Technical Specifications

MASTER HP UL

65 - 250 kVA THREEPHASE/THREEPHASE
On Line Double Conversion (VFI) Technology
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1. PURPOSE

The present specification defines the technical characteristics of the UPS Master HP 65 to 250 kVA UL certified, a device which supplies clean energy to the connected load, without any interruption due to disturbances in the mains power supply, including a total power failure.

Master HP is a series of UPSs designed entirely by Riello UPS a leading manufacturer of Uninterruptible Power Supply (UPS) from 350 VA to 800 kVA CE mark, with over 25 years of experience in the sector.

If you are interested to see all the Riello products UL and CE marked, as for example the Frequency Converters, the Static Transfer Switch (STS) and the PV inverters for solar application please visit the websites www.riello-ups.com and www.aros-solar.

2. SYSTEM DESCRIPTION

Master HP UL series is available in three phase models 65-80-100-125-200-250 kVA with On Line double conversion technology in accordance with VFI-SS-111 classification – as defined by standard IEC EN 62040-3 - with transformer in output to the inverter.

Master HP UL is compatible with the most critical, industrial and Information Technology (IT), services thanks to its many features including:

a) Easy Source
   - Low input current distortion below 3% and power factor up to the unit, from 10% to 100% of the load. This is possible thanks to the rectifier realized with IGBT three phase bridge and controlled by DSP technology;
   - Compatibility with motor generators thanks functions as power walk-in, that guarantees a progressive start-up of the rectifier, power walk-in delay timer and battery inhibition.

b) Battery Care System
   - Battery recharge with two voltage levels as per characteristics IU1 U2;
   - Voltage Recharge with temperature compensation;
   - Compatibility to recharge battery with long autonomy;
   - Battery test to check a battery decay.

c) Isolation transformer on the inverter that protects the load from network disturbances in all the working conditions without altering the overall efficiency that remains around 94%.

d) Double load protection towards the battery: one furnished with intrinsic electronic protection in the control circuits and galvanic furnished with output transformer from the inverter.

e) Thermal overrating of the inverter to guarantee an overload (kVA) at 110% for 60 minutes.

f) The nominal output power rating of the UPS is given with a power factor of 0.9.

g) Backfeed protection.

h) System expandability up to 8 units.

i) Parallel features included in the base version.


k) The UPS system can work with or without the neutral connection, no additional kits are required.
The UPS models available are:

<table>
<thead>
<tr>
<th>UPS Model</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>MHT 65 UL P</td>
<td>UPS 65 kVA 480 V – 60 Hz single &amp; parallel</td>
</tr>
<tr>
<td>MHT 80 UL P</td>
<td>UPS 80 kVA 480 V – 60 Hz single &amp; parallel</td>
</tr>
<tr>
<td>MHT 100 UL P</td>
<td>UPS 80 kVA 480 V – 60 Hz single &amp; parallel</td>
</tr>
<tr>
<td>MHT 125 UL P</td>
<td>UPS 125 kVA 480 V – 60 Hz single &amp; parallel</td>
</tr>
<tr>
<td>MHT 160 UL P</td>
<td>UPS 160 kVA 480 V – 60 Hz single &amp; parallel (w/o internal MYB)</td>
</tr>
<tr>
<td>MHT 160 UL MBY TCE</td>
<td>UPS 160 kVA 480 V – 60 Hz single &amp; parallel (with internal MYB &amp; Top Cable Entry)</td>
</tr>
<tr>
<td>MHT 200 UL P</td>
<td>UPS 200 kVA 480 V – 60 Hz single &amp; parallel (w/o internal MYB)</td>
</tr>
<tr>
<td>MHT 200 UL MBY TCE</td>
<td>UPS 200 kVA 480 V – 60 Hz single &amp; parallel (with internal MYB &amp; Top Cable Entry)</td>
</tr>
<tr>
<td>MHT 250 UL P</td>
<td>UPS 250 kVA 480 V – 60 Hz single &amp; parallel (w/o internal MYB)</td>
</tr>
<tr>
<td>MHT 250 UL MBY TCE</td>
<td>UPS 250 kVA 480 V – 60 Hz single &amp; parallel (with internal MYB &amp; Top Cable Entry)</td>
</tr>
</tbody>
</table>

The Battery cabinets models available are:

<table>
<thead>
<tr>
<th>Battery Cabinet Model</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>BBX 1900 480 UL L8 3 U</td>
<td>Empty battery cabinet suitable for 40 blocks, 12 V 55 Ah or 100 Ah</td>
</tr>
<tr>
<td>BBX 1900 480V UL 5C 3 U</td>
<td>Battery cabinet with 40 blocks 12 V 55 Ah Model CSB HRL12200W-FR</td>
</tr>
<tr>
<td>BBX 1900 480V UL 5F 3U</td>
<td>Battery cabinet with 40 blocks 12 V 55 Ah Model FIAMM 12F LX200 or 12FLB200</td>
</tr>
<tr>
<td>BBX 1900 480V UL 0C 3 U</td>
<td>Battery cabinet with 40 blocks 12 V 100 Ah Model CSB HRL12390W-FR</td>
</tr>
<tr>
<td>BBX 1900 480V UL 0F 3 U</td>
<td>Battery cabinet with 40 blocks 12 V 100 Ah Model FIAMM 12F LX400 or 12FL4200</td>
</tr>
</tbody>
</table>

3. REFERENCE STANDARDS

Our company quality system is certified ISO 9001/2000 (Certificate No CERT-04674-99-AQ-VEN- SINCERT) and covers all procedures, operating methods and monitoring of all stages from design to production and sales activities.

This certification is a guarantee for the customer with regard to the following aspects:

- Use of quality materials;
- Meticulousness in the production and testing phases;
- Constant customer support.

Besides company certification the product is classified VFI-SS-111 in conformity with standard IEC EN 62040-3 and satisfies the following UPS specific standards:

**UPS 65-80-100-125 kVA**

- UL 1778 2nd CSA C 22.2 No 107.1_M01 Uninterruptible Power System
- National Electrical Code (NFPA-70)
- FCC Part 15 Subpart J class A – Radio Frequency
- IEC 62040-3 – Methods of specifying the performance and test requirements;
- UL 924 and OUST category – Emergency Lighting and power equipment

**UPS 160-200-250 kVA**

- UL 1778 4th edition CSA C 22.2 No 107.3-05: Uninterruptible Power System
- UL 60950-1: Information Technology Equipment - Safety - Part 1: General Requirements
- National Electrical Code (NFPA-70)
- FCC Part 15 Subpart J class A – Radio Frequency
- IEC 62040-3 – Methods of specifying the performance and test requirements;
- UL 924 and OUST category – Emergency Lighting and power equipment

The UPS range from 65 to 250 kVA are complimentary listed as Lighting and Power Equipment, Auxiliary (OUST)
CODE of CONDUCT (CoC) on Energy Efficiency and Quality of UPS

To help all parties to address the issue of energy efficiency whilst avoiding competitive pressures to raise energy consumption of equipment all manufacturers of UPS are invited to sign the Code of Conduct. Taking into account that the energy efficiency of UPS is influenced by the quality realized, the mode of operation as well as the components used. The Code of Conduct sets out the basic principles to be followed by all parties involved in Uninterruptible Power Systems, operating in the European Community in respect of energy efficient equipment.

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Certificate of Compliance

Certificate Number: 20110119-E333331
Issue Date: 2011 January 19

Issued to: RPS S P A
Viale Europa 7
Legnano, Vg 37045
Italy

This is to certify that representative samples of UNINTERRUPTIBLE POWER-SUPPLY EQUIPMENT UPS Models UPS MHT XXX UL P, where XXX may be 80, 100 or 125

Have been investigated by Underwriters Laboratories in accordance with the Standard(s) indicated on this Certificate.


Additional Information: See UL On-line Certification Directory at WWW.UL.COM for additional information.

Only those products bearing the UL Listing Mark for the US and Canada should be considered as being covered by UL’s Listing and Follow-Up Service meeting the appropriate requirements for US and Canada.

The UL Listing Mark for the US and Canada generally includes: the UL in a circle symbol with “C” and “US” identifiers: UL; the word “LISTED”; a control number (may be alphanumeric) assigned by UL; and the product category name (product identifier) as indicated in the appropriate UL Directory.

Look for the UL Listing Mark on the product

William R. Carney
Director, North American Certification Programs

Underwriters Laboratories Inc.

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CERTIFICATE OF COMPLIANCE

Certificate Number: 20130425-E333331
Report Reference: E333331-20130425
Issue Date: 2013-APRIL-25
Issued to: RPS S.P.A
VIALE EUROPA 7
37045 LEGNAGO VR ITALY

This is to certify that representative samples of UNINTERRUPTIBLE POWER-SUPPLY EQUIPMENT USL, CUL – UPS Models: MHT 160 UL P, MHT 200 UL P, MHT 250 UL P, MHT 160 UL P MBB TCE, MHT 200 UL P MBB TCE and MHT 250 UL P MBB TCE

Have been investigated by UL in accordance with the Standard(s) indicated on this Certificate.

Standard(s) for Safety: UL 1778 and CSA C22.2 No. 107.3-05 - Standard for uninterruptible power supplies

Additional Information: See the UL Online Certifications Directory at www.ul.com/database for additional information

Only those products bearing the UL Listing Mark for the US and Canada should be considered as being covered by UL’s Listing and Follow-Up Service meeting the appropriate requirements for US and Canada.

The UL Listing Mark for the US and Canada generally includes: the UL in a circle symbol with “C” and “US” identifiers: the word “LISTED”, a control number (may be alphanumeric) assigned by UL; and the product category name (product identifier) as indicated in the appropriate UL Directory.

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William R. Carey, Director, North American Certification Programs
UL LLC

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CERTIFICATE OF COMPLIANCE

Certificate Number: 20140811-E333331
Report Reference: E333331-20110119
Issue Date: 2014-AUGUST-11

Issued to: RPS S P A
VIALE EUROPA 7
37045 LEGNAGO VR ITALY

This is to certify that representative samples of
UNINTERRUPTIBLE POWER-SUPPLY EQUIPMENT;
LIGHTING AND POWER EQUIPMENT, AUXILIARY
UPS Models MHT XXX UL P, where XXX may be 65, 80,
100 or 125.
These models are complementary Listed as Lighting and
Power Equipment, Auxiliary (OUST).
Frequency Converters Models (FC): MHT FC 80 UL P,
MHT FC 100 UL P, MHT FC 80 UL P (CK),
MHT FC 100 UL P (CK).

Have been investigated by UL in accordance with the
Standard(s) indicated on this Certificate.

Standard(s) for Safety:
Standard for Uninterruptible Power Supply Equipment, UL
1778.
Standard for Emergency Lighting and Power Equipment, UL
924.
Standard for General Use Power Supplies, CAN/CSA C22.2
No. 107.1.

Additional Information: See the UL Online Certifications Directory at

Only those products bearing the UL Listing Mark for the US and Canada should be considered
being covered by UL’s Listing and Follow-Up Service meeting the appropriate requirements for US
and Canada.
The UL Listing Mark for the US and Canada generally includes: the UL in a circle symbol with “C” and
“US” identifiers; a suffix “LISTED”; a control number (may be alphanumeric) assigned by UL;
and the product category name (product identifier) as indicated in the appropriate UL Directory.

Look for the UL Listing Mark on the product.

William R. Canev, Director, North American Certification Programs
UL LLC

Any information and documentation involving UL Mark services are provided on behalf of UL LLC (UL) or any authorized licensee of UL. For questions, please contact a local UL Customer Service Representative at customerservice@ul.com.
CERTIFICATE OF COMPLIANCE

Certificate Number: 20140811-E333331
Report Reference: E333331-20130425
Issue Date: 2014-AUGUST-11

Issued to: RPS S.P.A
VIALE EUROPA 7
37045 LEGNO VR ITALY

This is to certify that representative samples of UNINTERRUPTIBLE POWER-SUPPLY EQUIPMENT, LIGHTING AND POWER EQUIPMENT, AUXILIARY have been investigated by UL in accordance with the Standards indicated on the Certificate.

Standards for Safety:
UL 1778 and CSA C22.2 No. 107.3-05
Standard for Emergency Lighting and Power Equipment, UL 924.
Standard for Uninterruptible Power Systems, CSA C22.2 No. 107.3-05.

Additional Information:
See the UL Online Certifications Directory at www.ul.com/databases for additional information.

Only those products bearing the UL Listing Mark for the US and Canada should be considered as being covered by UL's Listing and Follow-up Service meeting the appropriate requirements for US and Canada. The UL Listing Mark for the US and Canada generally includes the UL in a circle symbol with "C" and "US" identifiers. The word "ULSTICK" is a trademark number (may be a shareholder assigned by UL, and the product category name (product identifier) as indicated in the appropriate UL Directory. Look for the UL Listing Mark on the product.

[Signature]

Page 1 of 2

CERTIFICATE OF COMPLIANCE

Certificate Number: 20140811-E333331
Report Reference: E333331-20130425
Issue Date: 2014-AUGUST-11

This is to certify that representative samples of the product as specified on this certificate were tested according to the current UL requirements.

USL, CUL - UPS Models: MHT 160 UL, P, MHT 200 UL, P, MHT 250 UL, P, MHT 160 UL, P MBY TCE, MHT 200 UL P MBY TCE and MHT 250 UL P MBY TCE.

USL - UPS Models: MHT 160 UL, P, MHT 200 UL, P, MHT 250 UL, P, are complementary Listed as Lighting and Power Equipment, Auxiliary (COST)

USL, CUL, Frequency converters Models (FC):
MHT FC 125 UL, P, MHT FC 125 UL, P TCE, MHT FC 160 UL, P, MHT FC 160 UL P TCE, MHT FC 200 UL P, MHT FC 200 UL P TCE.

USL, CUL, Frequency converters Models (FC CK):
MHT FC 125 UL, P (CK), MHT FC 125 UL, P TCE (CK), MHT FC 160 UL, P (CK), MHT FC 160 UL, P TCE (CK), MHT FC 200 UL, P (CK), MHT FC 200 UL, P TCE (CK).

[Signature]

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4. APPLICATIONS

The UPSs of the Master HP UL series are suitable for all applications requiring protection of the critical load, from simple installations to more complex systems where a higher level of reliability and maintainability is required.

**Data Centers and Telecommunication:** the uninterruptible power system can grow together with your business since the basic system can be expanded with up to eight units connected in parallel without compromising the initial investment.

**Industrial processes and electro-medical systems:** the UPS is particularly suitable for application with industrial processes and the power supply to electro-medical systems, thanks to its design principles and technical features, such as for example:

- inverter with output transformer guaranteeing isolation of the load from mains interference in all conditions;
- high short circuit and overload capacity;
- high battery recharging capacity, enabling applications with different kinds of batteries (sealed, vented or Nickel Cadmium) with long back-up time.
5. CONFIGURATIONS

The UPS is designed to work as Single input Unit or as Dual input Unit.

Schematic diagram: **Single input Unit**

(*) For MASTER HP 160-250 kVA the Maintenance Bypass switch (SWMB) is included only in the UL PTCE version, not in base version.

Schematic diagram: **Dual input Unit**

(*) For MASTER HP 160-250 kVA the Maintenance Bypass switch (SWMB) is included only in the UL PTCE version, not in base version.
The single version UPS, normally used for simple installations, can be expanded up to 8 modules in parallel to satisfy increases in load power or to introduce a level of redundancy. The unit has the parallel feature already included.

The system is defined as “redundant parallel” when the switch off of one or more UPSs does not determine the loss of the critical power supply.

All the UPSs fed the load simultaneously with automatic sharing of the current.

The units exchange information on the operating status and the sync signals by the connections in loop with dual redundancy. This means that even in the event of the accidental interruption of both connections, only the UPS affected by this interruption cuts itself off, while the other one continues to operate without any interference.

The “Hot System Expansion” (HSE) feature means that a new UPS can be added to the system while the other units are on-line and powering the load from the inverter.

The integrated UPS will configure itself automatically with the system data without any disturbance to the load.

In configurations with more than two units, to improve the normal and extraordinary maintenance operations, it is advisable to install an external maintenance by-pass and to inhibit the UPS’s internal one.

The UPS will be equipped with terminal to connect the following auxiliary contacts:

- External Maintenance Switch
- External Load Output Switch

In parallel systems, the “Efficiency Control System” (ECS) function enables the UPS to be switched on and off automatically according to load variations, while retaining the level of redundancy defined by the operator. This significantly reduces the total energy dissipated by the system since only those UPSs required to power the connected load remain switched on (for example during the night or at weekends).
6. UPS DESCRIPTION

The Uninterruptible Power Supply can be set to operate in four operating modes: ON-LINE, STAND-BY ON, SMART ACTIVE and STAND-BY OFF.

Mode: ON-LINE

- **Normal Operation**: The rectifier draws energy from the mains to power the inverter and keep the batteries charged; the inverter powers the load with voltage and frequency stabilised and in sync with the by-pass mains, if appropriate.

- **Emergency operation**: when the mains power supply goes out of the pre-set limits, the rectifier switches off and the inverter is powered from the battery for the envisaged back-up time without any disturbance to the load. When the mains power supply is restored, the Rectifier starts to operate gradually (power walk in), powering the batteries again and charging the inverter.

- **By-pass operation**: in the event of an inverter overload beyond the envisaged limits, or a manual shutdown, the load is automatically transferred onto the by-pass mains by means of the Static switch without any disturbance to the load.

Mode: STAND-BY ON

The load is normally powered from the by-pass mains, the rectifier keeps the batteries charged. When the mains goes outside the preset range, the load is transferred automatically onto the inverter until the mains returns to a suitable level. This mode is suitable for powering loads that are not sensitive to mains interference, thus allowing increased system efficiency of up to 98%.

Mode: SMART ACTIVE

When the Master HP UL is configured in SMART ACTIVE mode, it automatically defines whether to operate in ON-LINE or STAND-BY OFF mode.

This is done by monitoring the by-pass mains: if this remains suitable for a defined period, the system sets itself to STAND-BY ON mode; otherwise it remains in ON-LINE mode.
Mode: STAND-BY OFF

When the mains power supply is present, the rectifier keeps the batteries charged and the inverter is switched off. When the mains fails, the rectifier switches off and the inverter is activated in approx. 200 ms, using the battery energy.

The block diagram of the Master HP UL - P TCE system is shown below:

**6.1. AC/DC Converter**

The AC/DC Converter converts the alternate voltage into direct voltage to power the inverter at nominal load and to charge the batteries. The input stage of Master HP UL UPS is realized with a technology such as to reduce the harmonics of current rejected into the mains by up to 3% and increase the power factor up to the unit from 10 to 100% of the load (see the tables with the Technical Data at the end of the present specifications).
6.1.1 Easy Source

Master HP UL is designed in order to reduce at minimum the impact on the mains source or on the upstream Generator Set. In detail the features are as follow:

- **Input Harmonics**: thanks to a low input harmonics content of the and the high power factor, the installation costs are reduced as well as the sizing of a possible generator set upstream.

- **Power Walk-In duration**: when the input voltage is applied to the rectifier, as per example after a mains power failure, this reaches the nominal power progressively in a programmable time from 0 to 125 seconds.

- **Power Walk-in start delay**: in parallel configurations the start-up of the rectifiers can be delayed to reduce the impact to any generator located upstream. The delayed start-up is programmable up to 125 seconds.

![Example of calibration from the rectifiers in a parallel system](image)

- **Inhibition of the battery charge current**: while the UPS is operating with a generator set, battery recharging can be excluded and all the available power can be used to feed the load.

- **Inhibition of bypass synchronism**: in case of the generator set with a very unstable output frequency, the Inverter synchronization with bypass can be inhibited. In such as case the inverter generates an output voltage in the free running mode by using the internal oscillator. Consequently, the transfer of the load on the bypass is not allowed.

The “battery recharge current” and “Inverter Synchro with bypass” inhibitions are activated by a remote contact of the generator set connected to the optional Rely Card (see Chapter 12 - Options).
6.2. DC/DC Converter

The DC/DC converter takes the output direct current from PFC converter to allow the battery recharge. Such a system closes inside it a STEP-UP/STEP-DOWN converter that takes care of the charging and discharging of the battery, reducing drastically the current ripple in the battery. The DC/DC converter is also characterized by the following main functions:

6.2.1 Battery Care System

The “Battery Care System” is a set of functions to control, manage and preserve the battery as long as possible.

a) **Battery Recharging:** This UPS is suitable for hermetic lead batteries (VRLA), AGM, open vase and Ni-Cd. Depending on the battery type, two recharge methods are available:

- **Cyclical recharging (factory set):** the state of the battery charge is kept constantly under control and when the charge level drops below the established level, a recharge cycle starts up automatically following the IU characteristic (EN 50272-2). In any case the UPS automatically runs a top-up charge cycle every 24 hours.

- **Two level recharging (configurable):** this recharge is carried out with two levels of current at two voltage levels following the IU1 U2 characteristic (EN 50272-2). During the first phase the charging takes place at the rapid charge voltage (U1), followed by a second phase at the floating charge level (U2). Both these recharge values are ensured with temperature compensation of the recharge current as required by the battery manufacturers so that battery life is not jeopardize. This type of recharge can be configured on-site and is mainly used with open vase or Ni-Cd batteries.

b) **Battery test:** in normal operating conditions the battery is checked automatically at regular intervals or on manual command. The test takes place without appreciably discharging the battery, in complete safety for the load and without compromising the battery service life. If the test has a negative outcome, a report signal will appear on the UPS panel and remotely.

c) **Protection against slow discharge:** in the event of discharges of long duration and low load, the end of discharge voltage is raised to approx. 1.8 V/el as prescribed by the battery manufacturers so at to avoid damaging the batteries.

d) **Current Ripple:** thanks to the STEP-UP/STEP-DOWN converter, that provides to recharge and discharge the battery, the current ripple in the battery is extremely reduced. This feature eliminates one of the main causes of reduced battery reliability.

6.3. DC/AC Converter

The DC/AC converter converts direct voltage in to stabilized, alternate sinusoidal current to supply the load. With the UPS in ON-LINE mode, the load is always powered from the inverter.

This comprises a three phase inverter with IGBT (Isolated Gate Bipolar Transistor), a transistor that allows high switching frequencies (>20 kHz) and consequently low consumption and low noise.

The inverter output is connected to the transformer, thus ensuring galvanic isolation between output and battery.

**Voltage regulation**

Output voltage is regulated by using the independent phase control, a characteristic that allows a better static and dynamic response. In detail:

a) **Static condition:** the output voltage from the inverter remains within ±1% for all the input tension variations within the permissible limits;

b) **Dynamic condition:** for load variations from 0 to 100%, the output voltage remains within ±5% below the values defined by class 1 of standard EN62040-3.
Frequency regulation

The inverter output frequency is generated autonomously by an internal oscillator in synch with that of the by-pass mains; the frequency stability towards the load therefore depends on the operating conditions:

a) Frequency stability

b) With mains available: the internal oscillator follows the variations in frequency of the by-pass mains, according to the set value, which is normally ±2% (can be calibrated form ±1% al ±6%).

c) With mains not available: the inverter generates the output current frequency autonomously with a stability of ±0.05%.

d) Speed of frequency variation.

The maximum output frequency variation of the inverter to reach onto that of the backup by-pass mains is 2 Hz/s for the single UPS and 1 Hz/s for the parallel version.

Output voltage distortion

The regulation of the inverter guarantees the output voltage distortion with linear loads within 1% (maximum 2% with battery nearly discharged). With non-linear loads, as defined by standard EN 62040-3, the output voltage distortion does not exceed 3%.

Output power

The Inverter is sized to supply output power (kVA) with power factor of 0.9 inductive.

Overload

The inverter is sized to supply a power overload (kVA) of 110% for 1 hour, 125% for 10 minutes and 150% for 1 minute, on the three phases. On two phases, the limit is 200% for 7 s.

If the time or the power limits are exceeded, the load is transferred onto the by-pass mains.

Short circuit capacity

In the event of a short circuit on the load and with power supply from the battery, the inverter can supply a current limited to 200% for 1 s in the event of a short circuit on the three phases, and 300% for 1 s in the presence of a short circuit between phase and neutral.

Symmetry of output voltage

In all conditions, the symmetry output voltage is guaranteed within ±1%, for balanced loads and ±2% for 100% unbalanced loads (e.g. one phase at nominal load, the other two without load).

Phase displacement

The inverter three phase output voltages are guaranteed with a phase shift angle of 120° ±1° for 100% balanced and unbalanced loads.

6.4. Static switch

The Static Switch is an electronic device that transfers the load onto the by-pass mains without any break in power in the following circumstances:

a) manual shutdown of the inverter;

b) exceeding of the inverter overload limits;

c) exceeding of the internal overtemperature limits;

d) inverter fault;

e) DC voltage outside the admitted range.

If at the time of switching the inverter voltage is not in sync with that of the by-pass mains, the transfer takes place with a delay of approx. 20 ms to avoid possible damage to the load. However this value can be set from 10 to 100 ms to cover all the requirements of the various types of load.
By-pass mains voltage

Transfer onto the by-pass mains only takes place if the voltage and frequency are considered "suitable" to power the load. The limits of acceptability are defined by the user in relation to the connected load:

- **Voltage window**: ±10% (can be calibrated from ±5% to ±15%);
- **Frequency window**: ±1 Hz (can be calibrated ±1 Hz to ±6 Hz).

Overload

In order to guarantee the maximum of service continuity, the static switch does not have protection for overload. This allows the compatibility with any type of system, commissioning to protection devices, externally installed, the selectivity ensuring.

The UPS Static switch is sized to support the following overloads:

- 110% for 60 minutes
- 125% for 10 minutes
- 150% for 1 minute

The short-circuit capacity may also vary according to the load (see table in the Technical Data section).
7. CONTROL PANEL

The control panel located at the front of the equipment may be used to monitor and control all the parameters of the UPS and the batteries connected to it. The operating status of the UPS is shown on a liquid crystal display (LCD), with two rows of 40 characters and four LEDs with three operating status: On (steady), On (flashing), and Off.

![Control Panel Diagram]

- **1** LED Bypass input line indicator
- **2** LED Mains input line indicator
- **3** LED Battery indicator
- **4** LED bypass output
- **5** LED bypass output
- **6** LED alarm for internal fault
- **7** Graphic display

**F1, F2, F3, F4, F5, F6, F7, F8** FUNCTION KEYS

The function of each key is shown at the bottom of the display screen and varies according to the menu displayed.

**EPO** = Emergency Power OFF Button

The display shows the event history log up to 120; the measurements and associated alarms are recorded for each event. The messages are available in the following languages: Italian, English, French, German, Spanish, Dutch, Swedish, Polish, Hungarian, Turkish, Czech, Russian (optional), Romanian and Portuguese.
Measurements

- Input voltage and frequency
- By-pass voltage and frequency
- Input power
- Output voltage and frequency
- Output power
- Output power peak
- Battery voltage
- Battery recharge/discharge current
- Inverter input voltage
- Internal temperature (logic control, rectifier, Inverter, static switch and magnetic components)
- Sinewave view of the following signals:
  - Input Current /Output Current
  - Input Voltage/ Output Voltage
- Hours of operation on inverter
- Hours of operation on by-pass
- Hours of operation on battery
- Battery time
- Number of complete battery discharges
Messages

The alarm messages are the following:

<table>
<thead>
<tr>
<th>Message</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>DISTURBANCES ONBY-PASS LINE</td>
<td>Presence of disturbances on the by-pass line.</td>
</tr>
<tr>
<td>MANUAL BY-PASS SWITCH CLOSED</td>
<td>The manual maintenance by-pass switch is closed.</td>
</tr>
<tr>
<td>INCORRECT BY-PASS VOLTAGE OR SWBY, FSCR OFF</td>
<td>The line voltage or frequency is outside the limits or the switch is open.</td>
</tr>
<tr>
<td>INCORRECT VOLTAGE SUPPLY OR SWIN OFF</td>
<td>The rectifier power supply voltage is outside the limits or the rectifier is faulty.</td>
</tr>
<tr>
<td>PREALARM FOR MINIMAL BATTERY LIFE</td>
<td>The battery is discharging and has reached the minimum back-up time value (can be calibrated).</td>
</tr>
<tr>
<td>BATTERY TEST FAILED OR BATTERY SWITCH OPEN</td>
<td>The battery test has failed or the battery switch is open.</td>
</tr>
<tr>
<td>SUPPLY VOLTAGE LOW</td>
<td>The battery voltage is below the preset limit.</td>
</tr>
<tr>
<td>OUTPUT OVERLOAD</td>
<td>The load connected to the inverter has exceeded the nominal value in kVA.</td>
</tr>
<tr>
<td>LOAD SUPPLIED BY BY-PASS PER MINIMUM LOAD</td>
<td>When the load is less than the value set by the operator, it is transferred onto the by-pass line.</td>
</tr>
<tr>
<td>INTERNAL DAMAGE number</td>
<td>Internal fault, details of the alarm are provided by a code.</td>
</tr>
<tr>
<td>LOAD TEMPORARILY ON BY-PASS</td>
<td>The load is temporarily on the bypass due to inrush current or inverter start-up.</td>
</tr>
<tr>
<td>LOAD ON BY-PASS DUE TO OUTPUT OVERLOAD</td>
<td>Load on bypass due to exceeding of the inverter overload limits.</td>
</tr>
<tr>
<td>ACTIVE BY-PASS COMMAND</td>
<td>Load forced onto bypass.</td>
</tr>
<tr>
<td>REMOTE COMMAND FOR BY-PASS: ACTIVE</td>
<td>Load forced onto by-pass by a remote command.</td>
</tr>
<tr>
<td>OVERLOAD TEMPERATURE OR VENTILATION DAMAGED</td>
<td>The temperature inside the cabinet has exceeded the maximum limit due to too high ambient temperature or ventilation fault.</td>
</tr>
<tr>
<td>INPUT PHASE SEQUENCE INCORRECT</td>
<td>Indicates that the sequence of the input phase is incorrect.</td>
</tr>
<tr>
<td>MISSING OUTPUT VOLTAGE</td>
<td>Alarm when the output voltage is not present because the SWOUT and SWMB are open at the same time.</td>
</tr>
<tr>
<td>AUTO-OFF Timer: Toff= 0: 0', Ton= 0: 0'</td>
<td>Setting of the date and time of automatic UPS start-up and shutdown.</td>
</tr>
</tbody>
</table>
8. DISCONNECTING SWITCHES

The UPS is equipped with four switches under load located on the front of the cabinet that can be accessed by opening the front door:

- SWIN: Input Rectifier switch
- SWOUT: Output load switch
- SWMB: Maintenance bypass switch
- SWBY: Static bypass input Switch

The battery switch is located in the matching battery cabinet. In case the user will not use the Riello proposal it’s necessary to install a battery circuit breaker near to the battery bank with the following characteristics:

<table>
<thead>
<tr>
<th>UPS models</th>
<th>Nominal Current</th>
<th>Maximum Current</th>
<th>OCP Device rating</th>
</tr>
</thead>
<tbody>
<tr>
<td>65 kVA</td>
<td>127 A @ 480 Vdc</td>
<td>156 A @ 400.8 Vdc</td>
<td>160 A</td>
</tr>
<tr>
<td>80 kVA</td>
<td>156 A @ 480 Vdc</td>
<td>196 A @ 400.8 Vdc</td>
<td>200 A</td>
</tr>
<tr>
<td>100 kVA</td>
<td>195 A @ 480 Vdc</td>
<td>236 A @ 400.8 Vdc</td>
<td>250 A</td>
</tr>
<tr>
<td>125 kVA</td>
<td>244 A @ 480 Vdc</td>
<td>296 A @ 400.8 Vdc</td>
<td>300 A</td>
</tr>
<tr>
<td>160 kVA</td>
<td>316 A @ 480 Vdc</td>
<td>378 A @ 400.8 Vdc</td>
<td>400 A</td>
</tr>
<tr>
<td>200 kVA</td>
<td>395 A @ 480 Vdc</td>
<td>473 A @ 400.8 Vdc</td>
<td>500 A</td>
</tr>
<tr>
<td>250 kVA</td>
<td>493 A @ 480 Vdc</td>
<td>591 A @ 400.8 Vdc</td>
<td>600 A</td>
</tr>
</tbody>
</table>
8.1. Emergency Power Off (E.P.O.)

The UPS has an EPO (Emergency Power Off) function. In the event of an emergency by this function the UPS shuts down the rectifier, inverter, static switch and completely disconnects the power to the load.

The Output circuit of the UPS should not be considered safe, unless the UPS is Off and the input power source to the UPS has been removed by opening the input disconnect devices which are external to the UPS, including the battery.

This function can be activated from the button (under a hinged clear plastic cover) on the control panel or by a remote contact. This button must be depressed and held down until the UPS shuts down.

The remote EPO is supplied by others
9. COMMUNICATION

The alarms, commands and the communication software supplied together with the UPS to interface the unit with the communication system are listed below. If these are not sufficient, please see the Options chapter.

UPS from 65 to 125 kVA

A - SLOT 1 (main)
B - SLOT 2 (aux)
C – REMOTE ALARMS & CONTROLS
D – Interface Terminal board
E - REMOTE ALARM CARD (optional max 2)

D – Interface Terminal board
UPS from 160 to 250 kVA

A - SLOT 1 (main)
B - SLOT 2 (aux)
C – REMOTE ALARMS & CONTROLS
D – Interface Terminal board
E - REMOTE ALARM CARD (optional, max 1)
9.1. Remote Alarms and Controls (standard)

The card is equipped with a terminal board with 14 positions.

- **POWER SUPPLY:** 1 power supply 12 Vdc 80 mA (max.) [pins 10 and 11];
- **ALARMS:** 3 potential-free change-over contacts for alarms (they are capable of switching up to 30 VAC or DC at up to 1 A);
- **COMMAND:** 1 command programmable from the panel [pins 11 and 12];

The position of the contacts as shown is without the alarm present. The contacts can take a max. current of 1 A with 24 Vac.

<table>
<thead>
<tr>
<th>PIN</th>
<th>NAME</th>
<th>TYPE</th>
<th>FUNCTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>1,2,3</td>
<td>RL 1</td>
<td>OUTPUT 1</td>
<td>Bypass / fault, the contact changes position when the UPS switches the load onto the bypass line either during normal operation (e.g. due to overload) or as a result of a fault in the inverter stage. See Note below</td>
</tr>
<tr>
<td>4,5,6</td>
<td>RL 2</td>
<td>OUTPUT 2</td>
<td>Battery discharging, the contact changes position when the load is powered from the battery due to a mains power failure</td>
</tr>
<tr>
<td>7,8,9</td>
<td>RL 3</td>
<td>OUTPUT 3</td>
<td>End of battery discharge, the contact changes position when, during a mains outage, the remaining time for battery discharge has reached the minimum value defined. Once this time has passed, the load will remain unpowered (the factory-set end of discharge pre-alarm value is 5 minutes)</td>
</tr>
<tr>
<td>10</td>
<td>+12 V</td>
<td>POWER</td>
<td>Power supply +12 Vdc 80 mA (max.) [pins 10 and 11]</td>
</tr>
<tr>
<td>11</td>
<td>GND</td>
<td>POWER</td>
<td></td>
</tr>
<tr>
<td>12</td>
<td>IN 1</td>
<td>INPUT 1</td>
<td>Inverter OFF. Connect pin 11 to pin 12 (for at least 2 seconds). - In &quot;NORMAL OPERATION&quot;, if the INVERTER OFF command is received, the UPS switches the power supply of the load onto the bypass line (load is not protected should there be a mains outage). - In &quot;EMERGENCY OPERATION&quot;, if the STOP INVERTER command is received, the UPS shuts down (load is not powered). See Note below</td>
</tr>
<tr>
<td>13,14</td>
<td>EPO</td>
<td>INPUT EPO</td>
<td>If the jumper on the connector is opened, the voltage on the UPS output will be cut. The UPS is factory-fitted with the EPO terminals short circuited. If this input is used, the UPS can be shut down in a hazardous situation from a remote position simply by pressing a button.</td>
</tr>
</tbody>
</table>

In case the standard alarms and the commands are not matching the requirements the three contacts and the input can be reprogrammed via the UPS display panel, refer to the UPS User Manual for details (approx. other 50 alarms are available).
9.2. Monitoring and control software

The system is provided, as standard, with Powershield monitoring and control software with the following features:

- **Sequential and priority-based shutdown:** PowerShield provides unattended shutdown of single and networked PCs, saving any active work and the most widely used applications Windows. Users can define their own shutdown procedures and establish the order in which critical computers (such as servers) are to be powered down.

- **Multi-platform compatibility:** PowerShield uses the TCP/IP communications protocol to achieve standardized management and monitoring across the widest possible range of platforms. This makes it possible to monitor computers with different operating systems from a single console, for example monitoring a UNIX server from a PC with Windows and also connecting to UPS located in different geographical areas using dedicated networks (intranets) or the Internet.

- **Event scheduling:** PowerShield users can program their own shutdown procedures, detailing power-off and power-up scenarios to increase system safety and, equally important, power economy.

- **Messages management:** PowerShield keeps users constantly informed about the status of their local and network UPS, and environmental sensors. A list can be defined of users who should receive e-mail messages, faxes and SMS when faults or sudden mains power supply failures occur.

- **Integrated SNMP agent:** PowerShield features an integrated SNMP agent for UPS management which can send all the information required and generate traps using the RFC 1628 MIB standard and environmental sensors. This PowerShield can be downloaded free of charge from www.riello-ups.com. All the trademarks indicated are the property of their respective owners.

- **Communication:** Software feature makes it possible to manage the UPS in compatible SNMP management stations such as HP Open View, Novell ManageWise and IBM NetView.

For more information please see the website: www.riello-ups.com
10. UPS CABINET

The cabinet is made in galvanized steel with degree of protection IP20 even with the front door(s) open. The forced ventilation is ensured by means of fans at the top; air intake is from the front, and output is from the top. The parts with greater dissipation, such as the power modules and magnetic parts, are monitored by temperature sensors.
UPS 65-80 kVA FRONT VIEW

A  Control panel with graphic display
B  Door Handle
C  Ventilation grille
D  Communication area
E  Pocket for the User Manual
F  Panel protection for connection bus bars
G  Door

1  SWIN - Input power switch
2  SWOUT - Output load switch
3  SWMB – Maintenance bypass switch
4  SWBY - Static bypass switch
UPS 100-125 kVA FRONT VIEW

A  Control panel with graphic display
B  Door Handle
C  Ventilation grille
D  Communication area
E  Pocket for the User Manual
F  Panel protection for connection bus bars
G  Door

1  SWIN - Input power switch
2  SWOUT - Output load switch
3  SWMB - Maintenance bypass switch
4  SWBY - Static bypass switch
UPS 160-250 kVA FRONT VIEW
(version without Internal maintenance bypass)

A  Control panel with graphic display
B  Door Handle
C  Ventilation grille
D  Communication area
E  Pocket for the User Manual
F  Panel protection for connection bus bars
G  Front Cover panel with ventilation grille

1  SWIN - Input power switch
2  SWBY - Static bypass switch
3  SWOUT - Output load switch

Note: this version is without internal Maintenance bypass switch.
UPS 160-250 kVA MBY TCE - Front View
(version with Internal maintenance bypass and top cable entry)

A  Control panel with graphic display
B  Door Handle
C  Ventilation grille
D  Communication area
E  Pocket for the User Manual
F  Panel protection for connection bus bars
G  Front Cover panel with ventilation grille

1  SWIN - Input power switch
2  SWBY - Static bypass switch
3  SWOUT - Output load switch
4  SWMB - Maintenance bypass
11. INSTALLATION

The UPS cabinets are designed with IP20 protection therefore are only for indoor installations.

All the regular and extraordinary maintenance operations can be from the front, thus making back or side access is superfluous. The cables input is from the bottom unless the cabinet is provided with TCE included (versions available only for the power rating 160-200 and 250 kVA).

Pallet lifters may be used to move the systems.

12. Option

12.1. Communication

The software PowerNETGuard is a centralized management program used by the UPS that operates through the SNMP communication protocol. It is an ideal instrument for EDP manager in medium and large scale Data Centre.

The main features are the following:

- Centralized control of remote UPS via Ethernet with SNMP control
- Multi-level display of geographical areas, building plant
- Multi-server access with various security levels
- Compatible with standard RFC 1628 SNMP agents.
- Creation of graphics and saving on file for physical input and output values.
- Alarm notification via e-mail and SMS.
- Integrated Wap Server for the alarms display.

Note: more details are available on the website: www.riello-ups.com

Hardware

Two slots are available inside the device, at the bottom, to house the optional communication card:

- NetMan 102 Plus: network agent for the management of the FC connected directly on the LAN 10/100Mbps using the main protocol of network communication (TCP/IP, HTTP and SNMP). A MODEM can also be connected to the same device.

In addition to the card above mentioned the following communication options are available:

- I/O Expansion board: This card has six power relay (5A-250V) for connecting a remote monitoring control device and two inputs to receive the commands.

a. Load on inverter
b. Load on mains power;
c. Low battery;
d. Overload;
e. Over-temperature;
f. Load on maintenance by-pass.

There are also two programmable inputs (24 VCA) for: “battery charge inhibition” and “by-pass inhibition” that can be used when is connected a generator-set.

In case the standard alarms and the commands are not matching the requirements of the three contacts and the input be reprogrammed via the UPS display panel, refer to the UPS User Manual for details (approx. other 50 alarms are available).
12.2. **Battery cabinet**

The UPS can be provided with the matching battery cabinet, here are the main features:

- protection fuse and circuit breaker
- Protection degree IP20 with front door open;
- Complete with batteries or empty with connection cables between the compartments (cells).

The size is (WxDxH): 860 x 800 x 1900 mm.

### Table 2 – Floor Loading

<table>
<thead>
<tr>
<th>Battery Cabinet with batteries 100Ah</th>
<th>Point Loading</th>
</tr>
</thead>
<tbody>
<tr>
<td>Maximum Weight</td>
<td></td>
</tr>
<tr>
<td>1750 kg (3859 lbs)</td>
<td>A 3,8 kg/cm² (54lb/in²)</td>
</tr>
<tr>
<td></td>
<td>B 1,3 kg/cm² (12lb/in²)</td>
</tr>
<tr>
<td>Battery Cabinet with batteries 55Ah</td>
<td></td>
</tr>
<tr>
<td>Maximum Weight</td>
<td></td>
</tr>
<tr>
<td>1150 kg (2536 lbs)</td>
<td>A 2,5 kg/cm² (36lb/in²)</td>
</tr>
<tr>
<td></td>
<td>B 0,8 kg/cm² (11lb/in²)</td>
</tr>
<tr>
<td>Battery Cabinet without batteries</td>
<td></td>
</tr>
<tr>
<td>Maximum Weight</td>
<td></td>
</tr>
<tr>
<td>300 kg (662 lbs)</td>
<td></td>
</tr>
</tbody>
</table>
BATTERY ASSEMBLY MODE

Following the steps below, mount 8 battery units for each of the 5 trays. 40 battery units total.

<table>
<thead>
<tr>
<th>Battery blocks dimensions. max</th>
<th>55 Ah</th>
<th>100 Ah</th>
</tr>
</thead>
<tbody>
<tr>
<td>L mm [in]</td>
<td>229 [9.01]</td>
<td>344.5 [13.56]</td>
</tr>
<tr>
<td>Weight kg [lb]</td>
<td>18 [39.7]</td>
<td>35.5 [7.2]</td>
</tr>
</tbody>
</table>
The battery cabinets can be connected in parallel to reach the required battery back-up time, the max number is limited from the battery connection bars of the UPS.
For the UPS 160-200-250 in TCE version there is a space for connection of more than 5 battery cabinets, the limit is given from the gland plates and the cables used. Check on the UPS Installation drawing the space available.
### 13. ENVIRONMENTAL REQUIREMENTS

<table>
<thead>
<tr>
<th>Requirement</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ambient temperature for the UPS</td>
<td>0 to 40°C</td>
</tr>
<tr>
<td>Maximum temperature for 8 hours a day</td>
<td>40°C</td>
</tr>
<tr>
<td>Average temperature for 24 hours</td>
<td>35°C</td>
</tr>
<tr>
<td>Recommended battery temperature</td>
<td>20 to 30°C</td>
</tr>
<tr>
<td>Humidity</td>
<td>&lt;95% (without condensing)</td>
</tr>
<tr>
<td>Maximum operating altitude</td>
<td>up to 1000 m o.s.l. (derating of 1% each 100 m between 1000 and 4000 m)</td>
</tr>
<tr>
<td>Storage temperature</td>
<td>from -20°C up to 70°C (UPS) -20, +30°C (for battery)</td>
</tr>
</tbody>
</table>

### 14. TECHNICAL DATA UPS

#### MECHANICAL DATA

<table>
<thead>
<tr>
<th>UPS Size (kVA)</th>
<th>65</th>
<th>80</th>
<th>100</th>
<th>125</th>
<th>160</th>
<th>200</th>
<th>250</th>
</tr>
</thead>
<tbody>
<tr>
<td>Width (Inches/mm)</td>
<td>31.49 / 800</td>
<td>39.4 / 1000</td>
<td>55 / 1400 (MBY TCE version)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Depth (Inches/mm)</td>
<td>33.46 / 850</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Height (Inches/mm)</td>
<td>74.80 /1900</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Weight (lb/Kg)</td>
<td>1500 / 680</td>
<td>1500 / 680</td>
<td>1610 / 730</td>
<td>1742 / 790</td>
<td>1851 / 840</td>
<td>2138 / 970</td>
<td>2447 / 1110</td>
</tr>
<tr>
<td></td>
<td>1500 / 680</td>
<td>1500 / 680</td>
<td>1610 / 730</td>
<td>1742 / 790</td>
<td>1851 / 840</td>
<td>2138 / 970</td>
<td>2447 / 1110</td>
</tr>
<tr>
<td>Ventilation</td>
<td>Forced by internal fans</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Level of cabinet protection</td>
<td>IP20 (higher levels of protection on request)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Input cables</td>
<td>From the bottom</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Colour</td>
<td>RAL 7016</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

#### ELECTRICAL DATA

<table>
<thead>
<tr>
<th>UPS Size (kVA)</th>
<th>65</th>
<th>80</th>
<th>100</th>
<th>125</th>
<th>160</th>
<th>200</th>
<th>250</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rated Voltage</td>
<td>480 Vac 3 Ph-phase without neutral</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Rated Voltage tolerance (%) with battery recharge, depending on the load percentage</td>
<td>+10%, -10% (100% load)</td>
<td>+10%, -20% (85% load)</td>
<td>+10%, -30% (75% load)</td>
<td>+10%, -40% (65% load)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Rated Frequency (Hz)</td>
<td>60 Hz</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Input frequency tolerance</td>
<td>From 45 to 65 Hz</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Rated power absorbed (kVA) at 480 V</td>
<td>64</td>
<td>78</td>
<td>98</td>
<td>122</td>
<td>156</td>
<td>194</td>
<td>242</td>
</tr>
<tr>
<td>Max current absorbed (A) at full load and battery in recharge or o/p overload</td>
<td>89</td>
<td>109</td>
<td>136</td>
<td>160</td>
<td>212</td>
<td>265</td>
<td>331</td>
</tr>
<tr>
<td>Input Power Factor at rated voltage with battery in recharge (from 25% to 100% load)</td>
<td>&gt;0.99</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Current Harmonic distortion (THDI) with mains</td>
<td>THDV &lt;1%</td>
<td>Load 100%</td>
<td>Load 75%</td>
<td>Load 50%</td>
<td>Load 25%</td>
<td>&lt;3%</td>
<td>&lt;3%</td>
</tr>
<tr>
<td>Progressive start of rectifier (Power Walk-in Duration)</td>
<td>From 0 to 125 seconds (Configurable)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Delay of Progressive start of rectifier (Power Walk-in Start Delay)</td>
<td>From 0 to 125 seconds (Configurable)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
### D.C. INTERMEDIATE CIRCUIT

| Monoblocks (12 V) / Number of Pb elements - (See note 1) | 40/240 |
| Rated battery voltage (Vdc) | 480 |
| Ripple current with recharged battery(%) | Approx. 0 |
| Float voltage (2.26 V/el., can be calibrated) – Vdc | 542 |
| Recharge Voltage (2.4 V/el., can be calibrated) Vdc | 576 |
| Maximum output voltage (Vdc) | 600 |
| End of discharge voltage Vdc (1.6 V/el., can be calibrated) - Vdc | 384 |
| Voltage Compensation with reference to the battery cabinet temperature (V per °C) | -0.11% |

#### Maximum current to charge battery with 240 elements (A). (mains voltage 480V )

- Load 100%: 16, 20, 24, 30, 35, 45, 55
- Load 90%: 27, 33, 42, 50, 60, 80, 100
- Load 80%: 38, 47, 51, 70, 90, 110, 140
- Load ≤50%: 49, 60, 76, 95, 110, 130, 165

### ELECTRICAL DATA (CONTINUED)

<table>
<thead>
<tr>
<th>UPS Power (kVA)</th>
</tr>
</thead>
<tbody>
<tr>
<td>65</td>
</tr>
<tr>
<td>INVERTER</td>
</tr>
<tr>
<td>Rated Power Pf 0.9 inductive</td>
</tr>
<tr>
<td>Active Power with Pf 1 (KW)</td>
</tr>
<tr>
<td>Nominal Current (A)</td>
</tr>
<tr>
<td>Rated power reduction (KW and kVA) with capacitive loads 0.8/0.9 leading</td>
</tr>
<tr>
<td>Rated Voltage</td>
</tr>
<tr>
<td>Rated Frequency</td>
</tr>
<tr>
<td>Static variation</td>
</tr>
<tr>
<td>Dynamic variation</td>
</tr>
<tr>
<td>Restore time within ±1%</td>
</tr>
<tr>
<td>Non Linear load capability</td>
</tr>
<tr>
<td>Voltage distortion with linear load</td>
</tr>
<tr>
<td>Voltage distortion with non-linear load (EN 62040-3)</td>
</tr>
<tr>
<td>Frequency stability with inverter not synchronized to the by-pass mains.</td>
</tr>
<tr>
<td>Speed of frequency variation</td>
</tr>
<tr>
<td>Phase voltage asymmetry with balanced and unbalanced load.</td>
</tr>
<tr>
<td>Voltage phase shift with balanced and unbalanced load.</td>
</tr>
<tr>
<td>Overload referred to the rated power</td>
</tr>
<tr>
<td>Three phase</td>
</tr>
<tr>
<td>Single phase</td>
</tr>
<tr>
<td>Short circuit Current</td>
</tr>
<tr>
<td>Phase / Phase</td>
</tr>
<tr>
<td>Phase / Neutral</td>
</tr>
<tr>
<td>Inverter efficiency (%) from battery</td>
</tr>
</tbody>
</table>
### ELECTRICAL DATA

<table>
<thead>
<tr>
<th>UPS Power (kVA)</th>
<th>65</th>
<th>80</th>
<th>100</th>
<th>125</th>
<th>160</th>
<th>200</th>
<th>250</th>
</tr>
</thead>
</table>

#### BY-PASS

<table>
<thead>
<tr>
<th>Nominal voltage</th>
<th>480 Vca 3Phase + N</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nominal voltage tolerance</td>
<td>±10% factory set (adjustable ±5 ±15% from the control panel)</td>
</tr>
<tr>
<td>Nominal frequency</td>
<td>60 Hz</td>
</tr>
<tr>
<td>Frequency tolerance</td>
<td>±2% (can be regulated from ±1% up to a ±6% from the control panel)</td>
</tr>
</tbody>
</table>

- **Switching onto by-pass with Inverter synchronized (UPS in “Normal Mode”)**: <1 ms
- **Switching onto by-pass with non-synchronized Inverter (UPS in “Normal Mode”)**: 20 ms (see note 3)
- **Switching from by-pass to Inverter (UPS in “Stand-by On mode”)**: 2 to 5 ms
- **Delay in transferring to Inverter after the switching onto by-pass**: 4 sec

<table>
<thead>
<tr>
<th>Overload Capacity of by-pass line (kVA)</th>
<th>110 % for 60 minutes, 125 % for 10 minutes, 150 % per 1 minute</th>
</tr>
</thead>
<tbody>
<tr>
<td>I2 t SCR bypass 25°C/130°C, 8+10 ms [A2S]</td>
<td>145000 / 125000 / 405000 / 320000</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Short circuit capacity of by-pass line (x nominal voltage) I/In</th>
</tr>
</thead>
<tbody>
<tr>
<td>• 1 sec</td>
</tr>
<tr>
<td>• 500 ms</td>
</tr>
<tr>
<td>• 200 ms</td>
</tr>
<tr>
<td>• 100 ms</td>
</tr>
<tr>
<td>• 10 ms</td>
</tr>
</tbody>
</table>

#### SYSTEM

<table>
<thead>
<tr>
<th>AC/AC Master HP efficiency (On line) – (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Full load</td>
</tr>
<tr>
<td>• Load 75%</td>
</tr>
<tr>
<td>• Load 50 %</td>
</tr>
<tr>
<td>• Load 25%</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Efficiency with UPS in STAND-BY mode</th>
<th>98.5 %</th>
</tr>
</thead>
<tbody>
<tr>
<td>Neutral Sizing (I/In)</td>
<td>1.9</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Dissipated Power Without load</th>
</tr>
</thead>
<tbody>
<tr>
<td>• kW</td>
</tr>
<tr>
<td>• kcal/h</td>
</tr>
<tr>
<td>• BTU/h (see note 4)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Dissipated Power With 50% load</th>
</tr>
</thead>
<tbody>
<tr>
<td>• kW</td>
</tr>
<tr>
<td>• kcal/h</td>
</tr>
<tr>
<td>• BTU/h (see note 4)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Dissipated Power With 100% load</th>
</tr>
</thead>
<tbody>
<tr>
<td>• kW</td>
</tr>
<tr>
<td>• kcal/h</td>
</tr>
<tr>
<td>• BTU/h (see note 4)</td>
</tr>
</tbody>
</table>

| Minimum sensitivity for i/p Residual Current Device | 300 mA |

| Noise level at 1m from the front (from 0 to full load) | 65 | 68 |

**Notes:**
1. The number of Pb elements can vary from 222 to 258.
2. The parallel version can be calibrated from 0.1 to 1 Hz/s.
3. Can be calibrated from 10 to 100 ms or with inhibition of transfer on bypass.
4. 3.97 BTU = 1 kcal.
## 15. TECHNICAL DATA BATTERY CABINET

**Model Names:**
- BBX 1900 480 V UL L6 3U (55 Ah) – suitable for UPS up to 80 kVA
- BBX 1900 480 V UL L8 3U (100 Ah) – suitable for UPS up to 250 kVA

<table>
<thead>
<tr>
<th>Mechanical Data</th>
<th>BATTERY CABINET</th>
<th>55 Ah</th>
<th>100 Ah</th>
</tr>
</thead>
<tbody>
<tr>
<td>Width (Inches/mm)</td>
<td></td>
<td>39.37 / 1000</td>
<td></td>
</tr>
<tr>
<td>Depth (Inches/mm)</td>
<td></td>
<td>33.46 / 850</td>
<td></td>
</tr>
<tr>
<td>Height (Inches/mm)</td>
<td></td>
<td>74.8 / 1900</td>
<td></td>
</tr>
<tr>
<td>Max Weight (lb/kg)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>W/O battery</td>
<td></td>
<td>662 / 300</td>
<td>662 / 300</td>
</tr>
<tr>
<td>With battery</td>
<td></td>
<td>2536 / 1150</td>
<td>3859 / 1750</td>
</tr>
<tr>
<td>Ventilation</td>
<td></td>
<td>Natural</td>
<td></td>
</tr>
<tr>
<td>Level of cabinet protection</td>
<td></td>
<td>IP20 (higher levels of protection on request)</td>
<td></td>
</tr>
<tr>
<td>Input cables</td>
<td></td>
<td>From the bottom</td>
<td></td>
</tr>
<tr>
<td>Colour</td>
<td></td>
<td>RAL 7016</td>
<td></td>
</tr>
</tbody>
</table>