# MODULYS XL

Ultimate modular UPS

from 200 kW to 4.8 MW

**ULTIMATE**

Fault tolerant power
without compromise

3 LEVEL TECHNOLOGY

97% EFFICIENCY

kW = kVA


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# 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.

# 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.

# 1. ARCHITECTURE

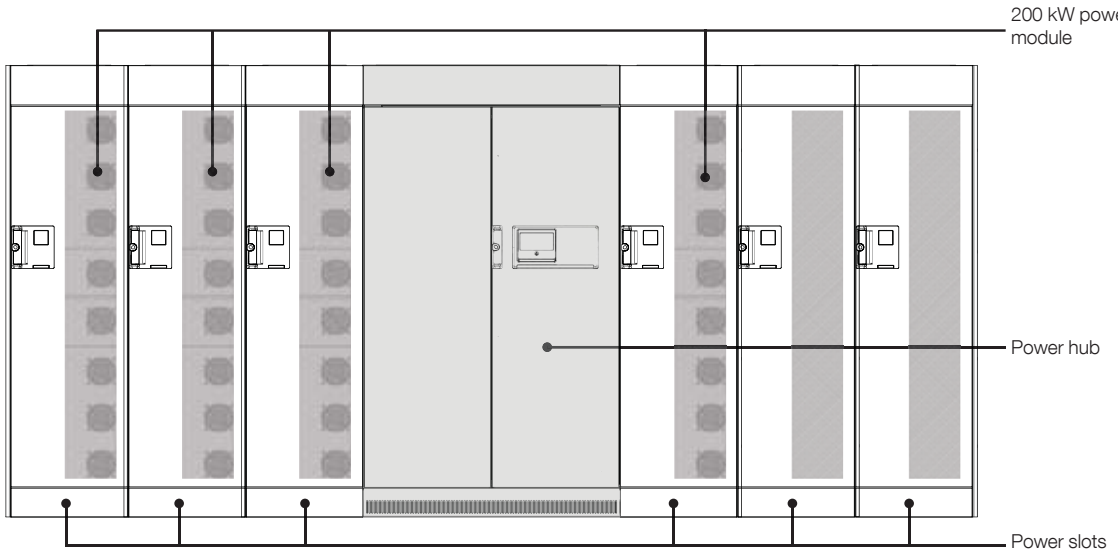
## 1.1 RANGE

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
- 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.

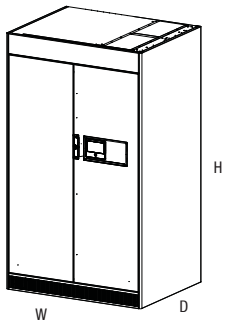
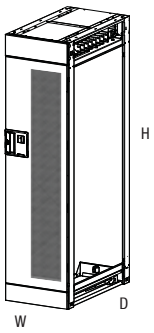
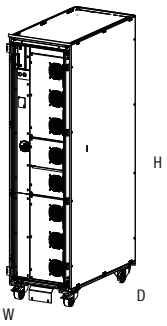
The number of Power slots installed at the beginning defines maximum power that can be reached trough Hot-scalability at each UPS UNIT level.

| **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 | | | | | | | | | | | | | | | | | |

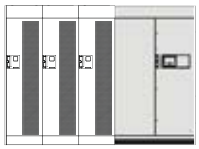
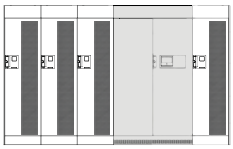
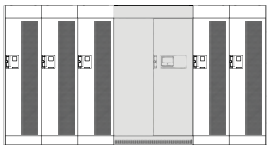
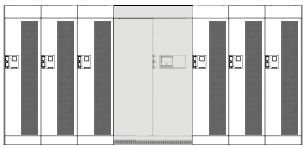
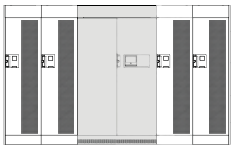
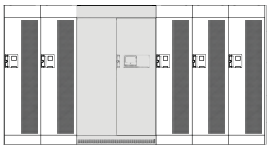
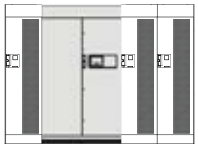
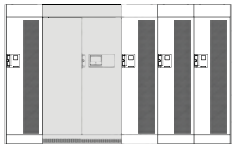
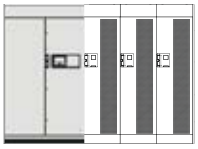
## 1.3 THE BRICKS

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

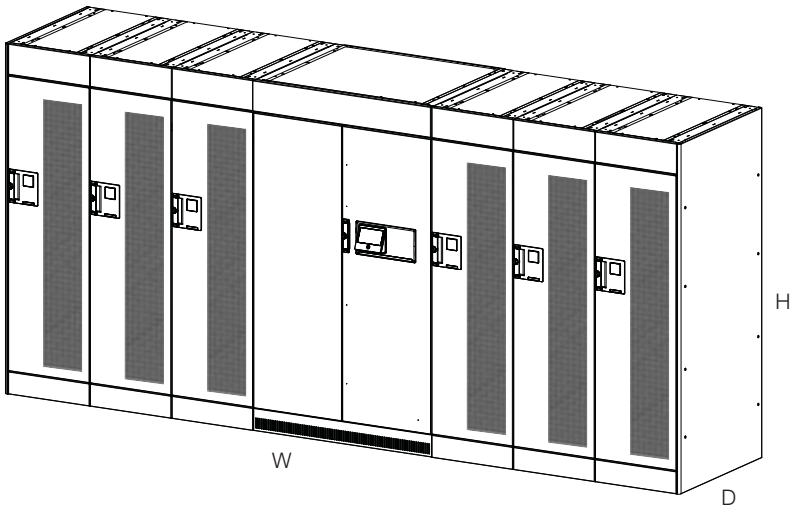
| 3 *Power* slots | 4 *Power* slots | 5 *Power* slots | 6 *Power* slots |
|---|---|---|---|
|  |  |  |  |
|  |  |  | |
|  |  | | |
|  | | | |

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.*

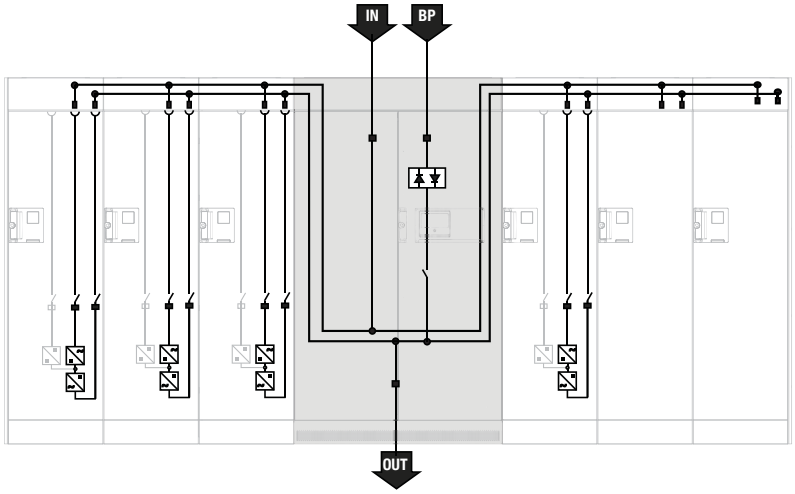
## 1.4 SYSTEM ARCHITECTURES

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

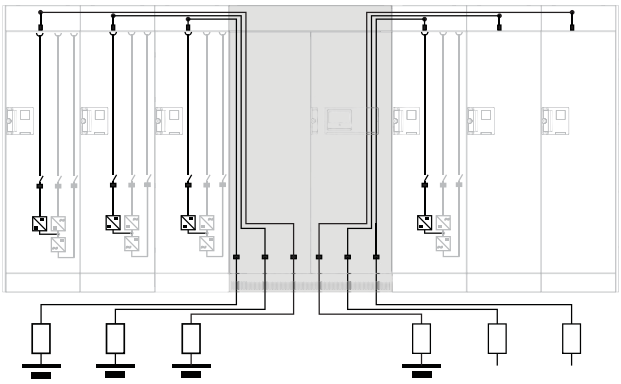



By-pass architecture for each UPS UNIT

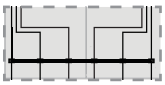
The above drawings show simplified diagrams for separated inputs (Rectifier / Bypass).

### 1.4.2 BATTERY CONNECTION

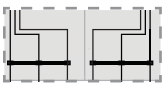
Modulys XL provides full flexibility in regards to the batteries connection. This permits to address all different needs in term of availability, cost and footprint optimization.



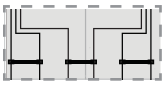
Distributed battery



1 battery set shared for
All installed slots/modules



1 battery set shared for
3 power slots/modules



1 battery set shared for
2 power slots/modules

Flexible battery sharing

For full hot-scalability, the future battery protection should be prewired to the Power HUB, so that the battery set can be added later on.

The battery protections that have to be close to the batteries.

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.
- Redundant bypass cooling.
- Distributed batteries (1 per module).
- Battery 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

## 2.3 ELECTRICAL OPTIONS.

- Input, output and maintenance bypass switches.
- 3-wire bypass and output distribution kit.
- PEN kit for TN-C grounding system.
- 4-wire rectifier (neutral connection kit).
- Shared batteries (1, 2 or 3 per unit).
- Enhanced battery charger.
- Battery tripping kit.
- Unit parallel kit.
- Redundant electronic power supplies.
- BCR (Battery Capacity Re-injection).
- ACS synchronisation system.
- Cold start.
- Top roof.

## 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)
- 2 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 volatge-free contacts).
- MODBUS RTU RS485 or TCP
- PROFIBUS / PROFINET gateway.
- BACnet/IP interface.
- 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 UPS mobile app.
- Remote touch-screen panel.
- Addional Com-Slot extension.

## 2.6 REMOTE MONITORING AND CLOUD SERVICES.

- LINK-UPS: Socomec 24/7 Remote Monitoring Service connecting your installation to the nearest Socomec Service Centre.
- SoLive UPS: Mobile app taking the surveillance of all your UPS systems into your smartphone (only available in some countries, please consult us for more information).

# 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 mo*dule (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 | |
|---|---|
| Number of poles | 2 wires (+/-) |
| Min/Max number of battery cells with load PF=1 | 258 |
| Min/Max number of battery cells with load PF ≤ 0.9 | 234 |
| Min/Max number of 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)<br>120A per module (optional) |

| Electrical characteristics - Static Bypass | | |
|---|---|---|
| Bypass rated voltage | | Nominal output voltage ±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 | | 1.5 Hz/s settable from 1 to 3 Hz/s |
| Semiconductors characteristics | $I^2t$ ($A^2s$) | 7 220 000 |
| | Is/c (A peak) | 38 000 |
| 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) |

| Electrical characteristics - Inverter | | | | | | | |
|---|---|---|---|---|---|---|---|
| Number of installed *Power mo*dule (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 | |
|---|---|
| Storage temperatures | -20 to +70 °C (-4 to +158 °F)<br>(15 to 25 °C for longer battery life) |
| Start-up and working temperature | 0 to +40 °C (+50 to +104 °F)<br>(15 to 25 °C for longer battery life) |
| Air inlet | Front |
| Air outlet | Top |
| Maximum 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 | 1000 |
| 600 | 3 | 1000 | 4 | 1600 |
| 800 | 4 | 1600 | 5 | 2000 |
| 1000 | 5 | 2000 | 6 | 2000 |
| 1200 | 6 | 2000 | | |

| **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 planed to be installed, at initial stage or later.

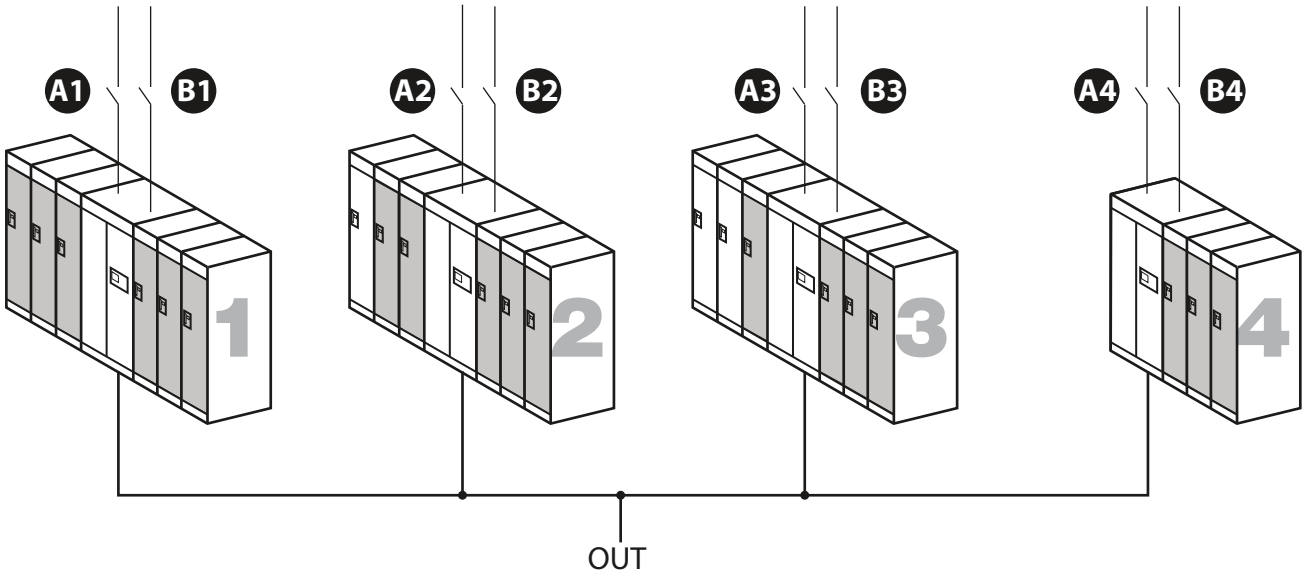
### 3.3.2 INPUT PROTECTIONS FOR PARALLEL UNITS CONFIGURATION

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 and protection shall be protected size 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



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## 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

| Cables connection – Power HUB [10] | | | |
|---|---|---|---|
| | Maximum number of cable according the size (Others on demand) | | |
| Rectifier terminals 3PH [11] | 6 x 240 mm2 per pole | 5 x 300 mm2 per pole | 4 x 400 mm2 per pole |
| Bypass terminals 3PH+N [11] | 6 x 240 mm2 per pole | 5 x 300 mm2 per pole | 4 x 400 mm2 per pole |
| Output terminals 3PH+N [11] | 6 x 240 mm2 per pole | 5 x 300 mm2 per pole | 4 x 400 mm2 per pole |
| Battery coupling type | Distributed batteries | Shared batteries | |
| Number of terminals | 2 poles (1 per modules) | up to 6 x 2 poles | |
| Battery terminals | up to 2x240 $mm^2$ per pole | up to 2x240 $mm^2$ per pole | |

7. *Applicable to separate inputs. The bypass protection is given as a recommendation (including overload capability). 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). 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.*
8. *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.*
9. *Average Peak Current*
10. *Based on HO7 RNF or R2V cable type; for other please consult us*
11. *On demand, the Unit can be adapted to match specific installation requirements:*
    - *Rectifier with input Neutral terminal connection (consult us to ensure it is allowed by local standards)*
    - *Bypass without input Neutral available (for 3 phases load without 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 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

## 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

### 4.2.4 ENVIRONMENTAL

IEC 62040-4 Uninterruptible Power System (UPS) - Part 4: Enviromental 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.