•	•	•	•	•	•	•	•
RM3	•	•	•		•	•	•	
RM4	•	•	•	•	•	•	•	•
TC3	•	•	•		•	•	•	

Matrix table for model and kVA power rating

MODULYS XS has been specifically designed to meet the demands of loads in specific application contexts, in order to optimise the features of the product and facilitate its integration within the system.

4. FLEXIBILITY

4.1. Power ratings from 2.5 to 20 kVA/kW

The equipment has been designed with a minimum direct and indirect footprint (the actual space occupied by the unit and the space required around it for maintenance, ventilation and access to the operating mechanisms and communication devices).

The detailed design also provides easy access for maintenance and installation.

The air inlet is on the front, with outflow from the rear side; this means other equipment or external battery enclosures can be placed alongside the UPS unit.

MODULYS XS MC					
	Dimensions	Width [mm]	Depth [mm]	Height [mm]	weight (kg)
MC6		550	635	1060	90
MC9		550	635	1460	120
MODULYS XS RM					
RM3		449 (19")	570	575	44
RM4		449 (19")	570	708	50
MODULYS XS TC3					
TC3		600	600	1400	140

Additional module

MODULYS XS POWER MODULE					
	Dimensions	Width [mm]	Depth [mm]	Height [mm]	weight (kg)
2.5 kW Power Module		446	475	131	14
5 kW Module		446	475	131	18
MODULYS XS BATTERY MODULE					
Battery Module		446	475	131	10
Battery Pack long life		100	330	115	9
Battery Pack normal life		100	330	115	9
Battery for TC3 100 Ah		Mounted inside the TC3 cabinet			145

4.2. Flexible back-up time

Different extended back-up times are possible by using battery modules with a enhanced battery charger.
Selection of the back-up time is flexible thanks to the wide range of battery packs.

4.2.1. MODULYS XS (MC systems)

Back up time in minutes @ typical load

System power (kVA/kW)		**2.5**	**5**	**7.5**	**10**		**5**	**10**	**15**	**20**
Module Rated power		2.5 (kVA/kW)					5 (kVA/kW)			
	2	8		Consult us						
	3	14								
	4	21	8				8			
	5	27	11				12		Consult us	
	6	35	14	8			14			
	7	42	17	10			17			
	8	49	21	12	8	MC-6/MC-9	21	8		
	9	57	24	14	10		24	10		
	10	65	27	16	11		28	12		
	11	73	31	18	13		31	13		
	12	81	35	21	14		35	14	8	
	13	90	38	23	16		38	16	9	
	14	98	42	25	17		42	17	10	
	15	105	46	27	19		46	19	12	
	16	114	49	30	21		49	21	12	8
	17	123	52	32	23		53	23	13	9
Battery pack number	**18**	132	57	35	24		57	24	14	10
	19	140	61	37	25		61	26	16	11
	20	148	65	39	27		66	28	17	12
	21	157	69	42	29		69	29	17	
	22	167	73	44	31		73	31	19	
	23	176	76	47	33		77	33	20	
	24	185	81	49	35		81	35	21	
	25	194	86	51	36	MC-9	86	36		
	26	202	90	54	38		90	38		
	27	209	94	57	40		94	40		
	28	220	98	60	42		98	42		
	29	229	101	63			102			
	30	238	105	65			105			
	31	248	109				109		Consult us	
	32	256	114				114			
	33	264		Consult us						
	34	272								

Typical load = 70% Pn

socomec
Innovative Power Solutions

4.2.2. MODULYS XS (RM systems)

Back up time in minutes @ typical load

System power (kVA/kW)		2.5	5	7.5	10		5	10	15	20
Module Rated power		2.5 (kVA/kW)					5 (kVA/kW)			
Battery pack number	2	8				RM-3/RM-4				
	3	14								
	4	21	8	Consult us			8			
	5	27	11				12			
	6	35	14	8			14			
	7	42	17	10			17			
	8	49	21	12	8		21	8	Consult us	
	9	57	24	14		RM-4	24			
	10	65	27	16			28			
	11	73	31	Consult us			31			
	12	81	35				35			
	13	90								
	14	98								

Typical load = 70% Pn

4.2.3. MODULYS XS (TC System)

Back up time in minutes @ typical load

System power (kVA/kW)		2.5	5	7.5		5	10	15
Module Rated power		2.5 (kVA/kW)				5 (kVA/kW)		
Battery Capacity	100 Ah	118	50	28		50	19	10
	200 Ah	271	118	72		118	50	28

Typical load = 70% Pn

5. STANDARD FEATURES AND OPTIONS

AVAILABILITY	
O	Available as option (installation on site)
STD	Standard feature

	MC	RM	TC	Notes
Communication Option				
ADC+SL card (Advanced Dry Contact + Serial Link)	O	O	O	
External temperature sensor	O	O	O	⚠ ❗ ADC+SL card
Remote touchscreen display	O	O	O	⚠ ❗ ADC+SL card
Modbus TCP interface card	O	O	O	
Net Vision card (professional WEB/SNMP interface for UPS monitoring)	O	O	O	
EMD (Environmental Monitoring Device: temperature, humidity, 2 dry contacts)	O	O	O	⚠ ❗ Net Vision card
Electrical Option				
Dual Input	STD	STD	STD	
Tropicalization	STD	STD	STD	
External maintenance bypass	O	O	O	

❗ Required option

6. SPECIFICATIONS MC6 / MC9

6.1. Installation parameters

INSTALLATION PARAMENTERS											
System Rated power (kVA/kW)			2.5	5	7.5	10	5	10	15	20
Module Rated power (kVA/kW)			2.5				5			
Number of Modules			1	2	3	4	1	2	3	4
Phase in/out			1/1				1/1 or 3/1			
Active power		kW	2.5	5	7.5	10	5	10	15	20
Rated/maximum rectifier input current (EN 62040-3)		A	12/15	24/30	36/44	47/59	24/30	47/59	71/87	95/118
Rated bypass input current (1)		A	11	22	33	44	22	44	65	87
Inverter output current @ 230 V Pn		A	11	22	33	44	22	44	65	87
Recommended air flow capacity		m^3/h	160	320	480	640	240	480	720	960
Acoustic noise @ 70% Pn		dBA	43	46	49	52	45	48	51	54
Power dissipation in nominal conditions (2)		W	220	440	660	880	420	840	1260	1680
		kcal/h	189	378	567	757	361	722	1083	1445
		BTU/h	751	1501	2252	3003	1433	2866	4299	5732
Power dissipation (max) in the worst conditions (3)		W	250	500	750	1000	480	960	1440	1920
		kcal/h	215	430	645	860	413	825	1238	1651
		BTU/h	853	1706	2559	3412	1638	3276	4913	6551
Dimensions MC6/MC9	Width	mm	550							
	Depth	mm	635							
	Height	mm	1060 / 1460							
Single unit Clearances	Operational	mm	Rear 300 lateral 0							
	Maintenance	mm	Front 1000 top 800							
Weight MC6/MC9		kg	90 / 120							

(1) Considering nominal bypass current calculated @ 230 V, considering a continuos overload of 110%.
(2) Considering nominal input current (230 V, battery charged) and rated output active power.
(3) Considering maximum input current (low input voltage, battery charged) and rated output active power.

6.2. Electrical characteristics

ELECTRICAL CHARACTERISTICS - RECTIFIER INPUT									
System Rated power (kVA/kW)		2.5	5	7.5	10	5	10	15	20
Module Rated power (kVA/kW)		2.5				5			
Number of Modules		1	2	3	4	1	2	3	4
Rated mains supply voltage	V	230 1ph + N				230 1ph + N 400 3ph + N			
Voltage tolerance	V	184 to 276 (±20%)				184 to 276 (±20%) 320 to 480 (±20%)			
Voltage tolerance at derated load	V	up to 150 @ 70% of nominal load				up to 150 1ph + N up to 260 3ph + N @ 70% of nominal load			
Rated frequency	Hz	50/60							
Frequency tolerance		±10%							
Current Total harmonic distortion (THDi)		≤ 6%				≤ 5.4%			
Power factor (at full load and rated voltage)		≥ 0.98							
Max inrush current at start-up		<In							

ELECTRICAL CHARACTERISTICS - BYPASS									
System Rated power (kVA/kW)		2.5	5	7.5	10	5	10	15	20
Module Rated power (kVA/kW)		2.5				5			
Number of Modules		1	2	3	4	1	2	3	4
Bypass frequency variation speed	Hz/s	1 Hz/s							
Bypass rated voltage		Nominal output voltage ±15%							
Bypass rated frequency	Hz	50/60 Hz (selectable)							
Bypass frequency tolerance		±2% (±8% with genset)							
Bypass current overload (A)	5 min	13	25	38	51	25	51	77	100
	1 min	15	30	44	59	30	59	88	117
	20 sec	19	39	59	79	39	79	117	156

ELECTRICAL CHARACTERISTICS -INVERTER									
System Rated power (kVA/kW)		2.5	5	7.5	10	5	10	15	20
Module Rated power (kVA/kW)		2.5				5			
Number of Modules		1	2	3	4	1	2	3	4
Rated output voltage	V	208(1)/220/230/240 (selectable)							
Output voltage tolerance		Static: ±3% VFI-SS (EN 62040-3 compliant)							
Rated output frequency	Hz	50/60 Hz (selectable)							
Output frequency tolerance		±0.1% on mains power failure							
Load crest factor		≥ 2.3							
Voltage total harmonic distortion THDV		< 3.5% with linear load							
Inverter overload (kW) in normal mode	5 min	2.75	5.5	8.25	11	5.5	11	16.5	22
	10 sec	3.25	6.5	9.75	13	6.5	13	19.5	26
Short-circuit inverter current (A) (when AUX MAINS is not present)	0 to 60 ms	25	50	75	100	50	100	150	200

ELECTRICAL CHARACTERISTICS - EFFICIENCY		
Double conversion efficiency		up to 92.8%
EcoMode efficiency		99%

ELECTRICAL CHARACTERISTICS - ENVIRONMENT		
Storage temperatures	°C	-5 to +50 (15 to 25 for better battery life)
Working temperature	°C	0 to +40 (15 to 25 for better battery life)
Maximum relative humidity (non-condensing)		95%
Maximum altitude without derating	m (ft)	1000 (3300)
Degree of protection		IP20
Colour		RAL 7016

ELECTRICAL CHARACTERISTICS - BATTERY		
Standard max. recharge current	A	2.4 per Battery Module

(1) Up to 90% Pn

socomec
Innovative Power Solutions

6.3. Recommended protections

RECOMMENDED PROTECTION DEVICES - RECTIFIER (1)									
System Rated power (kVA/kW)		2.5	5	7.5	10	5	10	15	20
Module Rated power (kVA/kW)		2.5				5			
Number of Modules		1	2	3	4	1	2	3	4
C curve circuit breaker (1ph/3ph)	A	16	32	50	63	32/13	63/26	100/32	125/50
gG fuse (1ph/3ph)	A	16	32	50	63	32/12	63/25	100/32	125/50

RECOMMENDED PROTECTION DEVICES - GENERAL BYPASS (2)									
System Rated power (kVA/kW)		2.5	5	7.5	10	5	10	15	20
Module Rated power (kVA/kW)		2.5				5			
Number of Modules		1	2	3	4	1	2	3	4
Conditional short circuit current rating (Icc)	kA	10				10			
C curve circuit breaker	A	16	32	40	63	32	63	100	125
gG fuse	A	16	32	40	63	32	63	100	125

RECOMMENDED PROTECTION DEVICES - INPUT RESIDUAL CURRENT CIRCUIT (RCD) BREAKER (3)		
Input residual current circuit breaker	A	0.1 A Selective type B

RECOMMENDED PROTECTION DEVICES - OUTPUT (4)									
C curve circuit breaker (3)	A	2	4	6	8	4	8	13	16
B curve circuit breaker (3)	A	4	8	12	16	8	16	25	32

CABLES - MAXIMUM CABLE SECTION (5)		
Rectifier terminals	mm	50
Bypass terminals	mm	50
Battery terminals (5)	mm	2x 95
Output terminals	mm	50

(1) Rectifier protection should only be considered in the event of separate inputs. Recommended values to avoid unwanted tripping with UPS at full power. When the bypass and rectifier inputs are combined (common input), the general input protection rating must be the highest of the two (bypass or rectifier).
(2) Recommended values to avoid unwanted tripping with UPS at full power. When the bypass and rectifier inputs are combined (common input), the general input protection rating must be the highest of the two (bypass or rectifier).
(3) RCD is not necessary when the UPS is installed in a TN-S system. RCD is not permitted on TN-C systems. If an RCD is required a B-type should be used. Must be coordinate with residual current circuit breakers downstream of the UPS connected to the UPS output.
(4) Protection tripping downstream of the UPS with inverter short circuit current (Worst case = AUX MAINS not present). In the Normal case, with AUX MAINS present, fault clearing is determined by the Mains short-circuit capability.
(5) Use cable with tin-plated eyelets for the connection

7. SPECIFICATIONS RM3 / RM4

7.1. Installation parameters

INSTALLATION PARAMENTERS										
RM3 System Rated power (kVA/kW)			2.5	5	7.5		5	10	15	
RM4 System Rated power (kVA/kW)			2.5	5	7.5	10	5	10	15	20
Module Rated power (kVA/kW)			2.5				5			
Number of Modules			1	2	3	4	1	2	3	4
Phase in/out			1/1				1/1 or 3/1			
Active power		kW	2.5	5	7.5	10	5	10	15	20
Rated/maximum rectifier input current (EN 62040-3)		A	12/15	24/30	36/44	47/59	24/30	47/59	71/87	95/118
Rated bypass input current (1)		A	11	22	33	44	22	44	65	87
Inverter output current @ 230 V Pn		A	11	22	33	44	22	44	65	87
Recommended air flow capacity		m^3/h	160	320	480	640	240	480	720	960
Acoustic noise @ 70% Pn		dBA	43	46	49	52	45	48	51	54
Power dissipation in nominal conditions (2)		W	220	440	660	880	420	840	1260	1680
		kcal/h	189	378	567	757	361	722	1083	1445
		BTU/h	751	1501	2252	3003	1433	2866	4299	5732
Power dissipation (max) in the worst conditions (3)		W	250	500	750	1000	480	960	1440	1920
		kcal/h	215	430	645	860	413	825	1238	1651
		BTU/h	853	1706	2559	3412	1638	3276	4913	6551
Dimensions RM3/RM4	Width	mm	449							
	Depth	mm	570							
	Height	mm	575 / 708							
Weight		kg	44 / 50							

(1) Considering nominal bypass current calculated @ 230 V, considering a continuos overload of 110%.
(2) Considering nominal input current (230 V, battery charged) and rated output active power.
(3) Considering maximum input current (low input voltage, battery charged) and rated output active power.

7.2. Electrical characteristics

ELECTRICAL CHARACTERISTICS - RECTIFIER INPUT									
RM3 System Rated power (kVA/kW)		2.5	5	7.5		5	10	15	
RM4 System Rated power (kVA/kW)		2.5	5	7.5	10	5	10	15	20
Module Rated power (kVA/kW)		2.5				5			
Number of Modules		1	2	3	4	1	2	3	4
Rated mains supply voltage	V	230 1ph + N				230 1ph + N 400 3ph + N			
Voltage tolerance	V	184 to 276 (±20%)				184 to 276 (±20%) 320 to 480 (±20%)			
Voltage tolerance at derated load	V	up to 150 @ 70% of nominal load				up to 150 1ph + N up to 260 3ph + N @ 70% of nominal load			
Rated frequency	Hz	50/60							
Frequency tolerance		±10%							
Current Total harmonic distortion (THDi)		≤ 6%				≤ 5.4%			
Power factor (at full load and rated voltage)		≥ 0.98							
Max inrush current at start-up		<In							

ELECTRICAL CHARACTERISTICS - BYPASS									
RM3 System Rated power (kVA/kW)		2.5	5	7.5		5	10	15	
RM4 System Rated power (kVA/kW)		2.5	5	7.5	10	5	10	15	20
Module Rated power (kVA/kW)		2.5				5			
Number of Modules		1	2	3	4	1	2	3	4
Bypass frequency variation speed	Hz/s	1 Hz/s							
Bypass rated voltage		Nominal output voltage ±15%							
Bypass rated frequency	Hz	50/60 Hz (selectable)							
Bypass frequency tolerance		±2% (±8% with genset)							
Bypass current overload (A)	5 min	13	25	38	51	25	51	77	100
	1 min	15	30	44	59	30	59	88	117
	20 sec	19	39	59	79	39	79	117	156

ELECTRICAL CHARACTERISTICS -INVERTER									
RM3 System Rated power (kVA/kW)		2.5	5	7.5		5	10	15	
RM4 System Rated power (kVA/kW)		2.5	5	7.5	10	5	10	15	20
Module Rated power (kVA/kW)		2.5				5			
Number of Modules		1	2	3	4	1	2	3	4
Rated output voltage	V	208(1)/220/230/240 (selectable)							
Output voltage tolerance		Static: ±3% VFI-SS (EN 62040-3 compliant)							
Rated output frequency	Hz	50/60 Hz (selectable)							
Output frequency tolerance		±0.1% on mains power failure							
Load crest factor		≥ 2.3							
Voltage total harmonic distortion THDV		< 3.5% with linear load							
Inverter overload (kW)	5 min	2.75	5.5	8.25	11	5.5	11	16.5	22
	10 sec	3.25	6.5	9.75	13	6.5	13	19.5	26
Short-circuit inverter current (A) (when AUX MAINS is not present)	0 to 60 ms	25	50	75	100	50	100	150	200

ELECTRICAL CHARACTERISTICS - EFFICIENCY	
Double conversion efficiency	up to 92.8%
EcoMode efficiency	99%

ELECTRICAL CHARACTERISTICS - ENVIRONMENT		
Storage temperatures	°C	-5 to +50 (15 to 25 for better battery life)
Working temperature	°C	0 to +40 (15 to 25 for better battery life)
Maximum relative humidity (non-condensing)		95%
Maximum altitude without derating	m (ft)	1000 (3300)
Degree of protection		IP20
Colour		RAL 7016

ELECTRICAL CHARACTERISTICS - BATTERY		
Standard max. recharge current	A	2.4 per Battery Module

(1) Up to 90% Pn

7.3. Recommended protections

RECOMMENDED PROTECTION DEVICES - RECTIFIER (1)									
RM3 System Rated power (kVA/kW)		2.5	5	7.5		5	10	15	
RM4 System Rated power (kVA/kW)		2.5	5	7.5	10	5	10	15	20
Module Rated power (kVA/kW)		2.5				5			
Number of Modules		1	2	3	4	1	2	3	4
C curve circuit breaker (1ph/3ph)	A	16	32	50	63	32/13	63/26	100/32	125/50
gG fuse (1ph/3ph)	A	16	32	50	63	32/12	63/25	100/32	125/50

RECOMMENDED PROTECTION DEVICES - GENERAL BYPASS (2)									
RM3 System Rated power (kVA/kW)		2.5	5	7.5		5	10	15	
RM4 System Rated power (kVA/kW)		2.5	5	7.5	10	5	10	15	20
Module Rated power (kVA/kW)		2.5				5			
Number of Modules		1	2	3	4	1	2	3	4
Conditional short circuit current rating (Icc)	kA	10				10			
C curve circuit breaker	A	16	32	40	63	32	63	100	125
gG fuse	A	16	32	40	63	32	63	100	125

RECOMMENDED PROTECTION DEVICES - INPUT RESIDUAL CURRENT CIRCUIT (RCD) BREAKER (3)		
Input residual current circuit breaker	A	0.1 A Selective type B

RECOMMENDED PROTECTION DEVICES - OUTPUT (4)									
RM3 System Rated power (kVA/kW)		2.5	5	7.5		5	10	15	
RM4 System Rated power (kVA/kW)		2.5	5	7.5	10	5	10	15	20
Module Rated power (kVA/kW)		2.5				5			
Number of Modules		1	2	3	4	1	2	3	4
C curve circuit breaker (3)	A	2	4	6	8	4	8	13	16
B curve circuit breaker (3)	A	4	8	12	16	8	16	25	32

CABLES - MAXIMUM CABLE SECTION (5)		
Rectifier terminals	mm	50
Bypass terminals	mm	50
Battery terminals (5)	mm	2x 95
Output terminals	mm	50

(1) Rectifier protection should only be considered in the event of separate inputs. Recommended values to avoid unwanted tripping with UPS at full power. When the bypass and rectifier inputs are combined (common input), the general input protection rating must be the highest of the two (bypass or rectifier).
(2) Recommended values to avoid unwanted tripping with UPS at full power. When the bypass and rectifier inputs are combined (common input), the general input protection rating must be the highest of the two (bypass or rectifier).
(3) RCD is not necessary when the UPS is installed in a TN-S system. RCD is not permitted on TN-C systems. If an RCD is required a B-type should be used. Must be coordinate with residual current circuit breakers downstream of the UPS connected to the UPS output.
(4) Protection tripping downstream of the UPS with inverter short circuit current (Worst case = AUX MAINS not present). In the Normal case, with AUX MAINS present, fault clearing is determined by the Mains short-circuit capability.
(5) Use cable with tin-plated eyelets for the connection

8. SPECIFICATIONS TC3

8.1. Installation parameters

INSTALLATION PARAMENTERS									
System Rated power (kVA/kW)			2.5	5	7.5	5	10	15
Module Rated power (kVA/kW)			2.5			5		
Number of Modules			1	2	3	1	2	3
Phase in/out			1/1			1/1 or 3/1		
Active power		kW	2.5	5	7.5	5	10	15
Rated/maximum rectifier input current (EN 62040-3)		A	12/15	24/30	36/44	24/30	47/59	71/87
Rated bypass input current (1)		A	11	22	33	22	44	65
Inverter output current @ 230 V Pn		A	11	22	33	22	44	65
Recommended air flow capacity		m^3/h	160	320	480	240	480	720
Acoustic noise @ 70% Pn		dBA	43	46	49	45	48	51
Power dissipation in nominal conditions (2)		W	220	440	660	420	840	1260
		kcal/h	189	378	567	361	722	1083
		BTU/h	751	1501	2252	1433	2866	4299
Power dissipation (max) in the worst conditions (3)		W	250	500	750	480	960	1440
		kcal/h	215	430	645	413	825	1238
		BTU/h	853	1706	2559	1638	3276	4913
Dimensions	Width	mm	600					
	Depth	mm	600					
	Height	mm	1400					
Single unit Clearances	Operational	mm	Rear 300 lateral 0					
	Maintenance	mm	Front 1000 top 800					
Weight		kg	140					

(1) Considering nominal bypass current calculated @ 230 V, considering a continuos overload of 110%.
(2) Considering nominal input current (230 V, battery charged) and rated output active power.
(3) Considering maximum input current (low input voltage, battery charged) and rated output active power.

8.2. Electrical characteristics

ELECTRICAL CHARACTERISTICS - RECTIFIER INPUT							
System Rated power (kVA/kW)		2.5	5	7.5	5	10	15
Module Rated power (kVA/kW)		2.5			5		
Number of Modules		1	2	3	1	2	3
Rated mains supply voltage	V	230 V 1ph + N			230 1ph + N 400 3ph + N		
Voltage tolerance	V	184 to 276 (±20%)			184 to 276 (±20%) 320 to 480 (±20%)		
Voltage tolerance at derated load	V	up to 150 V @ 70% of nominal load			up to 150 1ph + N up to 260 3ph + N @ 70% of nominal load		
Rated frequency	Hz	50/60					
Frequency tolerance		±10%					
Current Total harmonic distortion (THDi)		≤ 6%			≤ 5.4%		
Power factor (at full load and rated voltage)		≥ 0.98					
Max inrush current at start-up		<In					

ELECTRICAL CHARACTERISTICS - BYPASS							
System Rated power (kVA/kW)		2.5	5	7.5	5	10	15
Module Rated power (kVA/kW)		2.5			5		
Number of Modules		1	2	3	1	2	3
Bypass frequency variation speed	Hz/s	1					
Bypass rated voltage		Nominal output voltage ±15%					
Bypass rated frequency	Hz	50/60 (selectable)					
Bypass frequency tolerance		±2% (±8% with genset)					
Bypass current overload (A)	5 min	13	25	38	25	51	77
	1 min	15	30	44	30	59	88
	20 sec	19	39	59	39	79	117

ELECTRICAL CHARACTERISTICS -INVERTER							
System Rated power (kVA/kW)		2.5	5	7.5	5	10	15
Module Rated power (kVA/kW)		2.5			5		
Number of Modules		1	2	3	1	2	3
Rated output voltage	V	208(1)/220/230/240 (selectable)					
Output voltage tolerance		Static: ±3% VFI-SS (EN 62040-3 compliant)					
Rated output frequency	Hz	50/60 (selectable)					
Output frequency tolerance		±0.1% on mains power failure					
Load crest factor		≥ 2.3					
Voltage total harmonic distortion THDV		< 3.5% with linear load					
Inverter overload (kW)	5 min	2.75	5.5	8.25	5.5	11	16.5
	10 sec	3.25	6.5	9.75	6.5	13	19.5
Short-circuit inverter current (A) (when AUX MAINS is not present)	0 to 60 ms	25	50	75	50	100	150

ELECTRICAL CHARACTERISTICS - EFFICIENCY	
Double conversion efficiency	up to 92.8%
EcoMode efficiency	99%

ELECTRICAL CHARACTERISTICS - ENVIRONMENT		
Storage temperatures	°C	-5 to +50 (15 to 25 for better battery life)
Working temperature	°C	0 to +40 (15 to 25 for better battery life)
Maximum relative humidity (non-condensing)		95%
Maximum altitude without derating	m (ft)	1000 (3300)
Degree of protection		IP20
Colour		RAL 7016

ELECTRICAL CHARACTERISTICS - BATTERY		
Standard max. recharge current	A	2.4 per Battery Module

(1) Up to 90% Pn

8.3. Recommended protections

RECOMMENDED PROTECTION DEVICES - RECTIFIER (1)							
System Rated power (kVA/kW)		2.5	5	7.5	5	10	15
Module Rated power (kVA/kW)		2.5			5		
Number of Modules		1	2	3	1	2	3
C curve circuit breaker (1ph/3ph)	A	16	32	50	32/13	63/26	100/32
gG fuse (1ph/3ph)	A	16	32	50	32/12	63/25	100/32

RECOMMENDED PROTECTION DEVICES - GENERAL BYPASS (2)							
System Rated power (kVA/kW)		2.5	5	7.5	5	10	15
Module Rated power (kVA/kW)		2.5			5		
Number of Modules		1	2	3	1	2	3
Conditional short circuit current rating (Icc)	kA	10			10		
C curve circuit breaker	A	16	32	40	32	63	100
gG fuse	A	16	32	40	32	63	100

RECOMMENDED PROTECTION DEVICES - INPUT RESIDUAL CURRENT CIRCUIT (RCD) BREAKER (3)		
Input residual current circuit breaker	A	0.1 A Selective type B

RECOMMENDED PROTECTION DEVICES - OUTPUT (4)							
C curve circuit breaker (3)	A	2	4	6	4	8	13
B curve circuit breaker (3)	A	4	8	12	8	16	25

CABLES - MAXIMUM CABLE SECTION (5)		
Rectifier terminals	mm	50
Bypass terminals	mm	50
Battery terminals (5)	mm	2x 95
Output terminals	mm	50

(1) Rectifier protection should only be considered in the event of separate inputs. Recommended values to avoid unwanted tripping with UPS at full power. When the bypass and rectifier inputs are combined (common input), the general input protection rating must be the highest of the two (bypass or rectifier).
(2) Recommended values to avoid unwanted tripping with UPS at full power. When the bypass and rectifier inputs are combined (common input), the general input protection rating must be the highest of the two (bypass or rectifier).
(3) RCD is not necessary when the UPS is installed in a TN-S system. RCD is not permitted on TN-C systems. If an RCD is required a B-type should be used. Must be coordinate with residual current circuit breakers downstream of the UPS connected to the UPS output.
(4) Protection tripping downstream of the UPS with inverter short circuit current (Worst case = AUX MAINS not present). In the Normal case, with AUX MAINS present, fault clearing is determined by the Mains short-circuit capability.
(5) Use cable with tin-plated eyelets for the connection

9. REFERENCE STANDARDS AND DIRECTIVES

9.1. Overview

The equipment, installed, used and serviced in accordance with its intended use, its regulations and standards, its manufacturer instructions and rules, is in compliance with the relevant Union harmonisation legislation:

LVD 2014 / 35 / EU

DIRECTIVE 2014/35/EU OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 26 February 2014, on the harmonisation of the laws of the Member States relating to the making available on the market of electrical equipment designed for use within certain voltage limits.

EMC 2014 / 30 / EU

DIRECTIVE 2014/30/EU OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 26 February 2014, on the harmonisation of the laws of the Member States relating to electromagnetic compatibility.

RoHS 2011/65/EU

Directive 2011/65 of the European parliament and of the council of 8 June 2011 on the restriction of the use of certain hazardous substances in electrical and electronic equipment

9.2. Standards

9.2.1. Safety

EN 62040-1	Uninterruptible Power System (UPS) - Part 1: General sand safety requirements (certified by TÜV)
IEC 62040-1	Uninterruptible Power System (UPS) - Part 1: Safety requirements (CB scheme by TÜV)

9.2.2. Electromagnetic compatibility

EN 62040-2	Uninterruptible Power System (UPS) - Part 2: Electromagnetic compatibility (EMC) requirements (LCIE)
IEC 62040-2	Uninterruptible Power System (UPS) - Part 2: Electromagnetic compatibility (EMC) requirements (LCIE)

9.2.3. TEST and performance

EN 62040-3	Uninterruptible Power System (UPS) - Part 3: Method of specifying the performance and test requirements

9.2.4. ENVIRONMENTAL

IEC 62040-4	Uninterruptible Power System (UPS) - Part 4: Enviromental aspects - Requirements and reporting

9.3. SYSTEM AND INSTALLATION GUIDELINES

When carrying out electrical installation, all the above standards must be observed. All national and international standards (e.g IEC60364)applicable to the specific electrical installation including batteries must be observed. For further information refer to ‘Technical specifications’ chapter in the user manual.

ELITE UPS: a mark of efficiency

Socomec, as CEMEP UPS manufacturer member, has signed a Code of Conduct put forward by the Joint Research Centre of the European Commission (JRC), to ensure the protection of critical applications and processes ensuring 24/7 continuous high quality supply. The JRC commits to mitigating energy losses and gas emissions caused by UPS equipment, therefore maximising UPS efficiency.

TECHNICAL GUIDE

EN

MODULYS GP

25 to 200 kW
Redundant Modular UPS

ULTIMATE
Fault tolerant power
without compromise

Socomec Resource Center
To download, brochures, catalogues
and technical manuals

socomec
Innovative Power Solutions

1. OBJECTIVES

The purpose of these specifications is to provide the information required to prepare the system and installation site.

The specifications are intended for:

- installation engineers.
- design engineers.
- engineering consultants.

For detailed information, see the installation and operating manual.

2. ARCHITECTURE

2.1. Range and Flexibility

Modulys GP is a modular, scalable and redundant UPS system based on plug-in and hot-swap power modules.

The modularity enables power scalability by simply plugging one or more additional modules into the existing system (up to 8 modules per system).

The modularity also enables redundancy, which is an essential feature to ensure UPS system fault tolerance. The redundant configuration can be set from N+0 up to N+R, it is strongly recommended to use N+1 to benefit from all the great advantages of redundancy.

2.1.1. FLEXIBLE RATED POWER

POWER MODULES									
Number of Power Modules	1	2	3	4	5	6	7	8	
N+1 redundant System Power (kW)	25 + 0 (1)	25 + 25	50 + 25	75 + 25	100 + 25	125 + 25	150 + 25	175 + 25	200 + 0 (1)

(1) No Power redundancy

2.1.2. FLEXIBLE CABLING

The standard solution has bottom cabling configuration.

As an option they can also accept top cabling and mixed top-bottom cabling.

2.1.3. FLEXIBLE GROUNDING COMPATIBILITY

Compatible with any grounding system: TN-S, TN-C, TT, IT.

3. FLEXIBLE BACK-UP TIME

Different extended back-up times are possible by using: (1) the internal battery; (2) a modular battery cabinet; (3) a high capacity battery cabinet. The latter two occupy minimum floor space.

Each battery pack comprises an acid-proof container designed to prevent damage in the case of acid leakage.

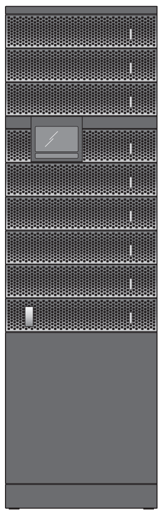
Each Power Module has a powerful embedded battery charger able to provide up to 8 A (without derating).

A special Power Module with double battery charger inside is available when very long back-up times are required.

3.1.1. Internal hot-swap battery

A standard UPS cabinet can house both Power Modules and Battery Boxes, thus providing a compact solution with a small footprint and optimised costs.

Each battery box has its own independent protection and it is hot-swappable.



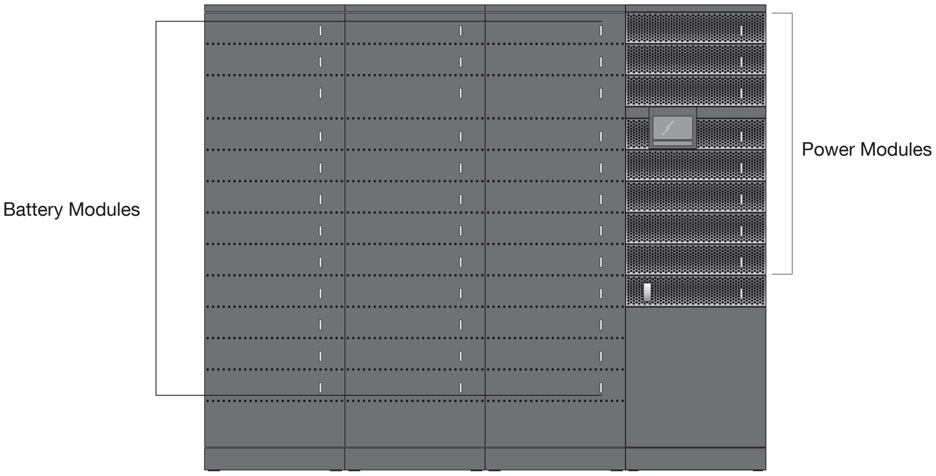
INTERNAL HOT-SWAP BATTERY CABINET BACK UP TIMES IN MINUTES @ 75% OF RATED LOAD												
Number of Power Modules				1	2	3	4	5	6	7	8	
N+1 redundant System Power (kW)				25 + 0(1)	25 + 25	50 + 25	75 + 25	100 + 25	125 + 25	150 + 25	175 + 25	200 + 0(1)
Number of String	1	Cumultative Ah	5	/	/	/	/	/	/	/	/	/
	2		10	6	6	/	/	/	/	/	/	/
	3		15	11	11	/	/	/	/	/	/	/
	4		20	16	16	6	/	/	/	/	/	/
	5		25	21	21	8	/	/	/	/	/	/
	6		30	26	26	/	/	/	/	/	/	/
	7		35	34	34	/	/	/	/	/	/	/

(1) No Power redundancy

3.1.2. Modular hot-swap battery cabinet - medium capacity

The modular battery system is based on vertical and horizontal modularity thanks to independent battery strings connected in parallel, each one made of hot-swap long life battery packs.

Each battery string has its own independent protection and its own independent switch for fast and safe maintenance.



DIMENSIONS AND WEIGHT																																				
	Number of Modular hot-swap battery cabinets - medium capacity																																			
	1												2												3											
	Number of battery strings																																			
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36
Height (mm)	1990																																			
Depth (mm)	950																																			
Width (mm)	810												1620												2430											
Weight (kg)	384	508	632	756	880	1004	1128	1252	1376	1500	1624	1748	2132	2256	2380	2504	2628	2752	2876	3000	3124	3248	3372	3496	3880	4004	4128	4252	4376	4500	4624	4748	4872	4996	5120	5244

Vertical modularity using a modular battery cabinet with hot-swap battery boxes provides scalable power back-up with to 12 battery strings per cabinet.

Horizontal modularity provides very high and scalable back-up.

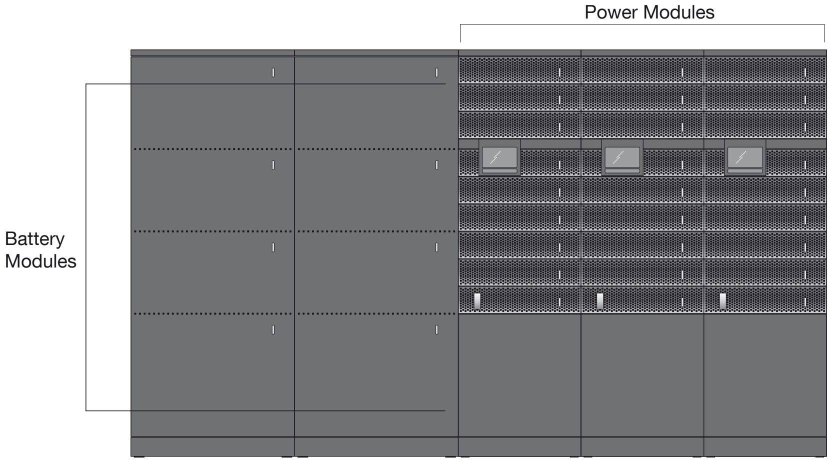
A standard temperature sensor optimises the battery recharging parameters according to the ambient operating temperature to extend battery life.

MODULAR HOT-SWAP BATTERY CABINET - MEDIUM CAPACITY
BACK-UP TIMES IN MINUTES @75 % OF RATED LOAD

		Number of Power Modules	1	2	3	4	5	6	7	8	
		N+1 redundant System Power (kW)	25 + 0(1)	25 + 25	50 + 25	75 + 25	100 + 25	125 + 25	150 + 25	175 + 25	200 + 0(1)
Number of battery cabinets	Numer of battery strings	Cumultative Ah									
1	1	9	5	5							
	2	18	15	15	5						
	3	27	23	23	9	5					
	4	36	34	34	15	8	5				
	5	45	44	44	19	11	7	5			
	6	54	57	57	23	15	9	6	5		
	7	63	68	68	28	18	12	8	6	5	
	8	72	80	80	34	20	15	11	8	6	5
	9	81	92	92	40	23	17	13	9	7	6
	10	90	103	103	44	26	19	15	11	9	7
	11	99	116	116	51	30	21	17	13	10	8
	12	108	129	129	57	34	23	18	15	12	9
2	13	117	141	141	63	38	25	20	16	13	11
	14	126	151	151	68	41	28	22	18	15	12
	15	135	163	163	73	44	31	23	19	16	14
	16	144	177	177	80	48	34	25	20	17	15
	17	153	190	190	86	53	37	27	22	18	16
	18	162	206	206	92	57	40	29	23	19	17
	19	171	221	221	98	61	42	32	25	21	18
	20	180	235	235	103	65	44	34	26	22	19
	21	189	249	249	109	68	47	37	28	23	20
	22	198	261	261	116	71	51	39	30	25	21
	23	207	272	272	123	75	54	41	32	26	22
	24	216	282	282	129	80	57	43	34	27	23
3	25	225	294	294	135	84	60	44	36	29	24
	26	234	310	310	141	88	63	46	38	31	25
	27	243	326	326	146	92	66	49	40	33	26
	28	252	341	341	151	96	68	52	41	34	28
	29	261	354	354	156	99	71	55	43	36	30
	30	270	367	367	163	103	73	57	44	38	31
	31	279	383	383	170	107	76	59	46	39	33
	32	288	402	402	177	111	80	62	48	41	34
	33	297	419	419	183	116	83	64	51	42	36
	34	306	436	436	190	120	86	66	53	43	37
	35	315	451	451	197	125	89	68	55	44	39
	36	324	466	466	206	129	92	70	57	46	40

(1) No Power redundancy

3.1.3. Modular battery cabinet - high capacity



DIMENSIONS AND WEIGHT		
Number of Strings	0	1
Height (mm)	1990	
Depth (mm)	890	
Width (mm)	810	
Weight (kg)	220	1792

High-capacity modular battery cabinets are designed for long back-up times (BUT) with higher power.

A standard temperature sensor optimizes the battery recharging parameters according to the ambient operating temperature to extend battery life.

MODULAR BATTERY CABINET BACK-UP TIMES IN MINUTES @75% OF RATED LOAD														
Number of Power Modules						1	2	3	4	5	6	7	8	
N+1 redundant System Power (kW)						25 + 0(1)	25 + 25	50 + 25	75 + 25	100 + 25	125 + 25	150 + 25	175 + 25	200 + 0(1)
Number of battery cabinets	1	Number of battery strings	1	Cumulative Ah	92	119	119	56	33	21	15	-	-	-
	2		2		184	279	279	119	75	56	45	33	25	21
	3		3		276	447	447	201	119	84	66	56	49	41
	4		4		368	654	654	279	170	119	89	75	62	56
	5		5		460	-	-	378	226	154	119	92	81	70
	6		6		552	-	-	-	279	201	146	119	96	84

(1) No Power redundancy

4. SPECIFICATIONS

4.1. Installation parameters

DIMENSIONS AND WEIGHT								
Number of Power Modules	1	2	3	4	5	6	7	8
Height (mm)	1990							
Depth (mm)	890							
Width (mm)	600							
Weight (kg)	286	319	352	385	418	451	484	517

RATED CURRENT AND MAX CURRENT									
Number of Power Modules	1	2	3	4	5	6	7	8	
N+1 redundant System Power (kW)	25 + 0(1)	25 + 25	50 + 25	75 + 25	100 + 25	125 + 25	150 + 25	175 + 25	200 + 0(1)
Rated rectifier input current (A) (EN 62040-1)	38	75	113	151	189	226	264	302	
Maximum rectifier input current (A) (EN 62040-3)	45	90	135	180	225	270	315	360	
Nominal Inverter output current (A)	36	72	109	145	181	217	253	290	
Maximum bypass input current (A) (EN 62040-3)	320								
Maximum battery current (A)	80	160	240	320	400	480	560	640	

(1) No Power redundancy

COOLING										
Number of Power Modules		1	2	3	4	5	6	7	8	
N+1 redundant System Power (kW)		25 + 0(1)	25 + 25	50 + 25	75 + 25	100 + 25	125 + 25	150 + 25	175 + 25	200 + 0(1)
Maximum air flow	(m3/h)	400	800	1200	1600	2000	2400	2800	3200	
Power Dissipation under nominal conditions(2)	(W)	1140	1140	2280	3420	4560	5700	6840	7980	9120
	(kcal/h)	980	980	1961	2941	3922	4902	5882	6863	7843
	(BTU/h)	3891	3891	7782	11672	15563	19454	23345	27236	31127
Power Dissipation (maximum) under worst-case conditions(3)	(W)	1350	1350	2650	3950	5250	6550	7850	9150	10450
	(kcal/h)	1161	1161	2279	3397	4515	5633	6751	7869	8987
	(BTU/h)	4608	4608	9044	13481	17918	22355	26792	31229	35666

(1) No Power redundancy
(2) Nominal input voltage and rated output active power (PF=1)
(3) Low input voltage, battery recharged and rated output active power (PF=1)

ACOUSTIC NOISE									
Number of Power Modules	1	2	3	4	5	6	7	8	
N+1 redundant System Power (kW)	25 + 0(1)	25 + 25	50 + 25	75 + 25	100 + 25	125 + 25	150 + 25	175 + 25	200 + 0(1)
Acoustic noise at 1m (dBA) (2)	51	53	54	55	56	57	58	59	

(1) No Power redundancy
(2) At 70% nominal load.

4.2. Electrical characteristics

4.2.1. Electrical characteristics independent OF the number of modules

ELECTRICAL CHARACTERISTICS - INPUT	
Rated mains supply voltage (V)	400 V 3-phase+N
Voltage tolerance at full load	340 V to 480 V (+20/-15%)
Voltage tolerance at derated load	up to 240 V @ 50% of nominal load (linear decrease)
Rated frequency (Hz)	40 - 70 Hz
Power factor	> 0.99[1]
Total harmonic input current distortion (THDi)	≤ 3% (@: Pn, Resistive load, Mains THDv ≤ 1%)
Max inrush current at start-up	Power walk-in / Soft-start (selectable parameters)

(1) Pout ≥ 50% of nominal Power.

ELECTRICAL CHARACTERISTICS - BYPASS	
Bypass rated voltage (V)	Nominal output voltage ±15% (±20% if GENSET is used)
Bypass rated frequency (Hz)	50 / 60
Bypass frequency tolerance	±2% selectable (±8% if GENSET is used)
Bypass frequency variation speed	50 / 60 ±10%

ELECTRICAL CHARACTERISTICS - INVERTER	
Rated output voltage (V)	(3ph + N) 400 380 / 400 / 415 selectable
Output voltage tolerance (V)	±1%
Rated output frequency (Hz)	50 / 60 (selectable)
Output frequency tolerance	±0.05% (on battery mode)
Load crest factor	≥ 2.7 :1
Total output voltage distortion (THDv)	≤ 1% (Ph / Ph) ; ≤ 2% (Ph / N) (@: Pn, Resistive load)

ELECTRICAL CHARACTERISTICS - STORED ENERGY OPERATING MODE	
Number of battery blocks (VRLA)	From 18+18 to 24+24[1]

(1) Consult us

ELECTRICAL CHARACTERISTICS - EFFICIENCY	
Efficiency (on-line mode)	up to 96.5%
Efficiency (eco-mode)	up to 99.3%

ELECTRICAL CHARACTERISTICS - BYPASS OVERLOAD AND SHORTCIRCUIT		
Number of Power Modules		1 → 8
Bypass overload (A)	Nominal	290
	Continuous	320
	10'	362
	1'	450
	1"	510
Bypass Max short-circuit current ITSM (A)		9000
Bypass I^2t (A^2s)		40000

ELECTRICAL CHARACTERISTICS - SYSTEM SHORTCIRCUIT SAFETY PERFORMANCE	
Number of Power Modules	1 → 8
Short-circuit current withstand (Icw)	10 kA
Conditional short-circuit current (Icc)	50 kA

4.2.2. Electrical characteristics dependent on the number of modules

ELECTRICAL CHARACTERISTICS - INVERTER OVERLOAD AND SHORT-CIRCUIT										
Number of Power Modules		1	2	3	4	5	6	7	8	
N+1 redundant System Power (kW)		25 + 0(1)	25 + 25	50 + 25	75 + 25	100 + 25	125 + 25	150 + 25	175 + 25	200 + 0(1)
Inverter overload (kW)(2)	10 min	31,2	62,4	94	125	157	188	219	250	
	5 min	33,3	66,5	100	133	166	200	233	266	
	1 min	37,5	75,0	113	150	188	225	263	300	
Inverter short-circuit (A) Ik1 = Ik2 = Ik3	40 ms	100	200	300	400	500	600	700	800	
	40 to 100 ms	80	160	240	320	400	480	560	640	

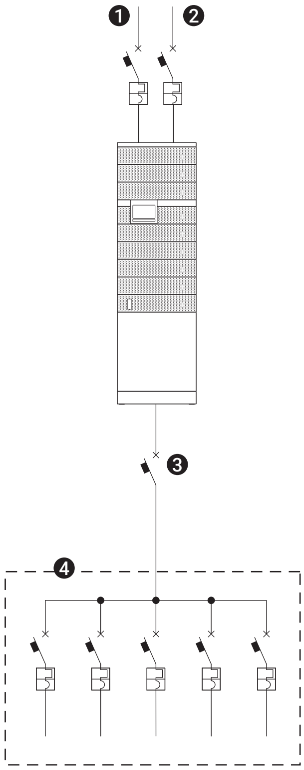
(1) No Power redundancy
(2) Conditions: Initial Pout ≤ 80% Pn, Vin nominal

ELECTRICAL CHARACTERISTICS - BATTERY CHARGER MAX CURRENT									
Number of Power Modules	1	2	3	4	5	6	7	8	
N+1 redundant System Power (kW)	25 + 0(1)	25 + 25	50 + 25	75 + 25	100 + 25	125 + 25	150 + 25	175 + 25	200 + 0(1)
Standard Maximum Current (A)	8	16	24	32	40	48	56	64	64
Enhanced Battery Charger Maximum current (A)	16	32	48	64	80	96	112	128	128

(1) No power redundancy

4.3. Recommended protection

4.3.1. System from 25 to 200 kW



Key

1. Input mains magneto-thermal switch
2. Auxiliary mains magneto-thermal switch
3. System shutdown switch
4. Distribution

The installation and system should comply with national plant regulations.

The electrical distribution panel should have a sectioning and protection system installed for input and auxiliary mains.

SYSTEM CABLES - MAX SECTION		
Number of Modules		1 → 8
Rectifier terminals (mm^2)	Flexible	2 x 150
	Rigid	2 x 150
Bypass terminals (mm^2)	Flexible	2 x 150
	Rigid	2 x 150
Battery terminals (mm^2)	Flexible	2 x 150
	Rigid	2 x 150
Output terminals (mm^2)	Flexible	2 x 150
	Rigid	2 x 150

M10 terminals

Tightening torque 20 Nm

Maximum cross-section is determined by the size of the terminals.

As specified in EN 62040-3 Appendix 3 (Non-Linear Load Reference), in the event of three-phase non-linear loads connected downstream of the UPS, the neutral current on the load can be 1.5 - 2 times higher than the phase current. This should be taken into account when estimating the correct size of output and auxiliary neutral cables.

RECOMMENDED PROTECTION DEVICES - RECTIFIER										
Number of Modules		1	2	3	4	5	6	7	8	
N+1 redundant System Power (kW)		25 + 0[1]	25 + 25	50 + 25	75 + 25	100 + 25	125 + 25	150 + 25	175 + 25	200 + 0[1]
Circuit breaker with Im ≤ 10 x In (A)	Minimum	50	100	160	200	250	320	400	400	
	Maximum	400	400	400	400	400	400	400	400	

(1) No Power redundancy

A circuit breaker switch is recommended with magnetic intervention threshold ≥10 In.

It is necessary to use a circuit breaker with Im ≤ 20 x In (A) selective breaker if an optional external transformer is used. The minimum value depends on the size of the power cables in the installation, while the maximum value is limited by the UPS cabinet.

The system can accept the maximum value of protection, regardless of the number of modules installed, in order to enable future scalability, while the minimum value depends on the size of the power cables in the installation. A protection value of less than the maximum shall be used when the mains grid structure cannot support the full power load, and shall be chosen between the minimum and maximum values (as per the table above) according to mains grid design.

Rectifier protection should be taken into account in the event of separate inputs; when the auxiliary mains and rectifier inputs are combined (common input), the general input protection rating should be higher than both (auxiliary mains or rectifier).

RECOMMENDED PROTECTION DEVICES - AUXILIARY MAINS										
Number of Modules		1	2	3	4	5	6	7	8	
N+1 redundant System Power (kW)		25 + 0[1]	25 + 25	50 + 25	75 + 25	100 + 25	125 + 25	150 + 25	175 + 25	200 + 0[1]
Circuit breaker with Im ≤ 10 x In (A)	Minimum	50	100	160	200	250	320	400	400	
	Maximum	400	400	400	400	400	400	400	400	

(1) No Power redundancy

A circuit breaker switch is recommended with magnetic intervention threshold ≥10 In.

It is necessary to use a circuit breaker with Im ≤ 20 x In (A) selective breaker if an optional external transformer is used. The minimum value depends on the size of the power cables in the installation, while the maximum value is limited by the UPS cabinet.

The conditional short circuit current (Icc) according to IEC 62040-1 is 65KA rms, provided that the UPS is protected by a MCCB with adequate breaking capability and current-limiting capability under short-circuit conditions. Contact us for detailed information.

RECOMMENDED PROTECTION DEVICES - UPSTREAM RESIDUAL CURRENT DETECTION CIRCUIT BREAKER										
Number of Modules		1	2	3	4	5	6	7	8	
N+1 redundant System Power (kW)		25 + 0[1]	25 + 25	50 + 25	75 + 25	100 + 25	125 + 25	150 + 25	175 + 25	200 + 0[1]
Residual Current Detection (A)	Minimum	0.5								

(1) No Power redundancy

An RCD is not necessary when the UPS is installed on a TN-S system. RCDs are not allowed on TN-C systems. If an RCD is required, a B type should be used.

Caution! Use four-pole selective (S) residual current detectors (RCDs). Load leakage currents are to be added to those generated by the UPS and short current peaks may occur during transitory phases (power failures and power returns). If loads with high leakage current are present, adjust the residual current protection. It is advisable in all cases to carry out a preliminary check on the ground current leakage with the UPS installed and operating with the definitive load, so as to prevent tripping of the RCD switch.

OUTPUT SELECTIVITY ON BATTERY MODE (AUX MAINS NOT PRESENT)										
Number of Modules		1	2	3	4	5	6	7	8	
N+1 redundant System Power (kW)		25 + 0[1]	25 + 25	50 + 25	75 + 25	100 + 25	125 + 25	150 + 25	175 + 25	200 + 0[1]
Circuit breaker with Im ≤ 5 x In (A)	Maximum	13	25	40	50	63	80	100	100	
Circuit breaker with Im ≤ 10 x In (A)	Maximum	6	13	20	25	32	40	50	50	

(1) No Power redundancy

5. REFERENCE STANDARDS AND DIRECTIVES

5.1. Overview

The construction of the equipment and choice of materials and components comply with all laws, decrees, directives and standards currently in force. In particular, the equipment is fully compliant with all European Directives concerning CE marking.

2014/35/EU

Directive 2014/35/EU of the European Parliament and of the Council of 26 February 2014 on the harmonisation of the laws of the Member States relating to the making available on the market of electrical equipment designed for use within certain voltage limits.

2014/30/EU

Directive 2014/30/EU of the European Parliament and of the Council of 26 February 2014 on the harmonisation of the laws of the Member States relating to electromagnetic compatibility.

2011/65/EU

Directive 2011/65/EU of the European Parliament and of the Council of 8 June 2011 on the restriction of the use of certain hazardous substances in electrical and electronic equipment.

5.2. Standards

STANDARD	
Safety	EN / IEC 62040-1 - AS 62040-1
EMC	EN / IEC 62040-2 - AS 62040-2
Product certification	IECEE CB Scheme
Performance	EN / IEC 62040-3 - AS 62040-3
Product marks	CE - RCM(1) - EAC(1) - CMIM(1) - UKCA(1)
Protective class	Protective Class I
Protection level	IP20

(1) Depends on the production site. Consult the data plate on the equipment

ELITE UPS: a mark of efficiency

Socomec, as CEMEP UPS manufacturer member, has signed a Code of Conduct put forward by the Joint Research Centre of the European Commission (JRC), to ensure the protection of critical applications and processes ensuring 24/7 continuous high quality supply. The JRC commits to mitigating energy losses and gas emissions caused by UPS equipment, therefore maximising UPS efficiency.

TECHNICAL GUIDE

EN

MODULYS RM GP

up to 4 x 25 kVA/kW
Rack-mounted modular UPS system, Green Power 2.0 range

ULTIMATE
Fault tolerant power
without compromise

19"

3 LEVEL TECHNOLOGY

96.5% EFFICIENCY

kW = kVA

Socomec Resource Center
To download, brochures, catalogues
and technical manuals

socomec
Innovative Power Solutions

1. OBJECTIVES

The aim of these specifications is to provide the information required to prepare the system and installation site.

The specifications are intended for:

- installation engineers,
- design engineers,
- engineering consultants.

Please contact us for further information, or if you would like to receive a full documentation package for detailed product know-how, including schematics, integration instructions, technical data sheets, user’s manual, etc.

1. ARCHITECTURE

1.1. Range and flexibility

MODULYS RM GP is a 3-phase modular UPS system designed for 19” rack integration. The product is easy to integrate and install, as well as being very simple to operate and maintain. It provides maximum power availability and protection in a compact design that leaves free space for other rack mounted devices.

MODULYS RM GP:

- provides easy and fully-assured rack integration to meet all requirement across multiple applications, even for existing installations;
- simplifies and optimises every step of the integration process - from sizing to installation, including the logistics, making project management easy, risk-free and economic;
- provides reliable power whilst ensuring optimum load protection even during power upgrades or maintenance procedures.

Pre-cabled rack with maintenance bypass

M4-R-075-82B0 15U rack, 4 slots
M4-R-050-82B0 9U rack, 2 slots

Plug-in boards

1C-CP-OP-ADC+SL Programmable IN / OUT dry contact + serial link
1C-CP-OP-MODTCP MODBUS TCP interface
NET-VISION7CARD NET VISION card, WEB / SNMP interface IPV4 / IPV6

Other options

NET-VISION-EMD Environment temp. and humidity sensor + 4 dry contacts

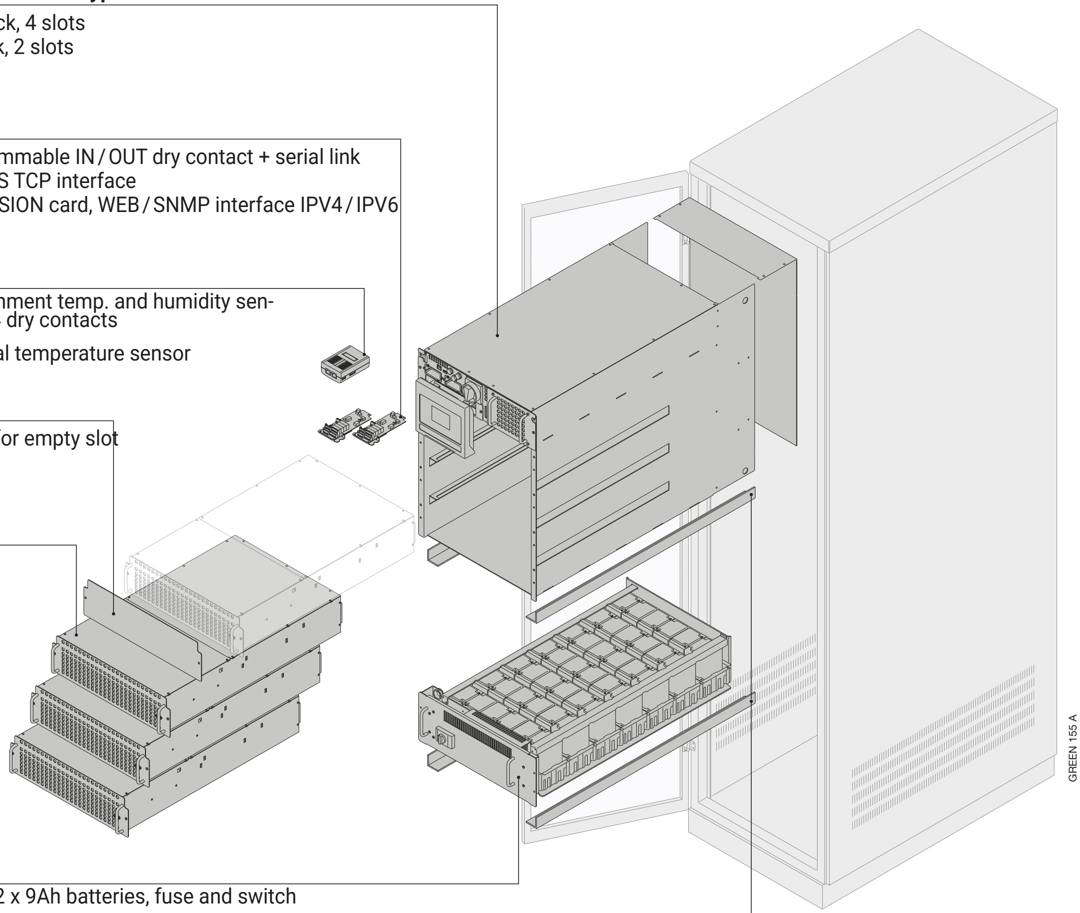
1C-OP-P-TEMP External temperature sensor

Blank panel

M4-OP-SSC Cover for empty slot

Power module - 25 kW

M4-RI-25



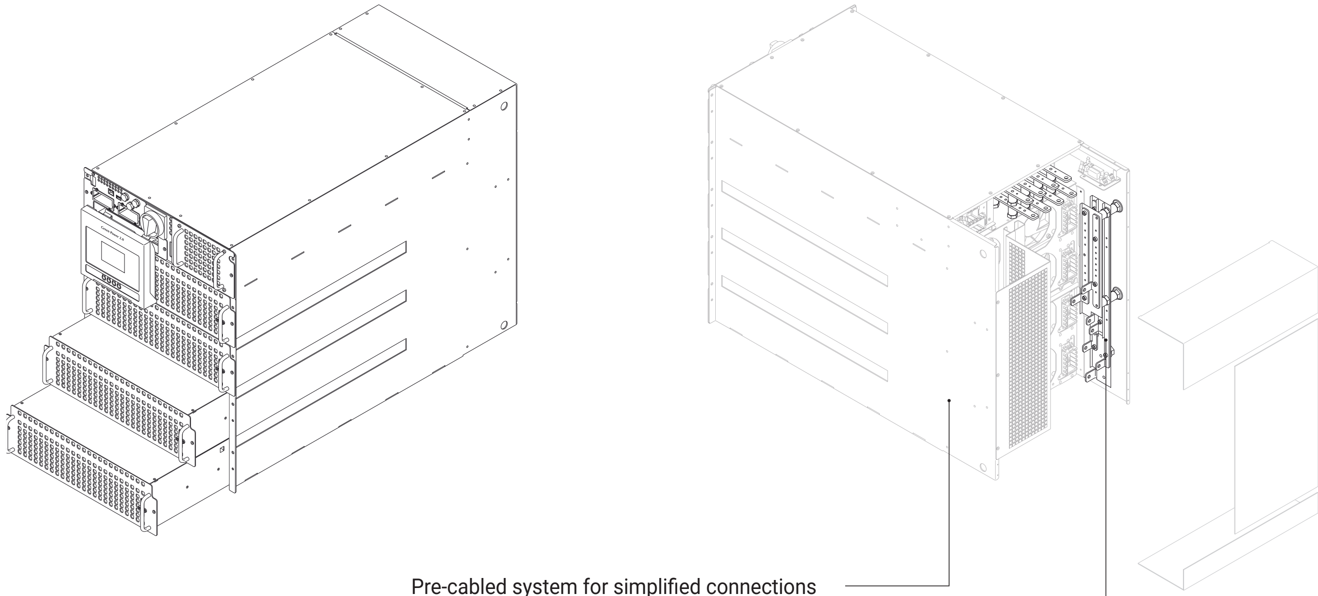
4U battery rack

M4-BR-009L With 42 x 9Ah batteries, fuse and switch

M4-BR-009L-B Empty, for 42 x 9Ah batteries, including interconnections, fuses and switch

Mounting accessories

M4-RI-OP-RAIL Adjustable rails for rack mounting support



Pre-cabled system for simplified connections

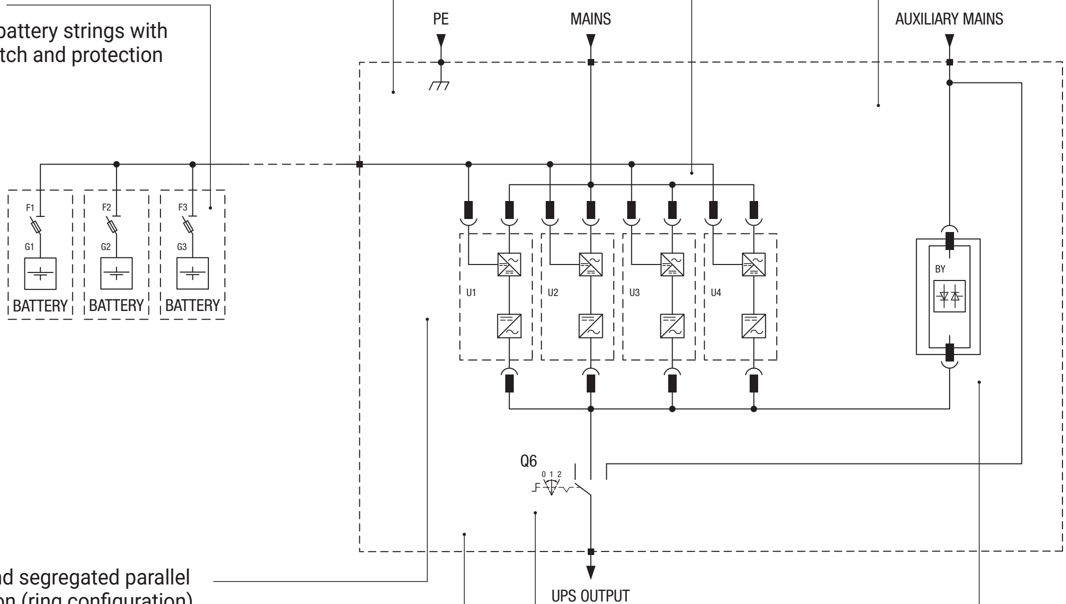
Flexible cabling management for top, bottom
and mixed top / bottom entry cable

No centralised control for parallel
and load sharing management

Totally independent and self-suffi-
cient hot-swap power modules

Electronics-free (failure-free) sub-
rack enclosure

Battery rack
Independent battery strings with
individual switch and protection

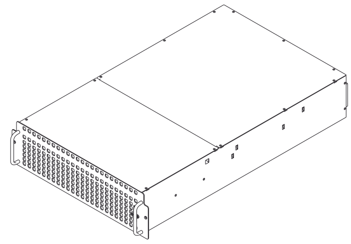
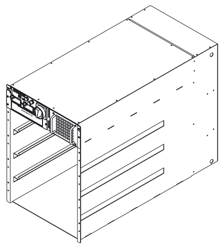
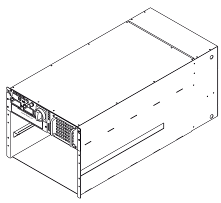


Redundant and segregated parallel
bus connection (ring configuration)

No single point of failure

Embedded manual bypass

Totally segregated, fully sized and
centralised hot-swap auxiliary mains bypass

CONFIGURATIONS AND RATED POWER (KW)					
					
		M4-RI-25			
		Number of power modules			
		1	2	3	4
 M4-R-075-82B0	N configuration	25	50	75	-
	N+1 redundancy	-	25	50	75
 M4-R-050-82B0	N configuration	25	50	-	-
	1+1 redundancy	-	25	-	-

1.2. Flexible back-up time

Different extended back-up times are possible by using: (1) 4U rack-mounted battery modules; (2) a modular battery cabinet; (3) a high capacity battery cabinet.

Each battery pack comprises an acid-proof container designed to prevent damage in case of acid leakage.

Each Power Module has a powerful embedded battery charger able to provide up to 8 A (without power derating).

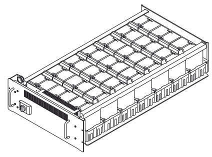
A special Power Module with extra battery charger inside is available when very long back-up times are required.

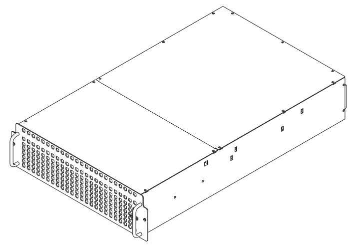
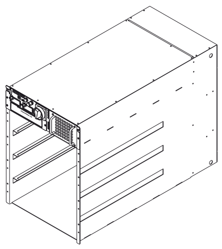
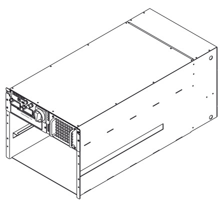
MODULYS RM GP is compatible with different battery technologies.

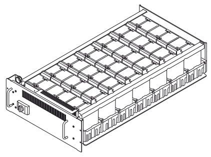
BATTERY BLOCK DYNAMICS(1)		
Sealed lead-acid	Min	108 + 108
	Max	144 + 144
Open vented (flooded lead-acid)	Min	108 + 108
	Max	144 + 144
Nickel Cadmium	Min	180 + 180
	Max	228 + 228

(1) 2 strings / 3 cables configuration (+ N -).

1.2.1. 4U rack-mounted battery modules

DIMENSIONS AND WEIGHT		
	Height (mm)	175
	Depth (mm)	920
	Width (mm)	442 (482)
	Weight - empty (kg)	23
M4-BR-009L	Weight - with batteries (kg)	136

4U RACK-MOUNTED BATTERY MODULES BACK UP TIMES IN MINUTES AT RATED LOAD				
				
		M4-RI-25		
		Number of power modules		
 M4-R-075-82B0	Without redundancy	1	2	3
	N+1 redundancy	2	3	4
 M4-R-050-82B0	Without redundancy	1	2	-
	1+1 redundancy	2	-	-

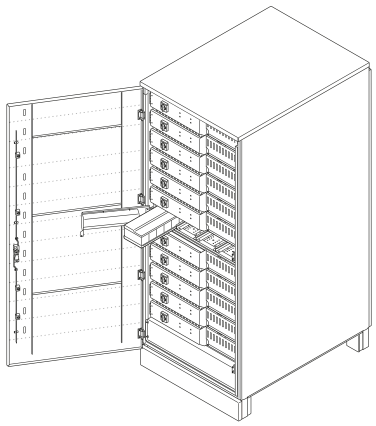
LOAD POWER (KW)	Number of battery racks	Cumulative Ah	5	10	15	18	20	25	30	36	40	50	54	60	75
	1	9	25	11	6	4	3	-	-	-	-	-	-	-	-
	2	18	62	26	17	13	11	8	6	4	3	-	-	-	-
	3	27	100	44	26	22	19	15	11	8	7	5	4	3	-
	4	36	138	64	40	31	26	20	17	13	11	8	7	6	4
	5	45	176	84	51	41	37	26	21	17	15	11	9	8	6
M4-BR-009L	> 5		consult us												

1.2.2. Modular hot-swap battery cabinet

The modular battery system is based on vertical and horizontal modularity thanks to independent battery strings connected in parallel, each string comprising hot-swap long life battery packs.

Each battery string has its own independent protection and its own independent switch for fast and safe maintenance.

MODULAR HOT-SWAP BATTERY CABINET



Number of strings	Item code
0 (empty cabinet)	M4-BH-00S-009L
1	M4-BH-01S-009L
2	M4-BH-02S-009L
3	M4-BH-03S-009L
4	M4-BH-04S-009L
5	M4-BH-05S-009L
6	M4-BH-06S-009L
7	M4-BH-07S-009L
8	M4-BH-08S-009L
9	M4-BH-09S-009L
10	M4-BH-10S-009L
11	M4-BH-11S-009L
12	M4-BH-12S-009L

DIMENSIONS AND WEIGHT

	Number of battery cabinets																																				
	1													2												3											
	Number of strings																																				
	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36
Height (mm)	1990																																				
Depth (mm)	950																																				
Width (mm)	810													1620												2430											
Weight (kg)	260	384	508	632	756	880	1004	1128	1252	1376	1500	1624	1748	2132	2256	2380	2504	2628	2752	2876	3000	3124	3248	3372	3496	3880	4004	4128	4252	4376	4500	4624	4748	4872	4996	5120	5244

MODULAR HOT-SWAP BATTERY CABINET BACK UP TIMES IN MINUTES @ 75 % OF RATED LOAD

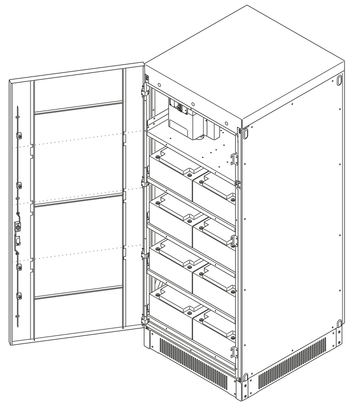
Number of battery cabinets	Number of strings	Cumulative Ah	Number of power modules		
Without redundancy			1	2	3
N+1 redundancy			2	3	4
1	1	9	5	-	-
	2	18	15	5	-
	3	27	23	9	5
	4	36	34	15	8
	5	45	44	19	11
	6	54	57	23	15
	7	63	68	28	18
	8	72	80	34	20
	9	81	92	40	23
	10	90	103	44	26
	11	99	116	51	30
	12	108	129	57	34
2	13	117	141	63	38
	14	126	151	68	41
	15	135	163	73	44
	16	144	177	80	48
	17	153	190	86	53
	18	162	206	92	57
	19	171	221	98	61
	20	180	235	103	65
	21	189	249	109	68
	22	198	261	116	71
	23	207	272	123	75
	24	216	282	129	80
3	25	225	294	135	84
	26	234	310	141	88
	27	243	326	146	92
	28	252	341	151	96
	29	261	354	156	99
	30	270	367	163	103
	31	279	383	170	107
	32	288	402	177	111
	33	297	419	183	116
	34	306	436	190	120
	35	315	451	197	125
	36	324	466	206	129

Number of battery cabinets	Number of strings	Cumulative Ah	Number of power modules	
Without redundancy			1	2
1+1 redundancy			2	-
1	1	9	5	-
	2	18	15	5
	3	27	23	9
	4	36	34	15
	5	45	44	19
	6	54	57	23
	7	63	68	28
	8	72	80	34
	9	81	92	40
	10	90	103	44
	11	99	116	51
	12	108	129	57
2	13	117	141	63
	14	126	151	68
	15	135	163	73
	16	144	177	80
	17	153	190	86
	18	162	206	92
	19	171	221	98
	20	180	235	103
	21	189	249	109
	22	198	261	116
	23	207	272	123
	24	216	282	129
3	25	225	294	135
	26	234	310	141
	27	243	326	146
	28	252	341	151
	29	261	354	156
	30	270	367	163
	31	279	383	170
	32	288	402	177
	33	297	419	183
	34	306	436	190
	35	315	451	197
	36	324	466	206

For very long BUT, it is recommended to use the power module with 16 A charging current (refer to page 14).

1.2.3. Modular battery cabinet - high capacity

MODULAR HOT-SWAP BATTERY CABINET



M4-BC-01S-92L

DIMENSIONS AND WEIGHT

		Number of strings	
		0	1
Height	(mm)	1990	
Depth	(mm)	890	
Width	(mm)	810	
Weight	(kg)	220	1792

MODULAR BATTERY CABINET
BACK UP TIMES IN MINUTES @ 75% OF RATED LOAD

			Number of power modules		
Without redundancy			1	2	3
N+1 redundancy			2	3	4
Number of battery cabinets	Number of battery racks	Cumulative Ah			
1	1	92	119	56	33
	2	184	279	119	75
	3	276	447	201	119
	4	368	654	279	170
	5	460	-	378	226
	6	552	-	-	279

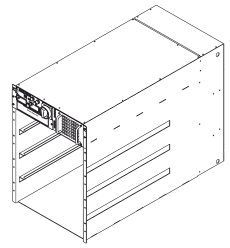
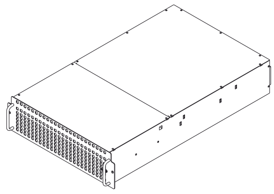
MODULAR BATTERY CABINET
BACK UP TIMES IN MINUTES @ 75% OF RATED LOAD

			Number of power modules	
Without redundancy			1	2
1+1 redundancy			2	-
Number of battery cabinets	Number of battery racks	Cumulative Ah		
1	1	92	119	56
	2	184	279	119
	3	276	447	201
	4	368	654	279
	5	460	-	378

For very long BUT, it is recommended to use the power module with 16 A charging current (refer to page 14).

2. SPECIFICATIONS

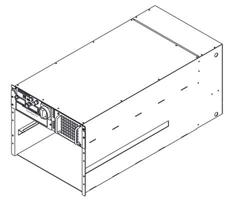
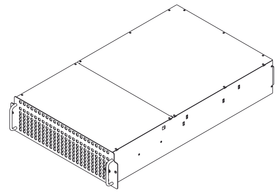
2.1. Installation parameters

	
M4-R-075-82B0	M4-RI-25

CONFIGURATIONS AND RATED POWER (KW)				
	Number of power modules			
	1	2	3	4
N configuration	25	50	75	-
N+1 redundancy	-	25	50	75

RATED CURRENT AND MAX CURRENT			
	Number of power modules		
Without redundancy	1	2	3
N+1 redundancy	2	3	4
Rated rectifier input current (A) (EN 62040-3)	37.7	75	113
Max rectifier input current (A) (EN 62040-3)	45.0	90	135
Rated inverter output current (A)	36.2	72	109
Maximum bypass input current (A) (EN 62040-3)	120		
Max battery current (A)	80	160	240

COOLING				
		Number of power modules		
Without redundancy		1	2	3
N+1 redundancy		2	3	4
Maximum air flow	m^3/h	400	800	1200
Max dissipation in nominal conditions(1)	W	1140	2280	3420
	kcal/h	980	1961	2941
	BTU/h	3891	7782	11672
Max dissipation in worst conditions(2)	W	1350	2650	3950
	kcal/h	1161	2279	3397
	BTU/h	4608	9044	13481

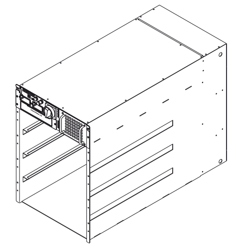
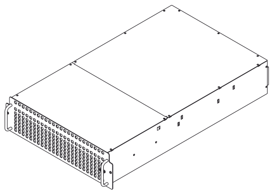
	
M4-R-050-82B0	M4-RI-25

CONFIGURATIONS AND RATED POWER (KW)		
	Number of power modules	
	1	2
N configuration	25	50
1+1 redundancy	-	25

RATED CURRENT AND MAX CURRENT		
	Number of power modules	
Without redundancy	1	2
1+1 redundancy	2	-
Rated rectifier input current (A) (EN 62040-3)	37.7	75
Max rectifier input current (A) (EN 62040-3)	45.0	90
Rated inverter output current (A)	36.2	72
Maximum bypass input current (A) (EN 62040-3)	120	
Max battery current (A)	80	160

COOLING			
		Number of power modules	
Without redundancy		1	2
1+1 redundancy		2	-
Maximum air flow	m^3/h	400	800
Max dissipation in nominal conditions(1)	W	1140	2280
	kcal/h	980	1961
	BTU/h	3891	7782
Max dissipation in worst conditions(2)	W	1350	2650
	kcal/h	1161	2279
	BTU/h	4608	9044

(1) Nominal input voltage and rated output active power (PF1).
(2) Low input voltage, battery recharge and rated output active power (PF1).

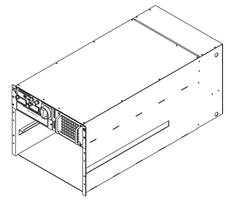
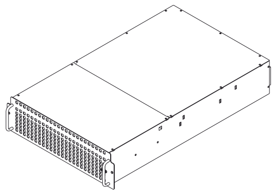
	
M4-R-075-82B0	M4-RI-25

ACOUSTIC NOISE			
	Number of power modules		
Without redundancy	1	2	3
N+1 redundancy	2	3	4
Acoustic noise at 1 m (dBA)(1)	51	53	54

(1) 75 % of nominal load.

DIMENSIONS AND WEIGHT				
	Number of power modules			
	1	2	3	4
Height (mm)	664			
Depth (mm)	920			
Width (mm)	442 (482)			
Weight - sub-rack (kg)	49			
Weight (kg)	82	115	148	181

ENVIRONMENT	
Storage temperature	-5 to +50 °C
Operating temperature	0 to 40 °C(1)(2)
Maximum relative humidity	95 % condensation-free
Degree of protection	IP20

	
M4-R-050-82B0	M4-RI-25

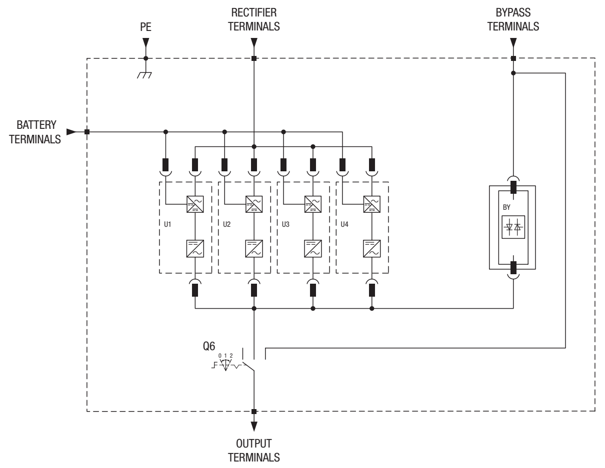
ACOUSTIC NOISE		
	Number of power modules	
Without redundancy	1	2
1+1 redundancy	2	-
Acoustic noise at 1 m (dBA)(1)	51	53

DIMENSIONS AND WEIGHT		
	Number of power modules	
	1	2
Height (mm)	397	
Depth (mm)	920	
Width (mm)	442 (482)	
Weight - sub-rack (kg)	43	
Weight (kg)	76	109

ENVIRONMENT	
Storage temperature	-5 to +50 °C
Operating temperature	0 to 40 °C(1)(2)
Maximum relative humidity	95 % condensation-free
Degree of protection	IP20

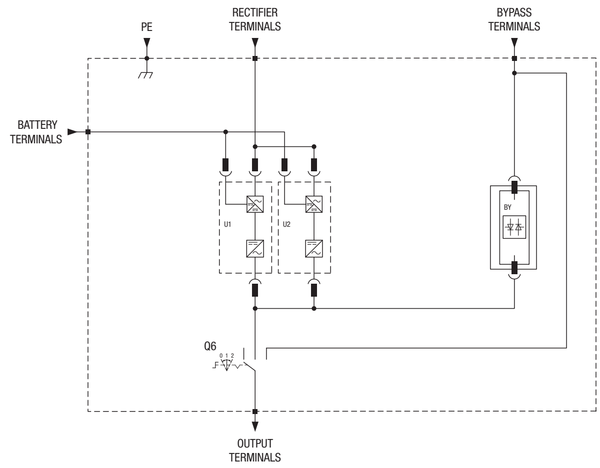
(1) According to EN 62040-3.
(2) For optimum battery lifetime the ideal temperature range is 15 °C - 25 °C

CABLING SYSTEM AND MAX CABLE SECTION



		Number of power modules			
		1	2	3	4
Rectifier terminals (mm^2)	Flexible	50			
	Rigid	50			
Bypass terminals (mm^2)	Flexible	50			
	Rigid	50			
Battery terminals (mm^2)	Flexible	70			
	Rigid	70			
Output terminals (mm^2)	Flexible	50			
	Rigid	50			

CABLING SYSTEM AND MAX CABLE SECTION



		Number of power modules	
		1	2
Rectifier terminals (mm^2)	Flexible	35	
	Rigid	35	
Bypass terminals (mm^2)	Flexible	35	
	Rigid	35	
Battery terminals (mm^2)	Flexible	35	
	Rigid	35	
Output terminals (mm^2)	Flexible	35	
	Rigid	35	

2.2. Electrical characteristics

2.2.1. Electrical characteristics independent of the number of modules

ELECTRICAL CHARACTERISTICS - INPUT	
Rated mains supply voltage (V)	400 V 3-phase+N
Voltage tolerance at full load	340 V to 480 V (+20/-15%)
Voltage tolerance at derated load	up to 240 V @ 50% of nominal load (linear decrease)
Rated frequency (Hz)	40 - 70Hz
Power factor	> 0.99(1)
Total harmonic input current distortion (THDi)	≤ 3% (@: Pn, Resistive load, Mains THDv ≤ 1%)
Max inrush current at start-up	Power walk-in/Soft-start (selectable parameters)

(1) Pout ≥ 50% Sn.

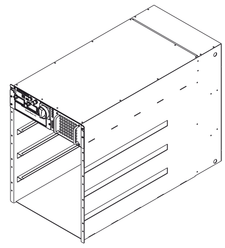
ELECTRICAL CHARACTERISTICS - BYPASS	
Bypass rated voltage (V)	Nominal output voltage ±15% (±20% if GENSET is used)
Bypass rated frequency (Hz)	50/60
Bypass frequency tolerance (Hz)	±2% selectable (±8% if GENSET is used)
Bypass frequency variation speed	50/60 ±10%

ELECTRICAL CHARACTERISTICS - INVERTER	
Rated output voltage (V)	(3ph + N) 380/400/415 selectable
Output voltage tolerance (Hz)	±1
Rated output frequency (Hz)	50/60 (selectable)
Output frequency tolerance	±0.05% (on battery mode)
Load crest factor	≥ 2.7:1
Total output voltage distortion (THDv)	≤ 1% (Ph/Ph); ≤ 2% (Ph/N) (@: Pn, Resistive load)

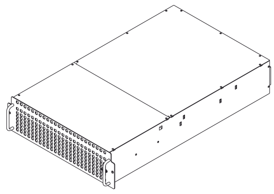
ELECTRICAL CHARACTERISTICS - STORED ENERGY OPERATING MODE	
Number of battery blocks (VRLA)	From 18+18 to 24+24

ELECTRICAL CHARACTERISTICS - EFFICIENCY	
Efficiency (on-line mode)	up to 96.5%
Efficiency (eco-mode)	up to 99.3%

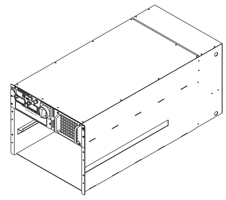
2.2.2. Electrical characteristics dependent of the number of modules



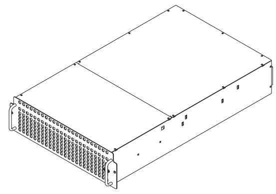
M4-R-075-82B0



M4-RI-25



M4-R-050-82B0



M4-RI-25

ELECTRICAL CHARACTERISTICS - INVERTER OVERLOAD

		Number of power modules		
		1	2	3-4
Inverter overload (kW)(1)	10 min	31.2	62.4	94
	5 min	33.3	66.5	100
	1 min	37.5	75.0	113

		Number of power modules	
		1	2
Inverter overload (kW)(1)	10 min	31.2	62.4
	5 min	33.3	66.5
	1 min	37.5	75.0

(1) Initial condition Pout ≤ 80 % Pn.

ELECTRICAL CHARACTERISTICS - INVERTER SHORT-CIRCUIT

		Number of power modules			
		1	2	3	4
Inverter short-circuit (A) Ik1 = Ik2 = Ik3	40 ms	100	200	300	400
	40 to 80 ms	80	160	240	320

		Number of power modules	
		1	2
Inverter short-circuit (A) Ik1 = Ik2 = Ik3	40 ms	100	200
	40 to 80 ms	80	160

ELECTRICAL CHARACTERISTICS - BYPASS OVERLOAD AND SHORT-CIRCUIT

		Number of power modules			
		1	2	3	4
Bypass overload (A)	Nominal	109			
	Continuous	120			
	30 min	136			
	10 min	163			
	1 sec	> 190			
Bypass I^2t (A^2s)		130000			
Bypass Max Peak Current (A)		5000			

		Number of power modules	
		1	2
Bypass overload (A)	Nominal	73	
	Continuous	80	
	30 min	91	
	10 min	109	
	1 sec	> 127	
Bypass I^2t (A^2s)		130000	
Bypass Max Peak Current (A)		5000	

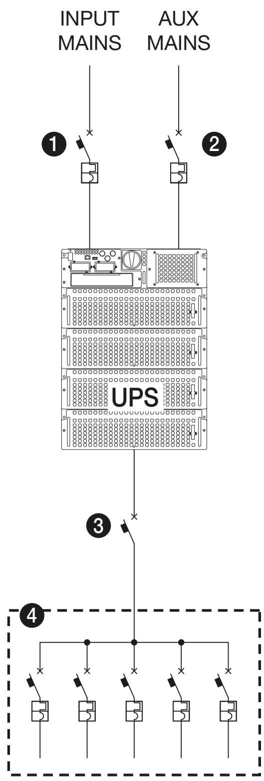
ELECTRICAL CHARACTERISTICS - BATTERY CHARGER MAX CURRENT

	Number of power modules			
	1	2	3	4
Standard max. current (A) M4-RI-25	8	16	24	32
Enhanced battery charger max. current (A) M4-RI-25+CH	16	32	48	64

	Number of power modules	
	1	2
Standard max. current (A) M4-RI-25	8	16
Enhanced battery charger max. current (A) M4-RI-25+CH	16	32

socomec
Innovative Power Solutions

2.3. Recommended protection devices

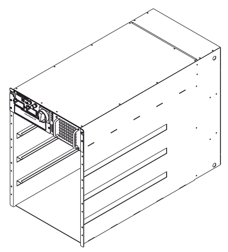


Key

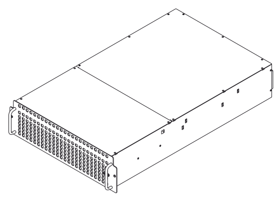
1. Input mains magneto-thermal switch
2. Auxiliary mains magneto-thermal switch
3. System shutdown switch
4. Distribution

The installation and system should comply with national plant regulations.

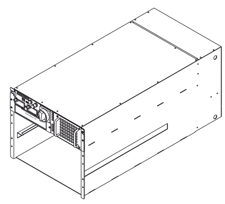
The electrical distribution panel should have a sectioning and protection system installed for input and auxiliary mains.



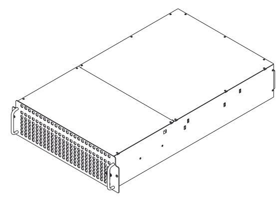
M4-R-075-82B0



M4-RI-25



M4-R-050-82B0



M4-RI-25

RECOMMENDED PROTECTION DEVICES - RECTIFIER

		Number of power modules		
Without redundancy		1	2	3-4
N+1 redundancy		2	3	4
C curve circuit breaker (A)	Min	50	100	160
	Max	160		
Gg fuse (A)	Min	50	100	160
	Max	160		

		Number of power modules	
Without redundancy		1	2
1+1 redundancy		2	-
C curve circuit breaker (A)	Min	50	100
	Max	160	
Gg fuse (A)	Min	50	100
	Max	100	

A circuit breaker switch is recommended with a magnetic tripping threshold of ≥ 10 In (curve C). A D curve selective breaker should be fitted if an optional external transformer is used.

The minimum value depends on the size of the power cables in the installation, while the maximum value is limited by the UPS cabinet.

The system can accept the max. value of protection, whatever the number of modules installed, in order to allow future scalability, while the min. value depends on the size of the power cables in the installation. A value of protection less than the recommended Max shall be used when the mains network structure cannot support the full power load, and shall be chosen between max. and min. values (as per the table below) according to the mains network design.

Rectifier protection should be taken into account in the event of separate inputs; when the auxiliary mains and rectifier inputs are combined (common input), the general input protection rating should be higher than both (auxiliary mains or rectifier).

RECOMMENDED PROTECTION DEVICES - AUXILIARY MAINS					
		Number of power modules			
		1	2	3	4
C curve circuit breaker (A)	Min	50	100	160	200
	Max	200			
Gg fuse (A)	Min	50	100	160	200
	Max	200			

If an optional external transformer is used, a D curve selective breaker should be used.

Auxiliary mains protection should be taken into account in the event of separate inputs; when the auxiliary mains and rectifier inputs are combined (common input), the general input protection rating should be higher than both (auxiliary mains or rectifier).

RECOMMENDED PROTECTION DEVICES - INPUT RESIDUAL CURRENT CIRCUIT BREAKER				
	Number of power modules			
	1	2	3	4
Input residual current circuit breaker (A)	0.5			

An RCD is not necessary when the UPS is installed in TN-S system. RCDs are not allowed on TN-C systems. If an RCD is required, a B type should be used.

Caution!

Use four-pole selective (S) residual current detectors (RCDs). Load leakage currents are to be added to those generated by the UPS and during transitory phases (power failures and power returns) short current peaks may occur. If loads with high leakage current are present, adjust the residual current protection. It is advisable in all cases to carry out a preliminary check on the earth current leakage with the UPS installed and operating with the definitive load, so as to prevent the sudden activation of the RCD switch.

OUTPUT SELECTIVITY ON BATTERY MODE (AUX MAINS NOT PRESENT)				
	Number of power modules			
	1	2	3	4
B curve circuit breaker (A)	≤ 20	≤ 40	≤ 50	≤ 80
C curve circuit breaker (A)	≤ 10	≤ 20	≤ 25	≤ 40

Selectivity of distribution downstream of UPS with downstream short-circuit (AUX MAINS not present).

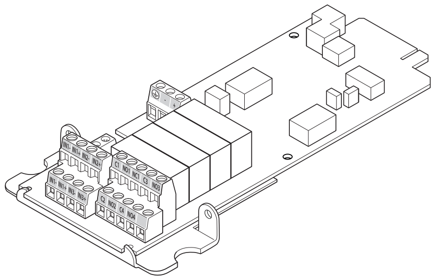
2.4. Communication options

2.4.1. Programmable IN / OUT dry contact card with serial link

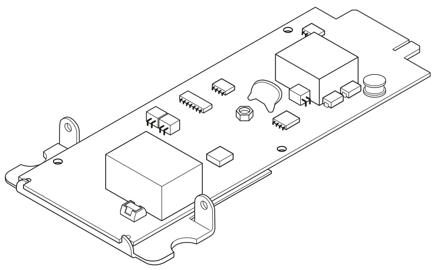
The board is plug&play: the UPS is able to recognize its presence and configuration.

Up to 4 standard operating modes can be selected simply using two jumpers; the selected operating mode manages the ADC outputs and the inputs accordingly.

It is also possible to create a custom operation mode (consult us).

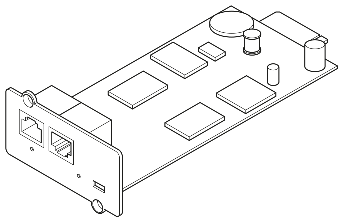
PROGRAMMABLE IN / OUT DRY CONTACT CARD WITH SERIAL LINK	
	
CP-OP-ADC+SL	
• 4 relays for external device activation (can be set as normally closed or normally open)	- general alarm, - back-up operation, - bypass operation, - preventive maintenance request.
• 3 free inputs to report external contacts to UPS	- emergency stop devices (ESD), - operation with generating set, - battery protection status.
• 1 connector for external temperature sensor (optional) • RS485 insulated serial link providing MODBUS RTU protocol • 2 LEDs to display the board status	

2.4.2. MODBUS TCP card for connection with BMS system

MODBUS TCP – IDA INTERFACE (MODBUS TCP CARD)

CP-OP-MODTCP
Detailed information on the MODBUS protocol serial link or Ethernet network for MODULYS RM GP is available in the Modbus TCP User Manual.

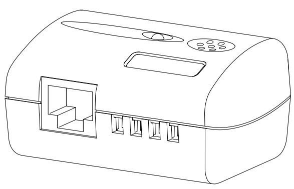
2.4.3. NET VISION card for interface with IT infrastructure

Net Vision is a network adapter for the professional monitoring and remote control of MODULYS RM GP. The Net Vision network adaptor allows the UPS to be connected directly to the Ethernet network allowing secure management of the UPS over the network using a web browser, a TELNET interface or NMS application via SNMP. The protocols used for connection are independent of the platform and operating system, therefore Net Vision is extremely flexible and suitable for all systems. In addition to monitoring and control, the Net Vision interface is able to provide a high level of protection for servers powered by the UPS. In critical conditions, up to 250 devices powered by the UPS can be switched off in an orderly sequence whilst ensuring data integrity. The remote shutdown is provided by a client shutdown to be installed on all computers that require this automatic function. Some clients for Net Vision are native to certain operating systems, otherwise a universal shutdown client (JNC) can be used.

NET VISION

NET-VISIONxCARD
• NET VISION FUNCTIONS • UPS monitoring via HTML pages and synoptic • UPS control • UPS event notification via email • SNMP TRAP notification to NMS system (NET VISION and RFC1628 TRAP from version 6.1 and above) • Server Shutdown (using JNC and VIRTUAL-JNC software agent on servers) • Events and measurements log • Multi-language capabilities

2.4.4. EMD (Environment Monitoring Device)

The EMD monitors temperature, humidity and other conditions in the room's environment and also offers 2 digital input connections for external dry contacts to monitor water, fire and smoke security alarms. All information is processed by MODULYS RM GP for a complete monitoring of external conditions and alarms. Easy connection to Net Vision card using standard CAT5 cables with straight through wiring.

EMD (ENVIRONMENT MONITORING DEVICE)

Net Vision EMD
EMD FUNCTIONS • External temperature monitoring • External humidity monitoring • 2 digital input connections for external dry contacts (for instance to monitor security alarms like fire, smoke, etc.)

2.4.5. External Temperature Sensor

The temperature sensor can be used to monitor the battery temperature should the battery cabinet be provided by another supplier by Socomec (all battery cabinets provided by Socomec are fitted with the temperature sensor as standard). The sensor should be connected to the ADC-SL board, using the relative connector. MODULYS RM GP uses the temperature measured by this sensor to correctly set the battery charge profile.

3. REFERENCE STANDARDS AND DIRECTIVES

3.1. Overview

The construction of the equipment and choice of materials and components comply with all laws, decrees, directives and standards currently in force. In particular, the equipment is fully compliant with all European Directives concerning CE marking.

2006 / 95 / EC

Council Directive 2006 / 95 / EC, dated 16 February 2007, on the reconciliation of legislation within Member States regarding electrical materials for use within specific voltage ranges.

2004 / 108 / EC

On the approximation of the laws of the Member States relating to electromagnetic compatibility.

3.2. Standards - Tests, verifications and certifications

STANDARDS		
Safety	IEC 62040-1	
EMC	IEC 62040-2 (C2)	
Performance(1)	IEC 62040-3 (VFI-SS-111)	
Power module efficiency(2)	IEC 62040-3	up to 96,5 %
Power module MTBF(3)	IEC 62380	1.000.000 h
Degree of protection	IEC 60529	IP20
Product certification	CE	

(1) EMC performances are tested and verified by CREI VEN.
(2) Power module efficiency is tested and verified by TÜV SÜD.
(3) Power Module MTBF is calculated and tested by SERMA ELECTRONICS.

ELITE UPS: a mark of efficiency

Socomec, as CEMEP UPS manufacturer member, has signed a Code of Conduct put forward by the Joint Research Centre of the European Commission (JRC), to ensure the protection of critical applications and processes ensuring 24/7 continuous high quality supply. The JRC commits to mitigating energy losses and gas emissions caused by UPS equipment, therefore maximising UPS efficiency.

TECHNICAL GUIDE

EN

MODULYS XM

50 to 250 + 50 kW
Redundant Modular UPS

ULTIMATE

Fault tolerant power
without compromise

Socomec Resource Center
To download, brochures, catalogues
and technical manuals

Innovative Power Solutions

1. OBJECTIVES

The purpose of these specifications is to provide the information required to prepare the system and installation site.

The specifications are intended for:

- installation engineers.
- design engineers.
- engineering consultants.

For detailed information, see the installation and operating manual.

2. ARCHITECTURE

2.1. Range and Flexibility

Modulys XM is a modular, scalable and redundant UPS system based on plug-in and hot-swap power modules.

The modularity enables power scalability by simply plugging one or more additional modules into the existing system (up to 6 modules per system).

The modularity also enables redundancy, which is an essential feature to ensure UPS system fault tolerance. The redundant configuration can be set from N+1 up to N+R.

2.1.1. FLEXIBLE RATED POWER

POWER MODULES						
Number of Power Modules	1	2	3	4	5	6
N+1 redundant System Power (kW)	50 + 0(1)	50 + 50	100 + 50	150 + 50	200 + 50	250 + 50

(1) No Power redundancy

2.1.2. FLEXIBLE SHORT-CIRCUIT PERFORMANCE

SYSTEM CONFIGURATIONS		
	Standard	High Short-circuit
System description	Short-circuit safety performance according to IEC/EN62040-1 requirements	- Extra-rugged system for enhanced short-circuit safety performance (beyond IEC/EN 62040-1 requirements) - Ready for +1 extra Bypass Module (option) for higher Bypass short-circuit capability
Number of Bypass Modules	1	1 + 1(1)
Number of Power Modules	1 → 6	1 → 6

(1) Extra Bypass

See § 2.2.1.

2.1.3. FLEXIBLE CABLING

The standard solution and high short-circuit solution have bottom cabling configuration.

As an option they can also accept top cabling and mixed top-bottom cabling.

2.1.4. FLEXIBLE GROUNDING COMPATIBILITY

Compatible with any grounding system: TN-S, TN-C, TT, IT.

2.2. Flexible back-up time

Various extended back-up times are possible by using: (1) a modular battery cabinet; (2) a high-capacity battery cabinet.

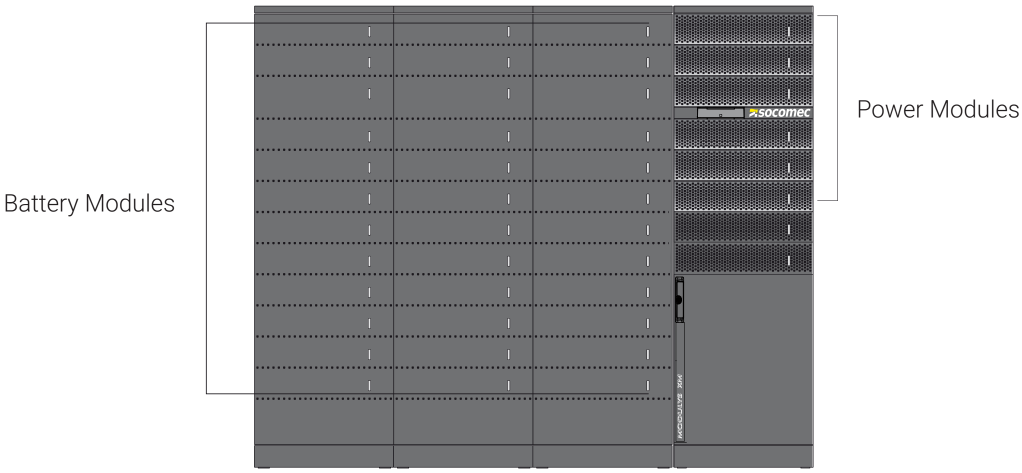
Each battery pack has an acid-proof container designed to prevent damage in the event of acid leakage.

Each Power Module has a powerful embedded battery charger able to provide up to 20 A.

2.2.1. Modular hot-swap battery cabinet - medium capacity

The modular battery system is based on vertical and horizontal modularity thanks to independent battery strings connected in parallel, each one made up of hot-swap long life battery packs.

Each battery string has its own independent protection device and its own independent switch for fast and safe maintenance.



DIMENSIONS AND WEIGHT																																				
	Number of 9 Ah Modular hot-swap battery cabinets 9 Ah - medium capacity																																			
	1												2												3											
	Number of battery strings																																			
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36
Height (mm)	1990																																			
Depth (mm)	950																																			
Width (mm)	810												1620												2430											
Weight (kg)	384	508	632	756	880	1004	1128	1252	1376	1500	1624	1748	2132	2256	2380	2504	2628	2752	2876	3000	3124	3248	3372	3496	3880	4004	4128	4252	4376	4500	4624	4748	4872	4996	5120	5244

Vertical modularity using a modular battery cabinet with hot-swap battery boxes provides scalable power back-up with up to 12 battery strings per cabinet.

Horizontal modularity provides very high and scalable back-up.

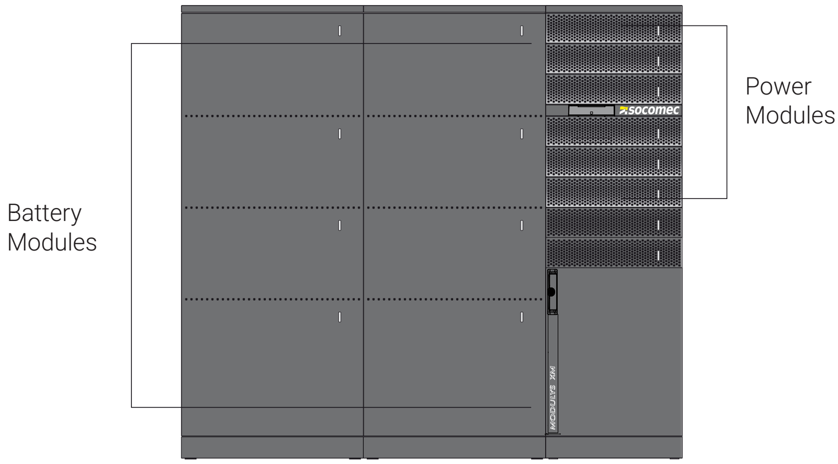
A standard temperature sensor optimizes the battery recharging parameters according to the ambient operating temperature to extend battery life.

MODULAR HOT-SWAP BATTERY CABINET
BACK UP TIMES IN MINUTES @ 75% OF RATED LOAD

Number of Modular battery cabinets	Number of strings	Cumulative Ah						
		Number of Power Modules	1	2	3	4	5	6
		N+1 redundant System Power (kW)	50 + 0 (1)	50 + 50	100 + 50	150 + 50	200 + 50	250 + 50
1	2	18	5,5	5,5				
1	3	27	10,8	10,8				
1	4	36	15,4	15,4	5,5			
1	5	45	18,6	18,6	8,1			
1	6	54	23,7	23,7	10,8	5,5		
1	7	63	31	31	13,2	7,3		
1	8	72	36	36	15,4	9,1	5,5	
1	9	81	42	42	17,2	10,8	6,9	
1	10	90	48	48	18,6	12,3	8,1	5,5
1	11	99	55	55	21	14	9,5	6,7
1	12	108	62	62	23,7	15,4	10,8	7,6
2	13	117	69	69	27,4	16,6	11,9	8,7
2	14	126	74	74	31	17,7	13,2	9,8
2	15	135	79	79	34	18,6	14,3	10,8
2	16	144	86	86	36	20,1	15,4	11,7
2	17	153	93	93	39	22	16,3	12,7
2	18	162	99	99	42	23,7	17,2	13,6
2	19	171	104	104	45	26,2	17,9	14,5
2	20	180	112	112	48	28,5	18,6	15,4
2	21	189	119	119	51	31	19,7	16,1
2	22	198	127	127	55	33	21	16,8
2	23	207	133	133	59	35	22,4	17,5
2	24	216	140	140	62	36	23,7	18,1
3	25	225	146	146	66	38	25,6	18,6
3	26	234	151	151	69	40	27,4	19,4
3	27	243	158	158	72	42	29,1	20,5
3	28	252	166	166	74	44	31	21,6
3	29	261	173	173	77	46	32	22,6
3	30	270	181	181	79	48	34	23,7
3	31	279	188	188	83	50	35	25,2
3	32	288	196	196	86	52	36	26,7
3	33	297	202	202	89	55	38	28,1
3	34	306	212	212	93	58	39	29,4
3	35	315	221	221	96	60	40	31
3	36	324	229	229	99	62	42	32

(1) No Power redundancy

2.2.2. Modular battery cabinet - high capacity



DIMENSIONS AND WEIGHT		
Number of Strings	0	1
Height (mm)	1990	
Depth (mm)	890	
Width (mm)	810	
Weight (kg)	220	1792

High-capacity modular battery cabinets are designed for long back-up times (BUT) with higher power.

A standard temperature sensor optimizes the battery recharging parameters according to the ambient operating temperature to extend battery life.

MODULAR BATTERY CABINET BACK-UP TIMES IN MINUTES @75% OF RATED LOAD											
					Number of Power Modules	1	2	3	4	5	6
					N+1 redundant System Power (kW)	50 + 0(1)	50 + 50	100 + 50	150 + 50	200 + 50	250 + 50
Number of battery cabinets	1	Number of battery strings	1	Cumulative Ah	92	49	49	19.8	0	0	0
	2		2		184	115	115	49	29.1	19.8	14.3
	3		3		276	184	184	82	49	34	25.3
	4		4		368	255	255	115	71	49	37
	5		5		460	329	329	148	93	66	49
	6		6		552	407	407	184	115	82	62

(1) No Power redundancy

3. SPECIFICATIONS

3.1. Installation parameters

DIMENSIONS AND WEIGHT						
Number of Power Modules	1	2	3	4	5	6
Height (mm)	1990					
Depth (mm)	890					
Width (mm)	600					
Weight (kg)	289	325	361	397	433	469

RATED CURRENT AND MAX CURRENT						
Number of Power Modules	1	2	3	4	5	6
N+1 redundant System Power (kW)	50 + 0[1]	50 + 50	100 + 50	150 + 50	200 + 50	250 + 50
Rated rectifier input current (A) (EN 62040-1)	75	75	150	226	301	376
Maximum rectifier input current (A) (EN 62040-3)	90	180	270	360	450	450
Nominal Inverter output current (A)	72	72	144	217	289	361
Maximum bypass input current (A) (EN 62040-3)	398					
Maximum battery current (A)	114	228	342	456	570	684

(1) No Power redundancy

COOLING							
Number of Power Modules		1	2	3	4	5	6
N+1 redundant System Power (kW)		50 + 0[1]	50 + 50	100 + 50	150 + 50	200 + 50	250 + 50
Maximum air flow	(m3/h)	600	1200	1800	2400	3000	3600
Power Dissipation under nominal conditions[2]	(W)	2240	1920	3950	6080	8110	10680
	(kcal/h)	1920	1650	3390	5220	6970	9180
	(BTU/h)	7640	6550	13470	20740	27670	36440
Power Dissipation (maximum) under worst-case conditions[3]	(W)	2580	2140	4390	6910	9430	12060
	(kcal/h)	2220	1840	3780	5950	8110	10370
	(BTU/h)	8810	7310	14980	23580	32180	41160

(1) No Power redundancy
(2) Nominal input voltage and rated output active power (PF=1)
(3) Low input voltage, battery recharge and rated output active power (PF=1)

ACOUSTIC NOISE						
Number of Power Modules	1	2	3	4	5	6
N+1 redundant System Power (kW)	50 + 0[1]	50 + 50	100 + 50	150 + 50	200 + 50	250 + 50
Acoustic noise at 1m (dBA) [2]	50	49	50	55	56	57

(1) No Power redundancy
(2) At 70% nominal load.

3.2. Electrical characteristics

3.2.1. Electrical characteristics independent OF the number of modules

ELECTRICAL CHARACTERISTICS - INPUT	
Rated mains supply voltage (V)	400 V 3-phase+N
Voltage tolerance at full load	340 V to 480 V (+20/-15%)
Voltage tolerance at derated load	up to 240 V @ 50% of nominal load (linear decrease)
Rated frequency (Hz)	40 - 70 Hz
Power factor	> 0.99(1)
Total harmonic input current distortion (THDi)	≤ 3% (@: Pn, Resistive load, Mains THDv ≤ 1%)
Max inrush current at start-up	Power walk-in / Soft-start (selectable parameters)

(1) Pout ≥ 50% of nominal Power.

ELECTRICAL CHARACTERISTICS - BYPASS	
Bypass rated voltage (V)	Nominal output voltage ±15% (±20% if GENSET is used)
Bypass rated frequency (Hz)	50 / 60
Bypass frequency tolerance	±2% selectable (±8% if GENSET is used)
Bypass frequency variation speed	50 / 60 ±10%

ELECTRICAL CHARACTERISTICS - INVERTER	
Rated output voltage (V)	(3ph + N) 400 380 / 400 / 415 selectable
Output voltage tolerance (V)	±1%
Rated output frequency (Hz)	50 / 60 (selectable)
Output frequency tolerance	±0.05% (on battery mode)
Load crest factor	≥ 2.7:1
Total output voltage distortion (THDv)	≤ 1% (Ph / Ph) ; ≤ 2% (Ph / N) (@: Pn, Resistive load)

ELECTRICAL CHARACTERISTICS - STORED ENERGY OPERATING MODE	
Number of battery blocks (VRLA)	From 18+18 to 24+24(1)

ELECTRICAL CHARACTERISTICS - EFFICIENCY	
Efficiency (on-line mode)	up to 96.5%
Efficiency (eco-mode)	up to 99.3%

(1) Consult us

ELECTRICAL CHARACTERISTICS - BYPASS OVERLOAD AND SHORTCIRCUIT			
Solution type		Standard	High Short-circuit (*)
Number of Bypass Modules		1	1 + 1(1)
Number of Power Modules		1 → 6	
Bypass overload (A)	Nominal	362	362
	Continuous	398	398
	10'	453	453
	1'	543	543
	1"	634	634
Bypass Max short-circuit current ITSM (A)		15000	28000
Bypass I^2t (A^2s)		1125000	3920000

(1) Extra Bypass Module (option) for higher Bypass short-circuit capability

ELECTRICAL CHARACTERISTICS - SYSTEM SHORTCIRCUIT SAFETY PERFORMANCE		
Solution type	Standard	High Short-circuit (*)
Number of Bypass Modules	1	1 or 1 + 1(1)
Number of Power Modules	1 → 6	
Short-circuit current withstand (Icw)	10 kA	25 kA up to 50 kA(2)
Conditional short-circuit current (Icc)		65 kA

(1) Extra Bypass Module (option) for higher Bypass short-circuit capability (2) option - contact us
(*) High short-circuit solution:
- Extra-rugged system for enhanced short-circuit saferty performance (beyond IEC/EN 62040-1 requirements)
- Ready for +1 extra Bypass Module (option) for higher Bypass short-circuit capability

socomec
Innovative Power Solutions

3.2.2. Electrical characteristics dependent on the number of modules

ELECTRICAL CHARACTERISTICS - INVERTER OVERLOAD AND SHORT-CIRCUIT							
Number of Power Modules		1	2	3	4	5	6
N+1 redundant System Power (kW)		50 + 0(1)	50 + 50	100 + 50	150 + 50	200 + 50	250 + 50
Inverter overload (kW)(2)	10 min	62.5	125	187	250	312	312
	5 min	66	132	198	264	330	330
	1 min	75	150	225	300	375	375
Inverter short-circuit (A) Ik1 = Ik2 = Ik3	40 ms	195	390	585	780	975	1170
	40 to 100 ms	162	324	486	648	810	972

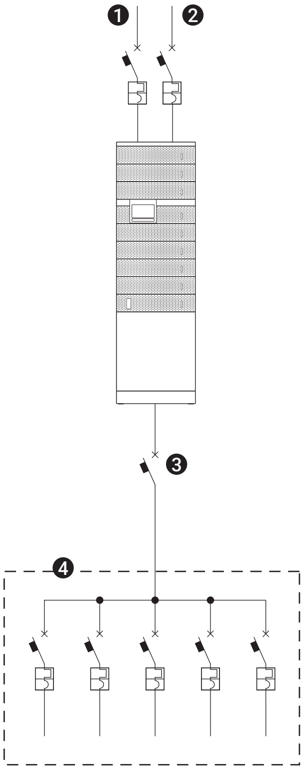
(1) No Power redundancy
(2) Conditions: Initial Pout ≤ 80% Pn, Vin nominal

ELECTRICAL CHARACTERISTICS - BATTERY CHARGER MAX CURRENT						
Number of Power Modules	1	2	3	4	5	6
N+1 redundant System Power (kW)	50 + 0(1)	50 + 50	100 + 50	150 + 50	200 + 50	250 + 50
Maximum Current (A)	20	40	60	80	100	120

(1) No power redundancy

3.3. Recommended protection

3.3.1. System from 50 to 250 + 50 kVA



Key

1. Input mains magneto-thermal switch
2. Auxiliary mains magneto-thermal switch
3. System shutdown switch
4. Distribution

The installation and system should comply with national plant regulations.

The electrical distribution panel should have a sectioning and protection system installed for input and auxiliary mains.

SYSTEM CABLES - MAX SECTION		
	Number of Modules	1 → 6
Rectifier terminals (mm^2)	Flexible	2 x 150
	Rigid	2 x 150
Bypass terminals (mm^2)	Flexible	2 x 150
	Rigid	2 x 150
Battery terminals (mm^2)	Flexible	2 x 150
	Rigid	2 x 150
Output terminals (mm^2)	Flexible	2 x 150
	Rigid	2 x 150

M10 terminals

Tightening torque 20 Nm

Maximum cross-section is determined by the size of the terminals.

As specified in EN 62040-3 Appendix 3 (Non-Linear Load Reference), in the event of three-phase non-linear loads connected downstream of the UPS, the neutral current on the load can be 1.5 - 2 times higher than the phase current. This should be taken into account when estimating the correct size of output and auxiliary neutral cables.

RECOMMENDED PROTECTION DEVICES - RECTIFIER							
Number of Modules		1	2	3	4	5	6
N+1 redundant System Power (kW)		50 + 0(1)	50 + 50	100 + 50	150 + 50	200 + 50	250 + 50
Circuit breaker with Im ≤ 10 x In (A)	Minimum	100	200	320	400	450	450
	Maximum	450	450	450	450	450	450

(1) No Power redundancy
(2) Caution! Residual Current Detection (RCD) can only be used with a common input and auxiliary mains (configuration not recommended). It must be placed upstream of the connection between input mains and auxiliary mains. Use type B four-pole selective (S) residual current detectors. Load leakage currents are to be added to those generated by the UPS and short current peaks may occur during transitory phases (power failures and power returns). If loads with high leakage current are present, adjust the residual current protection. It is advisable in all cases to carry out a preliminary check on the ground current leakage with the UPS installed and operational with the definitive load, to prevent the RCD tripping.

A circuit breaker switch is recommended with magnetic intervention threshold ≥10 In.

It is necessary to use a circuit breaker with Im ≤ 20 x In (A) selective breaker if an optional external transformer is used. The minimum value depends on the size of the power cables in the installation, while the maximum value is limited by the UPS cabinet.

The system can accept the maximum value of protection, regardless of the number of modules installed, in order to enable future scalability, while the minimum value depends on the size of the power cables in the installation. A protection value of less than the maximum shall be used when the mains network structure cannot support the full power load, and shall be chosen between the minimum and maximum values (as per the table above) according to mains network design.

Rectifier protection should be taken into account in the event of separate inputs; when the auxiliary mains and rectifier inputs are combined (common input), the general input protection rating should be higher than both (auxiliary mains or rectifier).

RECOMMENDED PROTECTION DEVICES - AUXILIARY MAINS							
Number of Modules		1	2	3	4	5	6
N+1 redundant System Power (kW)		50 + 0(1)	50 + 50	100 + 50	150 + 50	200 + 50	250 + 50
Circuit breaker with Im ≤ 10 x In (A)	Minimum	100	200	320	400	400	400
	Maximum	450	450	450	450	450	450

(1) No Power redundancy

A circuit breaker switch is recommended with magnetic intervention threshold ≥10 In.

It is necessary to use a circuit breaker with Im ≤ 20 x In (A) selective breaker if an optional external transformer is used. The minimum value depends on the size of the power cables in the installation, while the maximum value is limited by the UPS cabinet.

The conditional short circuit current (Icc) according to IEC 62040-1 is 65KA rms, provided that the UPS is protected by a MCCB with adequate breaking capability and current-limiting capability under short-circuit conditions. Contact us for detailed information.

RECOMMENDED PROTECTION DEVICES - UPSTREAM RESIDUAL CURRENT DETECTION CIRCUIT BREAKER							
Number of Modules		1	2	3	4	5	6
N+1 redundant System Power (kW)		50 + 0(1)	50 + 50	100 + 50	150 + 50	200 + 50	250 + 50
Residual Current Detection (A)	Minimum	0.5					

(1) No Power redundancy

An RCD is not necessary when the UPS is installed on a TN-S system. RCDs are not allowed on TN-C systems. If an RCD is required, a B type should be used.

Caution! Use four-pole selective (S) residual current detectors (RCDs). Load leakage currents are to be added to those generated by the UPS and short current peaks may occur during transitory phases (power failures and power returns). If loads with high leakage current are present, adjust the residual current protection. It is advisable in all cases to carry out a preliminary check on the ground current leakage with the UPS installed and operating with the definitive load, so as to prevent tripping of the RCD switch.

OUTPUT SELECTIVITY ON BATTERY MODE (AUX MAINS NOT PRESENT)							
Number of Modules		1	2	3	4	5	6
N+1 redundant System Power (kW)		50 + 0(1)	50 + 50	100 + 50	150 + 50	200 + 50	250 + 50
Circuit breaker with Im ≤ 5 x In (A)	Maximum	25	50	80	100	125	125
Circuit breaker with Im ≤ 10 x In (A)	Maximum	13	25	40	50	63	80

(1) No Power redundancy

4. REFERENCE STANDARDS AND DIRECTIVES

4.1. Overview

The construction of the equipment and choice of materials and components comply with all laws, decrees, directives and standards currently in force. In particular, the equipment is fully compliant with all European Directives concerning CE marking.

2006/95/EC

Council Directive 2006/95/EC, dated 16 February 2007, on the harmonization of the laws of Member States relating to electrical equipment designed for use within certain voltage limits.

2004/108/EC

On the approximation of the laws of the Member States relating to electromagnetic compatibility.

4.2. Standards

STANDARD	
Safety	EN / IEC 62040-1 - AS 62040-1
EMC	EN / IEC 62040-2 - AS 62040-2
Product certification	IECEE CB Scheme
Performance	EN / IEC 62040-3 - AS 62040-3
Product marks	CE - RCM(1) - EAC(1) - CMIM(1) - UKCA(1)
Protective class	Protective Class I
Protection level	IP20

(1) Depends on the production site. Consult the data plate on the equipment

ELITE UPS: a mark of efficiency

Socomec, as CEMEP UPS manufacturer member, has signed a Code of Conduct put forward by the Joint Research Centre of the European Commission (JRC), to ensure the protection of critical applications and processes ensuring 24/7 continuous high quality supply. The JRC commits to mitigating energy losses and gas emissions caused by UPS equipment, therefore maximising UPS efficiency.

TECHNICAL GUIDE

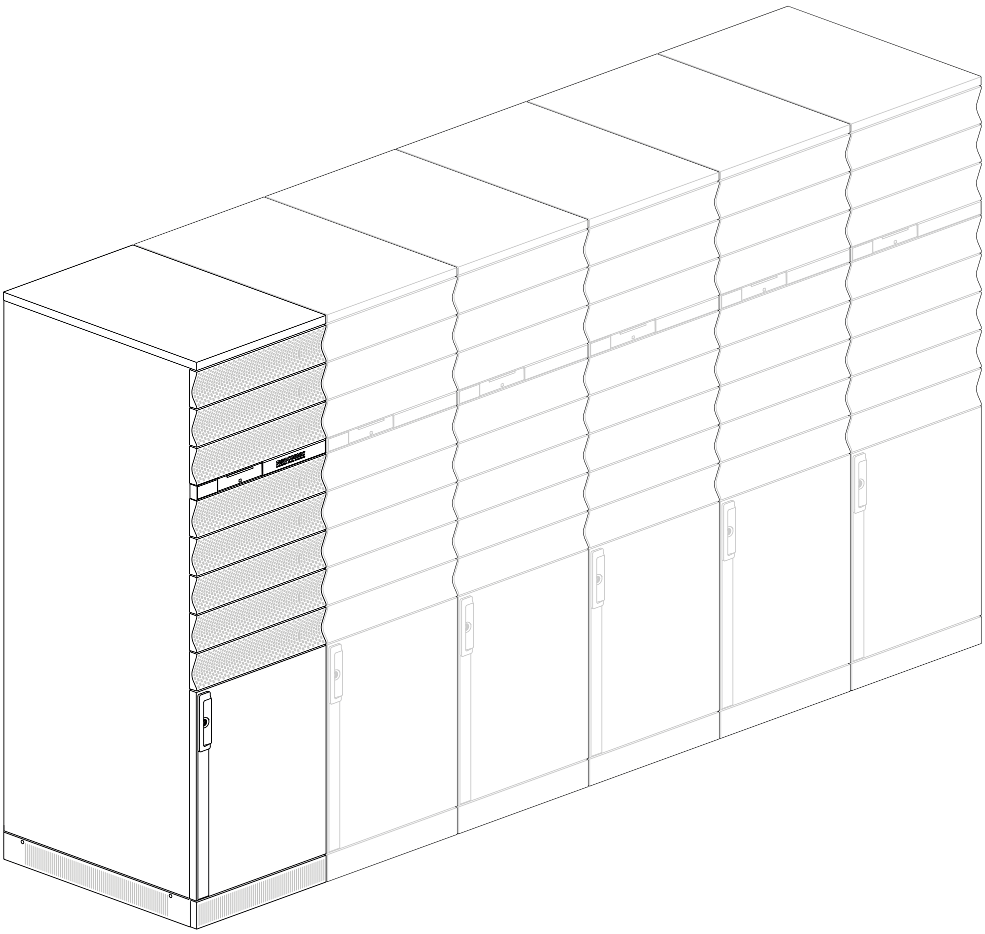
EN

MODULYS XM

50 to 300 kW Modular Unit
for parallel architecture up to 1,8 MW

ULTIMATE
Fault tolerant power
without compromise

1 000 000 HOURS MTBF | automatic firmware alignment | HOT-SWAP | FLEXIBILITY | 20+ YEARS | Li-Ion



Socomec Resource Center
To download, brochures, catalogues
and technical manuals

socomec
Innovative Power Solutions

1. OBJECTIVES

The purpose of these specifications is to provide the information required to prepare the system and installation site.

The specifications are intended for:

- installation engineers.
- design engineers.
- engineering consultants.

For detailed information, see the installation and operating manual.

2. ARCHITECTURE

2.1. Range and Flexibility

Modulys XM is a modular, scalable, and redundant UPS system based on plug-in, hot-swap power modules.

Its modular design enables power scalability by simply adding one or more additional modules to the existing unit (up to six modules per unit).

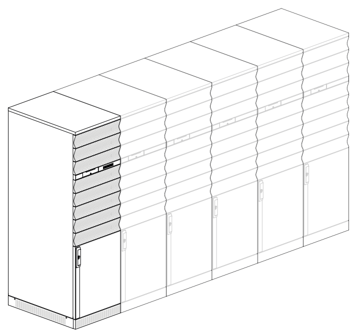
This modularity also allows for redundancy, an essential feature to ensure the fault tolerance of the UPS system. Redundant configurations of the power modules can be set, ranging from N+1 to N+R.

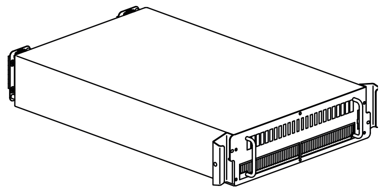
Modulys XM Units can be connected in parallel (up to 6) to increase overall power capacity to meet higher power requirements and increase the flexibility of the system.

Modulys XM is highly flexible, and this flexibility is further leveraged in its parallel architecture, providing exceptional versatility that encompasses all aspects of parallel architectures, configurations and design.

2.2. The bricks

modulys XM is built on a flexible brick concept. The UPS can be built by associating the bricks according to the requirements.

UNIT		
Max Unit Power (kW)	300	
Parallelability	Ready for parallel up to 6	
Height (mm)	1990	
Width (mm)	600	
Depth (mm)	890	
Weight (without modules)	253	
Cabling	Bottom (option for top)	
Access for installation/cabling, operation and maintenability	Front access, for all the parts composing the Unit: rear and lateral access are never necessary	
Grounding system	Flexibility to work on any grounding system: TN-C – TN-S – IT – TT	
Maintenability	Fast and safe maintenance based on parts (like power modules, static bypass, electronic boards, mimic panel) that can be all hot-swapped in inverter mode (double conversion mode) without the need of moving in maintenance bypass or static bypass	
	Electronic-free cabinet: all the electronics parts are plug-in (not fixed to the Unit enclosure) and can be hot-swapped	
Number of Power Modules	1 → 6	
Power Module Size (kW)	50	
Number of Static Bypass Modules	1	
Bypass Module Size (kW)	300	

POWER MODULES		
Power (kW)	50	
Architecture and reliability	Double conversion	
	Completely independent: Rectifier, Inverter, Battery Charger, Internal Control, Control for internal Parallel	
	Segregation at input and output stages for complete isolation of electronic: embedded upstream and downstream galvanic separation and fast fuses	
	Selective disconnection: any potential fault is isolated inside the affected power module, without affecting the remaining modules	
	Heavy duty connectors > 500 mating cycles (certified)	
	MTBF > 1.000.000 h (certified)	
Hot-swap and Module addition for scalability	Hot swap and hot plg-in: safe (EN 62040-1 and EN 50110-1) and completely automatic (certified)	
	Automatic power module self-configuration and testing (certified)	
	Automatic firmware alignment without any intervention of the operator (certified)	
	MTTR < 2 min	
Parallelability	Totally independent power modules with distributed parallel control (no single point of failure: no centralised control)	
Weight (kg)	36	
Cabling	Plug-in	

OPTIONS / EXTENSIONS	
Top-entry cable kit	Ready for on-site installation
Top exaust air kit	Ready for on-site installation
IP21 kit	Ready for on-site installation
N-PE connection kit for TN-C gounding system	Ready for on-site installation
Input / Auxiliary mains connection kit for common mains	Ready for on-site installation
Remote mimic panel	Ready for on-site installation
Programmable relay card 3 inputs / 4 outputs + insulated RS485 serial link	Ready for on-site installation
Net vision card web/SNMP interface	Ready for on-site installation
Environment temperature and humidity sensor and 2 inputs	Ready for on-site installation
External Battery temperature sensor	Ready for on-site installation
Cold-start kit	Ready for on-site installation
Automatic cross-synchronisation card	Ready for on-site installation (*)
Seismic kit	(*)

(*) consult us

socomec
Innovative Power Solutions

2.2.1. Flexible rated power

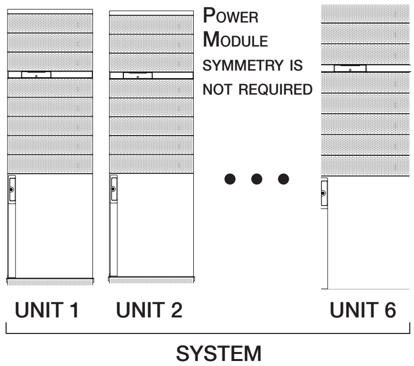
MAXIMUM POWER OF THE PARALLEL SYSTEMS						
Number of Units	1	2	3	4	5	6
Configuration w/o redundancy (kW) (1)	300	600	900	1200	1500	1800
N+1 redundant power module configuration (kW) (2)	250+50	550+50	850+50	1150+50	1450+50	1750+50
1 redundant Unit configuration (kW)	/	300+300	600+300	900+300	1200+300	1500+300
1+1 configuration (kW)	/	300+300	/	/	/	/
Stand-alone configuration (kW) (3)	300 250+50 (4)	/	/	/	/	/

(1) configuring the system without redundancy is not advisable in a high-reliability modular setup, unless the redundancy is at the infrastructure level (2N, 3N2, Catcher, etc.).
(2) power module redundancy can generally be configured as N+R.
(3) stand-alone configuration is possible, enabling operation with a single unit while retaining the flexibility to add additional units in the future.
(4) it is recommended that the standalone configuration includes internal redundancy.

2.2.2. Flexible architecture

Flexible Distribution of Power Modules:

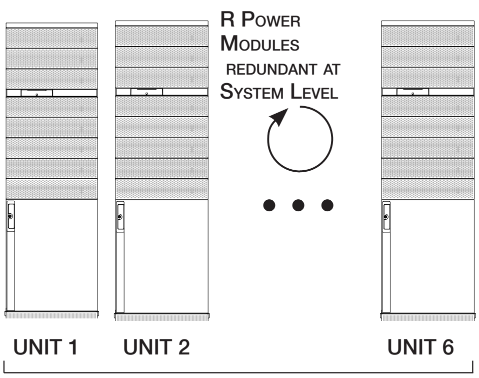
- Symmetry across units is not required.
- Units may contain different numbers of power modules.
- Units are not required to have the same power capacity



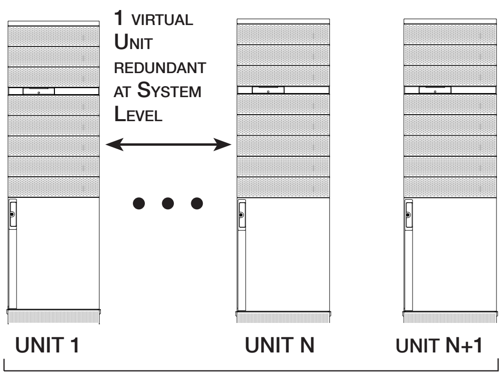
Flexible Scalability:

- A power module can be added to any available slot in the system, regardless of which unit it is in.
- There is no requirement to add one power module to each unit to maintain the same power capacity; symmetry is not necessary

Flexible Redundancy management



SYSTEM WITH DISTRIBUTED POWER MODULE REDUNDANCY



SYSTEM WITH DISTRBUTED UNIT REDUNDANCY

Power Module redundancy:

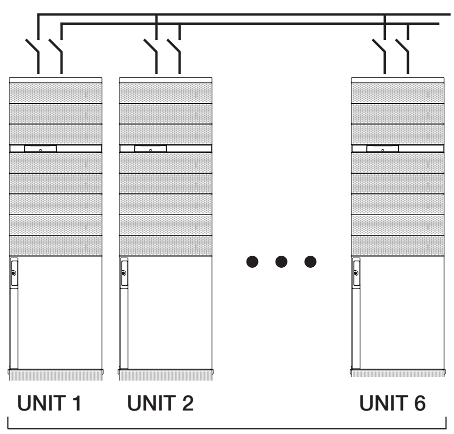
"R" virtual redundant modules (R=1, 2, 3, ...) are distributed across the entire system, eliminating the need for identical power module redundancy in each individual unit.

Unit redundancy:

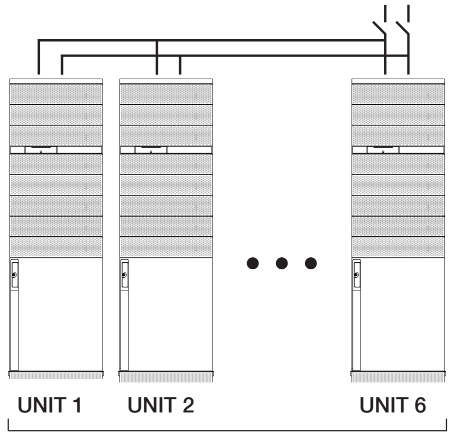
A single virtual redundant unit is designated across the system, with all redundant modules virtually allocated to this unit, though they remain physically distributed across the entire system.

Distributed redundancy across the global system allows for the avoidance of unnecessary duplication of system components, resulting in a cost-effective architecture, redundancy, scalability and maintenance.

Flexible upstream protection architecture

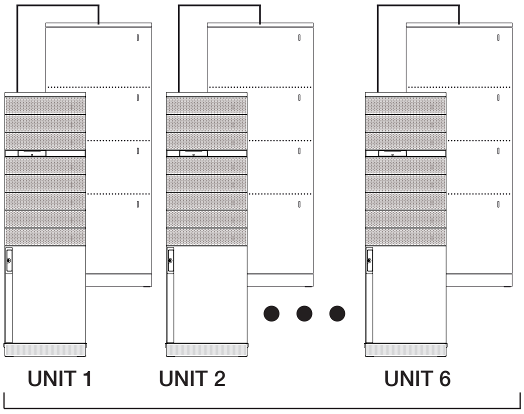


SYSTEM WITH DISTRIBUTED UPSTREAM ARCHITECTURE

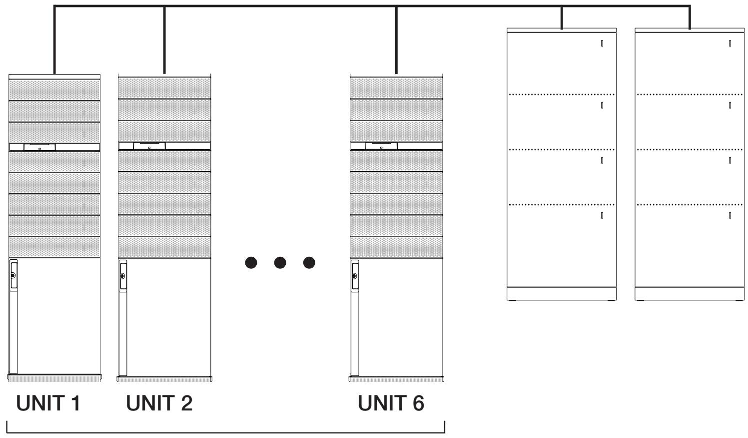


SYSTEM WITH COMMON UPSTREAM ARCHITECTURE

Flexible battery architecture



SYSTEM WITH DISTRIBUTED BATTERY



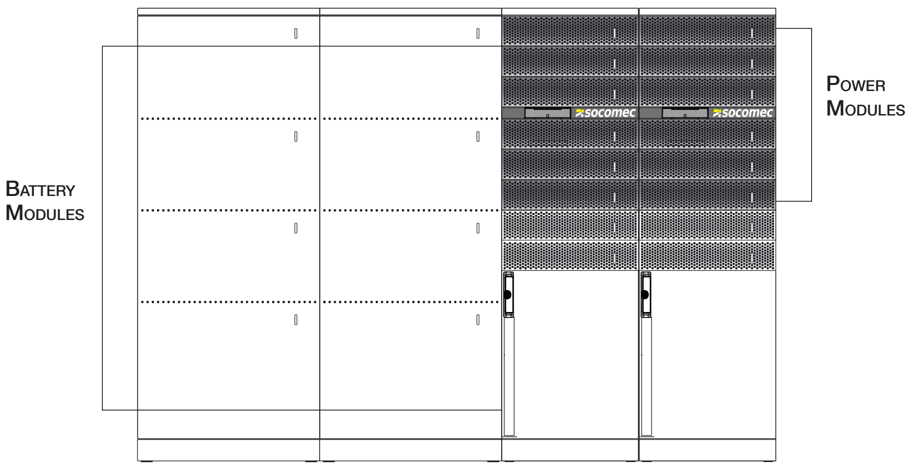
SYSTEM WITH SHARED BATTERY

2.2.3. Flexible grounding compatibility

Compatible with any grounding system: TN-S, TN-C, IT and TT.

2.3. Flexible back-up time

2.3.1. Modular battery cabinet - high capacity



DIMENSIONS AND WEIGHT		
Number of Strings	0	1
Height (mm)	1990	
Depth (mm)	890	
Width (mm)	810	
Weight (kg)	220	1792

High-capacity modular battery cabinets are designed for long back-up times (BUT) with higher power.

A standard temperature sensor optimizes the battery recharging parameters according to the ambient operating temperature to extend battery life.

2.3.2. Modular lithium battery cabinet

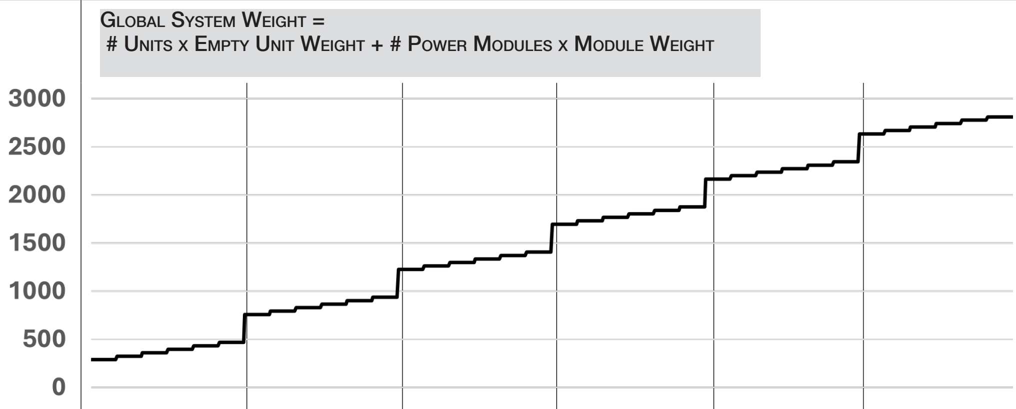
Consult us.

3. SPECIFICATIONS

3.1. Installation parameters

GLOBAL PARALLEL SYSYEM DIMENSIONS AND WEIGHT						
Number of Units	1	2	3	4	5	6
Width (mm)	600	1200	1800	2400	3000	3600
Height (mm)	1990					
Depth (mm)	890					
Number of Modules	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36					

Weight (kg)



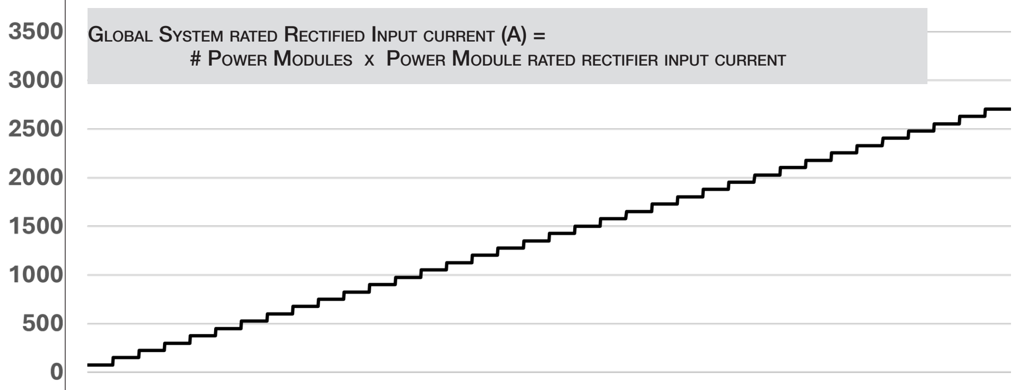
Single Empty Unit weight (kg)	253
Single Power Module weight (kg)	36

RATED CURRENT AND MAX CURRENT (SINGLE POWER MODULE)	
Rated rectifier input current (EN 62040-1) (A)	75
Max rectifier input current (EN 62040-3) (A)	90
Nominal Inverter output current (A)	72
Max battery current (A)	114

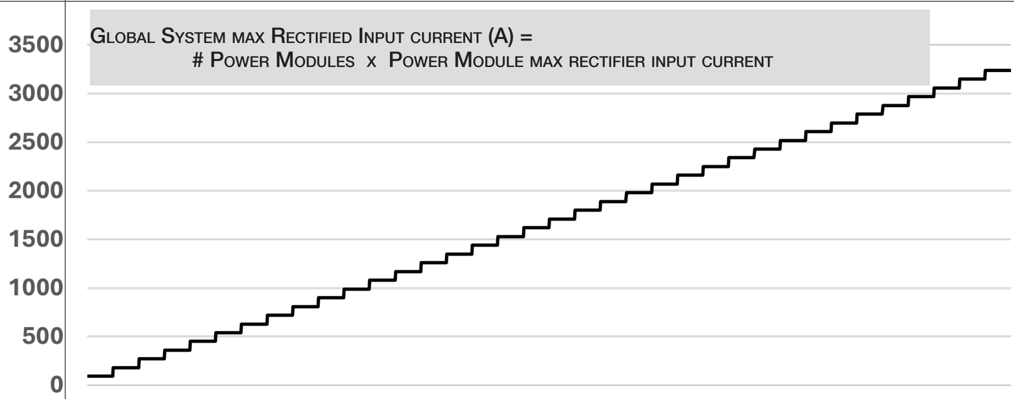
RATED CURRENT AND MAX CURRENT (GLOBAL PARALLEL SYSTEM)

Number of Modules: 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36

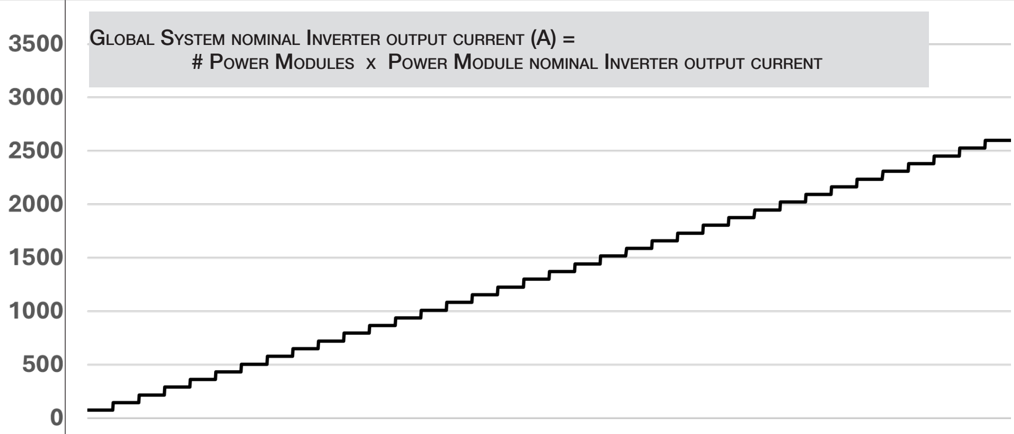
Rated rectifier input current (A) (EN 62040-1)



Max rectifier input current (A) (EN 62040-3)



Nominal Inverter output current (A)



Maximum bypass input current (A) (EN 62040-3)	478	956	1434	1912	2390	2868

COOLING (SINGLE POWER MODULE)		
Maximum air flow	(m3/h)	600
Power Dissipation under nominal conditions (1)	(W)	2240
	(kcal/h)	1920
	(BTU/h)	7640
Power Dissipation (maximum) under worst-case conditions (2)	(W)	2580
	(kcal/h)	2220
	(BTU/h)	8810

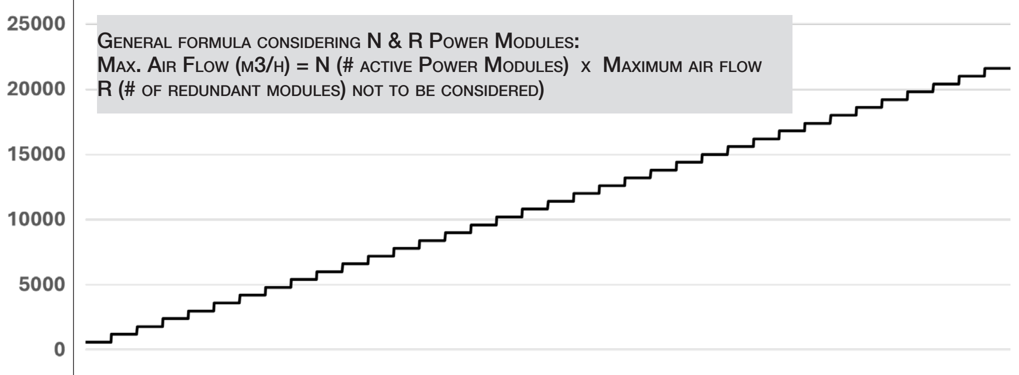
(1) worst-case: R (# redundant modules) = 0
(2) nominal input voltage and rated output active power (PF=1)

socomec
Innovative Power Solutions

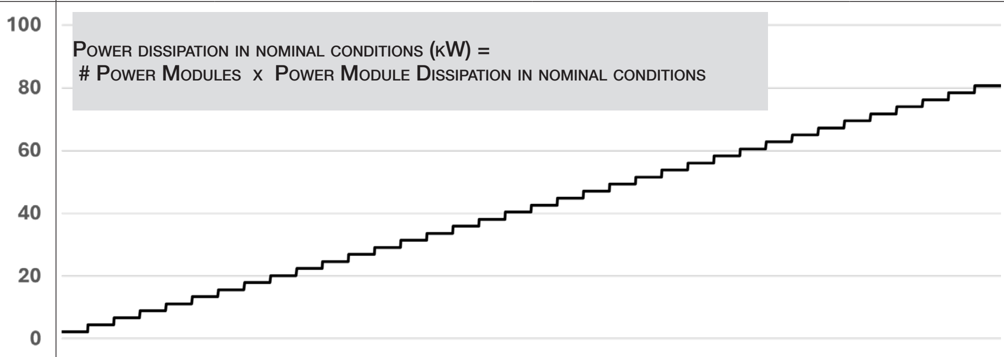
COOLING (GLOBAL PARALLEL SYSTEM)

Number of Units	1	2	3	4	5	6
Number of Modules	1 2 3 4 5 6	7 8 9 10 11 12	13 14 15 16 17 18	19 20 21 22 23 24	25 26 27 28 29 30	31 32 33 34 35 36

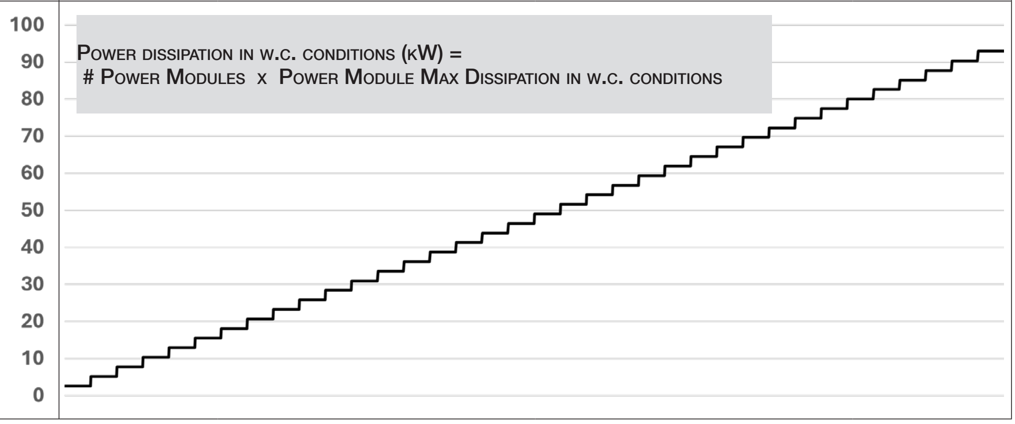
Maximum air flow [(1)]
(m^3/h)



Power Dissipation in
nominal conditions [(1) (2)]
(kW)



Power Dissipation in
worst-case conditions [(1) (2) (3)]
(kW)

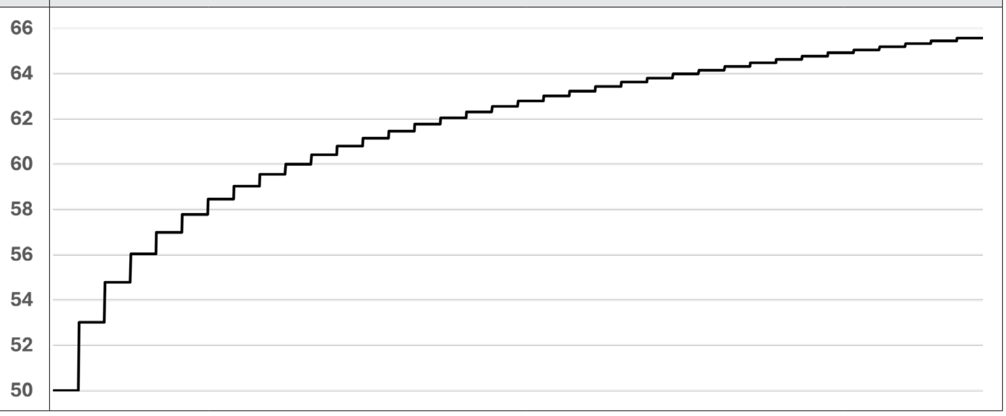


(1) worst-case: R (# redundant modules) = 0
(2) nominal input voltage and rated output active power (PF=1)
(3) low input voltage, battery recharge and rated output active power (PF=1)

ACOUSTIC NOISE

Number of Units	1	2	3	4	5	6
Number of Modules	1 2 3 4 5 6	7 8 9 10 11 12	13 14 15 16 17 18	19 20 21 22 23 24	25 26 27 28 29 30	31 32 33 34 35 36

Acoustic noise at 1m [(1)]
(dBA)



(1) at 70% nominal load.

3.2. Electrical characteristics

3.2.1. Electrical characteristics independent of the number of modules and units

ELECTRICAL CHARACTERISTICS - INPUT	
Rated mains supply voltage (V)	400 V 3-phase+N
Voltage tolerance at full load	340 V to 480 V (+20 / -15%)
Voltage tolerance at derated load	up to 240 V @ 50% of nominal load (linear decrease)
Rated frequency (Hz)	40 - 70 Hz
Power factor	> 0.99 [1]
Total harmonic input current distortion (THDi)	≤ 3% (@: Pn, Resistive load, Mains THDv ≤ 1%)
Max inrush current at start-up	Power walk-in / Soft-start (selectable parameters)

(1) Pout ≥ 50% of nominal Power.

ELECTRICAL CHARACTERISTICS - BYPASS	
Bypass rated voltage (V)	Nominal output voltage ±15% (±20% if GENSET is used)
Bypass rated frequency (Hz)	50 / 60
Bypass frequency tolerance	±2% selectable (±8% if GENSET is used)
Bypass frequency variation speed	50 / 60 ±10%

ELECTRICAL CHARACTERISTICS - INVERTER	
Rated output voltage (V)	(3ph + N) 400 380 / 400 / 415 selectable
Output voltage tolerance (V)	±1%
Rated output frequency (Hz)	50 / 60 (selectable)
Output frequency tolerance	±0.05% (on battery mode)
Load crest factor	≥ 2.7 :1
Total output voltage distortion (THDv)	≤ 1% (Ph / Ph) ; ≤ 2% (Ph / N) (@: Pn, Resistive load)

ELECTRICAL CHARACTERISTICS - STORED ENERGY OPERATING MODE	
Number of battery blocks (VRLA)	From 18+18 to 24+24 [1]

(1) Consult us

ELECTRICAL CHARACTERISTICS - EFFICIENCY	
Efficiency (on-line mode)	up to 96.5%
Efficiency (eco-mode)	up to 99.3%

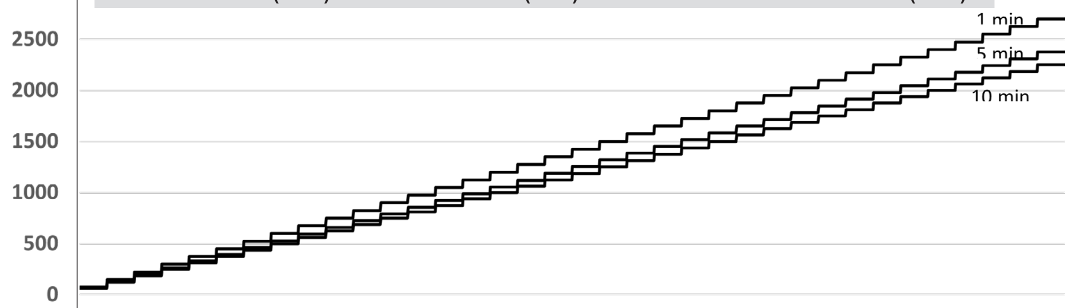
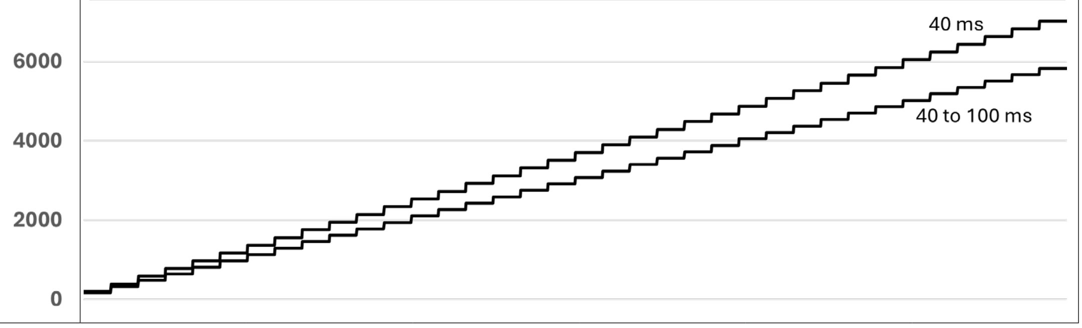
ELECTRICAL CHARACTERISTICS - BYPASS OVERLOAD AND SHORTCIRCUIT PERFORMANCE							
	Number of Units	1	2	3	4	5	6
	Number of Power Modules	1 → 6	7 → 12	13 → 18	14 → 24	25 → 30	31 → 36
Bypass overload (A)	Nominal	435	870	1304	1739	2174	2609
	Continuous	480	960	1440	1920	2400	2880
	10'	543	1087	1630	2174	2717	3261
	1'	652	1304	1957	2609	3261	3913
	1"	761	1522	2283	3043	3804	4565
Bypass Max short-circuit current I_{TSM} (A_{pk})	20 ms	15000	27000	40000	50000	65000	80000
Bypass I^2t (A^2s)		1125000	3645000	8000000	12500000	21125000	32000000

ELECTRICAL CHARACTERISTICS - SINGLE UNIT SHORT CIRCUIT SAFETY PERFORMANCE		
	Number of Power Modules	1 → 6
Conditional short circuit current Icc (A_{RMS}) [1][2]		65 kA
Short-circuit current withstand Icw (A_{RMS}) [3]	High short-circuit (Standard Unit) [4][6]	20 kA
	Extra-high short-circuit (Optional Unit) [5][6]	50 kA

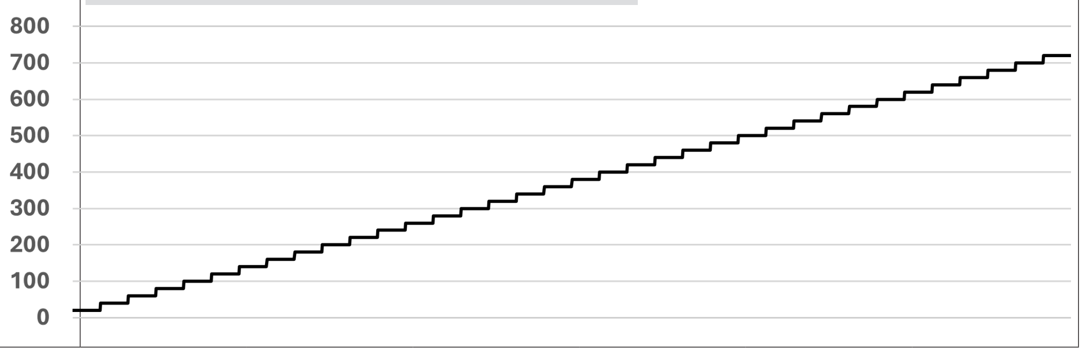
(1) short-circuit safety withstanding Icw (IEC/EN 62040-1 requirement without upstream protection)
(2) with Standard Unit (high short-circuit Icw = 25 kW) and each Unit with defined upstream protection (consult us)
(3) short-circuit safety withstanding Icc (IEC/EN 62040-1 requirement with upstream protection)
(4) standard Unit Icw = 20 kA for enhanced short-circuit safety withstanding (above IEC/EN 62040-1 requirements: Icw = 10 kA)
(5) extra rugged Unit Icw = 50 kA for enhanced short-circuit safety withstanding (above IEC/EN 62040-1 requirements: Icw = 10 kA)
(6) third party certified

3.2.2. Electrical characteristics dependent on the number of modules and units

ELECTRICAL CHARACTERSTICS (SINGLE POWER MODULE) – INVERTER OVERLOAD AND SHORT-CIRCUIT		
Inverter overload (1) (kW)	10 min	62.5
	5 min	66
	1 min	75
Inverter short-circuit (A) Ik1 = Ik2 = Ik3	40 ms	195
	40 to 100 ms	162

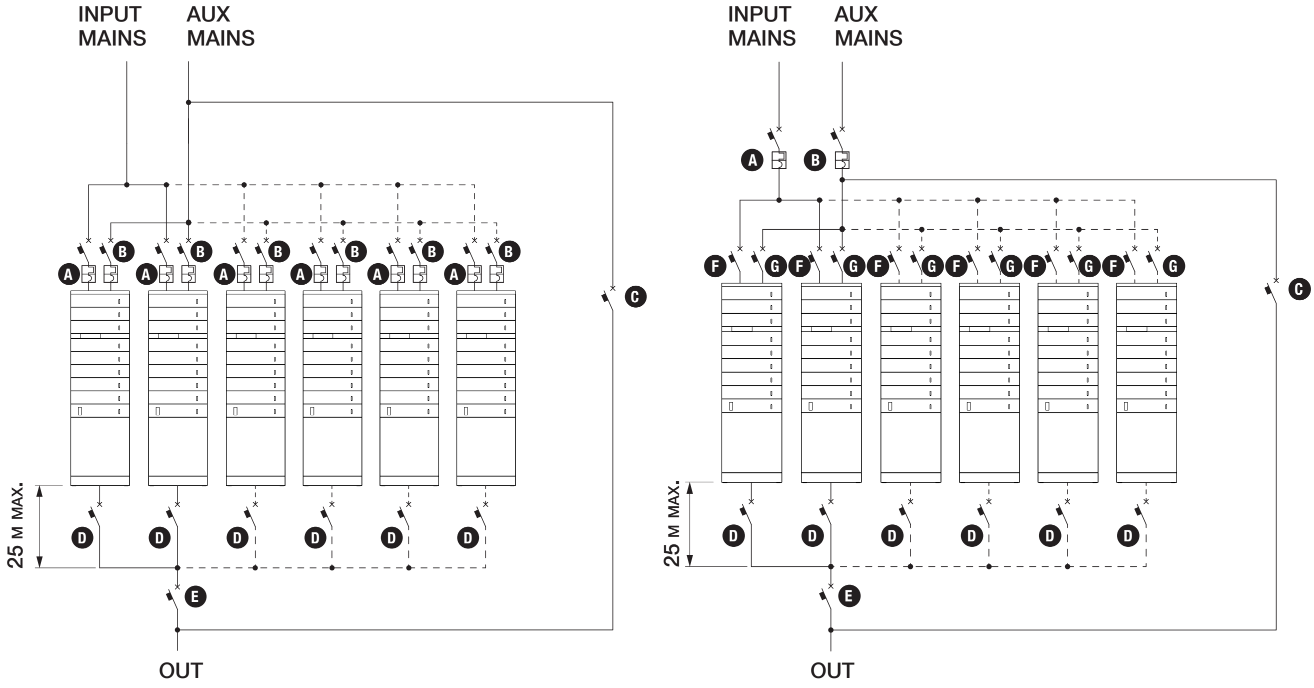
ELECTRICAL CHARACTERSTICS (GLOBAL PARALLEL SYSTEM) – INVERTER OVERLOAD AND SHORT-CIRCUIT						
Number of Units	1	2	3	4	5	6
Number of Modules	1 2 3 4 5 6	7 8 9 10 11 12	13 14 15 16 17 18	19 20 21 22 23 24	25 26 27 28 29 30	31 32 33 34 35 36
Inverter overload (1) (kW) 10 min 5 min 1 min	INVERTER OVERLOAD (10 MIN) = # POWER MODULES (N+R) x POWER MODULE INVERTER OVERLOAD (10 MIN) INVERTER OVERLOAD (5 MIN) = # POWER MODULES (N+R) x POWER MODULE INVERTER OVERLOAD (5 MIN) INVERTER OVERLOAD (1 MIN) = # POWER MODULES (N+R) x POWER MODULE INVERTER OVERLOAD (1 MIN) 					
Inverter short-circuit (A) Ik1 = Ik2 = Ik3	INVERTER SHORT-CIRCUIT (40 MS) = # POWER MODULES (N+R) x POWER MODULE INVERTER SHORT-CIRCUIT (40 MS) INVERTER SHORT-CIRCUIT (40-100 MS) = # POWER MODULES (N+R) x POWER MODULE INVERTER SHORT-CIRCUIT (40-100 MS) 					

(1) Conditions: Initial Pout ≤ 80% Pn, Vin nominal

ELECTRICAL CHARACTERSTICS - BATTERY CHARGER MAX CURRENT						
Number of Units	1	2	3	4	5	6
Number of Modules	1 2 3 4 5 6	7 8 9 10 11 12	13 14 15 16 17 18	19 20 21 22 23 24	25 26 27 28 29 30	31 32 33 34 35 36
Max battery current (A)	BATTERY CHARGER MAX. CURRENT = # POWER MODULES x 20 A 					

3.3. Recommended protection

3.3.1. Architectures of parallel system up to 1800 kW based on 50 → 300 kW units



PARALLEL SYSTEM with distributed UPSTREAM ARCHITECTURE

KEY

A	Unit input mains thermal-magnetic circuit breaker.
B	Unit auxiliary mains thermal-magnetic circuit breaker.
C	System external maintenance by pass switch (connect signal status to the parallel board)
D	Unit output switch
E	System shutdown switch

PARALLEL SYSTEM with common UPSTREAM ARCHITECTURE

KEY

A	System input mains thermal-magnetic circuit breaker.
B	System auxiliary mains thermal-magnetic circuit breaker.
C	System external maintenance by pass switch (connect signal status to the parallel board)
D	Unit output switch
E	System shutdown switch
F	Unit input mains switch
G	Unit auxiliary mains switch

The installation and system should comply with national plant regulations.

The electrical distribution panel should have a sectioning and protection system installed for input and auxiliary mains.

SINGLE UNIT CABLE - MAX SECTION		
Rectifier terminals (mm^2)	Flexible	2 x 150
	Rigid	2 x 150
Bypass terminals (mm^2)	Flexible	2 x 150
	Rigid	2 x 150
Battery terminals (mm^2)	Flexible	2 x 150
	Rigid	2 x 150
Output terminals (mm^2)	Flexible	2 x 150
	Rigid	2 x 150

M10 terminals

Tightening torque 20 Nm

Maximum cross-section is determined by the size of the terminals.

As specified in EN 62040-3 Appendix 3 (Non-Linear Load Reference), in the event of three-phase non-linear loads connected downstream of the UPS, the neutral current on the load can be 1.5 - 2 times higher than the phase current. This should be taken into account when estimating the correct size of output and auxiliary neutral cables.

The Unit is designed for bottom connections. A specific option is available for top connection.

RECOMMENDED PROTECTION DEVICES - INPUT MAINS									
Architecture		Distributed protections (1 rectifier protection for each Unit)	Common protections (1 rectifier protection for all the Units)						
Number of Units		1 → 6	1	2	3	4	5	6
Circuit breaker (A)	Minimum	630	For a common protection architecture, the sizing of the upstream protection system must consider the rated and maximum rectifier current of the parallel system (§ 2.1), the protection of connection cables based on their size (§ 2.3), and compliance with local standards and regulations.					
	Maxi-mum							

A circuit breaker switch with a magnetic intervention threshold of ≥10 In is recommended.

When an optional external transformer is used, a circuit breaker with Im ≤ 20 x In (A) and selective breaker capabilities is necessary.

The minimum value depends on the size of the power cables in the installation, while the maximum value is constrained by the UPS cabinet.

The system can accommodate the maximum size of protection, regardless of the number of modules installed, to allow for future scalability.

A protection value lower than the maximum must be used when the mains network structure or cables cannot support the full power load. This value should be selected accordingly.

When the auxiliary mains and input are connected together, the general input protection rating must be higher than that of either the auxiliary mains or the rectifier.

RECOMMENDED PROTECTION DEVICES - AUXILIARY MAINS								
Architecture		Distributed protections (1 rectifier protection for each Unit)	Common protections (1 rectifier protection for all the Units)					
Number of Units		1 → 6	1	2	3	4	5	6
Circuit breaker (A)	Minimum	630	For a common protection architecture, the sizing of the upstream protection system must consider the rated and maximum rectifier current of the parallel system (§ 2.1), the protection of connection cables based on their size (§ 2.3), and compliance with local standards and regulations.					
	Maximum							

A circuit breaker switch with a magnetic intervention threshold of ≥10 In is recommended.

If an optional external transformer is used, a circuit breaker with Im ≤ 20 x In (A) and selective breaker capabilities is required.

The minimum value depends on the size of the power cables in the installation, while the maximum value is limited by the UPS cabinet.

The conditional short-circuit current (Icc) in compliance with IEC 62040-1 is 65 kArms (§ 2.2.1), provided that the UPS is protected by an MCCB with adequate breaking capability and current-limiting capacity under short-circuit conditions.

For detailed information, please contact us.

RECOMMENDED PROTECTION DEVICES - UPSTREAM RESIDUAL DETECTION CIRCUIT BREAKER								
Architecture		Distributed protections (1 rectifier and aux. mains protection for each Unit)	Common protections (1 rectifier and aux. mains protection for the global parallel system)					
Number of Units		1 → 6	1	2	3	4	5	6
Differential input (A)	Minimum	RCD devices cannot be used on parallel system with distributed protections	0,5A (1)					

(1) RCD devices are not recommended as upstream common protection in a parallel system.
RCD devices are unnecessary when the UPS is installed in a TN-S system..
RCD devices are not permitted in TN-C systems.

4. REFERENCE STANDARDS AND DIRECTIVES

4.1. Overview

REFERENCE	TITLE
2014/35/EU	Directive of the European Parliament and of the council of 26 February 2014 on the harmonisation of the laws of the Member States relating to the making available on the market of electrical equipment designed for use within certain voltage limits.
2014/30/EU	Directive of the European Parliament and of the council of 26 February 2014 on the harmonisation of the laws of the Member States relating to electromagnetic compatibility.
2011/65/EU	Directive of the European Parliament and of the council of 8 June 2011 on the restriction of the use of certain hazardous substances in electrical and electronic equipment.

4.2. Standards

STANDARD	
Safety	EN / IEC 62040-1 - AS 62040-1
EMC	EN / IEC 62040-2 - AS 62040-2
Product certification	IECEE CB Scheme
Performance	EN / IEC 62040-3 - AS 62040-3
Product marks	CE - RCM[1] - CMIM[1] - UKCA [1]
Protective class	Protective Class I
Protection level	IP20

(1) depends on the production site. Consult the data plate on the equipment.

ELITE UPS: a mark of efficiency

Socomec, as CEMEP UPS manufacturer member, has signed a Code of Conduct put forward by the Joint Research Centre of the European Commission (JRC), to ensure the protection of critical applications and processes ensuring 24/7 continuous high quality supply. The JRC commits to mitigating energy losses and gas emissions caused by UPS equipment, therefore maximising UPS efficiency.

TECHNICAL GUIDE

EN

MODULYS XM

100 to 600 + 50 kW
Redundant Modular UPS

ULTIMATE

Fault tolerant power
without compromise

Socomec Resource Center
To download, brochures, catalogues
and technical manuals

socomec
Innovative Power Solutions

1. OBJECTIVES

The purpose of these specifications is to provide the information required to prepare the system and installation site.

The specifications are intended for:

- installation engineers.
- design engineers.
- engineering consultants.

For detailed information, see the installation and operating manual.

2. ARCHITECTURE

2.1. Range and Flexibility

Modulys XM is a modular, scalable and redundant UPS system based on plug-in and hot-swap power modules.

The modularity enables power scalability by simply plugging one or more additional modules into the existing system (up to 13 modules per system).

The modularity also enables redundancy, which is an essential feature to ensure UPS system fault tolerance. The redundant configuration can be set from N+1 up to N+R.

2.1.1. FLEXIBLE AND RATED POWER

POWER MODULES												
Number of Power Modules	2	3	4	5	6	7	8	9	10	11	12	13
N+1 redundant System Power (kW)	100+0 (1)	100+50	150+50	200+50	250+50	300+50	350+50	400+50	450+50	500+50	550+50	600+50

(1) No Power redundancy

2.1.2. FLEXIBLE SHORT-CIRCUIT PERFORMANCE

SYSTEM CONFIGURATIONS		
	Standard	High Short-circuit
System description	Short-circuit safety performance according to IEC/EN62040-1 requirements	- Extra-rugged system for enhanced short-circuit safety performance (beyond IEC/EN 62040-1 requirements) - Ready for +1 extra Bypass Module (option) for higher Bypass short-circuit capability
Number of Bypass Modules	2	2 + 1 (1)
Number of Power Modules	2 → 13	2 → 13

(1) Extra Bypass

See § 2.2.1 for detailed information on high short circuit solution.

2.1.3. FLEXIBLE CABLING

With the standard solution it is possible to meet every cabling configuration, without the need of any extra option: top cabling, bottom cabling and mixed top/bottom cabling. Decision can be taken even at last minute, on site.

With the high short-circuit solution, two different configurations (top cabling and bottom / mixed top-bottom cabling) are provided.

2.1.4. FLEXIBLE GROUNDING COMPATIBILITY

Compatible with any grounding system: TN-S, TN-C, TT, IT.

2.2. Flexible back-up time

Various extended back-up times are possible by using: (1) a modular battery cabinet; (2) a high-capacity battery cabinet.

Each battery pack has an acid-proof container designed to prevent damage in the event of acid leakage.

Each Power Module has a powerful embedded battery charger able to provide up to 20 A.

2.2.1. Modular hot-swap battery cabinet - medium capacity

The modular battery system is based on vertical and horizontal modularity thanks to independent battery strings connected in parallel, each one made up of hot-swap long life battery packs.

Each battery string has its own independent protection device and its own independent switch for fast and safe maintenance.

DIMENSIONS AND WEIGHT																																				
	Number of 9 Ah Modular hot-swap battery cabinets - medium capacity																																			
	1												2												3											
	Number of battery strings																																			
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36
Height (mm)	1990																																			
Depth (mm)	890																																			
Width (mm)	810												1620												2430											
Weight (kg)	384	508	632	756	880	1004	1128	1252	1376	1500	1624	1748	2132	2256	2380	2504	2628	2752	2876	3000	3124	3248	3372	3496	3880	4004	4128	4252	4376	4500	4624	4748	4872	4996	5120	5244

Vertical modularity using a modular battery cabinet with hot-swap battery boxes provides scalable power back-up with up to 12 battery strings per cabinet.

Horizontal modularity provides very high and scalable back-up.

A standard temperature sensor optimizes the battery recharging parameters according to the ambient operating temperature to extend battery life.

MODULAR HOT-SWAP BATTERY CABINET
BACK UP TIMES IN MINUTES @ 75% OF RATED LOAD

Number of Power Modules			2	3	4	5	6	7	8	9	10	11	12	13
N+1 redundant System Power (kW)			100+0[1]	100+50	150+50	200+50	250+50	300+50	350+50	400+50	450+50	500+50	550+50	600+50
Power (kW)	Number of strings	Cumultative Ah												
1	2	18	5,5											
	3	27	10,8											
	4	36	15,4	5,5										
	5	45	18,6	8,1										
	6	54	23,7	10,8	5,5									
	7	63	31	13,2	7,3									
	8	72	36	15,4	9,1	5,5								
	9	81	42	17,2	10,8	6,9								
	10	90	48	18,6	12,3	8,1	5,5							
	11	99	55	21	14	9,5	6,7							
	12	108	62	23,7	15,4	10,8	7,6	5,5						
2	13	117	69	27,4	16,6	11,9	8,7	6,5						
	14	126	74	31	17,7	13,2	9,8	7,3	5,5					
	15	135	79	34	18,6	14,3	10,8	8,1	6,4					
	16	144	86	36	20,1	15,4	11,7	9,1	7,1	5,5				
	17	153	93	39	22	16,3	12,7	9,9	7,7	6,3				
	18	162	99	42	23,7	17,2	13,6	10,8	8,6	6,9	5,5			
	19	171	104	45	26,2	17,9	14,5	11,5	9,3	7,5	6,2			
	20	180	112	48	28,5	18,6	15,4	12,3	10,1	8,1	6,8	5,5		
	21	189	119	51	31	19,7	16,1	13,2	10,8	8,9	7,3	6,1		
	22	198	127	55	33	21	16,8	14	11,4	9,5	7,8	6,7	5,5	
	23	207	133	59	35	22,4	17,5	14,7	12	10,2	8,5	7,1	6,1	
	24	216	140	62	36	23,7	18,1	15,4	12,8	10,8	9,1	7,6	6,6	5,5
3	25	225	146	66	38	25,6	18,6	16	13,5	11,4	9,7	8,1	7	6
	26	234	151	69	40	27,4	19,4	16,6	14,2	11,9	10,2	8,7	7,4	6,5
	27	243	158	72	42	29,1	20,5	17,2	14,8	12,5	10,8	9,3	7,8	6,9
	28	252	166	74	44	31	21,6	17,7	15,4	13,2	11,3	9,8	8,4	7,3
	29	261	173	77	46	32	22,6	18,2	15,9	13,8	11,8	10,3	8,9	7,6
	30	270	181	79	48	34	23,7	18,6	16,5	14,3	12,3	10,8	9,4	8,1
	31	279	188	83	50	35	25,2	19,2	16,9	14,8	12,9	11,2	9,9	8,6
	32	288	196	86	52	36	26,7	20,1	17,4	15,4	13,4	11,7	10,3	9,1
	33	297	202	89	55	38	28,1	21	17,8	15,9	14	12,1	10,8	9,5
	34	306	212	93	58	39	29,4	22	18,2	16,3	14,4	12,7	11,2	9,9
	35	315	221	96	60	40	31	22,8	18,6	16,8	14,9	13,2	11,6	10,4
	36	324	229	99	62	42	32	23,7	19,1	17,2	15,4	13,6	12	10,8

(1) No Power redundancy

2.2.2. Modular battery cabinet - high capacity

DIMENSIONS AND WEIGHT	
Height (mm)	1990
Depth (mm)	890
Width (mm)	810
Weight (kg)	1792

High-capacity modular battery cabinets are designed for long BUT (Back-up-times) also with higher power.

A standard temperature sensor optimizes the battery recharging parameters according to the ambient operating temperature to extend battery life.

MODULAR BATTERY CABINET
BACK-UP TIMES IN MINUTES @75 % OF RATED LOAD

Number of battery cabinets	Numer of battery strings	Cumulative Ah	2	3	4	5	6	7	8	9	10	11	12	13
		N+1 redundant System Power (kW)	100+0(1)	100+50	150+50	200+50	250+50	300+50	350+50	400+50	450+50	500+50	550+50	600+50
1	1	90	49	19,8										
2	2	180	115	49	29,1	19,8	14,3							
3	3	270	184	82	49	34	25,3	19,8	15,4					
4	4	360	255	115	71	49	37	29,1	23,9	19,8	16,3	14,3		
5	5	450	329	148	93	66	49	39	32	26,6	23,1	19,8	16,8	14,9
6	6	540	407	184	115	82	62	49	41	34	29,1	25,3	22,5	19,8

(1) No Power redundancy.

socomec
Innovative Power Solutions

3. SPECIFICATIONS

3.1. Installation parameters

DIMENSIONS AND WEIGHT													
Number of Power Modules	1	2	3	4	5	6	7	8	9	10	11	12	13
Height (mm)	1990												
Depth (mm)	950												
Width (mm)	1200												
Weight (kg)	536	572	608	644	680	716	752	788	824	860	896	932	968

RATED CURRENT AND MAX CURRENT												
Number of Power Modules	2	3	4	5	6	7	8	9	10	11	12	13
N+1 redundant System Power (kW)	100+0(1)	100+50	150+50	200+50	250+50	300+50	350+50	400+50	450+50	500+50	550+50	600+50
Rated rectifier input current (A) (EN 62040-1)	75	150	226	301	376	451	526	601	677	752	827	902
Maximum rectifier input current (A) (EN 62040-3)	180	270	360	450	540	630	720	810	900	990	1080	1080
Nominal Inverter output current (A)	72	144	217	289	361	433	505	577	650	722	794	866
Maximum bypass input current (A) (EN 62040-3)	956											
Maximum battery current (A)	228	342	456	570	684	798	912	1026	1140	1254	1368	1482

(1) No Power redundancy

COOLING													
Number of Power Modules		2	3	4	5	6	7	8	9	10	11	12	13
N+1 redundant System Power (kW)		100+0(1)	100+50	150+50	200+50	250+50	300+50	350+50	400+50	450+50	500+50	550+50	600+50
Maximum air flow	(m3/h)	1200	1800	2400	3000	3600	4200	4800	5400	6000	6600	7200	7800
Power Dissipation under nominal conditions(2)	(W)	1920	3950	6080	8110	10680	12820	15340	17530	19720	21920	24710	26950
	(kcal/h)	1650	3390	5220	6970	9180	11020	13180	15070	16950	18840	21240	23170
	(BTU/h)	6550	13470	20740	27670	36440	43740	52340	59810	67280	74790	84310	91950
Power Dissipation (Maximum) under worst-case conditions(3)	(W)	2140	4390	6910	9430	12060	14470	16880	19730	22200	25220	27740	30920
	(kcal/h)	1840	3780	5950	8110	10370	12450	14520	16970	19090	21690	23860	26590
	(BTU/h)	7310	14980	23580	32180	41160	49380	57600	67330	75750	86060	94660	105510

(1) No Power redundancy
(2) nominal input voltage and rated output active power (PF=1)
(3) low input voltage, battery recharge and rated output active power (PF=1)

ACOUSTIC NOISE												
Number of Power Modules	2	3	4	5	6	7	8	9	10	11	12	13
N+1 redundant System Power (kW)	100+0(1)	100+50	150+50	200+50	250+50	300+50	350+50	400+50	450+50	500+50	550+50	600+50
Acoustic noise at 1m (dBA) (1)	53	50	55	56	57	58	59	60	61	62	63	64

(1) at 70 % nominal load.

3.2. Electrical characteristics

3.2.1. Electrical characteristics independent of the number of modules

ELECTRICAL CHARACTERISTICS - INPUT	
Rated mains supply voltage (V)	400 V 3-phase+N
Voltage tolerance at full load	340 V to 480 V (+20/-15%)
Voltage tolerance at derated load	up to 240 V @ 50% of nominal load (linear decrease)
Rated frequency (Hz)	40 - 70 Hz
Power factor	> 0.99(1)
Total harmonic input current distortion (THDi)	≤ 3% (@: Pn, Resistive load, Mains THDv ≤ 1%)
Max inrush current at start-up	Power walk-in / Soft-start (selectable parameters)

(1) Pout ≥ 50% of nominal Power.

ELECTRICAL CHARACTERISTICS - BYPASS	
Bypass rated voltage (V)	Nominal output voltage ±15% (±20% if GENSET is used)
Bypass rated frequency (Hz)	50 / 60
Bypass frequency tolerance	±2% selectable (±8% if GENSET is used)
Bypass frequency variation speed	50 / 60 ±10%

ELECTRICAL CHARACTERISTICS - INVERTER	
Rated output voltage (V)	(3ph + N) 400 380 / 400 / 415 selectable
Output voltage tolerance (V)	±1%
Rated output frequency (Hz)	50 / 60 (selectable)
Output frequency tolerance	±0.05% (on battery mode)
Load crest factor	≥ 2.7:1
Total output voltage distortion (THDv)	≤ 1% (Ph / Ph); ≤ 2% (Ph / N) (@: Pn, Resistive load)

ELECTRICAL CHARACTERISTICS - STORED ENERGY OPERATING MODE	
Number of battery blocks (VRLA)	From 18+18 to 24+24 (1)

(1) Consult us

ELECTRICAL CHARACTERISTICS - EFFICIENCY	
Efficiency (on-line mode)	up to 96.5%
Efficiency (eco-mode)	up to 99.3%

ELECTRICAL CHARACTERISTICS - BYPASS OVERLOAD AND SHORTCIRCUIT			
Solution type		Standard	High Short-circuit (*)
Number of Bypass Modules		2	2 or 2 + 1[1]
Number of Power Modules		2 → 13	
Bypass overload (A)	Nominal	362	362
	Continuous	398	398
	10'	453	453
	1'	543	543
	1"	634	634
Bypass Maximum short-circuit current ITSM (A)		28000	40000
Bypass I^2t (A^2s)		3920000	8000000

(1) Extra Bypass Module (option) for higher Bypass short-circuit capability

ELECTRICAL CHARACTERISTICS - SYSTEM SHORTCIRCUIT SAFETY PERFORMANCE		
Solution type	Standard	High Short-circuit (*)
Number of Bypass Modules	2	2 or 2 + 1[1]
Number of Power Modules	2 → 13	
Short-circuit current withstand (Icw)	20 kA	35 kA up to 65 kA[2]

(1) Extra Bypass Module (option) for higher Bypass short-circuit capability (2) option - contact us

(*) High short-circuit solution:

- Extra-rugged system for enhanced short-circuit saferty performance (beyond IEC/EN 62040-1 requirements)
- Ready for +1 extra Bypass Module (option) for higher Bypass short-circuit capability

3.2.2. Electrical characteristics dependent on the number of modules

ELECTRICAL CHARACTERISTICS - Inverter overload and short-circuit													
Number of Power Modules		2	3	4	5	6	7	8	9	10	11	12	13
N+1 redundant System Power (kW)		100+0[1]	100+50	150+50	200+50	250+50	300+50	350+50	400+50	450+50	500+50	550+50	600+50
Inverter overload (kW)[2]	10 min	125	187,5	250	312,5	375	437,5	500	562,5	625	687,5	750	750
	5 min	132	198	264	330	396	462	528	594	660	726	792	792
	1 min	150	225	300	375	450	525	600	675	750	825	900	900
Inverter short-circuit (A) Ik1 = Ik2 = Ik3	40 ms	390	585	780	975	1170	1365	1560	1755	1950	2145	2340	2535
	40 to 100 ms	324	486	648	810	972	1134	1296	1458	1620	1782	1944	2106

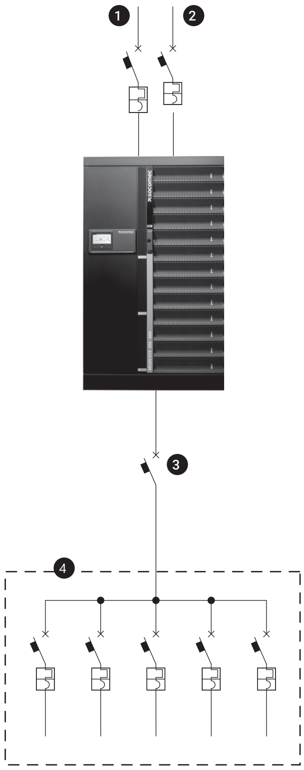
(1) No Power redundancy
(2) Conditions: Initial Pout ≤ 80% Pn, Vin nominal

ELECTRICAL CHARACTERISTICS - BATTERY CHARGER MAX CURRENT												
Number of Power Modules	2	3	4	5	6	7	8	9	10	11	12	13
N+1 redundant System Power (kW)	100+0[1]	100+50	150+50	200+50	250+50	300+50	350+50	400+50	450+50	500+50	550+50	600+50
Maximum Current (A)	40	60	80	100	120	140	160	180	200	220	240	260

(1) No power redundancy

3.3. Recommended protection

3.3.1. System from 50 to 600 + 50 kVA



Key

1. Input mains magneto-thermal switch
2. Auxiliary mains magneto-thermal switch
3. System shutdown switch
4. Distribution

The installation and system should comply with national plant regulations.

The electrical distribution panel should have a sectioning and protection system installed for input and auxiliary mains.

SYSTEM CABLES - MAX SECTION		
Number of Modules		1 → 13
Rectifier terminals (mm2)	Flexible	3 x 240
	Rigid	3 x 240
Bypass terminals (mm2)	Flexible	3 x 240
	Rigid	3 x 240
Battery terminals (mm2)	Flexible	3 x 240
	Rigid	3 x 240
Output terminals (mm2)	Flexible	3 x 240
	Rigid	3 x 240

M10 terminals for In, Aux and Out; M12 for battery connections

Tightening torque 20Nm

Maximum cross-section is determined by the size of the terminals.

As specified in EN 62040-3 Appendix 3 (Non-Linear Load Reference), in the event of three-phase non-linear loads connected downstream of the UPS, the neutral current on the load can be 1.5 - 2 times higher than the phase current. This should be taken into account when estimating the correct size of output and auxiliary neutral cables.

RECOMMENDED PROTECTION DEVICES - RECTIFIER													
Number of Modules		2	3	4	5	6	7	8	9	10	11	12	13
N+1 redundant System Power (kW)		100+0(1)	100+50	150+50	200+50	250+50	300+50	350+50	400+50	450+50	500+50	550+50	600+50
C Curve circuit breaker (A)	Min	200	320	400	630	630	630	800	1000	1000	1000	1250	1250
	Max	1250	1250	1250	1250	1250	1250	1250	1250	1250	1250	1250	1250

(1) No Power redundancy
(2) Caution! Residual Current Detection (RCD) can only be used with a common input and auxiliary mains (configuration not recommended). It must be placed upstream of the connection between input mains and auxiliary mains. Use type B four-pole selective (S) residual current detectors. Load leakage currents are to be added to those generated by the UPS and during transitory phases (power failures and power returns) short current peaks may occur. If loads with high leakage current are present, adjust the residual current protection. It is advisable in all cases to carry out a preliminary check on the earth current leakage with the UPS installed and operational with the definitive load, to prevent the RCD tipping over.

A circuit breaker switch is recommended with magnetic intervention threshold ≥10 In.

It is necessary to use a circuit breaker with Im ≤ 20 x In (A) selective breaker if an optional external transformer is used. The min value depends on the size of the power cables in the installation, while the max value is limited by the UPS cabinet.

The system can accept the max. value of protection, whatever the number of modules installed, in order to allow future scalability, while the min. value depends on the size of the power cables in the installation. A value of protection less then Max shall be used when the mains network structure cannot support the full power load, and shall be chosen between max. and min. values (as per the table above) according to mains network design.

Rectifier protection should be taken into account in the event of separate inputs; when the auxiliary mains and rectifier inputs are combined (common input), the general input protection rating should be higher than both (auxiliary mains or rectifier).

RECOMMENDED PROTECTION DEVICES - AUXILIARY MAINS													
Number of Modules		2	3	4	5	6	7	8	9	10	11	12	13
N+1 redundant System Power (kW)		100+0(1)	100+50	150+50	200+50	250+50	300+50	350+50	400+50	450+50	500+50	550+50	600+50
C Curve circuit breaker (A)	Min	200	320	400	630	630	630	800	1000	1000	1000	1000	1000
	Max	1250	1250	1250	1250	1250	1250	1250	1250	1250	1250	1250	1250

(1) No Power redundancy

A circuit breaker switch is recommended with magnetic intervention threshold ≥10 In.

It is necessary to use a circuit breaker with Im ≤ 20 x In (A) selective breaker if an optional external transformer is used. The minimum value depends on the size of the power cables in the installation, while the maximum value is limited by the UPS cabinet.

The conditional short circuit current (Icc) according to IEC 62040-1 is 65KA rms, provided that the UPS is protected by a MCCB with adequate breaking capability and current-limiting capability under short-circuit conditions. Contact us for detailed information.

RECOMMENDED PROTECTION DEVICES - UPSTREAM RESIDUAL CURRENT DETECTION CIRCUIT BREAKER													
Number of Modules		2	3	4	5	6	7	8	9	10	11	12	13
N+1 redundant System Power (kW)		100+0(1)	100+50	150+50	200+50	250+50	300+50	350+50	400+50	450+50	500+50	550+50	600+50
Differential input (A)	Min												

(1) No Power redundancy

An RCD is not necessary when the UPS is installed on a TN-S system. RCDs are not allowed on TN-C systems. If an RCD is required, a B type should be used.

Caution! Use four-pole selective (S) residual current detectors (RCDs). Load leakage currents are to be added to those generated by the UPS and short current peaks may occur during transitory phases (power failures and power returns). If loads with high leakage current are present, adjust the residual current protection. It is advisable in all cases to carry out a preliminary check on the ground current leakage with the UPS installed and operating with the definitive load, so as to prevent the tripping of the RCD switch.

OUTPUT SELECTIVITY ON BATTERY MODE (AUX MAINS NOT PRESENT)													
Number of Modules		2	3	4	5	6	7	8	9	10	11	12	13
N+1 redundant System Power (kW)		100+0(1)	100+50	150+50	200+50	250+50	300+50	350+50	400+50	450+50	500+50	550+50	600+50
Circuit breaker with Im ≤ 5 x In (A)	Max	50	80	100	125	125	200	200	250	250	250	250	250
Circuit breaker with Im ≤ 10 x In (A)	Max	25	40	50	63	80	100	100	125	125	160	160	160

(1) No Power redundancy

4. REFERENCE STANDARDS AND DIRECTIVES

4.1. Overview

The construction of the equipment and choice of materials and components comply with all laws, decrees, directives and standards currently in force. In particular, the equipment is fully compliant with all European Directives concerning CE marking.

2006/95 / EC

Council Directive 2006/95 / EC, dated 16 February 2007, on the harmonization of the laws of Member States relating to electrical equipment designed for use within certain voltage limits..

2004/108 / EC

On the approximation of the laws of the Member States relating to electromagnetic compatibility.

4.2. Standards

STANDARD	
Safety	EN/IEC 62040-1 - AS 62040-1
EMC	EN/IEC 62040-2 - AS 62040-2
Product certification	IECEE CB Scheme
Performance	EN/IEC 62040-3 - AS 62040-3
Product marks	CE - RCM(1) - EAC(1) - CMIM(1) - UKCA(1)
Protective class	Protective Class I
Protection level	IP20

(1) Depends on the production site. Consult the data plate on the equipment

ELITE UPS: a mark of efficiency

Socomec, as CEMEP UPS manufacturer member, has signed a Code of Conduct put forward by the Joint Research Centre of the European Commission (JRC), to ensure the protection of critical applications and processes ensuring 24/7 continuous high quality supply. The JRC commits to mitigating energy losses and gas emissions caused by UPS equipment, therefore maximising UPS efficiency.

TECHNICAL GUIDE

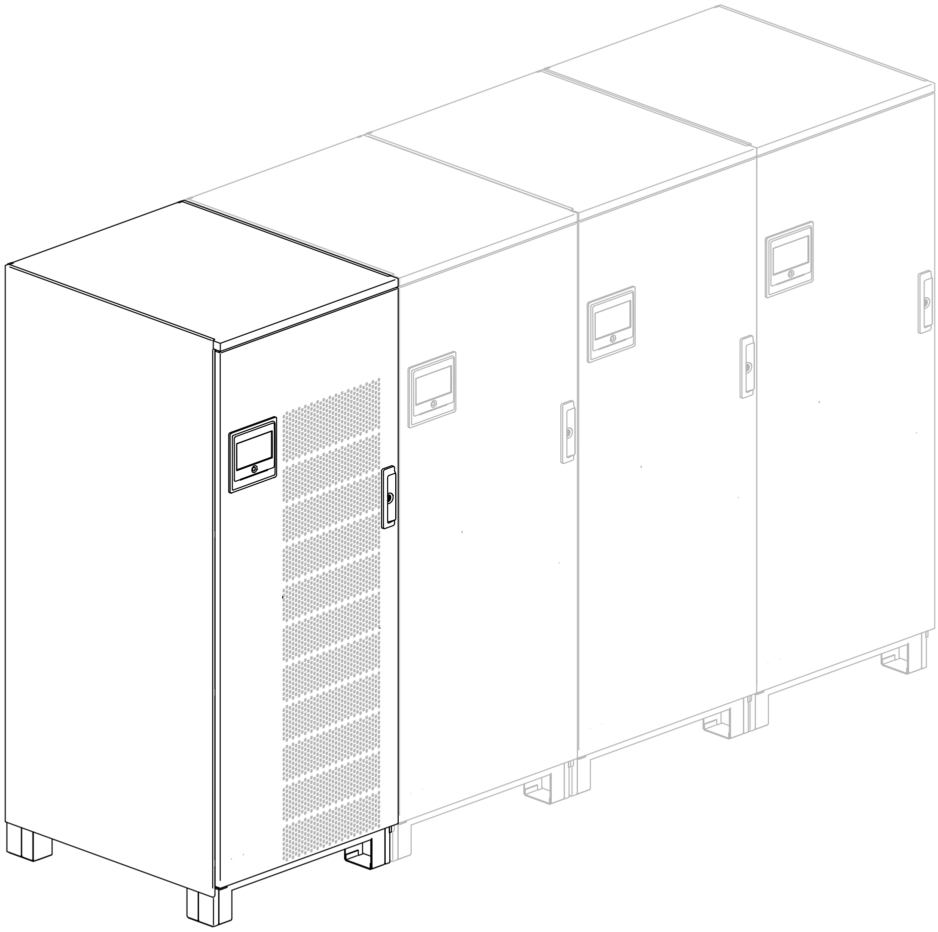
EN

MODULYS XM

50 to 500kW Modular Unit
for parallel architecture up to 2,0 MW

ULTIMATE
Fault tolerant power
without compromise

1 000 000 HOURS MTBF | automatic firmware alignment | HOT-SWAP | FLEXIBILITY | 20+ YEARS | Li-Ion



Socomec Resource Center
To download, brochures, catalogues
and technical manuals

socomec
Innovative Power Solutions

1. OBJECTIVES

The purpose of these specifications is to provide the information required to prepare the system and installation site.

The specifications are intended for:

- installation engineers.
- design engineers.
- engineering consultants.

For detailed information, see the installation and operating manual.

2. ARCHITECTURE

2.1. Range and Flexibility

Modulys XM is a modular, scalable, and redundant UPS system based on plug-in, hot-swap power modules.

Its modular design enables power scalability by simply adding one or more additional modules to the existing unit (up to six modules per unit).

This modularity also allows for redundancy, an essential feature to ensure the fault tolerance of the UPS system. Redundant configurations of the power modules can be set, ranging from N+1 to N+R.

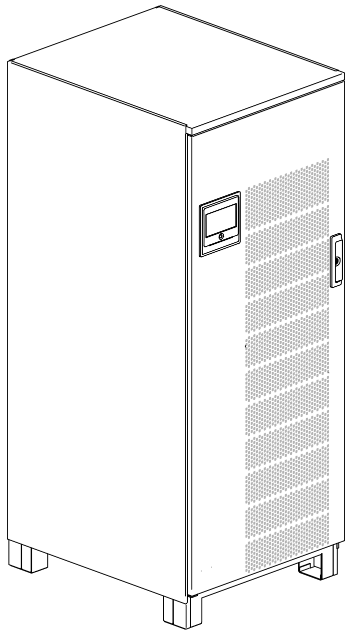
Modulys XM Units can be connected in parallel (up to 4) to increase overall power capacity to meet higher power requirements and increase the flexibility of the system.

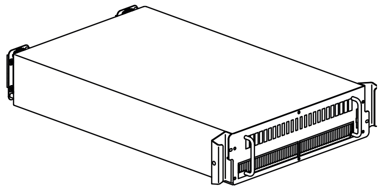
Modulys XM is highly flexible, and this flexibility is further leveraged in its parallel architecture, providing exceptional versatility that encompasses all aspects of parallel architectures, configurations and design.

2.1.1. THE BRICKS

Modulys XM is built on a flexible brick concept. The UPS can be built by associating the bricks according to the requirements.

UNIT	
Max Unit Power (kW)	500
Parallelability	Ready for parallel up to 4
Height (mm)	1990
Width (mm)	800
Depth (mm)	950
Weight (without modules)	400
Cabling	Top
Access for installation/cabling, operation and maintenability	Front access, for all the parts composing the Unit: rear and lateral access are never necessary
Grounding system	Flexibility to work on any grounding system: TN-C – TN-S – IT – TT
Maintenability	Fast and safe maintenance based on parts (like power modules, static bypass, electronic boards, mimic panel) that can be all hot-swapped in inverter mode (double conversion mode) without the need of moving in maintenance bypass or static bypass
	Electronic-free cabinet: all the electronics parts are plug-in (not fixed to the Unit enclosure) and can be hot-swapped
Number of Power Modules	2 → 10
Power Module Size (kW)	50
Number of Static Bypass Modules	1
Bypass Module Size (kW)	500



POWER MODULES		
Power (kW)	50	
Architecture and reliability	Double conversion	
	Completely independent: Rectifier, Inverter, Battery Charger, Internal Control, Control for internal Parallel	
	Segregation at input and output stages for complete isolation of electronic: embedded upstream and downstream galvanic separation and fast fuses	
	Selective disconnection: any potential fault is isolated inside the affected power module, without affecting the remaining modules	
	Heavy duty connectors > 500 mating cycles (certified)	
	MTBF > 1.000.000 h (certified)	
Hot-swap and Module addition for scalability	Hot swap and hot plg-in: safe (EN 62040-1 and EN 50110-1) and completely automatic (certified)	
	Automatic power module self-configuration and testing (certified)	
	Automatic firmware alignment without any intervention of the operator (certified)	
	MTTR < 2 min	
Parallelability	Totally independent power modules with distributed parallel control (no single point of failure: no centralised control)	
Weight (kg)	36	
Cabling	Plug-in	

OPTIONS / EXTENSIONS	
N-PE connection kit for TN-C gounding system	Ready for on-site installation
Input / Auxiliary mains connection kit for common mains	Ready for on-site installation
Remote mimic panel	Ready for on-site installation
Programmable relay card 3 inputs / 4 outputs + insulated RS485 serial link	Ready for on-site installation
Net vision card web/SNMP interface	Ready for on-site installation
Environment temperature and humidity sensor and 2 inputs	Ready for on-site installation
External Battery temperature sensor	Ready for on-site installation
Cold-start kit	Ready for on-site installation
Automatic cross-synchronisation card	Ready for on-site installation (*)
Seismic kit	(*)

(*) consult us

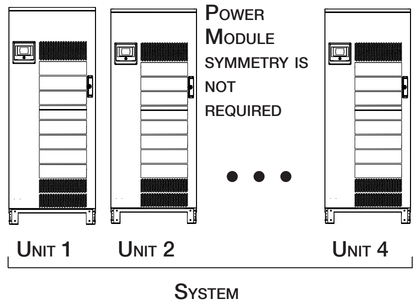
socomec
Innovative Power Solutions

2.1.2. FLEXIBLE RATED POWER

MAXIMUM POWER OF THE PARALLEL SYSTEMS				
Number of Units	1	2	3	4
Configuration w/o redundancy (kW) (1)	500	1000	1500	2000
N+1 redundant power module configuration (kW) (2)	450+50	950+50	1450+50	1950+50
1 redundant Unit configuration (kW)	/	500+500	1000+500	1500+500
1+1 configuration (kW)	/	500+500	/	/
Stand-alone configuration (kW) (3)	500 450+50 (4)	/	/	/

(1) configuring the system without redundancy is not advisable in a high-reliability modular setup, unless the redundancy is at the infrastructure level (2N, 3N2, Catcher, etc.).
(2) power module redundancy can generally be configured as N+R.
(3) stand-alone configuration is possible, enabling operation with a single unit while retaining the flexibility to add additional units in the future.
(4) it is recommended that the standalone configuration includes internal redundancy.

2.1.3. FLEXIBLE ARCHITECTURE



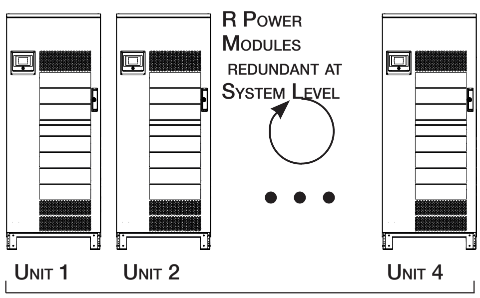
Flexible Distribution of Power Modules:

- Symmetry across units is not required.
- Units may contain different numbers of power modules.
- Units are not required to have the same power capacity

Flexible Scalability:

- A power module can be added to any available slot in the system, regardless of which unit it is in.
- There is no requirement to add one power module to each unit to maintain the same power capacity; symmetry is not necessary

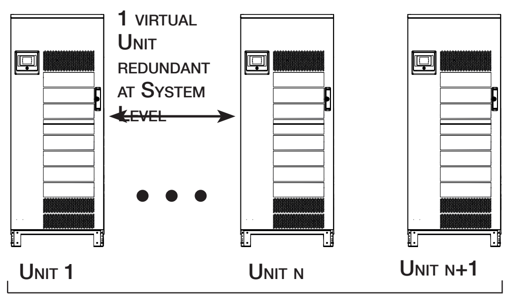
<u>Flexible Redundancy management</u>



System with distributed power module redundancy

Power Module redundancy:

"R" virtual redundant modules (R=1, 2, 3, …) are distributed across the entire system, eliminating the need for identical power module redundancy in each individual unit.



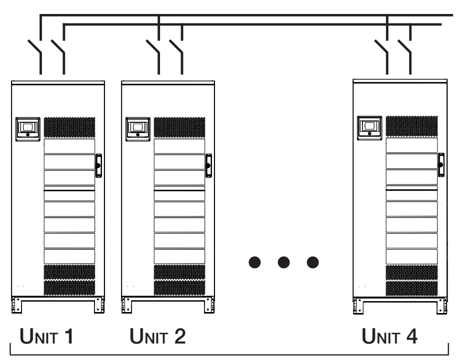
System with distrbuted unit redundancy

Unit redundancy:

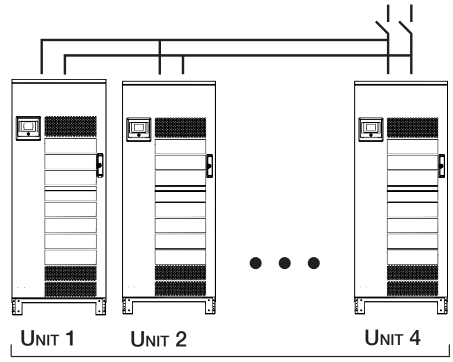
A single virtual redundant unit is designated across the system, with all redundant modules virtually allocated to this unit, though they remain physically distributed across the entire system.

Distributed redundancy across the global system allows for the avoidance of unnecessary duplication of system components, resulting in a cost-effective architecture, redundancy, scalability and maintenance.

Flexible upstream protection architecture

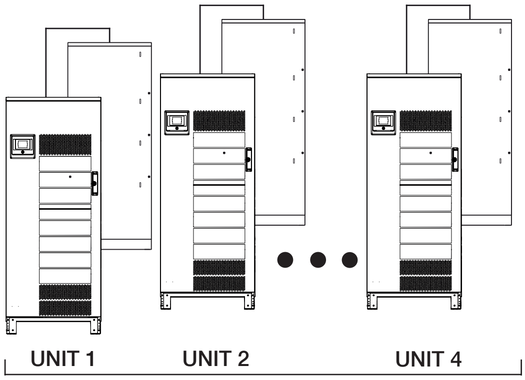


System with distributed upstream architecture

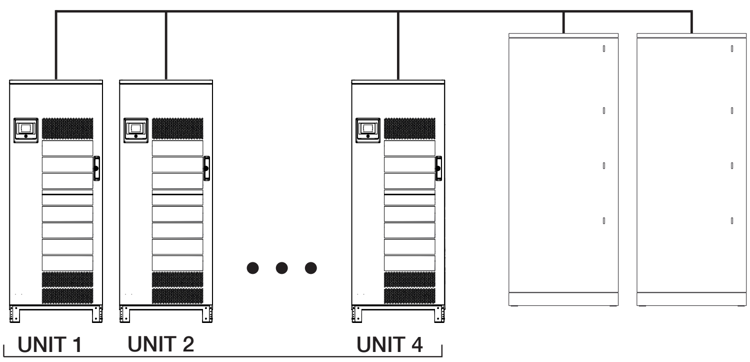


System with common upstream architecture

Flexible battery architecture



System with distributed battery



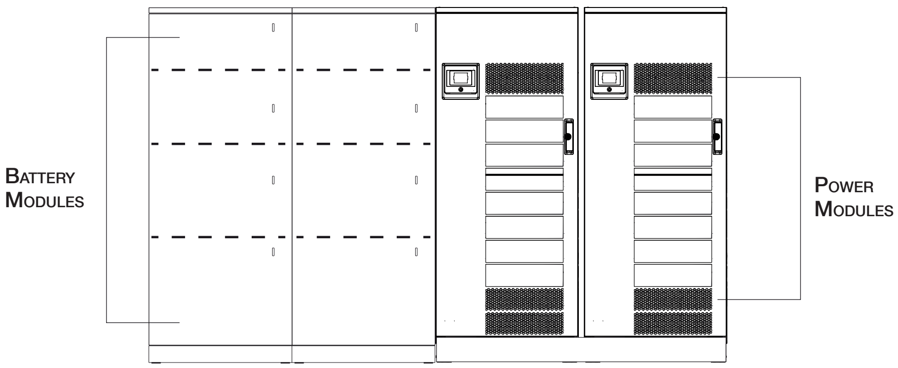
System with shared battery

2.1.4. FLEXIBLE GROUNDING COMPATIBILITY

Compatible with any grounding system: TN-S, TN-C, IT and TT.

2.2. Flexible back-up time

2.2.1. Modular battery cabinet - high capacity



DIMENSIONS AND WEIGHT		
Number of Strings	0	1
Height (mm)	1990	
Depth (mm)	890	
Width (mm)	810	
Weight (kg)	220	1792

High-capacity modular battery cabinets are designed for long back-up times (BUT) with higher power.

A standard temperature sensor optimizes the battery recharging parameters according to the ambient operating temperature to extend battery life.

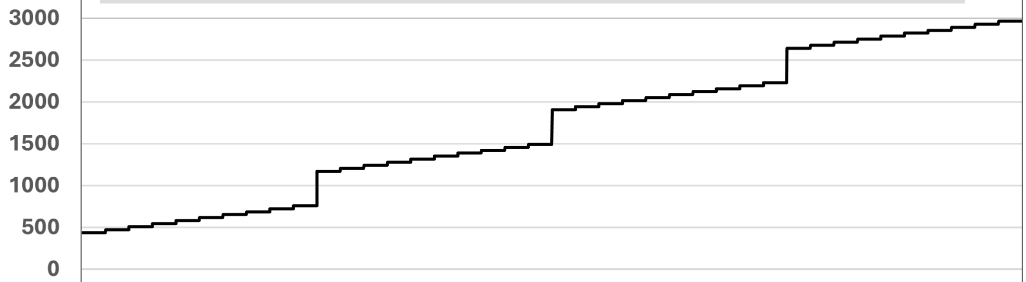
2.2.2. Modular Lithium Battery Cabinet

Consult us.

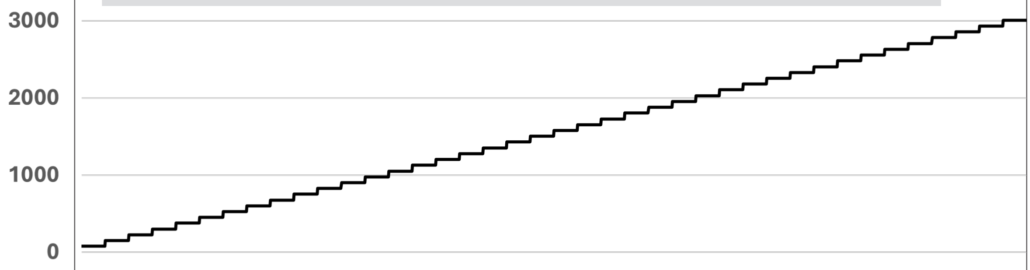
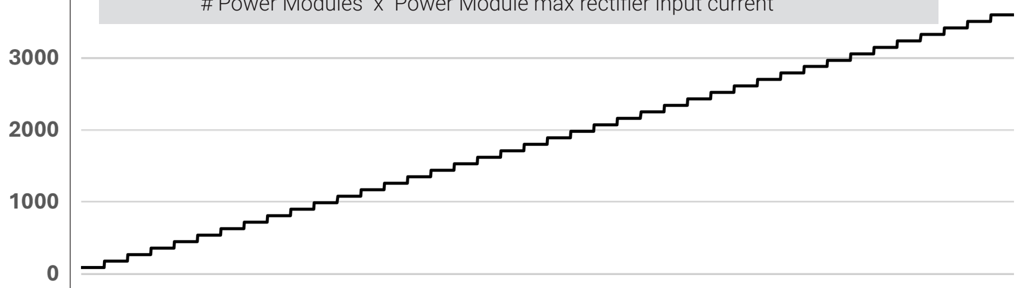
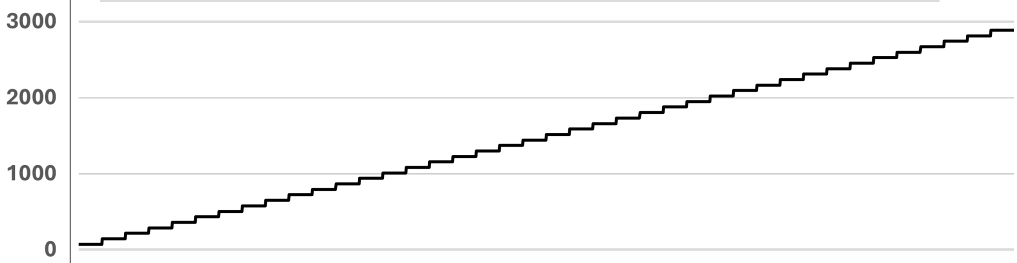
socomec
Innovative Power Solutions

3. SPECIFICATIONS

3.1. Installation parameters

GLOBAL PARALLEL SYSYEM DIMENSIONS AND WEIGHT				
Number of Units	1	2	3	4
Width (mm)	800	1600	2400	3200
Height (mm)	1990			
Depth (mm)	950			
Number of Modules	01 02 03 04 05 06 07 08 09 10	11 12 13 14 15 16 17 18 19 20	21 22 23 24 25 26 27 28 29 30	31 32 33 34 35 36 37 38 39 40
Weight (kg)	Global System Weight = # Units x Empty Unit Weight + # Power Modules x Module Weight 			
Single Empty Unit weight (kg)	400			
Single Power Module weight (kg)	36			

RATED CURRENT AND MAX CURRENT (SINGLE POWER MODULE)	
Rated rectifier input current (EN 62040-1) (A)	75
Max rectifier input current (EN 62040-3) (A)	90
Nominal Inverter output current (A)	72
Max battery current (A)	114

RATED CURRENT AND MAX CURRENT (GLOBAL PARALLEL SYSTEM)				
Number of Modules	01 02 03 04 05 06 07 08 09 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40			
Rated rectifier input current (A) (EN 62040-1)	Global System rated Rectified Input current (A) = # Power Modules x Power Module rated rectifier input current 			
Max rectifier input current (A) (EN 62040-3)	Global System max Rectified Input current (A) = # Power Modules x Power Module max rectifier input current 			
Nominal Inverter output current (A)	Global System nominal Inverter output current (A) = # Power Modules x Power Module nominal Inverter output current 			
Maximum bypass input current (A) (EN 62040-3)	797	1594	2391	3198

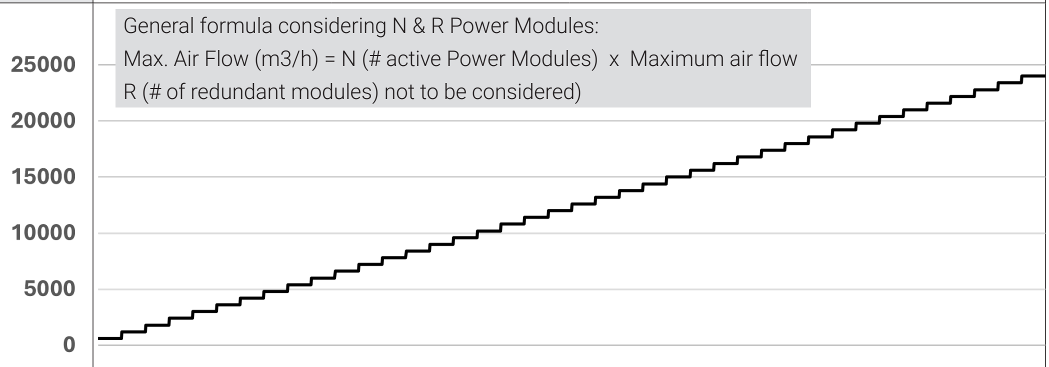
COOLING (SINGLE POWER MODULE)		
Maximum air flow	(m3/h)	600
Power Dissipation under nominal conditions (1)	(W)	2240
	(kcal/h)	1920
	(BTU/h)	7640
Power Dissipation (maximum) under worst-case conditions (2)	(W)	2580
	(kcal/h)	2220
	(BTU/h)	8810

(1) worst-case: R (# redundant modules) = 0
(2) nominal input voltage and rated output active power (PF=1)

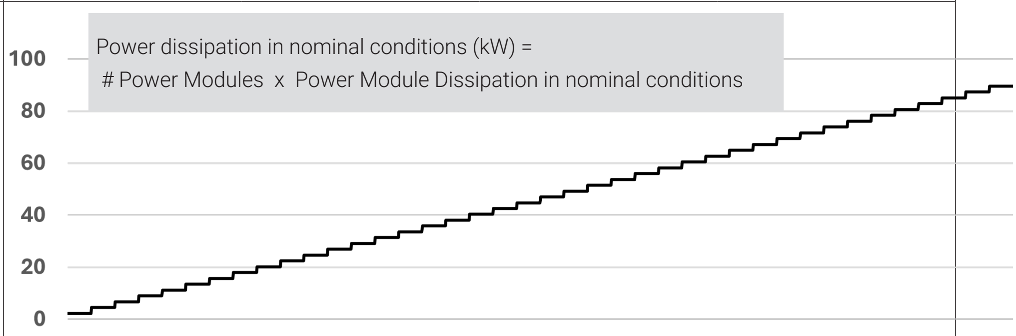
COOLING (GLOBAL PARALLEL SYSTEM)

Number of Units	1	2	3	4
Number of Modules	01 02 03 04 05 06 07 08 09 10	11 12 13 14 15 16 17 18 19 20	21 22 23 24 25 26 27 28 29 30	31 32 33 34 35 36 37 38 39 40

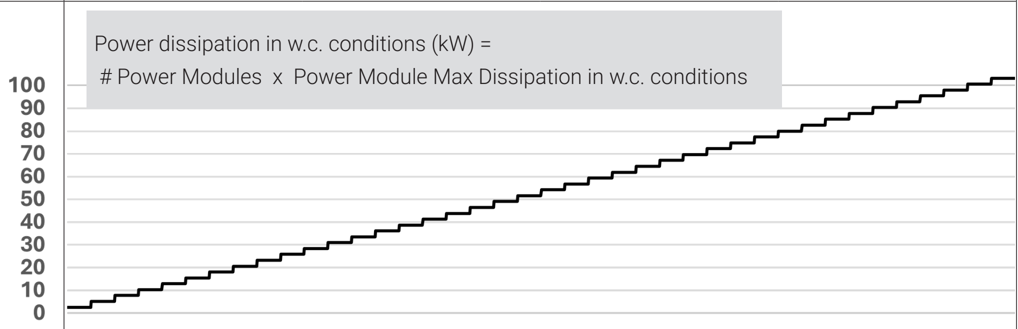
Maximum air flow [1] (m^3/h)



Power Dissipation in nominal conditions [1] [2] (kW)



Power Dissipation in worst-case conditions [1] [2] [3] (kW)

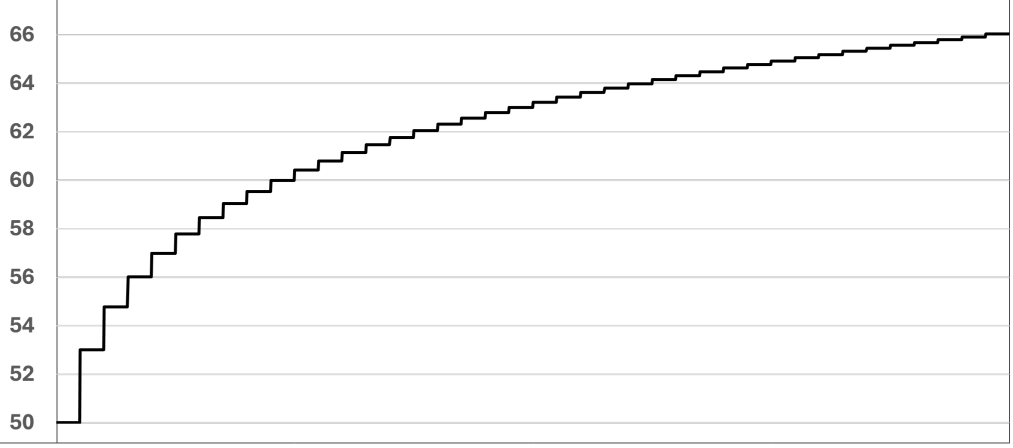


(1) worst-case: R (# redundant modules) = 0
(2) nominal input voltage and rated output active power (PF=1)
(3) low input voltage, battery recharge and rated output active power (PF=1)

ACOUSTIC NOISE

Number of Units	1	2	3	4
Number of Modules	01 02 03 04 05 06 07 08 09 10	11 12 13 14 15 16 17 18 19 20	21 22 23 24 25 26 27 28 29 30	31 32 33 34 35 36 37 38 39 40

Acoustic noise at 1m [1] (dBA)



(1) at 70% nominal load.

3.2. Electrical characteristics

3.2.1. Electrical characteristics independent OF the number of modules and units

ELECTRICAL CHARACTERISTICS - INPUT	
Rated mains supply voltage (V)	400 V 3-phase+N
Voltage tolerance at full load	340 V to 480 V (+20 / -15%)
Voltage tolerance at derated load	up to 240 V @ 50% of nominal load (linear decrease)
Rated frequency (Hz)	40 - 70 Hz
Power factor	> 0.99 (1)
Total harmonic input current distortion (THDi)	≤ 3% (@: Pn, Resistive load, Mains THDv ≤ 1%)
Max inrush current at start-up	Power walk-in / Soft-start (selectable parameters)

(2) Pout ≥ 50% of nominal Power.

ELECTRICAL CHARACTERISTICS - BYPASS	
Bypass rated voltage (V)	Nominal output voltage ±15% (±20% if GENSET is used)
Bypass rated frequency (Hz)	50 / 60
Bypass frequency tolerance	±2% selectable (±8% if GENSET is used)
Bypass frequency variation speed	50 / 60 ±10%

ELECTRICAL CHARACTERISTICS - INVERTER	
Rated output voltage (V)	(3ph + N) 400 380 / 400 / 415 selectable
Output voltage tolerance (V)	±1%
Rated output frequency (Hz)	50 / 60 (selectable)
Output frequency tolerance	±0.05% (on battery mode)
Load crest factor	≥ 2.7 :1
Total output voltage distortion (THDv)	≤ 1% (Ph / Ph) ; ≤ 2% (Ph / N) (@: Pn, Resistive load)

ELECTRICAL CHARACTERISTICS - STORED ENERGY OPERATING MODE	
Number of battery blocks (VRLA)	From 18+18 to 24+24 (1)

(3) Consult us

ELECTRICAL CHARACTERISTICS - EFFICIENCY	
Efficiency (on-line mode)	up to 96.5%
Efficiency (eco-mode)	up to 99.3%

ELECTRICAL CHARACTERISTICS - BYPASS OVERLOAD AND SHORTCIRCUIT PERFORMANCE					
	Number of Units	1	2	3	4
	Number of Power Modules	2 → 10	11 → 20	21 → 30	31 → 40
Bypass overload (A)	Nominal	725	1449	2174	2899
	Continuous	797	1594	2391	3188
	10'	906	1812	2717	3623
	1'	1087	2174	3261	4348
	1"	1268	2536	3804	5072
Bypass Max short-circuit current I_{TSM} (A_{pk}) (1)	20 ms	21000	34000	50000	67000
Bypass I^2t (A^2s) (1)		2200000	5600000	12700000	22600000

ELECTRICAL CHARACTERISTICS - SINGLE UNIT SHORT CIRCUIT SAFETY PERFORMANCE		
	Number of Power Modules	1 → 10
Conditional short circuit current Icc (A_{RMS}) (2) (3)		100 kA
Short-circuit current withstand Icw (A_{RMS}) (4)	High short-circuit (Standard Unit) (5) (7)	35 kA
	Extra-high short-circuit (Optional Unit) (6) (7)	65 kA

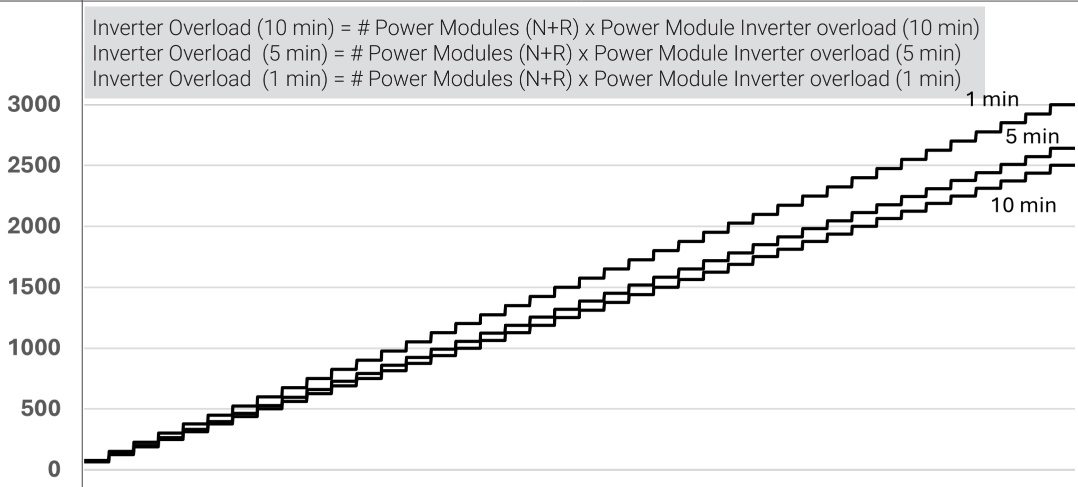
(1) Ta = 25°C
(2) short-circuit safety withstanding Icw (IEC/EN 62040-1 requirement without upstream protection)
(3) with Standard Unit (high short-circuit Icw = 35 kW) and each Unit with defined upstream protection (consult us)
(4) short-circuit safety withstanding Icc (IEC/EN 62040-1 requirement with upstream protection)
(5) standard Unit Icw = 35 kA for enhanced short-circuit safety withstanding (above IEC/EN 62040-1 requirements: Icw = 17 kA)
(6) extra rugged Unit Icw = 65 kA for enhanced short-circuit safety withstanding (above IEC/EN 62040-1 requirements: Icw = 17 kA)
(7) third party certified

3.2.2. Electrical characteristics dependent on the number of modules AND UNITS

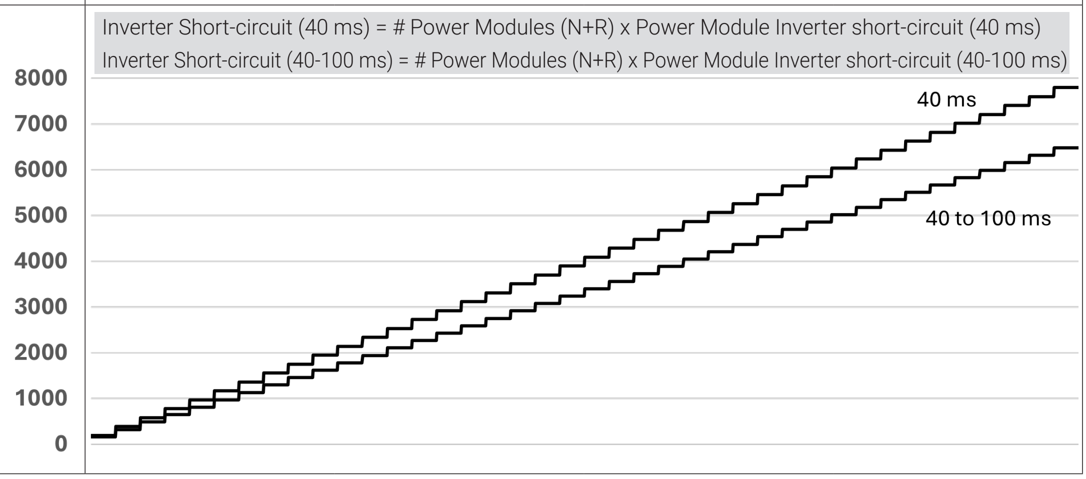
ELECTRICAL CHARACTERSTICS (SINGLE POWER MODULE) – INVERTER OVERLOAD AND SHORT-CIRCUIT		
Inverter overload (1) (kW)	10 min	62.5
	5 min	66
	1 min	75
Inverter short-circuit (A) Ik1 = Ik2 = Ik3	40 ms	195
	40 to 100 ms	162

ELECTRICAL CHARACTERSTICS (GLOBAL PARALLEL SYSTEM) – INVERTER OVERLOAD AND SHORT-CIRCUIT				
Number of Units	1	2	3	4
Number of Modules	01 02 03 04 05 06 07 08 09 10	11 12 13 14 15 16 17 18 19 20	21 22 23 24 25 26 27 28 29 30	31 32 33 34 35 36 37 38 39 40

Inverter overload (1)
(kW)
10 min
5 min
1 min



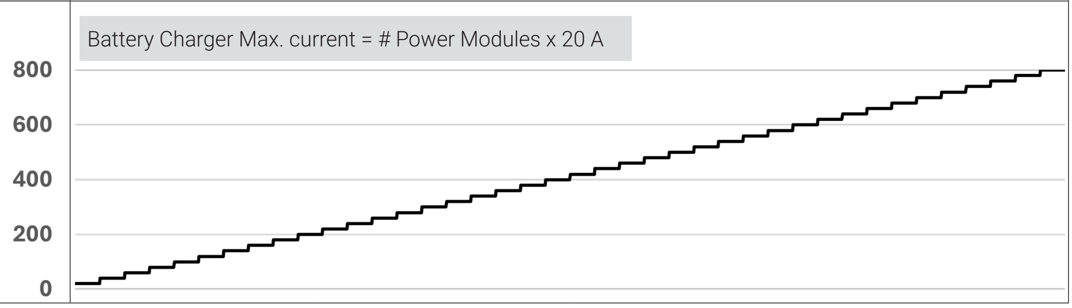
Inverter short-circuit
(A)
Ik1 = Ik2 = Ik3



(1) Conditions: Initial Pout ≤ 80% Pn, Vin nominal

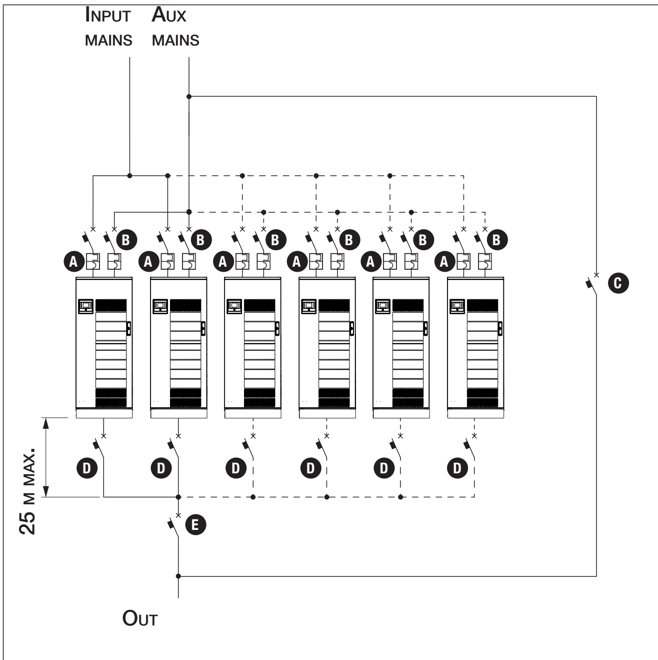
ELECTRICAL CHARACTERSTICS - BATTERY CHARGER MAX CURRENT				
Number of Units	1	2	3	4
Number of Modules	01 02 03 04 05 06 07 08 09 10	11 12 13 14 15 16 17 18 19 20	21 22 23 24 25 26 27 28 29 30	31 32 33 34 35 36 37 38 39 40

Max battery current
(A)



3.3. Recommended protection

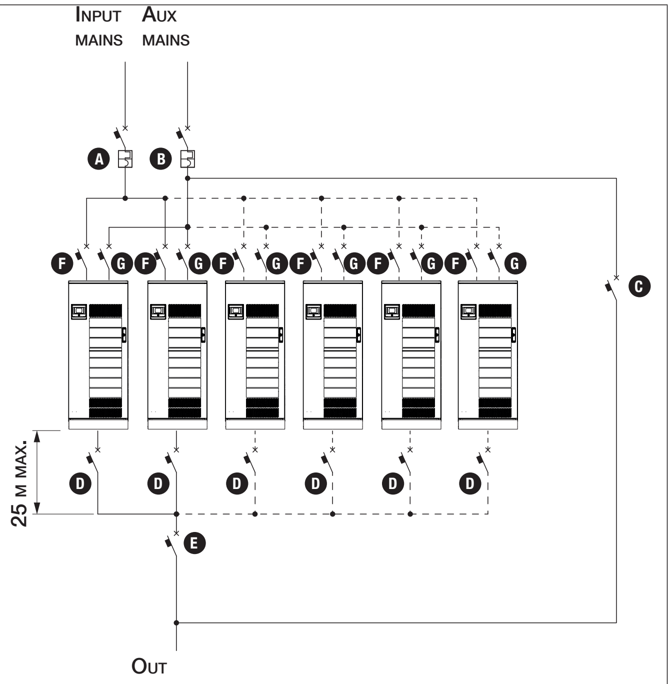
3.3.1. Architectures of Parallel System up to 2 MW based on 50→500 kW Units



PARALLEL SYSTEM WITH DISTRIBUTED UPSTREAM ARCHITECTURE

KEY

A	Unit input mains thermal-magnetic circuit breaker.
B	Unit auxiliary mains thermal-magnetic circuit breaker.
C	System external maintenance by pass switch (connect signal status to the parallel board)
D	Unit output switch
E	System shutdown switch



PARALLEL SYSTEM WITH COMMON UPSTREAM ARCHITECTURE

KEY

A	System input mains thermal-magnetic circuit breaker.
B	System auxiliary mains thermal-magnetic circuit breaker.
C	System external maintenance by pass switch (connect signal status to the parallel board)
D	Unit output switch
E	System shutdown switch
F	Unit input mains switch
G	Unit auxiliary mains switch

The installation and system should comply with national plant regulations.

The electrical distribution panel should have a sectioning and protection system installed for input and auxiliary mains.

SINGLE UNIT CABLE - MAX SECTION		
Rectifier terminals (mm²)	Flexible	3 x 240
	Rigid	3 x 240
Bypass terminals (mm²)	Flexible	3 x 240
	Rigid	3 x 240
Battery terminals (mm²)	Flexible	3 x 240
	Rigid	3 x 240
Output terminals (mm²)	Flexible	3 x 240
	Rigid	3 x 240

M10 terminals

Tightening torque 20 Nm

Maximum cross-section is determined by the size of the terminals.

As specified in EN 62040-3 Appendix 3 (Non-Linear Load Reference), in the event of three-phase non-linear loads connected downstream of the UPS, the neutral current on the load can be 1.5 - 2 times higher than the phase current. This should be taken into account when estimating the correct size of output and auxiliary neutral cables.

The Unit is designed for bottom connections. A specific option is available for top connection.

RECOMMENDED PROTECTION DEVICES - INPUT MAINS						
Architecture		Distributed protections (1 rectifier protection for each Unit)	Common protections (1 rectifier protection for all the Units)			
Number of Units		1 → 4	1	2	3	4
Circuit breaker (A)	Minimum	1000	For a common protection architecture, the sizing of the upstream protection system must consider the rated and maximum rectifier current of the parallel system (§ 2.1), the protection of connection cables based on their size (§ 2.3), and compliance with local standards and regulations.			
	Maximum					

A circuit breaker switch with a magnetic intervention threshold of ≥10 In is recommended.

When an optional external transformer is used, a circuit breaker with Im ≤ 20 x In (A) and selective breaker capabilities is necessary.

The minimum value depends on the size of the power cables in the installation, while the maximum value is constrained by the UPS cabinet.

The system can accommodate the maximum size of protection, regardless of the number of modules installed, to allow for future scalability.

A protection value lower than the maximum must be used when the mains network structure or cables cannot support the full power load. This value should be selected accordingly.

When the auxiliary mains and input are connected together, the general input protection rating must be higher than that of either the auxiliary mains or the rectifier.

RECOMMENDED PROTECTION DEVICES - AUXILIARY MAINS						
Architecture		Distributed protections (1 rectifier protection for each Unit)	Common protections (1 rectifier protection for all the Units)			
Number of Units		1 → 4	1	2	3	4
Circuit breaker (A)	Minimum	800	For a common protection architecture, the sizing of the upstream protection system must consider the rated and maximum rectifier current of the parallel system (§ 2.1), the protection of connection cables based on their size (§ 2.3), and compliance with local standards and regulations.			
	Maximum					

A circuit breaker switch with a magnetic intervention threshold of ≥10 In is recommended.

If an optional external transformer is used, a circuit breaker with Im ≤ 20 x In (A) and selective breaker capabilities is required.

The minimum value depends on the size of the power cables in the installation, while the maximum value is limited by the UPS cabinet.

The conditional short-circuit current (Icc) in compliance with IEC 62040-1 is 65 kArms (§ 2.2.1), provided that the UPS is protected by an MCCB with adequate breaking capability and current-limiting capacity under short-circuit conditions.

For detailed information, please contact us.

RECOMMENDED PROTECTION DEVICES - UPSTREAM RESIDUAL DETECTION CIRCUIT BREAKER						
Architecture		Distributed protections (1 rectifier and aux. mains protection for each Unit)	Common protections (1 rectifier and aux. mains protection for the global parallel system)			
Number of Units		1 → 4	1	2	3	4
Differential input (A)	Minimum	RCD devices cannot be used on parallel system with distributed protections	0,5A (1)			

(1) RCD devices are not recommended as upstream common protection in a parallel system.
RCD devices are unnecessary when the UPS is installed in a TN-S system.
RCD devices are not permitted in TN-C systems.

4. REFERENCE STANDARDS AND DIRECTIVES

4.1. Overview

REFERENCE	TITLE
2014/35/EU	Directive of the European Parliament and of the council of 26 February 2014 on the harmonisation of the laws of the Member States relating to the making available on the market of electrical equipment designed for use within certain voltage limits.
2014/30/EU	Directive of the European Parliament and of the council of 26 February 2014 on the harmonisation of the laws of the Member States relating to electromagnetic compatibility.
2011/65/EU	Directive of the European Parliament and of the council of 8 June 2011 on the restriction of the use of certain hazardous substances in electrical and electronic equipment.

4.2. Standards

STANDARD	
Safety	EN / IEC 62040-1 - AS 62040-1
EMC	EN / IEC 62040-2 - AS 62040-2
Product certification	IECEE CB Scheme
Performance	EN / IEC 62040-3 - AS 62040-3
Product marks	CE - RCM[1] - CMIM[1] - UKCA [1]
Protective class	Protective Class I
Protection level	IP20

(1) depends on the production site. Consult the data plate on the equipment.

ELITE UPS: a mark of efficiency

Socomec, as CEMEP UPS manufacturer member, has signed a Code of Conduct put forward by the Joint Research Centre of the European Commission (JRC), to ensure the protection of critical applications and processes ensuring 24/7 continuous high quality supply. The JRC commits to mitigating energy losses and gas emissions caused by UPS equipment, therefore maximising UPS efficiency.

TECHNICAL GUIDE

EN

MODULYS XL

200 kW to 4.8 MW
Ultimate modular UPS

ULTIMATE

Fault tolerant power
without compromise

3 LEVEL TECHNOLOGY

97% EFFICIENCY

kW = kVA

Socomec Resource Center
To download, brochures, catalogues
and technical manuals

socomec
Innovative Power Solutions

1. OBJECTIVES

The aim of these specifications is to provide the information required to prepare the system and installation site.

The specifications are intended for:

- Installation engineers.
- Design engineers.
- Engineering consultants.

2. INSTALLATION REQUIREMENTS AND PROTECTION

Connection to the mains power supply and to the load(s) must be made using cables of suitable size, in accordance with current standards. If not already present, an electrical control station which can isolate the network upstream of the UPS must be installed. This electrical control station must be equipped with a protection (or two, if there is a separate bypass line) of an appropriate rating for the power draw at full load.

For detailed information, see the installation and operating manual.

socomec
Innovative Power Solutions

1. ARCHITECTURE

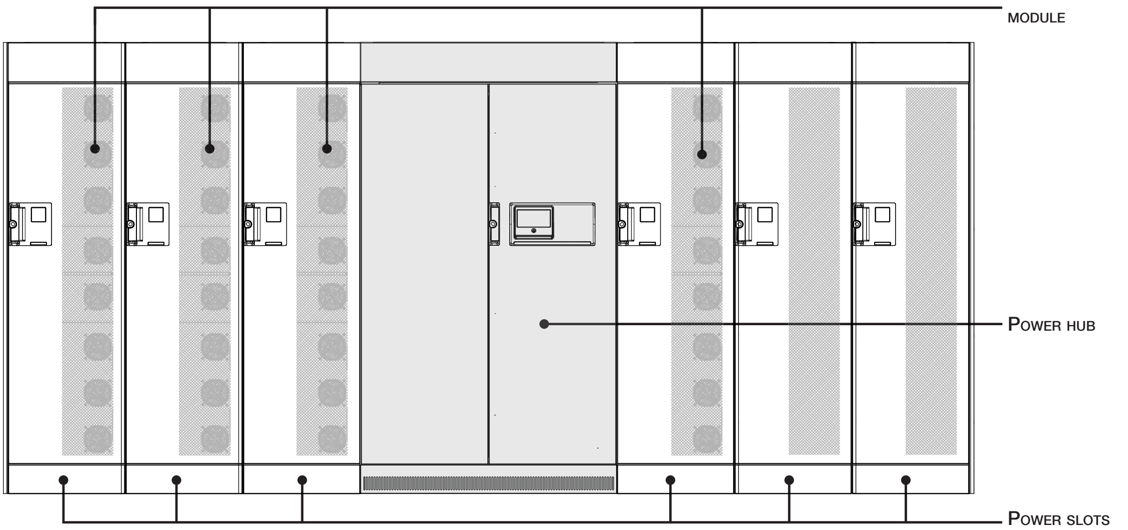
1.1. Range

MODULYS XL is a modular UPS system designed to provide high performance and power scalability.

Power scalability can be by adding power blocks of 200 kW (Power module) to extend the system up to 1200 kW or less, according to the maximum power requirement. Systems can be parallelised to increase the rated power up to 4,8 MW

As the system has been designed to allow the power module to be hot-swappable, the load can be fully protected by on-line double conversion during system extension or maintenance.

Manufactured in Europe, MODULYS XL is a modular system including an individual Socomec switching system for each power block enabling easy and safe coupling and disconnection.



Power HUB for the UPS Unit

- All input(s) - output and battery connections to the UPS unit.
- Full rated centralized static switch on bypass line
- Remote communication interfaces
- User interface (HMI)
- 63A-3Ph plug for advanced maintenance services

Power SLOT for Power MODULE plug-in

- built-in bus bars for interconnection together with others Power SLOTs and to the Power HUB
- Preconnected communication bus

Power MODULE rated for 200 kVA/kW permanent operating

- Single and full rated Rectifier - Inverter & Battery charger
- Double conversion's side bypass device
- Selective disconnection at input and output stages for complete isolation (contactors and fuses)
- Local battery disconnection switch - to isolate the module from the Battery bus
- Plug-in system (power and control) to connect on the Unit

1.2. Rated power

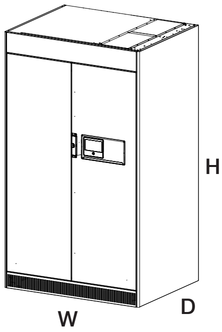
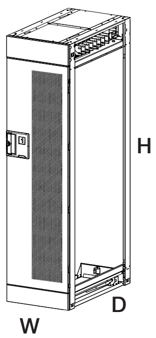
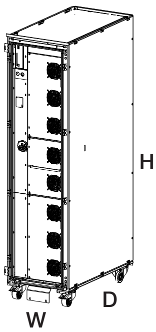
The rated power is related to the number of installed Power modules. The number of Power slots installed at the beginning defines maximum power that can be reached through Hot-scalability at each UPS UNIT level.

RATED POWER PER UPS UNIT																		
Number of Power Slots	3			4				5					6					
Number of power module (200 kW)	1	2	3	1	2	3	4	1	2	3	4	5	1	2	3	4	5	6
Power (kW) N configuration at 40°C	200	400	600	200	400	600	800	200	400	600	800	1000	200	400	600	800	1000	1200
Power (kW) N+1 configuration at 40°C		200	400		200	400	600		200	400	600	800		200	400	600	800	1000
Parallel units	up to 4 units (200-1200kVA/kW) in parallel																	

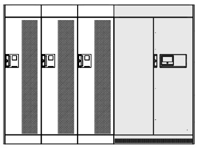
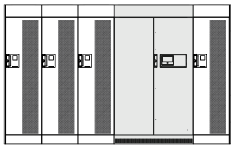
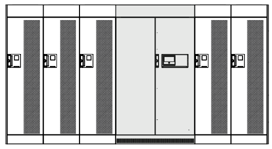
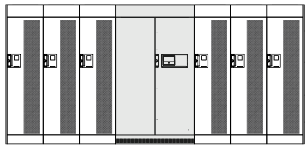
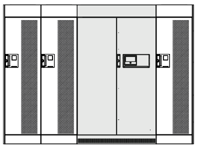
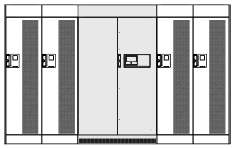
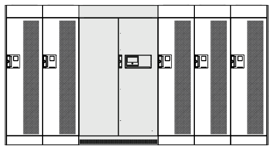
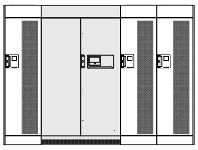
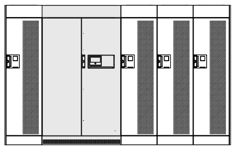
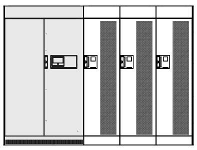
1.3. The BRICKS

MODULYS XL is built on a flexible brick concept. The UPS can be built by associating the bricks according to the requirements.

1. Select the Power HUB
2. Specify the number of Power slots according to the maximum power and the redundancy level which is required to protect the load at the final stage.
3. Specify the number of Power modules needed to protect the load at the initial stage; Power Modules are plugged into installed Power Slots.
   Unused Power slots are ready for later Power module hot plug-in, when needed.

DIMENSIONS AND WEIGHT						
Section	View	Rated power (kVA/kW)	Width [W] (mm)	Depth [D] (mm)	Height [H] (mm)	Weight (kg)
Power HUB		Up to 1200	1200	975	2120	750
Power slots		200	550	975	2120	110
Power module		200	500	950	1940	460

The design allow flexible power slot number and position- up to 3 on each side

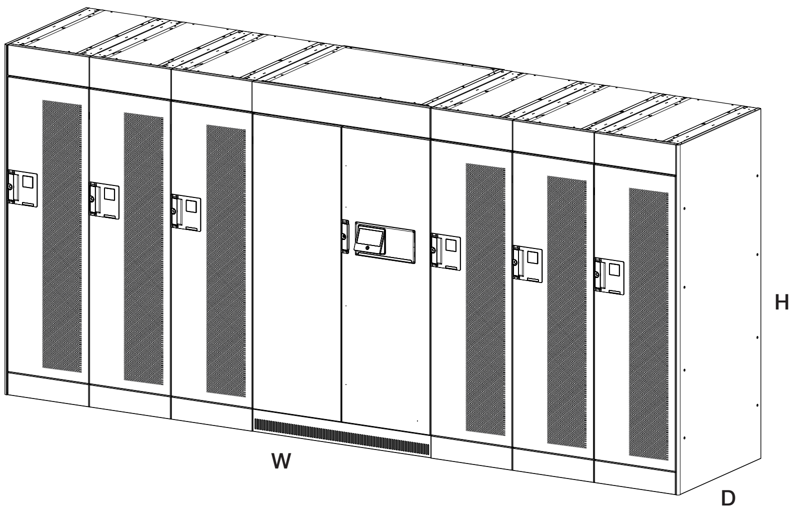
3 Power slots	4 Power slots	5 Power slots	6 Power slots
			
			
			
			

The UPS Unit can be defined as per required.

Slots installed at initial stage are ready to hot plug Power modules.

Power modules can be plugged into power slot without any constrain of position or number.

UNIT dimensions



UNIT DIMENSIONS						
Number of **Power slots**			3	4	5	6
Maximum power (kW)			600	800	1000	1200
UNIT size	Width [W] (1)	mm	2890	3440	3990	4540
	Depth [D]	mm	975			
	Height [H]	mm	2120			
Weight		kg	2500	3100	3650	4250
Single unit Clearances		mm	No rear or lateral clearance,Top = 400 mm			
Access for maintenance		mm	Front only (≥ 1200 mm free space for Module extraction)			

(1) Width is including left and right side panels.

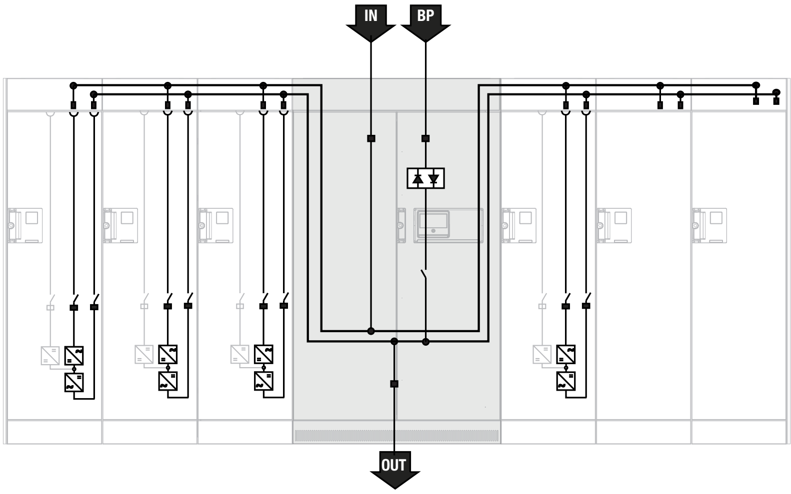
1.4. System architectures

MODULYS XL's design simplifies the connection to the upstream and downstream switchboards resulting in a simpler, faster and safer unit than a traditional UPS solution. All connections to the electrical infrastructure are performed on the system, without any modification to the site installation when power module(s) are added.

For full adaptation to all types of infrastructure and environments, MODULYS XL can be:

- set with common or separated inputs.
- top and bottom entry UPS connection
- energy storage flexibility (Distributed, Shared or Mixed).

1.4.1. Bypass architecture

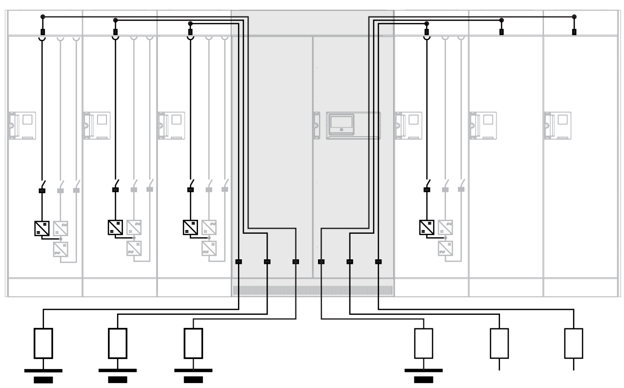
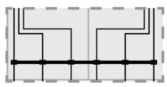
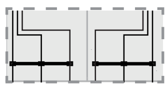
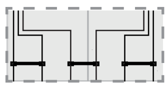


By-pass architecture for each UPS UNIT

The above drawings show simplified diagrams for separated inputs (Rectifier / Bypass).

1.4.2. Battery connection

Modulys XL provides full flexibility in regards to the batteries connection. This permits to address all different needs in term of availability, cost and footprint optimization.

<table>
<tr><td rowspan="3"></td><td></td><td>1 battery set shared for
All installed slots/modules</td></tr>
<tr><td></td><td>1 battery set shared for
3 power slots/modules</td></tr>
<tr><td></td><td>1 battery set shared for
2 power slots/modules</td></tr>
<tr><td>Distributed battery</td><td colspan="2">Flexible battery sharing</td></tr>
</table>

The battery switch in the module allows to connect / disconnect it from the battery bus without the need to remove the entire battery set (ie Shared battery).

For a full hot scalability during a battery set extension, 2 solutions are availbale with Modulys XL :

- The future battery protection can be directly prewired to the Power HUB

or

- An additionnal power slot can be installed to provide a full front access to the future battery set.

For parallel systems, each system can have its own battery coupling design.

2. STANDARD AND OPTIONAL EQUIPMENTS

2.1. FLEXIBLE UPS UNIT ARCHITECTURE

- Hot-scalable or Cold-scalable power.
- Adjustable redundancy level.
- Common or separated rectifier and bypass mains.
- Compatible with different energy storage technologies (e.g.VLRA, Li-Ion, Ni-Cd...).

2.2. Standard electrical features.

- Separated inputs (rectifier, bypass).
- Top or bottom cable entry.
- Backfeed protection: detection circuit.
- Full redundant cooling system.
- Distributed batteries (1 per module).
- Battery room temperature sensor.
- Module heat run test.
- Full system heat run test.
- 63 A three-phase plug for extracted module testing.
- External switches position management
- Firmware and parameter auto-alignment
- Energy Saver mode

2.3. Electrical options.

- Input, output and maintenance bypass switches.
- 3-wires bypass and output distribution kit.
- PEN kit for TN-C grounding system.
- Shared batteries (1, 2 or 3 per unit).
- Reinforced battery charger.
- Battery tripping kit.
- Additional battery temperature sensors.
- Redundant electronic power supplies.
- BCR (Battery Capacity Re-injection).
- Smart Conversion Mode.
- ACS synchronisation system.
- Cold start.

2.4. Standard communication features.

- User-friendly 7’ touch-screen multilingual color graphic display (Power Hub).
- Tricolour display with number for Power Module status (Power Slot)
- 4 Com-Slots for communication options.
- USB port to download UPS report and log file.
- Ethernet port for service purpose.

2.5. Communication options.

- Dry-contact interface (configurable Volt-free contacts).
- MODBUS RTU RS485 or TCP
- NET VISION: professional WEB/SNMP Ethernet interface for secure UPS monitoring and remote automatic shutdown.
- NET VISION EMD: Environment Temperature and Humidity sensor with 2 inputs
- Remote View Pro supervision software.
- IoT Gateway for Socomec cloud services and SoLive mobile app.
- Remote touch-screen panel.

2.6. REMOTE MONITORING AND CLOUD SERVICES.

- SoLink: Socomec 24/7 Remote Monitoring Service connecting your installation to the nearest Socomec Service Centre.
- SoLive: Mobile app taking the surveillance of all your UPS systems into your smartphone.

3. SPECIFICATIONS

3.1. Installation parameters

SYSTEM INSTALLATION												
Unit Rated power (kVA)		200	400	600	800	1000	1200	200	400	600	800	1000
System configuration		N configuration						N+1 redundant configuration				
Number of Power module (200 kW)		1	2	3	4	5	6	1+1	2+1	3+1	4+1	5+1
Active power	(kW)	200	400	600	800	1000	1200	200	400	600	800	1000
Rated rectifier input current	(A)	302	604	906	1208	1510	1812	302	604	906	1208	1510
Maximum rectifier input current	(A)	340	680	1020	1360	1700	2040	680	1020	1360	1700	2040
Rated input bypass current	(A)	289	577	866	1155	1443	1732	289	577	866	1155	1443
Maximum rated bypass current	(A)	1732										
Rated output current @ 400 V	(A)	289	577	866	1155	1443	1732	289	577	866	1155	1443
Maximum air flow	(m^3/h)	2100	4200	6300	8400	10500	12600	4200	6300	8400	10500	12600
Power dissipation in nominal conditions(1)	(kW)	8.5	17.0	25.5	34.0	42.5	51.0	8.5	17.0	25.5	34.0	42.5
	(kcal/h) x1000	7.3	14.6	21.9	29.2	36.5	43.8	7.3	14.6	21.9	29.2	36.5
	BTU/h x1000	29	58	87	116	145	174	29	58	87	116	145
Power dissipation (max) in the worst conditions (2)	(kW)	10.4	20.8	31.2	41.6	52.1	62.5	10.2	21.2	32.6	44.3	55.7
	(kcal/h) x1000	8.9	17.9	26.8	35.8	44.8	53.7	8.8	18.2	28	38.1	47.9
	BTU/h x1000	35.5	71	106	142	178	213	34.8	72.3	111	151	190

3.2. Electrical characteristics

ELECTRICAL CHARACTERISTICS - RECTIFIER INPUT(3)	
Rated mains supply voltage	400 V 3ph
Voltage tolerance	200 V to 480 V(4)
Rated frequency	50/60 Hz
Frequency tolerance	45 to 65 Hz
Power factor	> 0.99(5)
Total harmonic distortion (THDi)	< 2.5%(5)
Max inrush current at start-up	< In (no overcurrent)
Soft start (Power walk-in)	Configurable from 1A/s to 1000A/s per module

ELECTRICAL CHARACTERISTICS - BATTERY	
Battery Type	VRLA – Lithium Ion - Ni-Cd
Number of poles	2 wires (+/-)
Battery Voltage range	Up to 700V
Lithium Ion communication with UPS	Basic (Dry contact) / Smart (Modbus)
Min/Max number of VRLA battery cells with load PF=1	258
Min/Max number of VRLA battery cells with load PF ≤ 0.9	234
Min/Max number of VRLA battery cells with load PF ≤ 0.8	222
Battery AC ripple current	< 3% C10
Battery AC ripple voltage	< 1% on the battery bloc
Battery charger	40A per module (standard) 120A per module (optional)

ELECTRICAL CHARACTERISTICS - STATIC BYPASS		
Bypass rated voltage		Nominal output voltage
Bypass voltage tolerance		±15% (settable)
Bypass rated frequency		50/60 Hz (selectable)
Bypass frequency tolerance		±2% (from ±1% to ±5% (operation with generator unit))
Bypass frequency variation speed follow up		1 Hz/s settable from 1 to 3 Hz/s
Semiconductors characteristics	I^2t (A^2s)	Up to 10 400 000
	Is/c (A peak)	Up to 45 500
Overload tolerated on the bypass mains	60 min	110% of the installed apparent power
	10 min	125% of the installed apparent power
Short-circuit withstanding (Icw)	kA	100 (symmetrical) without fuses

ELECTRICAL CHARACTERISTICS - INVERTER							
Number of installed Power module (200 kVA/kW)		1	2	3	4	5	6
Rated output voltage (selectable)		400 V 3ph					
Output voltage tolerance		static load <1%, dynamic load VFI-SS-111 compliant					
Rated output frequency		50/60 Hz (selectable)					
Autonomous frequency tolerance		±0.01 Hz on mains power failure					
Harmonic voltage distortion		ThdU ≤ 1 % with rated linear load					
Overload tolerated(6) by the inverter	1h	220 kW	440 kW	660 kW	880 kW	1100 kW	1320 kW
	10 min	250 kW	500 kW	750 kW	1000 kW	1250 kW	1500 kW
	1 min	300 kW	600 kW	900 kW	1200 kW	1500 kW	1800 kW

ENVIRONMENT CHARACTERISTICS	
UPS storage conditions	-20 to +70 °C under ≤70% condensation free RH
UPS start-up and working conditions	0 to +50 °C under ≤95% condensation free RH
Air inlet	Front
Air outlet	Top
Operating relative humidity (non-condensing)	≤ 95%
Power module efficiency in double conversion (VFI)	up to 97%
Acoustic noise	< 75 dBA
Maximum altitude without derating	1000 m (3,300 ft)
Degree of protection	IP 20 (IP30 top grids)
Colour	RAL 7016

(1) Nominal input current and rated output active power (PF1). Losses for N+1 configuration is considering the worst case (Redundancy lost).
(2) Dissipation that may be generated temporary, considering: Low input voltage, battery recharge and rated output active power (PF1).
(3) IGBT rectifier.
(4) Conditions apply.
(5) At full load and rated input voltage (THDV < 1%).
(6) The tolerated output overload corresponds to the inverter capability only. The output overload performance is incremented by the static bypass capability (when available)

3.3. Recommended system protections

3.3.1. INPUT PROTECTIONS FOR SINGLE UNIT CONFIGURATION

RECOMMENDED PROTECTION DEVICES – RECTIFIER INPUT(7) Ax				
	Configuration N		Configuration N+1	
Max power (kVA)	Number of Power slots	Protection rating (A)	Number of Power slots	Protection rating (A)
400	2	800	3	1250
600	3	1250	4	1600
800	4	1600	5	2000
1000	5	2000	6	2500*
1200	6	2500*		

* Maximum input current can be configured to fit with a 2000A circuit breaker (please consult us)

RECOMMENDED PROTECTION DEVICES – BYPASS INPUT MAIN(7) Bx				
	Configuration N		Configuration N+1	
Max power (kVA)	Number of Power slots	Protection rating (A)	Number of Power slots	Protection rating (A)
400	2	800	3	800
600	3	1000	4	1000
800	4	1250	5	1250
1000	5	1600	6	1600
1200	6	2000		

All recommended protection are considering the number of Power slots planned to be installed, at initial stage or later.

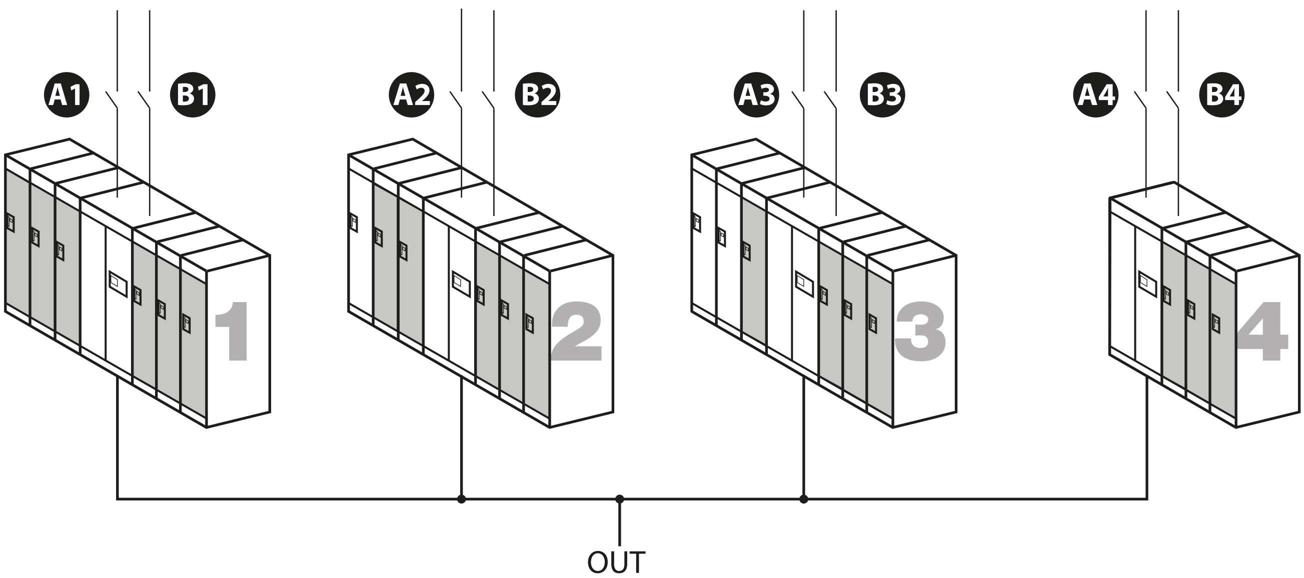
3.3.2. INPUT PROTECTIONS FOR PARALLEL UNITS CONFIGURATION

For parallel Units, protection devices upstream to each UPS UNIT are recommended as per the following guidelines:

Rectifiers: Each UNIT's input can be protected according to the number of installed Power Slots - Refer to the recommended protection for a Single Unit.

Bypass: Each UNIT's input feeders protection and cables section shall be properly sized according to the UNIT having the highest number of installed Power Slots - Refer to the recommended protection for a Single Unit.

Bx = Max B1 - B2 - B3 - B4



socomec
Innovative Power Solutions

3.3.3. OUTPUT PROTECTIONS

RECOMMENDED PROTECTION DEVICES – OUTPUT[8]							
Number of Power module (200 kVA/kW)		1	2	3	4	5	6
Inverter short-circuit current[9] (A) (when AUX MAINS is not present)	0 to 20 ms	820A	1640A	2460A	3280A	4100A	4920A
	20 to 100 ms	650A	1300A	1950A	2600A	3250A	3900A
Output protection rating (A)		≤ 80	≤ 160	≤ 200	≤ 250	≤ 400	≤ 400

On parallel system, selectivity can be calculated by using short-circuit current of a Power module X number of Power modules

3.3.4. CABLES CONNECTION

AC CABLES CONNECTION – POWER HUB [10]			
Maximum number of cable according the size (Others on demand)			
Rectifier terminals 3PH [11]	6 x 240 mm^2 per pole	5 x 300 mm^2 per pole	4 x 400 mm^2 per pole
Bypass terminals 3PH+N [12]	6 x 240 mm^2 per pole	5 x 300 mm^2 per pole	4 x 400 mm^2 per pole
Output terminals 3PH+N [12]	6 x 240 mm^2 per pole	5 x 300 mm^2 per pole	4 x 400 mm^2 per pole

DC CABLES CONNECTION – POWER HUB [10]		
Cables entry	Battery connection	Max section per pole
bottom entry	Distributed	Up to 6 batteries with max 1 x 240mm² per battery
	Shared all Power SLOT enclosures	Max 10 x 240mm² for the battery
	Shared 2 Power SLOT enclosures	Up to 3 batteries with max 2 x 240mm² each group
	Shared 3 Power SLOT enclosures	Up to 2 batteries with max 4 x 240mm² each group
top entry	Distributed	Up to 6 batteries with max 1 x 240mm² per battery
	Shared all Power SLOT enclosures	Max 8 x 240mm² for the battery
	Shared 2 Power SLOT enclosures	Up to 3 batteries with max 2 x 240mm² each group
	Shared 3 Power SLOT enclosures	Up to 2 batteries with max 4 x 240mm² each group

(1) Applicable to separate inputs by respecting the installation rules regarding cables lengths. The bypass protection is given as a recommendation (trip curves setting and distribution sizing shall be defined according to the rated load current and the UPS overload capability). The protection shall be settable according the number of installed power blocks, its setting range shall be from 0.4 to 1 x rated current. When the bypass and rectifier inputs are combined (common input), the general input protection rating must be at least equivalent to the highest between Ax and Bx (bypass or rectifier).
(2) Selectivity of distribution after the UPS with inverter short-circuit current (short-circuit with AUX MAINS not present). This must be selective with residual current circuit breakers connected downstream of the UPS.
(3) Average Peak Current
(4) Based on 90° HO7 RN or R2V cable type; for other please consult us
(5) Neutral is not required at the rectifier input. If however distributed, consult us to ensure it is allowed by installation standards.
(6) On demand, the Unit can supply a 3 wires distribution (without input and output neutral).

4. REFERENCE STANDARDS AND DIRECTIVES

4.1. Overview

The equipment, installed, used and serviced in accordance with its intended use, its regulations and standards, its manufacturer instructions and rules, is in compliance with the relevant Union harmonization legislation:

LVD 2014 / 35 / EU

DIRECTIVE 2014/35/EU OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 26 February 2014, on the harmonization of the laws of the Member States relating to the making available on the market of electrical equipment designed for use within certain voltage limits.

EMC 2014 / 30 / EU

DIRECTIVE 2014/30/EU OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 26 February 2014, on the harmonization of the laws of the Member States relating to electromagnetic compatibility.

RoHS 2011/65/EU

Directive 2011/65 of the European parliament and of the council of 8 June 2011 on the restriction of the use of certain hazardous substances in electrical and electronic equipment

4.2. Standards

4.2.1. Safety

EN 62040-1	Uninterruptible Power System (UPS) - Part 1: General and safety requirements
IEC 62040-1	Uninterruptible Power System (UPS) - Part 1: Safety requirements (CB scheme by TÜV)

4.2.2. Electromagnetic compatibility

EN 62040-2	Uninterruptible Power System (UPS) - Part 2: Electromagnetic compatibility (EMC) requirements (tested and verified by LCIE BUREAU VERITAS)
IEC 62040-2	Uninterruptible Power System (UPS) - Part 2: Electromagnetic compatibility (EMC) requirements (tested and verified by LCIE BUREAU VERITAS)

4.2.3. TEST and performance

EN 62040-3	Uninterruptible Power System (UPS) - Part 3: Method of specifying the performance and test requirements (tested and verified by TÜV)

4.2.4. ENVIRONMENTAL

IEC 62040-4	Uninterruptible Power System (UPS) - Part 4: Environmental aspects - Requirements and reporting

4.3. SYSTEM AND INSTALLATION GUIDELINES

When carrying out electrical installation, all the above standards must be observed. All national and international standards (e.g. IEC60364) applicable to the specific electrical installation including batteries must be observed. For further information, refer to 'Technical specifications' chapter in the user manual.

ELITE UPS: a mark of efficiency

Socomec, as CEMEP UPS manufacturer member, has signed a Code of Conduct put forward by the Joint Research Centre of the European Commission (JRC), to ensure the protection of critical applications and processes ensuring 24/7 continuous high quality supply. The JRC commits to mitigating energy losses and gas emissions caused by UPS equipment, therefore maximising UPS efficiency.

TECHNICAL GUIDE

EN

EMergency CPSS

2 to 200 kVA

PRIME
Trustworthy
power

Socomec Resource Center
To download, brochures, catalogues
and technical manuals

socomec
Innovative Power Solutions

1. OBJECTIVES

The aim of these specifications is to provide:

- the information required to choose the right uninterruptible power supply for a specific application.
- the information required to prepare the system and installation site.

The specifications are intended for:

- installation engineers.
- design engineers.
- engineering consultants.

2. INSTALLATION REQUIREMENTS AND PROTECTION

Connection to the mains power supply and to the load(s) must be made using cables of suitable size, in accordance with current standards. If not already present, an electrical control station which can isolate the network upstream of the UPS must be installed. This electrical control station must be equipped with a circuit breaker (or two, if there is a separate bypass line) of an appropriate rating for the power drawn at full load.

If an external manual bypass is required, only the model supplied by the manufacturer must be installed.

We recommend fitting two metres of unanchored flexible cable between the UPS output terminals and the cable anchor (wall or cabinet). This makes it possible to move and service the UPS.

For detailed information, see the installation and operating manual.

3. ARCHITECTURE

3.1. Range

The EMergency CPSS range has been designed to protect the power supply of safety systems.

All our EMergency products are compliant with standard EN 50171:2001.

The EMergency CPSS products are designed to power emergency escape lighting in the event of normal supply failure. Depending on the local legislation, it may be suitable for powering other essential safety equipment, for example:

- electric circuits of automatic fire extinguishing installations;
- paging systems and signalling safety installations;
- smoke extraction equipment;
- carbon monoxide warning systems;
- special safety installations related to specific buildings, e.g. high-risk areas.

CPSS Emergency EM from 2 to 200 kVA

- Designed and manufactured in compliance with standard EN 50171:2001.
- Ensures the power supply to emergency lighting, safety signalling lighting and anti-panic systems.

MODELS(1)(2)													
	Rated power (kVA)	2	6	10	15	20	25	30	40	80	120	160	200
EM+	ITYS 1/1	•	•	-	-	-	-	-	-	-	-	-	-
	MASTERYS 3/1	-	-	•	•	-	-	-	-	-	-	-	-
	MASTERYS 3/3	-	-	•	•	•	•	•	•	•	•	-	-
	DELPHYS 3/3	-	-	-	-	-	-	-	-	-	-	•	•

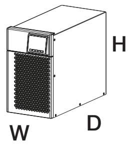
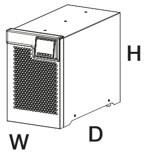
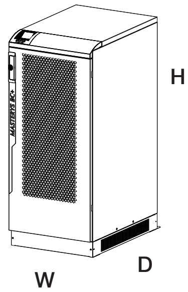
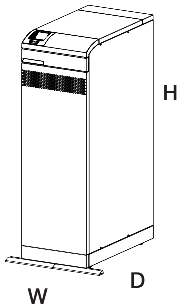
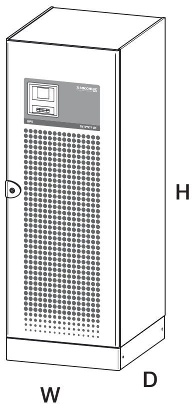
Matrix table for model and kVA power rating.

(1) Check the product availability for your country.
(2) Products can be adapted to application and site specifications.

Each range has been specifically designed to meet the demands of loads in specific application contexts, in order to optimise the features of the product and to facilitate its integration within the system.

4. FLEXIBILITY

4.1. Power ratings from 2 to 200 kVA

DIMENSIONS				
Cabinet type		Width (W) [mm]	Depth (D) [mm]	Height (H) [mm]
	ITYS EM+ 2 kVA	192	428	322
	ITYS EM+ 6 kVA	225	416	354
	MASTERYS EM+ 10 to 40 kVA	444	800	1400
	MASTERYS EM+ 80 to 120 kVA	600	855	1400
	DELPHYS EM 160 / 200 kVA	700	800	1930

The equipment has been designed with a minimum direct and indirect footprint (the actual space occupied by the unit and the space required around it for maintenance, ventilation and access to the operating mechanisms and communication devices).

The careful design also provides easy access for maintenance and installation.

All of the control mechanisms and communication interfaces are located in the upper front section and can be accessed from the metal door.

The air inlet is at the front, with outflow from the top/rear only; this means other equipment or external battery enclosures can be placed alongside the UPS unit.

5. STANDARD AND OPTIONS

5.1. EMergency CPSS EM from 2 to 200 kVA

The wide range is suitable for all standard requirements.

For non-standard requests, our team of experts is available to adapt products to your needs.

Features

- IP20 metal enclosure compliant with EN 60598-1.
- Battery charging: 80% in 12 h.
- Battery protection against damage due to polarity inversion.
- Battery protection against considerable discharge.
- Battery with 10-year life expectancy(1).
- Designed to withstand 120% of the nominal charge during the entire back-up period.
- Specific remote contacts and notifications.

Options

- Connection to downstream IT system.
- Eco mode to reach up to 98% efficiency.
- Other types of battery available.

(1) Not for ITYS EM+ 2 kVA (LPS system).

6. SPECIFICATIONS

6.1. ITYS EM+

6.1.1. Installation parameters

INSTALLATION PARAMETERS			
Sn - rated power (kVA)		2	6
Pn - active power (kW)		2	6
Pn according to EN 50171:2001 (kW)		1.5	5
Max withstand power according to EN 50171:2001 (kW)		2	6
Phase in/out		1/1	
Rated/maximum rectifier input current (EN 62040-3) (A)		9/16	28/42
Inverter output current @ 230 V (A) P/N		8.7	26
Maximum air flow (m^3/h)		192	230
Sound level (dBA)		< 50	
Dissipation at rated load (minimum mains power present and battery charging)	W	135	326
	kcal/h	116	280
	BTU/h	461	1112
Dimensions (W x D x H) (mm)		192 x 428 x 322	225 x 416 x 354
Maximum weight (kg)		11	13.5

6.1.2. Electrical characteristics

INSTALLATION PARAMETERS		
Rated power (kVA)	2	6
Phase in/out	1/1	
Rated mains supply voltage	230 V (1ph+N)	
Voltage tolerance (ensuring battery recharge)	160 V to 300 V	160 V to 276 V
	(up to 110 V with load linear decrease from 100% Pn to 50% Pn)	
Rated frequency	50/60 Hz (selectable)	
Frequency tolerance	±2%	
Power factor (input at full load and rated voltage)	≥ 0.995	
Total harmonic distortion (THDi)	< 5%	< 3%
Max inrush current at start-up	< 8 x In	

ELECTRICAL CHARACTERISTICS - BYPASS		
Rated power (kVA)	2	6
Bypass frequency variation speed	1 Hz/s - 3 Hz/s	
Bypass rated voltage	187-264 V	
Bypass rated frequency (selectable)	50/60 Hz (selectable)	
Bypass frequency tolerance	±10% (configurable from 1% to 10%)	

ELECTRICAL CHARACTERISTICS - INVERTER		
Rated power (kVA)	2	6
Rated output voltage (selectable)	220/230/240 V	
Output voltage tolerance	Static: ±1%	
Rated output frequency (selectable)	50/60 Hz (selectable)	
Output frequency tolerance	±0.1% (on mains power failure)	
Load crest factor	< 3:1	
Total voltage distortion	< 1% on linear load	
Overload tolerated by the inverter	110% x 5 min, 130% x 5 sec	

ELECTRICAL CHARACTERISTICS - EFFICIENCY		
Rated power (kVA)	2	6
Double conversion efficiency (normal mode - @ full load)	up to 93%	up to 95%
Efficiency in Eco Mode	up to 97%	up to 98%

ELECTRICAL CHARACTERISTICS - ENVIRONMENT		
Rated power (kVA)	2	6
Storage temperatures	-5 to +50 °C (23 to 122 °F) (15 to 25 °C for better battery life)	
Working temperature	0 to +40 °C (32 to 104 °F) (15 to 25 °C for better battery life)	
Maximum relative humidity (non-condensing)	95%	
Maximum altitude without derating	1000 m (3300 ft)	
Degree of protection	IP20	
Portability	ISTA 1H P-164000664	
Colour	RAL 7016 textured	

6.1.3. Recommended protection

RECOMMENDED PROTECTION - RECTIFIER		
Rated power (kVA)	2	6
Circuit breaker (A)	20 C curve	63 D curve

RECOMMENDED PROTECTION - INPUT RESIDUAL CURRENT CIRCUIT BREAKER		
Rated power (kVA)	2	6
Input residual current circuit breaker	0.03 A Selective Type A	

RECOMMENDED PROTECTION - OUTPUT		
Rated power (kVA)	2	6
B curve circuit breaker (A)	4	6

CABLES - MAXIMUM CABLE SECTION		
Rated power (kVA)	2	6
Rectifier terminals	IEC 320-C20	16 mm^2
Bypass terminals	-	
Battery terminals	Connector	
Output terminals	8x IEC 320-C13	

socomec
Innovative Power Solutions

6.2. Masterys EM+

6.2.1. Installation parameters

INSTALLATION PARAMETERS											
Sn - rated power (kVA)		10	15	10	15	20	25	30	40	80	120
Pn - active power (kW)		10	15	10	15	20	25	27	36	72	108
Pn according to EN50171:2001 (kW)		10	15	10	15	20	25	27	36	72	108
Max withstand power (kW) according to EN 50171:2001		12	18	12	18	24	30	32.4	43.2	86.4	129.6
Phase in/out		3/1		3/3							
Rated/maximum rectifier input current (EN 62040-3) (A)		15/28	23/37	15/28	23/37	31/45	39/55	42/55	56/73	111/146	166/219
Rated bypass input current (A)		48	72	16	24	32	40	48	64	128	191
Inverter output current @ 230 V (A) P/N		43	65	14	22	29	37	43	58	115	174
Maximum air flow	m³/h	240							360	720	1080
Sound level @70% Pn	dBA	≤ 43							≤ 49	≤ 53	≤ 55
Power dissipation in nominal conditions	W	440	665	440	665	905	1135	1270	1776	3550	5325
	kcal/h	378	572	378	572	778	976	1092	1526	3052	4579
	BTU/h	1501	2269	1501	2269	3088	3875	4335	6060	12120	18180
Power dissipation (max) in the worst conditions	W	490	750	490	750	1050	1315	1420	1930	3860	5790
	kcal/h	421	645	421	645	903	1130	1221	1660	3319	4979
	BTU/h	1672	2559	1672	2559	3582	4490	4848	6950	13179	19768
Dimensions (W x D x H)	mm	444 x 800 x 1400								600 x 855 x 1400	
Single unit clearances – Opertional	mm	Rear ≥ 200									
Single unit clearances – Mainte-nance	mm	Front ≥1500 top ≥ 800									
Weight (without bat-tery)	kg	89							95	186	240
Weight with internal battery (2/3/4/5 shelf)	kg	333 / 430 / 527 / 624				-					

6.2.2. Electrical characteristics

ELECTRICAL CHARACTERISTICS - INPUT										
Rated power (kVA)	10	15	10	15	20	25	30	40	80	120
Phase in/out	3/1		3/3							
Rated mains supply voltage	400 V (3ph + N)									
Voltage tolerance (ensuring battery recharge)	-15% +20% (output load at power factor 1) -20%+20% (output load at power factor 0.9) (up to -40% @70% of nominal active load (linear decrease)									
Rated frequency	50/60 Hz (selectable)									
Frequency tolerance	45 ÷ 66 Hz									
Power factor (input at full load and rated voltage)	≥ 0.99									
Total harmonic distortion (THDi)	< 3%	< 2.5%	< 3%	< 2.5%		< 2%				
Max inrush current at start-up	< In (no overcurrent)									
Power walk-in (from battery to normal mode	4 seconds (settable parameters)									

ELECTRICAL CHARACTERISTICS - BYPASS										
Rated power (kVA)	10	15	10	15	20	25	30	40	80	120
Phase in/out	3/1		3/3							
Bypass frequency variation speed	1 Hz/s - 3 Hz/s									
Bypass rated voltage	Nominal output voltage ±15%									
Bypass rated frequency (selectable)	50/60 Hz (selectable)									
Bypass frequency tolerance	±2% (from ±1% to ±8% (operation with generator unit))									

ELECTRICAL CHARACTERISTICS - INVERTER											
Rated power (kVA)		10	15	10	15	20	25	30	40	80	120
Phase in/out		3/1		3/3							
Rated output voltage (selectable)		220/230/240 V									
Output voltage tolerance		Static: ±1% Dynamic: VFI-SS-111 (EN62040-3) compliant									
Rated output frequency (selectable)		50/60 Hz (selectable)									
Output frequency tolerance		±0.01% (on mains power failure)									
Load crest factor		≥ 2.7									
Voltage harmonic distortion		< 1% on linear load									
Overload tolerated by the inverter kW	10 min	12.5	18.7	12.5	18.7	25	31.2	33.7	45	90	135
	1 min	15	22.5	15	22.5	30	37.5	40.5	54	108	162

ELECTRICAL CHARACTERISTICS - EFFICIENCY										
Rated power (kVA)	10	15	10	15	20	25	30	40	80	120
Phase in/out	3/1		3/3							
Double conversion efficiency @ full load (normal mode)	up to 96.2 %									
Efficiency in Eco Mode	≤ 99.4%									

ELECTRICAL CHARACTERISTICS - ENVIRONMENT										
Rated power (kVA)	10	15	10	15	20	25	30	40	80	120
Phase in/out	3/1		3/3							
Storage temperatures	-5 to +50 °C (23 to 113 °F) (15 to 25 °C for better battery life)									
Working temperature	0 to +40 °C(1) (32 to 104 °F) (15 to 25 °C for better battery life) Max +50°C (122°F) @ 70% Sn						0 to +35 °C(1) (32 to 95 °F) (15 to 25 °C for better battery life) Max +45°C (113°F) @ 70% Sn			
Maximum relative humidity (non-condensing)	95%									
Maximum altitude without derating	1000 m (3300 ft)									
Degree of protection	IP20 (IP21 optional)									
Colour	RAL 7016									

ELECTRICAL CHARACTERISTICS - BATTERY										
Rated power (kVA)	10	15	10	15	20	25	30	40	80	120
Phase in/out	3/1		3/3							
Maximum recharge current/with optional extra charger (A)	5/10					10			20	32

(1) Conditions apply.

socomec
Innovative Power Solutions

6.2.3. Recommended protection

RECOMMENDED PROTECTION DEVICES - RECTIFIER(1)										
Rated power (kVA)	10	15	10	15	20	25	30	40	80	120
Phase in/out	3/1		3/3							
C curve circuit breaker (A)	32	40	32	40	63	63	63	80	160	250
gG fuse (A)	32	40	32	40	63	63	63	80	160	250

RECOMMENDED PROTECTION DEVICES - GENERAL BYPASS(1)										
Rated power (kVA)	10	15	10	15	20	25	30	40	80	120
Phase in/out	3/1		3/3							
Maximum I^2t supported by the bypass (kA^2s)	16		8			15			120	400
Max Ipk supported by the bypass (kA)	2.4		1.2			1.7			5	9
C curve circuit breaker (A)	63	100	25	32	40	63	63	80	200	250
gG fuse (A)	63	100	25	32	40	63	63	80	200	250

RECOMMENDED PROTECTION DEVICES - INPUT RESIDUAL CURRENT CIRCUIT BREAKER(2)										
Rated power (kVA)	10	15	10	15	20	25	30	40	80	120
Phase in/out	3/1		3/3							
Input residual current circuit breaker	> 0.5 A Selective type B									

RECOMMENDED PROTECTION DEVICES - OUTPUT(3)											
Rated power (kVA)		10	15	10	15	20	25	30	40	80	120
Phase in/out		3/1		3/3							
Short-circuit inverter current (A) (when AUX MAINS is not present)	0 to 40 ms	120	177	40	59	79	98	106	141	282	423
	40 to 100 ms	99	147	33	49	66	82	88	117	236	351
C curve circuit breaker(3) (A)		8	13	3	4	6	6	8	10	20	32
B curve circuit breaker(3) (A)		16	25	6	8	10	13	16	20	40	63

CABLES - MAXIMUM CABLE SECTION										
Rated power (kVA)	10	15	10	15	20	25	30	40	80	120
Phase in/out	3/1		3/3							
Rectifier terminals	25					50			70	2x120
Bypass terminals	50					50			70	2x120
Battery terminals	25					50			70	2x120
Output terminals	50		25			50			70	2x120

(1) Rectifier protection should only be considered in the event of separate inputs. The bypass protection is given by recommendation. When the bypass and rectifier inputs are combined (common input), the general input protection rating must be the highest of the two (bypass or rectifier).
(2) Must be selective with residual current circuit breakers downstream of the UPS connected to the UPS output. If the bypass network is separate from the rectifier circuit, or in the event of parallel UPS arrangements, use a single residual current circuit breaker upstream of the UPS.
(3) Selectivity of distribution after the UPS with inverter short-circuit current (short-circuit with AUX MAINS not present). The rating of the protection can be increased by “n” times downstream of a parallel UPS system, with “n” equal to the number of parallel modules.

6.3. Delphys EM

6.3.1. Installation parameters

INSTALLATION PARAMETERS				
		Rated power (kVA)	160	200
		Phase in/out	3/3	
Active power		(kW)	144	180
Pn according to EN 50171			120	150
Rated/maximum rectifier input current (A)			220/290	278/340
Rated bypass input current (A)			232	290
Inverter output current @ 400 V (A) P/N			232	290
Maximum air flow (m^3/h)			2250	
Sound level (dBA)			< 68	
Power dissipation in nominal conditions(1)		W	9200	11500
		kcal/h	7911	9888
		BTU/h	31391	39239
Power dissipation (max) in the worst conditions(2)		W	10600	13300
		kcal/h	9114	11436
		BTU/h	36168	45380
Dimensions	Width	mm	700	
	Depth	mm	800	
	Height	mm	1930	
Weight		kg	480	500

(1) Considering nominal input current (400 V, battery charged) and rated output active power (PF 0.9).
(2) Considering maximum input current (low input voltage, battery recharge) and rated output active power (PF 0.9).

6.3.2. Electrical characteristics

ELECTRICAL CHARACTERISTICS - RECTIFIER(1) INPUT		
Rated power (kVA)	160	200
Rated mains supply voltage	400 V 3ph	
Voltage tolerance	240 to 480 V(2)	
Rated frequency	50/60 Hz (selectable)	
Frequency tolerance	±10%	
Power factor (input at full load and rated voltage)	≥ 0.99	
Total harmonic distortion (THDi)	< 3%	
Max inrush current at start-up	<In (no overcurrent)	

(1) IGBT rectifier.
(2) Conditions apply.

ELECTRICAL CHARACTERISTICS - BYPASS		
Rated power (kVA)	160	200
Bypass frequency variation speed	1.5 Hz/s (settable up to 3 Hz/s)	
Bypass rated voltage	Nominal output voltage ±15%	
Bypass rated frequency	50/60 Hz (selectable)	
Bypass frequency tolerance	from ±1% to ±8% (operation with generator unit)	

ELECTRICAL CHARACTERISTICS - INVERTER			
Rated power (kVA)		160	200
Rated output voltage (selectable)		380/400/415 V	
Output voltage tolerance		Static: ±1% Dynamic: VFI-SS-111 compliant	
Rated output frequency (selectable)		50/60 Hz (selectable)	
Output frequency tolerance		±0.01% on mains power failure	
Load crest factor		3:1	
Voltage harmonic distortion		< 1.5% with linear load	
Overload tolerated by the inverter - 25 °C	1 min	225 kW	270 kW
	10 min	180 kW	225 kW

ELECTRICAL CHARACTERISTICS - EFFICIENCY		
Rated power (kVA)	160	200
Double conversion efficiency (normal mode) - full load	up to 94%	

ELECTRICAL CHARACTERISTICS - ENVIRONMENT		
Rated power (kVA)	160	200
Storage temperatures	-5 to +45 °C (23 to 113 °F) (15 to 25 °C for better battery life)	
Working temperature	0 to +40(1) °C (32 to 104 °F) (15 to 25 °C for better battery life)	
Maximum relative humidity (non-condensing)	95%	
Maximum altitude without derating	1000 m (3300 ft)	
Degree of protection	IP20	
Colour	RAL 7012, silver grey frontal door	

(1) Conditions apply.

6.3.3. Recommended protection

RECOMMENDED PROTECTION DEVICES - RECTIFIER(1)		
Rated power (kVA)	160	200
D curve circuit breaker (A)	315	400
gG fuse (A)	315	400

RECOMMENDED PROTECTION DEVICES - GENERAL BYPASS(1)			
	Rated power (kVA)	160	200
Semiconductor characteristics	I^2t (A^2s)	320000	
	Is/c (A peak)	8000	
D curve circuit breaker (A)		400	
gG fuse (A)		400	

RECOMMENDED PROTECTION DEVICES - INPUT RESIDUAL CURRENT CIRCUIT BREAKER(2)		
Rated power (kVA)	160	200
Input residual current circuit breaker	3 A	

RECOMMENDED PROTECTION DEVICES - OUTPUT(3)		
Rated power (kVA)	160	200
Short-circuit inverter current (A) - (0 to 100 ms) (when AUX MAINS is not present)	720 A	
C curve circuit breaker(3) (A)	≤ 63 A	
B curve circuit breaker(3) (A)	≤ 125 A	
High-speed fuse(3) (A)	≤ 160 A	

CABLE CONNECTION - MAXIMUM CAPABILITY PER POLE		
Rated power (kVA)	160	200
Rectifier terminals	2 x 150 mm^2	
Bypass terminals	2 x 150 mm^2	
Battery terminals	2 x 240 mm^2	
Output terminals	2 x 150 mm^2	

(1) Rectifier protection should only be considered in the event of separate inputs. The bypass protection is given by recommendation. When the bypass and rectifier inputs are combined (common input), the general input protection rating must be the highest of the two (bypass or rectifier).
(2) Must be selective with residual current circuit breakers downstream of the UPS connected to the UPS output. If the bypass network is separate from the rectifier circuit, or in the event of parallel UPS arrangements, use a single residual current circuit breaker upstream of the UPS.
(3) Selectivity of distribution after the UPS with inverter short-circuit current (short-circuit with AUX MAINS not present). The rating of the protection can be increased by “n” times downstream of a parallel UPS system, with “n” equal to the number of parallel modules.

7. REFERENCE STANDARDS AND DIRECTIVES

7.1. Overview

The construction of the equipment and choice of materials and components comply with all laws, decrees, directives and standards currently in force.

In particular, the equipment is fully compliant with all European Directives concerning CE marking.

LVD 2014/35/EU

Directive of the European Parliament and council of 26 February 2014 on the harmonisation of the laws of Member States on making electrical equipment designed for use within certain voltage limits available on the market.

EMC 2014/30/EU

Directive of the European Parliament and council of 26 February 2014 on the harmonisation of the laws of Member States on electromagnetic compatibility.

RoHS 2011/65/EU

Directive 2011/65 of the European parliament and council of 8 June 2011 on restricting of the use of certain hazardous substances in electrical and electronic equipment

7.2. Standards

7.2.1. CPSS

EN 50171:2001	General requirements for central power supply systems for an independent energy supply to essential safety equipment

7.2.2. Safety

EN 62040-1	Uninterruptible Power System (UPS) - Part 1: General and safety requirements (certified by TÜV SÜD)
IEC 62040-1	Uninterruptible Power System (UPS) - Part 1: Safety requirements

7.2.3. Electromagnetic compatibility

EN 62040-2	Uninterruptible Power System (UPS) - Part 2: Electromagnetic compatibility (EMC) requirements (C3 category) (tested and verified by third party)
IEC 62040-2	Uninterruptible Power System (UPS) - Part 2: Electromagnetic compatibility (EMC) requirements
EN 60529	Degrees of protection provided by enclosures

7.3. System and installation guidelines

When carrying out electrical installation, all of the above standards must be observed. All national and international standards (e.g IEC60364) applicable to the specific electrical installation including batteries must be observed. For further information refer to the ‘Technical specifications’ chapter in the user manual.

ELITE UPS: a mark of efficiency

Socomec, as CEMEP UPS manufacturer member, has signed a Code of Conduct put forward by the Joint Research Centre of the European Commission (JRC), to ensure the protection of critical applications and processes ensuring 24/7 continuous high quality supply. The JRC commits to mitigating energy losses and gas emissions caused by UPS equipment, therefore maximising UPS efficiency.

TECHNICAL GUIDE

EN

STATYS XS

16 A / 32 A

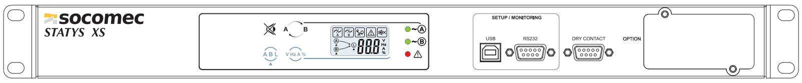
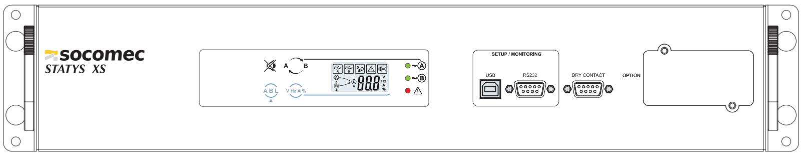
SUPERIOR

Unrivalled power performance

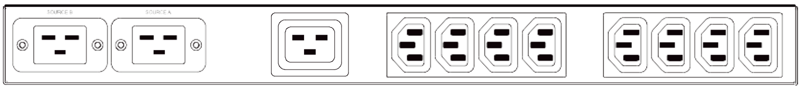
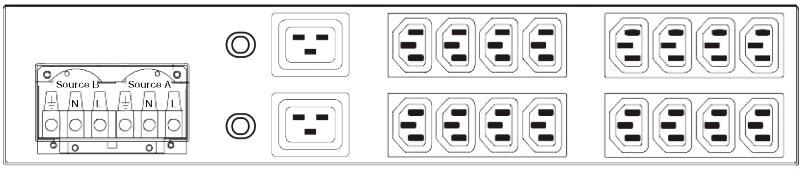
Socomec Resource Center
To download, brochures, catalogues and technical manuals

socomec
Innovative Power Solutions

DIMENSIONS

	Model	Width [mm]	Depth [mm]	Height [mm]	Weight [kg]
	16 A	440 (19”)	285	44 (1U)	4
	32 A		360	88 (2U)	6

CONNECTIONS

	Model	INPUT	OUTPUT
	16 A	2x IEC C20 (16 A)	1x IEC C19 (16 A) 8x IEC C13 (10 A)
	32 A	Terminal 1 x 6P (10 mm²)	2x IEC C19 (16 A) 16x IEC C13 (10 A)

ELECTRICAL CHARACTERISTICS	16 A	32 A
Rated mains supply voltage	200 / 208 / 220 / 230 / 240 V	
Input voltage range	150 Vac to 300 Vac	
RMS voltage tolerance	+/-10% (configurable +/-5% to +/-20%)	
Rated Frequency	50 / 60 Hz	
Frequency tolerance	+/-10% (configurable +/-5% to +/-20%)	
Transfer time	ITIC compliant	
Admitted overload	125% / 1 minutes, 150% / 30 seconds	

COMMUNICATION AND OPTIONS	16 A	32 A
Display	LCD + Display	
Standard communication features	Slot for optional communication board	
	5 dry contacts (Volt free) - Configurable	
	Setting port for configuration tool	
Options	SNMP communication board	
	RS485 Communication board	

ELECTRICAL CHARACTERISTICS - ENVIRONMENT	16 A	32 A
Storage conditions	-5 to 40 °C @ 0 to 90% RH (non-condensing)	
Working temperature	-5 to +40 °C	
Working relative humidity	0 - 90% (non-condensing)	
Noise	< 25 dBA	
Conformity	CE compliant	
Directives	2014/35/UE ; 2014/30/UE	
Standards	IEC60950-1 ; CEI/EN 62310-2	
Environmental	WEEE ; ROHS	

TECHNICAL GUIDE

EN

STATYS

32 to 1800 A

ULTIMATE

Fault tolerant power
without compromise

Socomec Resource Center
To download, brochures, catalogues
and technical manuals

socomec
Innovative Power Solutions

1. OBECTIVES

The aim of these specifications is to provide:

- the information required to choose the right Static Transfer System (STS) for a specific application,
- the information required to prepare the system and installation site.

The specifications are intended for:

- installation engineers,
- design engineers,
- engineering consultants.

2. INSTALLATION REQUIREMENTS AND PROTECTION

Connection to the mains power supply and to the load(s) must be made using cables of suitable size, in accordance with current standards. If not already present, an electrical control station which can isolate the network upstream of the STATYS must be installed. This electrical control station must be equipped with a circuit breaker of an appropriate rating for the power draw at full load.

If an RCD is required a selective B-type should be used. It must be coordinate with residual current circuit breakers downstream of the STATYS connected to the STATYS output.

Potential dispersion of current from utilities downstream of the STS should be added to that discharged from the STATYS, and it should also be noted that current peaks are also reached, albeit very briefly, during transitory phases.

If an external manual bypass is required, only the model supplied by the manufacturer must be installed. For the Integrable Chassis version, STATYS is able to manage the PDU's switches (input/output/maintenances bypasses) in order to protect against users miss-operation.

For detailed information, see the installation and operating manual.

3. ARCHITECTURE

3.1. Range

STATYS is a range of high performing STS designed to protect critical and sensitive appliances applications in the IT, telecom and industrial fields, such as enterprise servers, storage systems, networking equipment, telecommunications systems, diagnostic/medical devices and industrial applications.

MODELS															
	1-phase (A)		3-phase (A)												
	32	63	63	100	200	300	400	600	630	800	1000	1250	1400	1600	1800
19" RACK	•	•	•	•	-	-	-	-	-	-	-	-	-	-	-
Integrable Chassis (OEM)	-	-	-	-	•	•	•	•	•	•	•	•	•	•	•
Cabinet	-	-	-	-	•	•	•	•	•	•	•	•	•	•	-

Matrix table for model and A current rating

Each range has been specifically designed to meet the demands of loads in specific application contexts, in order to optimise the features of the product and to facilitate its integration within the system.

4. FLEXIBILITY

4.1. Currents from 32 to 1800 A

<table>
<tr><th colspan="6">DIMENSIONS</th></tr>
<tr><th colspan="2">Model</th><th>Range</th><th>Width (mm)</th><th>Depth (mm)</th><th>Height (mm)</th></tr>
<tr><td>1 phase</td><td rowspan="2">19” Rack</td><td>32/63 A</td><td rowspan="2">483 (19”)</td><td>747(1)</td><td>89 (2U)</td></tr>
<tr><td rowspan="10">3 phases</td><td>63/100 A</td><td>648(1)</td><td>400 (9U)</td></tr>
<tr><td rowspan="5">Integrable Chassis (OEM)</td><td>200 A</td><td>400</td><td rowspan="3">586</td><td rowspan="3">765</td></tr>
<tr><td>300/400 A</td><td rowspan="2">600</td></tr>
<tr><td>600/630 A</td></tr>
<tr><td>800/1000 A</td><td>1000</td><td>950(1)</td><td>1930</td></tr>
<tr><td>1250/1800 A</td><td>910</td><td>815</td><td>1955</td></tr>
<tr><td rowspan="5">Cabinet</td><td>200 A</td><td>500</td><td rowspan="3">600(1)</td><td rowspan="3">1930</td></tr>
<tr><td>300/400 A</td><td rowspan="2">700</td></tr>
<tr><td>600/630 A</td></tr>
<tr><td>800/1000 A</td><td>1400</td><td>950(1)</td><td>1930</td></tr>
<tr><td>1250/1600 A</td><td>2010</td><td>815</td><td>1955</td></tr>
</table>

(1) Depth does not include handles (+40 mm)

The equipment has been designed with a minimum direct and indirect footprint (the actual space occupied by the unit and the space required around it for maintenance, ventilation and access to the operating mechanisms and communication devices).

Please contact us for any other requirement.

4.2. Neutral management

STATYS is well adapted to all electrical environments.

For single-phase units, STATYS is available in 2-pole switching.

For three-phase units, it is available in 3 or 4-poles switching.

Built with fully rated thyristors, STATYS forces a short "make before break" neutral switching principle in order to keep the load reference and reduce the transfer time.

4.3. Transformer Management

In case of downstream transformer and asynchronous power, STATYS handles source switching which prevents untimely protection tripping, thanks to the ATSM system.

5. STANDARD AND OPTIONS

5.1. Standard Internal redundant design

- Individual driver per SCR paths, with dedicated local power supplies.
- Redundant cooling with fan failure monitoring.
- Real-time SCR fault sensing.
- Separation of main functions to prevent internal fault propagation.
- Robust internal field communication bus.
- Internal monitoring of sensors to ensure maximum system reliability.
- 24/7/365 real-time remote monitoring.

5.2. Optional redundancy (in standard for Statys above 800A)

- Redundant control system, using two microprocessor control boards.
- Redundant power supplies of the control boards.
- Dedicated Redundant power supplies for SCR driver boards.

5.3. Compact design

- Small footprint and compact units.
- Adjacent or back to back mounting.
- Front access for easy maintenance procedures.
- Compact Hot Swap 19” rack system.

5.4. Standard features

- Smart commutation system configurable according to the load.
- Synchronised and non-synchronised sources management (fully settable transfer modes).
- Fuse-free or fuse-protected design.
- Output fault management.
- Double maintenance bypass (rack and cabinet versions).
- Neutral oversizing for non-linear loads compatibility.

5.5. Standard communication features

- Ethernet network connection (WEB interface, SNMP and e-mail).
- I/O dry contacts interfaces.
- Flexible Com Slots.
- 7” Color Touchscreen.
- Full digital configuration and setting.

5.6. ADDITIONAL Options

- Additional dry contacts interface board.
- MODBUS RTU.
- Automatic maintenance bypass interlock.
- Voltage adaptation.

5.7. Remote monitoring service

- SoLink, remote monitoring service that connects your UPS to your Critical Power specialist 24/7.

6. SPECIFICATIONS

6.1. Installation parameters

1 phase:

INSTALLATION PARAMETERS			
Model		32	63
Phase in/out		1/1	1/1
Rated power	A	32	63
Maximum current on neutral(2)		32	63
Crest factor		< 3.5	
Minimum air flow	m^3/h	26	
Sound level	dBA	< 45	
Dissipation at rated load(1)	W	80	184
	kcal/h	69	160
	BTU/h	272	628
Dimensions Rack	W (mm)	483	
	D (mm)	747	
	H (mm)	89	
Weight	kg	26	

(1) Worst case:
- 4 pole switching
- cabinet version with internal input protection
- 4 wires
- no linear load

(2) Contact us for higher neutral sizing

3 phases:

INSTALLATION PARAMETERS														
Model		63	100	200	300	400	600	630	800	1000	1250	1400	1600	1800
Phase in/out		3/3	3/3	3/3	3/3	3/3	3/3	3/3	3/3	3/3	3/3	3/3	3/3	3/3
Rated power	A	63	100	200	300	400	600	630	800	1000	1250	1400	1600	1800
Maximum current on neutral(2)		126	173	200	400		600	630	800	1000	1600			1800
Crest factor		< 3.5		< 1.7					< 2.1	< 1.7	< 1.7			
Minimum air flow	m^3/h	60		800	1600				1950		3000			
Sound level	dBA	< 45		70					61		84			
Dissipation at rated load(1) CABINET or Rack	(W)	340	540	1180	2080	2770	3750	3940	4272	5597	6705	7238	7905	-
	kcal/h	293	464	1456	1787	2382	3224	3387	3674	4813	5765	6224	6797	
	BTU/h	1160	1843	4968	6097	8128	11001	11557	14536	19042	22829	24647	26916	
Dissipation at rated load(1) OEM	(W)	-		967	1760	2179	3036	3190	4133	5380	6705	7238	7905	8971
	kcal/h			1193	1512	1874	2609	2742	3554	4626	5765	6224	6797	7714
	BTU/h			4075	5164	6398	8910	9360	14074	18319	22829	24647	26916	30547
Dimensions Rack	W (mm)	483		-										
	D (mm)	648												
	H (mm)	400												
Dimensions OEM	W (mm)	-		400	600				1000		910			
	D (mm)			586					995		815			
	H (mm)			765					1930		1955			
Dimensions CABINET	W (mm)	-		500	700				1400		2010			-
	D (mm)			600					995		815			
	H (mm)			1930							1955			
Weight (kg)	Rack	58		-							-			
	OEM	-		70	105		130		495		570			
	Cabinet	-		195	270		345		685		1200			-

6.2. Electrical characteristics

ELECTRICAL CHARACTERISTICS - OPERATING RANGE			
Model	RACK 32 / 63 A	RACK 63 / 100 A	CABINET / OEM
Rated mains supply voltage(1)	220 to 240 V / 254 V (ph+N or ph+ph)	380 to 415 V (3ph+N or 3ph)	
RMS voltage tolerance	±10% (configurable)		
Tolerance to fast transients	±25% (configurable)		
Rated Frequency	50/60 Hz		
Frequency tolerance	±5% (configurable)		
Admitted Power Factor	no restriction		
Admitted overload	110% for 60 minutes, 150% for 2 minutes(2)		

(1) Consult us for other voltage requirements.
(2) Specific per model

ELECTRICAL CHARACTERISTICS - ENVIRONMENT			
Model	RACK 32 / 63 A	RACK 63 / 100 A	CABINET / OEM
Storage temperature	-25 to +70 °C (-13 to +158 °F)		
Working temperature	from 0 °C up to 40 °C (32 °F up to 104 °F) up to 50 °C with derating		
Maximum relative humidity (non-condensing)	95%		
Maximum altitude without derating	1000 m (3300 ft)		
Degree of protection	IP30		IP20 (cabinet), IP20 C (OEM)
Colour	Dark grey, RAL 7016		
Performance	up to 99%		
Leakage current	<10 mA	<10 mA	<30 mA

7. REFERENCE STANDARDS AND DIRECTIVES

7.1. Overview

The equipment, installed, used and serviced in accordance with its intended use, its regulations and standards, its manufacturer instructions and rules, is in compliance with the relevant Union harmonisation legislation:

LVD 2014 / 35 / EU

DIRECTIVE 2014/35/EU OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 26 February 2014, on the harmonisation of the laws of the Member States relating to the making available on the market of electrical equipment designed for use within certain voltage limits.

EMC 2014 / 30 / EU

DIRECTIVE 2014/30/EU OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 26 February 2014, on the harmonisation of the laws of the Member States relating to electromagnetic compatibility.

RoHS 2011/65/EU

Directive 2011/65 of the European parliament and of the council of 8 June 2011 on the restriction of the use of certain hazardous substances in electrical and electronic equipment.

7.2. Standards

7.2.1. Safety

EN 62310-1	Static transfer systems (STS) – General and safety requirements.
IEC 62310-1	Static transfer systems (STS) – General and safety requirements.

7.2.2. Electromagnetic compatibility

EN 62310-2	Static transfer systems (STS) – Electromagnetic compatibility (EMC) requirements.
IEC 62310-2	Static transfer systems (STS) – Electromagnetic compatibility (EMC) requirements.

7.3. SYSTEM AND INSTALLATION GUIDELINES

When carrying out electrical installation, all the above standards must be observed. All national and international standards (e.g IEC60364)applicable to the specific electrical installation must be observed. For further information refer to ‘Technical specifications’ chapter in the user manual.

TECHNICAL GUIDE

EN

Glossary

Terms and accessories

Socomec Resource Center
To download, brochures, catalogues
and technical manuals

socomec
Innovative Power Solutions

1. GLOSSARY

ACS

Automatic Cross Synchronisation (ACS) is an option which can be integrated into the machine without adding external enclosures and which synchronises the output voltage with an external source or with another stand-alone UPS (single or parallel system, Socomec or other brands).

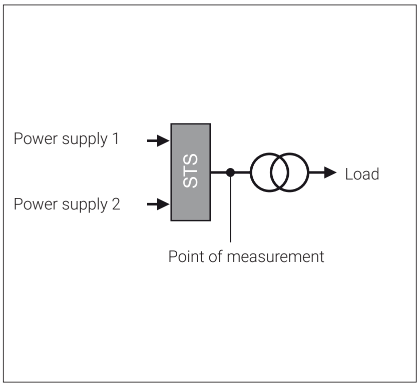
ADC

The Advanced Dry Contact (ADC) circuit board is an interface fitted with programmable dry contacts. It consists of up to four normally open or normally closed outputs and up to three digital inputs, all fully configurable. Up to four operating modes can be selected.

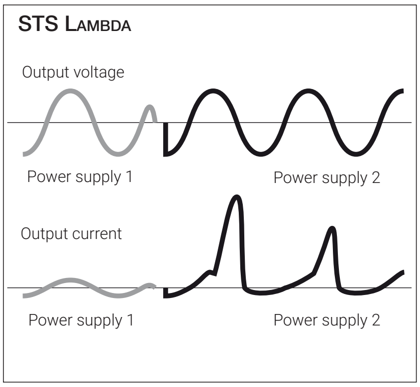
ADVANCED TRANSFORMER SWITCHING MANAGEMENT (ATSM)

Advanced switching management of downstream transformers for static transfer systems.

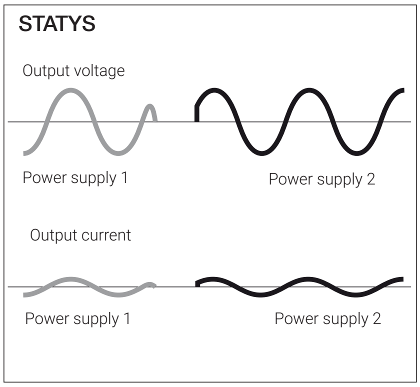
If the upstream network has no distributed neutral cable, two upstream transformers or one downstream transformer can be added to create a neutral reference point at the output. For the downstream solution, STATYS (thanks to ATSM) correctly manages the switching to limit inrush current and avoid the risk of spurious breaks.



STATY_039_A_BW



STATY_042_A_BW



STATY_043_A_BW

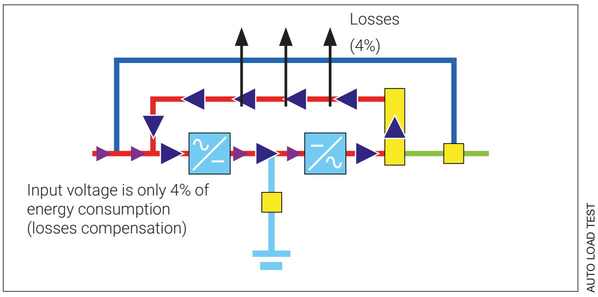
ADICOM (advanced interface)

- **User-friendly graphic colour display:** gives a clear view of the UPS subassemblies status and provides the user with a full array of controls for their management.
- **USB connection with front access:** for downloading or uploading of files from a memory key such as reports, custom language, software releases.
- LED status bar: gives the UPS status in 3 colours: green, yellow, or red.
- **Easy procedures for start and shutdown of the UPS:** the display gives operators a step-by-step explanation of the procedures.
- **Wide range of network connections:** extensive communication possibilities are on offer, including: HTML page for remote monitoring, SNMP agent sending TRAP to network management station, email sent according to events selection.
- **Shutdown agent:** allows sending a shutdown command to stand-alone or virtual servers.

GREEN_096_A

AUTO-LOAD TEST

Available for Green Power 2.0 range, Auto-Load Test feature allows to perform a full power test to rectifier, inverter, bypass, contactors, chokes, capacitors, cables and fuses for validating the performance of the installed UPS with no customer load or dummy load connnected.



AUTOMATIC RETRANSFER

In case of supply from the alternate sources, when the preferred source is restored, the STS must automatically retransfer the load back after a delay of 3 seconds.

The system must try to retransfer to the preferred source in the best conditions.

For specific operating conditions, the automatic retransfer can be disabled via the user settings. In this case, the transfer has to be performed manually by the operator.

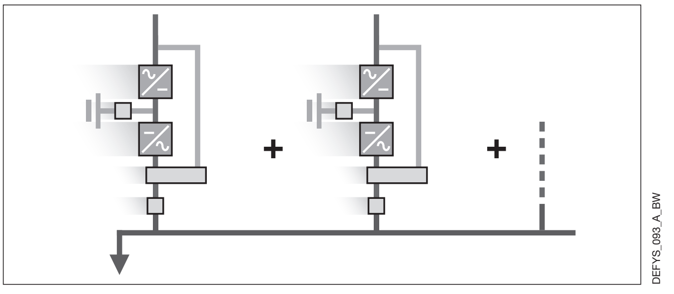
If the alternate source disappears before the manual retransfer, an automatic transfer must switch the load to the preferred source

Automatic retransfer must be activated by default and is configurable by the operator. This function can be delayed by the operator on each device in the case of multiple STS systems.

BYPASS

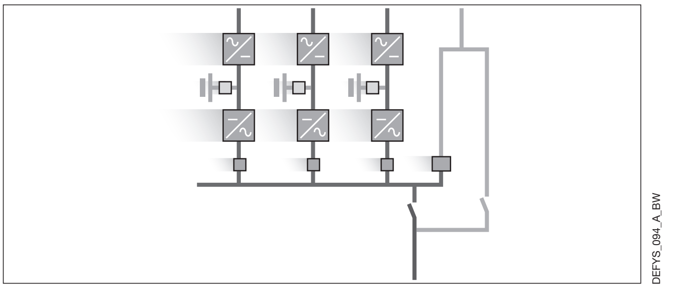
Distributed architecture.

The simplest solution to ensure power supply availability and flexibility in case of unscheduled installation upgrades by means of the parallel configuration of the UPS units, each one incorporating its own bypass. This configuration enables power output to be increased and is suitable for N+1 redundancy. Upgrades can also be performed keeping the load supplied by the system.



Centralised architecture.

The ideal solution for system redundancy and planned power upgrades. The automatic and maintenance bypass functions are centralized. In the event of anomalies inside the UPS or of an overload, the power is automaticaly switched to bypass ensuring the maximum availability. This solution also allows to adapt the bypass size according to the real power and installation short-circuit capability.



EBS

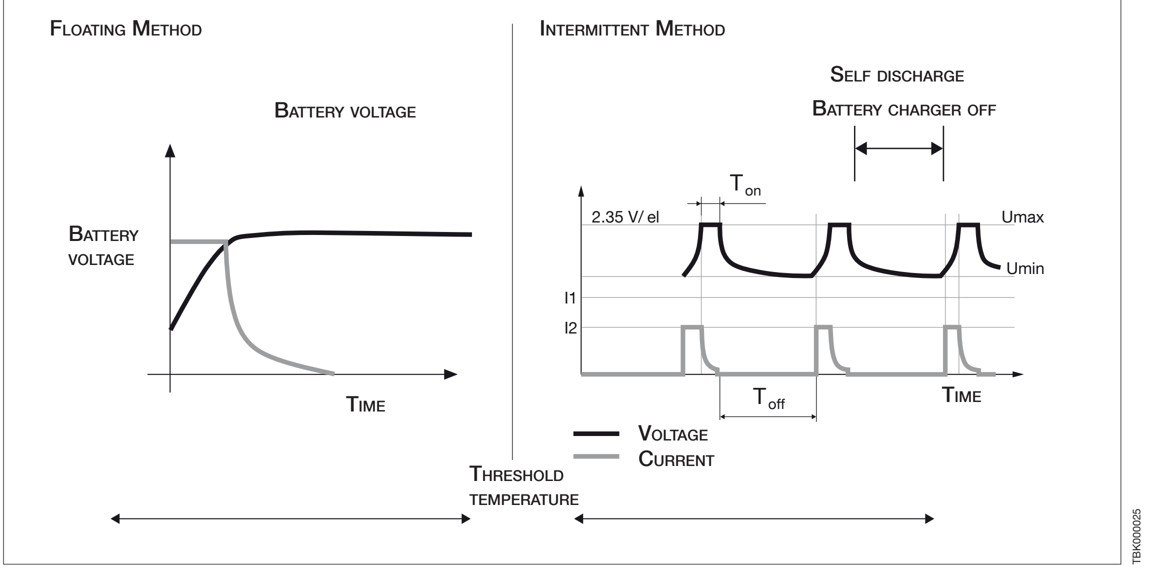
Expert Battery System (EBS) is a system which manages the battery charger. It responds to the working temperature to preserve battery life and reduce operating costs. Battery reliability depends on several variables: the working temperature, the installation environment, the number of charge and discharge cycles. Consequently it is important to introduce systems that can manage these variables in order to limit their impact on the UPS life cycle.

Premature ageing causes:

- corrosion: battery overcharge or high working temperature,
- sulfation: low charge voltage or long storage time,
- passivation: frequent charge/discharge cycles (cycling) resulting in capacity loss.
- EBS allows for:
- automatic selection of the recharging method according to environmental and battery conditions,
- elimination of overloading due to permanent floating, which accelerates the corrosion of the positive plates,
- isolation of the battery from the DC bus, thanks to the charger function which is separate from the rectifier,
- protection against deep discharge,
- management of different types of batteries (sealed, open lead-acid and nickel-cadmium batteries),
- real-time calculation of the remaining back-up time,
- real-time measurements concerning the battery (voltage, battery current and battery capacity),
- a periodic battery test for monitoring battery efficiency and for programming preventive or corrective maintenance in the case of abnormal situations.

Tests carried out by Socomec on several brands of batteries, together with years of experience, show that battery life can be enhanced by up to 30% with the use of EBS compared to a traditional battery management system.

Method of charging as a function of temperature



ECOMODE

ECOMODE increases efficiency as under normal operating conditions the utility is supplied directly from the emergency supply via the automatic bypass. The static UPS system remains on standby to replace the supply in the event of a failure.

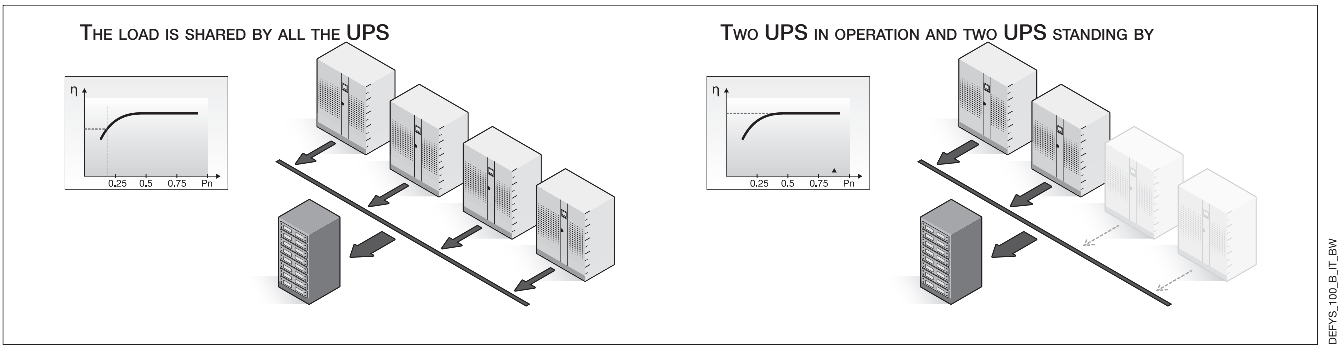
EMD

Environment Module Device (EMD) is a device to be used in conjunction with NET VISION with the following features:

- temperature and humidity measurements + 2 contact alarms,
- can be managed remotely from 2 to 15 metres,
- alarm thresholds configurable via Web browser,
- notification of environmental alarm via e-mail and SNMP traps.

ENERGY SAVER

- This function optimizes the efficiency (η) of your UPS in parallel when operating with a partial load.
- Only the UPS needed to supply the energy required by the applications are in operation.
- Redundancy can be ensured by maintaining an additional unit in operation.
- When the power consumed by the applications increases, the UPS units needed to meet the increased power requirements restart instantly.
- This type of operation is perfectly suited to applications subject to frequent variations in power.
- Energy Saver enables the increased efficiency of the whole system to be maintained.



socomec
Innovative Power Solutions

FAST ECOMODE

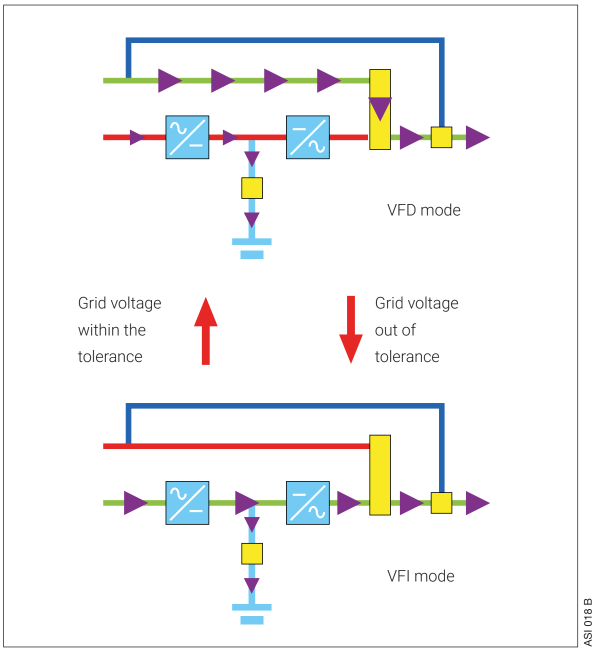
Available as option for GREEN POWER 2.0 160 to 800 kVA/kW, FAST ECOMODE is an automatic operating mode that optimizes the efficiency depending on the quality of the input voltage.

When the input voltage is within the tolerance (value is settable), the load is supplied by the bypss (VFD mode) and the efficiency achived is 99%.

Ultra fast transfer time from bypass to inverter (2 ms) if the input voltage is out of tolerances and automatic transfer back to bypass when the input voltage is restored.

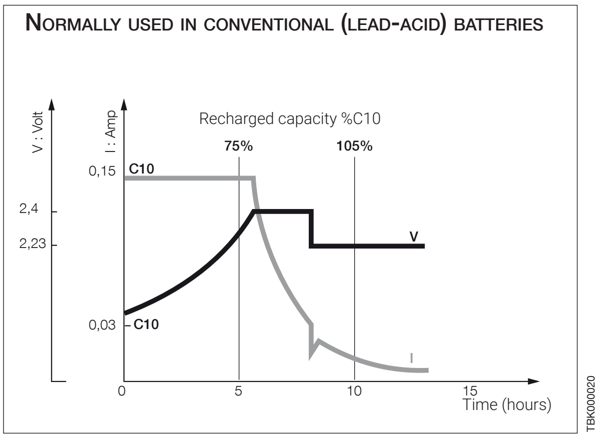
Batteries are permanently maintained under charging, avoiding periodic restarts of the rectifier

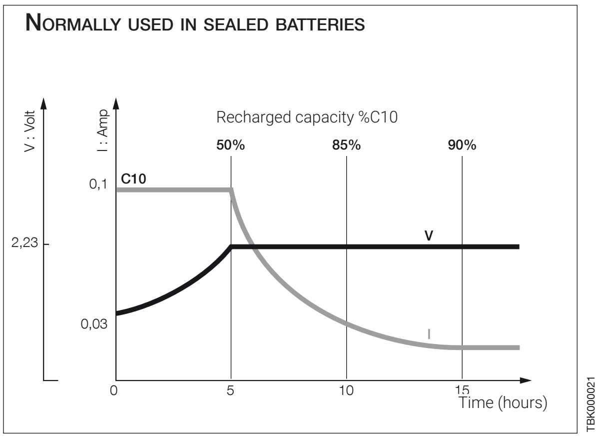
Available both for single and parallel units.



FLOATING AND TWO-LEVEL CHARGE

Lead-acid, sealed and open-vented batteries are extremely sensitive to the temperatures in which they operate. Charge algorithms exist which reduce the effect of these temperatures. In addition to the EBS system, Socomec offers floating and "two-level" mixed charging. Its characteristics are illustrated below.





Graphic Touch Screen

The colour graphic touch screen, available on request, for DELPHYS MP ELITE and DELPHYS MX, is a user-friendly interface providing both safe operation of the UPS as well as a global system overview. The mimic diagram is interactive and intuitive and provides a quick overview of the whole equipment. Direct access through the mimic panel to the main functions such as the event log, graphic reports and the interactive help menu makes using the controls easier and safer. Remote monitoring is available via LAN connection, and the interface is included in the graphical touch screen.

DEFYS_182_A

GREEN POWER 2.0

Energy Saving: high efficiency without compromise.

- Offers the highest efficiency in the market using VFI – Double Conversion Mode, the only UPS working-mode that assures total load protection against all mains quality problems.
- Ultra high efficiency output independently tested and verified by an international certification organization in a wide range of load and voltage operating conditions, to have the value in the real site conditions.
- Ultra high efficiency in VFI mode is provided by an innovative topology (3-Level technology) that has been developed for all the Green Power UPS ranges.

Full-rated power: kW=kVA

- No power downgrading when supplying the latest generation of servers (leading or unity power factor).
- Real full power, according to IEC 62040: kW=kVA (unity power factor design) means 25% more active power available compared to legacy UPS.
- Suitable also for leading power factor loads down to 0.9 without apparent power derating.

Significant cost-saving (TCO)

- Maximum energy saving thanks to 96% efficiency in true double conversion mode: 50% saving on energy losses compared to legacy UPS gives significant savings in energy bill.
- UPS “self-paying” with energy saving.
- Energy Saver mode for global efficiency improvement on parallel systems.
- kW=kVA means maximum power available with the same UPS rating: no overdesign cost and therefore less €/kW.
- Upstream infrastructure cost optimization (sources and distribution), thanks to high performance IGBT rectifier.
- Extended battery life and performance:
  - long life battery,
  - very wide input voltage and frequency acceptance, without battery use.
- EBS (Expert Battery System) charging management improves battery service life.

HMI (Human Machine Interface)

HMI is a multilanguage Human Machine Interface available on MASTERYS GP which displays information regarding operating status, electrical measurements, allows the access to control functions and configuration parameters and provides a global overview of the system. It includes a colour graphic display and a luminous status bar, and provides access to:

- main functions via the mimic panel,
- measurements, alerts and UPS commands,
- programming battery tests and UPS operating modes,
- assisted startup and switching to maintenance bypass procedures,
- configuration menu,
- event log and alerts.

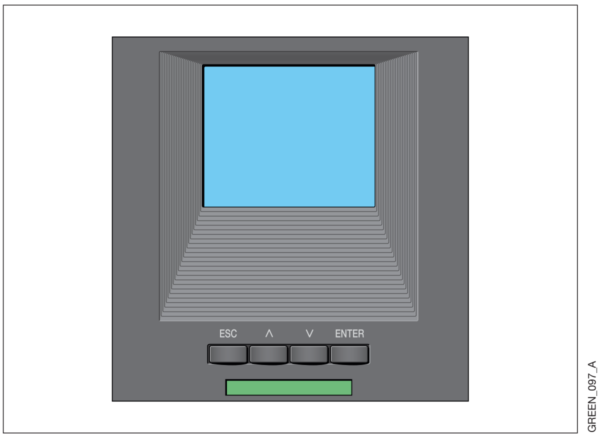
GREEN_055_A

JNC

The UPS back-up time might not always be long enough to cover the whole period of outage. In this case the best way to proceed is to save data and correctly shutdown the machines before the complete absence of the supply. The client is a small software application to be installed in the remote computers. It shows data and executes commands sent by Adicom or NetVision via the LAN network. Clients can be native for every single operating system (OS), or multi-OS and with more advanced features such as "JAVA & .NET Shutdown client" (JNC). The latter has been developed by Socomec on a JRE platform.

LCD SYNOPTIC PANELS

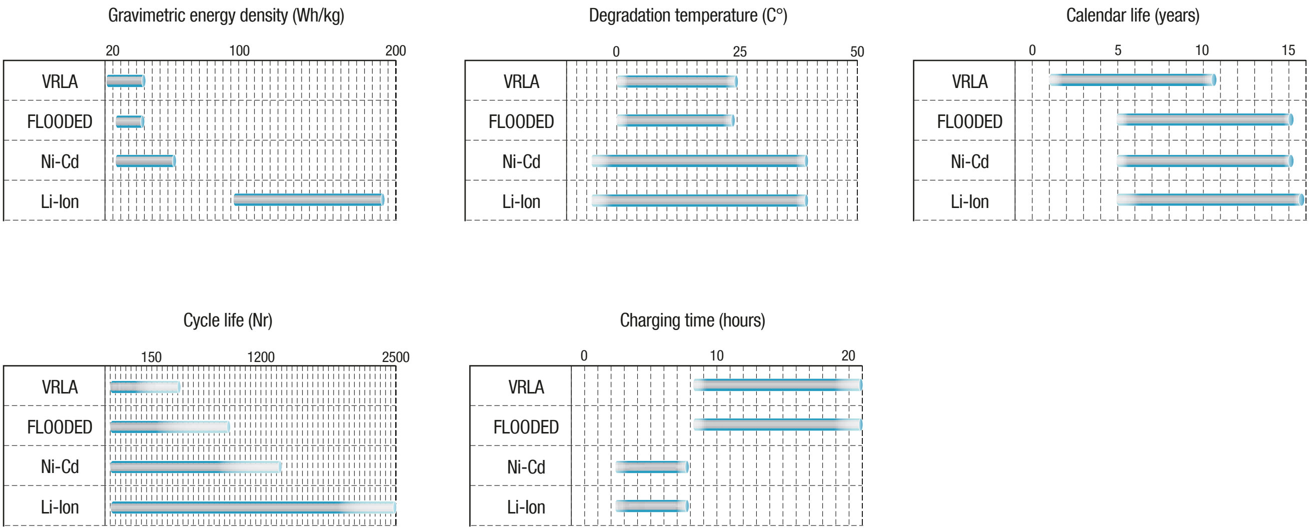
LCD synoptic panels show all items of information relative to operating status, electrical measurements, gives access to control functions and configuration parameters such as input voltage out of tolerance, output voltage present, no mains power, battery circuit broken, battery maintenance voltage fault, battery output operational with mains power present, slow discharge pre-alarm, slow discharge protection alarm, battery charger fault, earth leakage fault (option).



LIB (Lithium-ion batteries)

Recently introduced to batteries for UPS applications, lithium-ion technology clearly differs from conventional lead and nickelcadmium batteries. The most significant features include the considerable reduction in weight and floor space for the same runtime, the possibility of recharging them quickly, and their long cyclic and calendar lifetime.

However, their relatively brief history in highpower applications, and the need to introduce monitoring and equalisation electronics into batteries (which increases the initial cost), are still inhibiting on their widespread use.



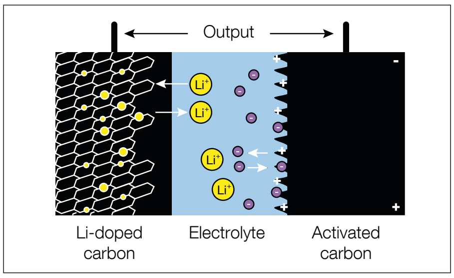
LIC (Li-Ion Capacitor)

LI-ION CAPACITOR UPS is the innovative UPS back-up storage solution specifically designed to protect:

- Applications requiring back-up times of a few seconds to several minutes.
- Processes sensitive to frequent micro interruptions.
- Applications working in critical environments where hazardous substances are not allowed.
- Applications with severe ambient conditions.

Lithium-ion capacitors: operating principle

- The activated carbon is a capacitor cathode
- The Li-doped carbon anode is a battery anode, undergoing Li doping during charge and de-doping during discharge
- Hybrid construction creates a capacitor which yields the best performance features of batteries and capacitors



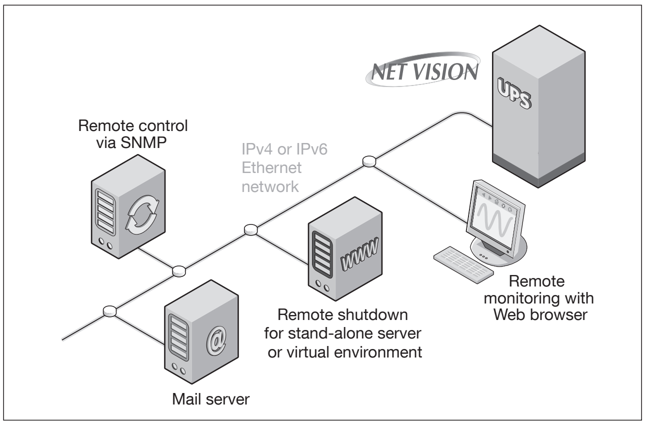
NET VISION

NET VISION is the most common Ethernet interface for use with Socomec products. It is a communication interface designed for business networks. The UPS behaves exactly like a networked peripheral, it can be managed remotely and allows the shutdown of server-based workstations.

NET VISION allows a direct interface between the UPS and Ethernet network avoiding dependence on the server. It is therefore compatible with all networks and multi-OS since it interacts via the Web browser.

The main specifications and functions are as follows:

- 10 / 100 Mb Ethernet connection (RJ 45),
- UPS monitoring screen via a Web browser,
- remote shutdown of stand-alone server (compatible with JNC) or Virtual environnement (compatible with VIRTUAL-JNC),
- notification of faults via email to up to 8 addresses,
- UPS management via SNMP protocol,
- monitoring of the operating environment (optional EMD temperature and humidity sensor). Configurable alarm trigger, notification via email.



LOGIC_017_C_GB_BW

“On-the-fly” transfer

In STS systems, the “on-the-fly” transfer mode is necessary to allow the operator to perform a synchronous transfer from the control panel when the two power sources are not permanently synchronous and the respective phases slowly diverge.

The “on-the-fly” transfer function must also be usable during automatic retransfer, to revert to the preferred source as soon as it is in better conditions than the alternative source.

The STS must transfer exactly when the source phase shift is below the preset tolerance window (which is adjustable).

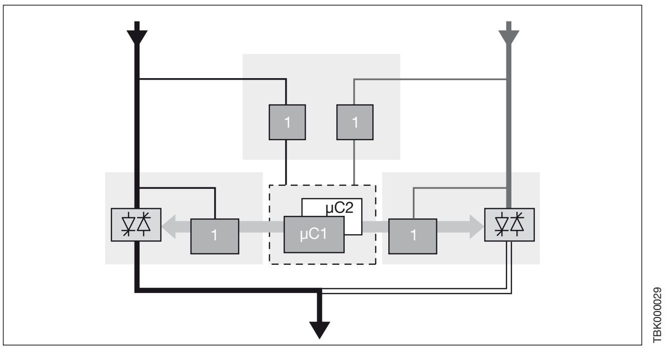
PARALLEL KIT

Parallel kits contain all of the components necessary for installing equipment units in parallel configurations. This can be anything from a cable to a cabinet, depending on the power and model of the UPS.

Contact Socomec for further details on the different solutions offered.

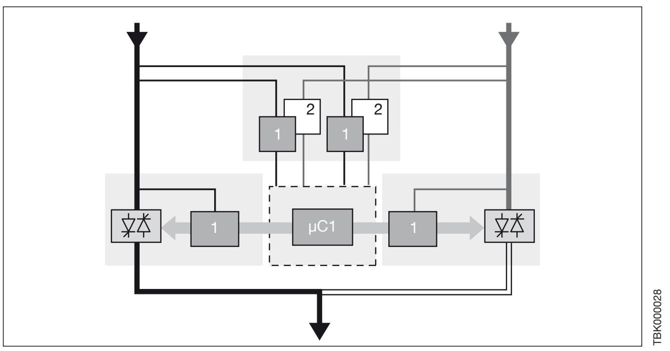
Redundant Microprocessor

In the case of mission-critical applications where system availability is fundamental, the equipment and all other components must be redundant intelligent. For the highest availability, even in the event of a control failure, the microprocessor can be redundant so that the system will not interrupt the power supply and full communication capacity will be maintained.



Redundant Supply and Dual Redundant Supply

A Static Transfer System for “redundant supply” is a redundant electronic power supply connected to each source that powers the control boards. The term “dual redundant supply” indicates the presence of a second redundant power supply in addition to the first one described above. If one power supply control board should fail, it enables internal redundancy to be maintained even with a single power source.



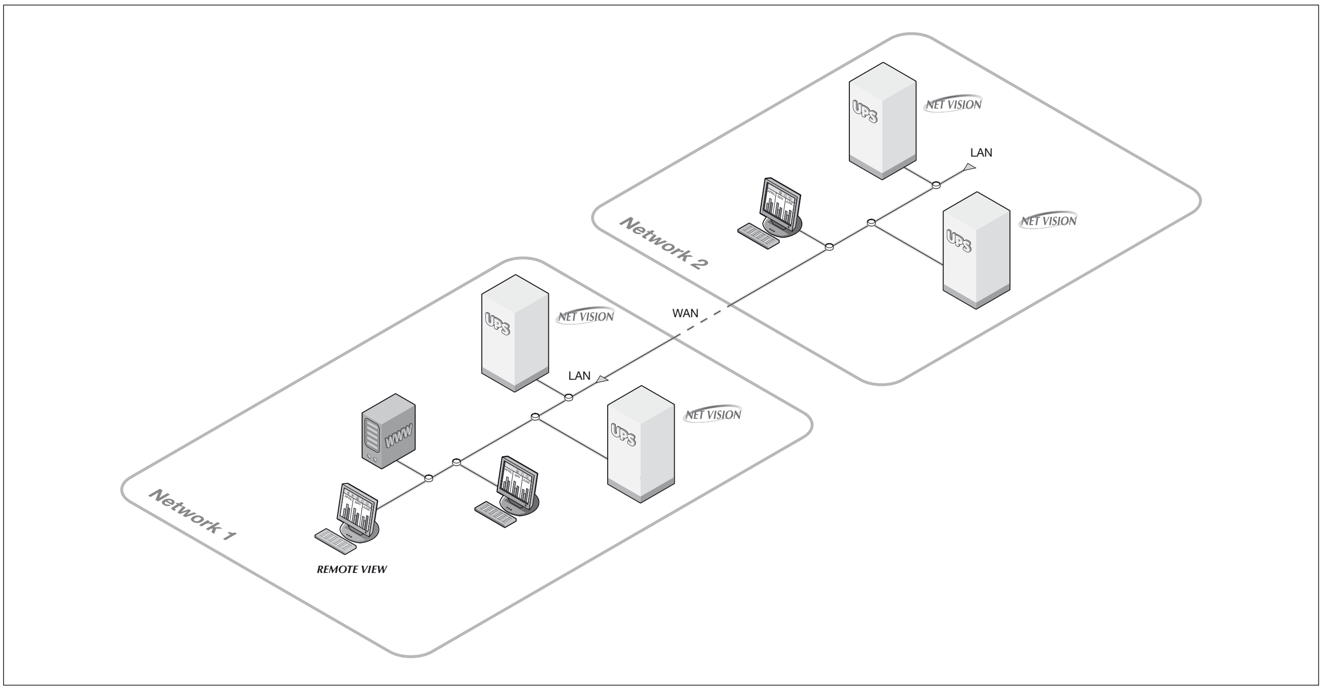
REMOTE VIEW

In addition to these protocols, another Socomec solution is REMOTE VIEW, a central monitoring programme for UPS systems over an Ethernet network, which is simpler and less expensive than the complex NMS platforms.

REMOTE VIEW is an application able to monitor simultaneously up to 1,024 devices equipped with NET VISION card or box through the Ethernet network. Users are provided with tree-view (hierarchy structure can have up to 8 levels) and list-view. When an alarm is triggered in one or other monitored UPS, (trap event), the icon that represents the UPS will change colour according to the severity level, sending an email to several addressees which have been set the programme configuration dialogue window.

If the programme is running in the background, a pop-up message appears. Input and output voltages, battery capacity and load percentage are continuously monitored by the REMOTE VIEW programme. Plant supervisors and technicians can monitor all the UPS in the same programme window.

REMOTE VIEW runs on Windows® 2000/2003/2008 (R2)/XP/VISTA/7 with administrator rights. REMOTE VIEW software is available from the Socomec's website for free download.



sydiv_013_a_gb_bw

SVM - Digital Space Vector Modulation

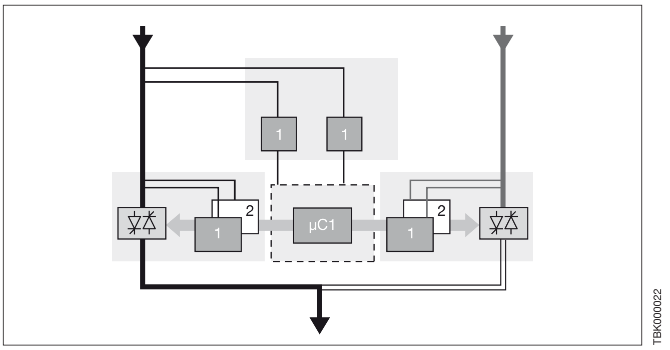
The SVM, digital Space Vector Modulation, along with the isolation transformer installed on the inverter output, provides:

- perfectly sinusoidal output voltage THDV < 2% with linear loads and < 3% with non-linear loads,
- output voltage precision even when load is completely unbalanced between phases,
- an immediate response to major variations in load, without deviating the output voltage (± 2% in less than 5 ms),
- a very high short-circuit capacity up to 4 In (Ph / N) allows selectivity,
- a complete galvanic isolation between DC circuit and load output.
- SVM, the latest high performance components and IGBT power bridges enable the supply of:
- non-linear loads with high crest factor up to 3,
- active power without derating, for loads with a lagging power factor and up to 0.9 leading.

SCR - INDEPENDENT CONTROL OF THE SILICON CONTROL RECTIFIER

Technology integrated in the Static Transfer System with individual, separate and autonomous control boards on each SCR path, increasing the redundancy and fault tolerance of each SCR path.

Physical separation between source 1 and source 2 SCRs prevents mutual disturbance.

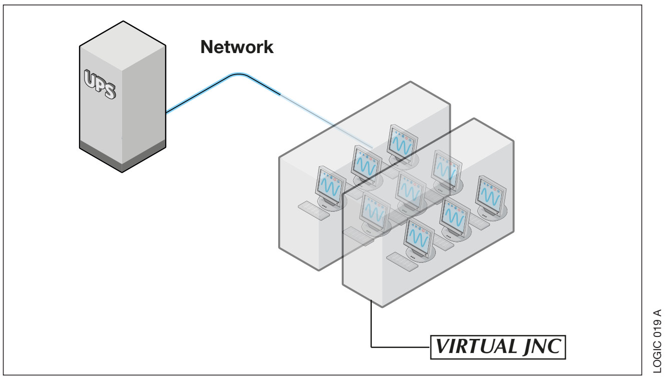


VIRTUAL JNC

Server virtualisation, which makes it possible to exploit the advantages of IT infrastructure consolidation, is becoming increasingly widespread. As a result, the correct management of virtual machines in the event of a fault with the electric power supply system is an increasingly common requirement. VIRTUAL JNC is the Socomec solution especially for virtual systems. It fully supports virtual machine shutdown, by acting on the physical server to correctly shutdown all virtual machines running on that server.

On Virtual Environment systems it is possible to manage the order of virtual machine shutdown (defining the shutdown as sequential or staggered)) and systems with more than one host (also in a cluster configuration), in a simple, efficient manner. VIRTUAL JNC is compatible with all Socomec UPS systems that support shutdown management via LAN. VIRTUAL JNC is compatible with VMware vCenterTM / vSphere, MicrosoftTM HYPER-V and Citrix XenServer.

VIRTUAL-JNC requires to be installed in a Windows® virtual machine. VIRTUAL-JNC software is available in the Socomec's web site for free download.



Model : SOCOMEC
Production : SOCOMEC
Photography : Martin Bernhart and Studio Objectif
Printing :

Socomec: our innovations supporting your energy performance

1 independent manufacturer

4,600 employees worldwide

8 % of sales revenue dedicated to R&D

400 experts dedicated to service provision

Your power management expert

POWER SWITCHING

POWER MONITORING

POWER CONVERSION

ENERGY STORAGE

EXPERT SERVICES

The specialist for critical applications

- Control, command of LV facilities
- Safety of persons and assets

- Measurement of electrical parameters
- Energy management

- Energy quality
- Energy availability
- Energy storage

- Prevention and repairs
- Measurement and analysis
- Optimisation
- Consultancy, commissioning and training

A worldwide presence

12 production sites
- France (x3)
- Italy (x2)
- Tunisia
- India
- China (x2)
- USA (x2)
- Canada

30 subsidiaries and commercial locations
- Algeria • Australia • Austria • Belgium • China • Canada
- Dubai (United Arab Emirates) • France • Germany
- India • Indonesia • Italy • Ivory Coast • Malaysia
- Netherlands • Poland • Portugal • Romania • Serbia
- Singapore • Slovenia • South Africa • Spain • Sweden
- Switzerland • Thailand • Tunisia • Turkey • UK • USA

80 countries where our brand is distributed

HEAD OFFICE

SOCOMEC GROUP

SAS SOCOMEC capital 10 535 460 €
R.C.S. Strasbourg B 548 500 149
B.P. 60010 - 1, rue de Westhouse
F-67235 Benfeld Cedex
Tel. +33 3 88 57 41 41 - Fax +33 3 88 57 78 78
info.scp.isd@socomec.com

www.socomec.com

YOUR DISTRIBUTOR / PARTNER

100 years OF SHARED ENERGY

socomec Innovative Power Solutions

TECHNICAL-GUIDE-BOOK_EN_2026_V13 - 12/25 - Photo: Martin Bernhart - Réalisation: Socomec