Technical Specification

multipower

15/25/42 kW -1 MW MODULAR THREE-PHASE IN/OUT

On Line Double Conversion Technology (VFI)

riello ups

CONTENTS

1- OBJECTIVE

This specification defines the technical characteristics of the MULTI POWER uninterruptible power supply (UPS). The UPS is designed to supply a clean and stable electrical supply, irrespective of the condition of the main utility supply or an alternative power supply.

The MULTI POWER series of UPS is designed and manufactured by Riello UPS, a leader in this field with a range of products from 350 VA to 800 kVA, and over 25 years of experience in power protection.

For more information please visit our website: www.riello-ups.com.

2- REFERENCE STANDARDS

Riello UPS operates a Quality Management System certified to ISO 9001/2000 (Certification No. CERT-04116-99-AQ-MIL-SINCERT) covering all company operations from design and manufacture to after sales services.

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

- use of quality materials;
- meticulousness in the production and testing phases;
- continual customer support.

In addition, the UPS meets the VFI-SS-111 classification (according to EN 62040-3) and complies with the following specific standards for UPS:

- **IEC EN 62040-1: Static uninterruptible power supplies (UPS): general and safety provisions;**
- **IEC EN 62040-2: Electromagnetic compatibility (EMC) requirements category C2;**
- **EN 62040-3: Methods of specification of performances and test provisions;**

The MULTI POWER series also satisfies the following general standards, where applicable:

- **IEC 60529:** Degree of protection provided by enclosures;
- **IEC 60664:** Insulation for low-voltage equipment;
- **IEC 60755:** General Requirements for Residual Current Operated Protective Devices;
- **IEC 62477-1:** Safety requirements for power electronic converter systems and equipment
- **IEC 61000-2-2:** Electromagnetic compatibility immunity;
- **IEC 61000-3-12:** Harmonic current emissions (for equipment with rated current > 16 A ≤ 75).
- **IEC 61000-4-2:** Electrostatic discharge immunity test;
- **IEC 61000-4-3:** Radio frequencies, electromagnetic immunity test;
- **IEC 61000-4-4:** Transitory overvoltage immunity test;
- **IEC 61000-4-5:** Overvoltage immunity test;
- **IEC 61000-4-6** Immunity to conducted disturbances, induced by radio-frequency fields
- **IEC 61000-4-8** Power frequency magnetic field immunity test
- **IEC 61000-6-4** Emission standard for industrial environments

European Directives:

LVD directive 2014/35/EU

The LVD covers all health and safety risks of electrical equipment operating with a voltage between 50 and 1000V for alternating current and between 75 and 1500 V for direct current.

EMC directive 2014/30/EU

The EMC Directive **limits electromagnetic emissions from equipment**; The Directive **also governs the immunity of such equipment to interferences**.

RoHS directive 2011/65/EU

Restriction of the Use of Certain Hazardous Substances in Electronic and Electrical Equipment. Aims to prevent hazardous substances from entering the production process and thereby keep them out of the waste stream.

3- APPLICATIONS

Multi Power UPS is suitable for applications requiring critical load protection including:

LAN, Server and Datacentres: The unity output power factor ensures greater active power availability for efficient UPS loading. The Modular design concept allows scalability to suit business growth.

e-business and Telecommunications: Parallel modular operation means that the installed UPS size can be increased (up to 28 units) to keep pace with the growth of the organization.

Critical load application: The UPS is designed to protect a range of critical loads within other specific sectors such as healthcare, commerce, education and transport, where power outages are not tolerated or result in loss of revenue for a system failure. This has been achieved through careful frame solutions based on modularity and scalability principles which ensure the following features:

- UPS and Battery modularity
- Redundancy granted at UPS, battery, power supply and communication level
- High short circuit and overload capability
- Overall operation flexibility and comprehensive monitoring

4- SYSTEM DESCRIPTION

The Multi Power UPS is a MODULAR three phase UPS Input / Output On-line double conversion technology, scalable from 15/ 25 /42 kW (one UPS Power Module) to 1176 kW (28 UPS Power Modules 42 kW).
Multi Power meets the VFI-SS-111 classification defined by IEC EN 62040-3.
Multi Power is designed to protect the most critical information Technology (IT) load and any mission critical applications where availability is the top concern.

Multi Power Key Features:

a) UPS Power Module compactness (up to 902 W/dm^3)

b) UPS Power module cutting edge design to achieve outstanding performances:

- Low input current distortion - as low as 3% and with a 0.99 input power factor
- Overall efficiency up to 96.5% in the operating temperature range (0-40°C) with no power de-rating
- Unity output pf (kW=kVA)

c) Outstanding Inverter and bypass overload capability:

- Inverter overload: up to 180% for 0.5 sec
- Short circuit up to 2.5 In
- Bypass overload: > 200%

d) Battery global care:

- Battery switch: embedded as standard including shunt trip
- Battery Unit: operation monitoring from the UPS system display
- High recharging current (up to 8 Amps available from each power module)

e) Back-feed relay protection (bypass opening contactor, optional for some versions)

f) Comprehensive user interface:

- 7" touch screen colour display
- Embedded Ethernet port
- Additional ports: 2 slots, relay, Service ports
- System configuration setup easy and intuitive through control panel

> 4.1 MODELS

The Multi Power series consists of the following five main models:
Starting from them it will be possible to build up the system according with the needs and scale both in power and battery backup time.

CABINET TYPE	PM TYPE FIT INSIDE	UPS SOLUTION	SCALABILITY RANGE
Power Cabinet MPX (MPX 130 PWC)	MPX 15 PM	75 kW three-phase input/output UPS	15÷75 kW (1)
	MPX 25 PM	125 kW three-phase input/output UPS	25÷125 kW (1)
Power Cabinet MPW (MPW 300 PWC)	MPW 42 PM	294 kW three-phase input/output UPS	42÷294 kW (1)
Combo Cabinet MPX (MPX 100 CBC)	MPX 15 PM	60 kW three-phase input/output UPS	15÷60 kW (1) and 1÷6 battery shelves
	MPX 25 PM	100 kW three-phase input/output UPS	25÷100 kW (1) and 1÷6 battery shelves
Combo Cabinet MPW (MPW 130 CBC)	MPW 42 PM	126 kW three-phase input/output UPS and Modular Batteries	42÷126 kW (1) and 1÷5 battery shelves
Battery Cabinet (MPW 170 BTC)	N.A	Modular Battery cabinet to build up autonomy	1÷9 battery shelves
Switching Cabinet 500 (MPW 500 SWC)	N.A.	Cabinet to connect up two MPW 300 PWC cabinets in parallel	N.A.

(1)= Including redundancy

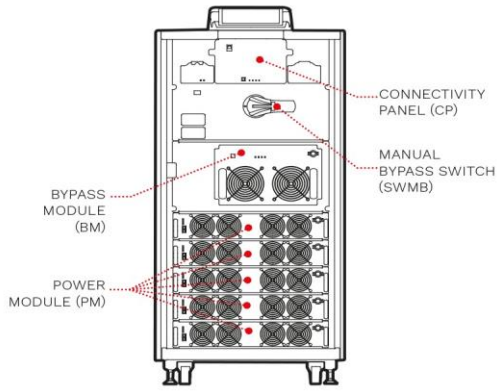
> 4.2 SYSTEM PARTS

The models described above (except switching cabinet) are constructed using the same major building blocks in all frames. The major parts listed below are hot swappable ensuring quick and safe operation during replacement or upgrading, therefore granting business continuity. In the exceptional event of “Connectivity Panel” replacement a manual bypass operation is highly recommended to ensure a safe operation for the site engineer.

ITEM	Acronym	Description
Power Module	PM	Acronym used to indicate either MPW 25 PM or MPW 42 PM
Power Module 15	MPX 15 PM	15 kW Power Module unit, 2U
Power Module 25	MPX 25 PM	25 kW Power Module unit, 2U
Power Module 42	MPW 42 PM	42 kW Power Module unit, 4U
Battery Unit	BU	Battery Back-up Intelligent Unit
Battery Unit Array	BUA	Battery Unit Array (4x BU with batteries)
Bypass Module	BM	Acronym used to indicate either MPW 130 BM, MPX 130 BM or MPW 300 BM
Bypass Module MPW 126	MPW 130 BM	126 kW Transfer device module
Bypass Module MPX 126	MPX 130 BM	126 kW Transfer device module without backfeed contactor
Bypass Module MPW 252	MPW 300 BM	252 kW Transfer device module
Connectivity Panel	CP	User and service system interface panel
Main Communication Unit	MCU	System interface (Display, Ethernet, and SA ports)
Monitoring Unit	MU	Intelligent microprocessor monitoring device
Power Supply Unit	PSU	Internal circuits Power Supply Unit
Switching Cabinet	MPW 500 SWC	Switching Cabinet to merge 2x MPW 300 PWC

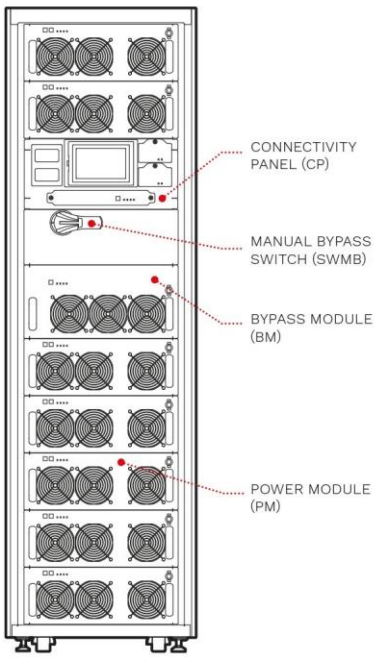
MPX 130 PWC

MPX Power Cabinet 15-75 kW or 25-125 kW (front)



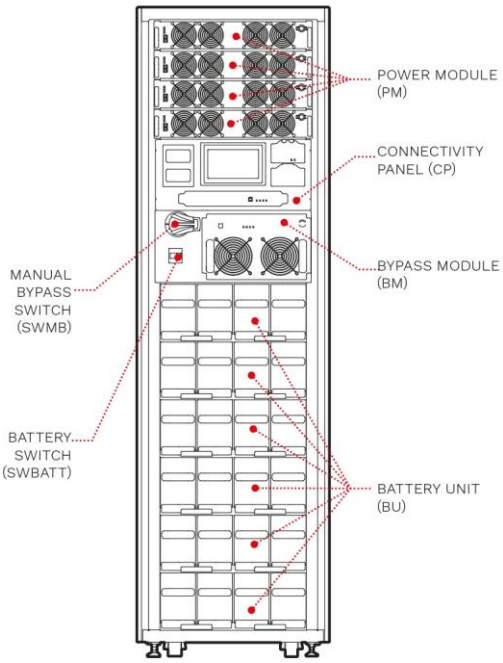
MPW 300 PWC

MPW Power Cabinet 42-294 kW (front)



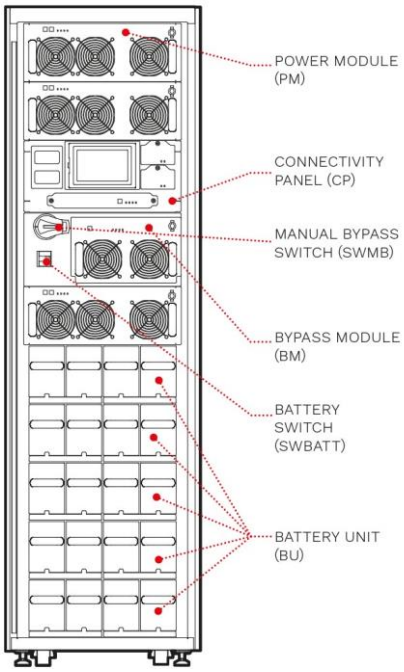
MPX 100 CBC

MPX Combo Cabinet
15-60 kW or 25-100 kW
(front)



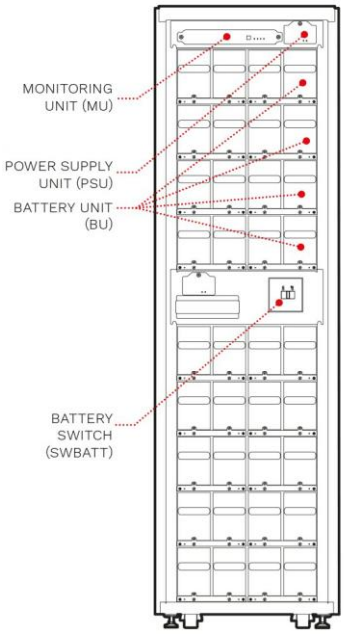
MPW 130 CBC

MPW Combo Cabinet
42-126 kW
(front)

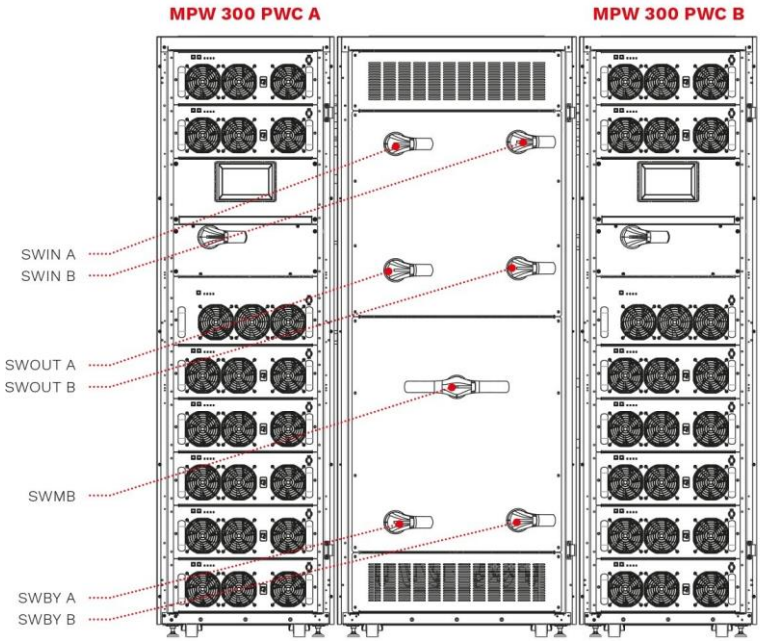


MPW 170 BTC

MPW Battery Cabinet



MPW Switching Cabinet 500
+ 2 x MPW 300 PWC



5- SYSTEM CONFIGURATIONS

Starting from the different cabinet frames and the single elements appointed to deliver uninterruptible power availability (Power Module) and back up time (Battery Unit), it will be possible to build the system according with the project specification.
The UPS Power Modules as well as Battery Units are 'hot swappable'; allowing non-intrusive (scaling up or down), and replacement as required, without the need to power down and interrupt the critical IT load.
The user might decide to build the UPS solution using the combination of PM either MPX 15 PM, MPX 25 PM or MPW 42 PM kW power sizes, however the rating of the modules cannot be mixed within the same cabinet.

> 5.1 POWER CABINET

Power Cabinet is the heart of the Riello Multi Power modular solution granting continuous and high quality power supply. All the relevant building blocks which make up the cabinet are hot swappable to ensure easy, safe, non-intrusive and quick maintenance operations.
Power Cabinets can accommodate either the 15 kW Power Modules (MPX 15 PM), 25 kW Power Modules (MPX 25 PM) or 42 kW Power Modules (MPW 42 PM).
Up to four complete Power Cabinets can be connected in parallel, increasing the capacity including redundancy.
The parallel logic is "loop type" which ensures continuous and secure UPS operation even if one communication link fails. If this condition does occur, a warning is immediately raised to the user, so that all corrective actions can be taken in order to restore the full communication link.

The available UPS power and redundancy level can expand vertically using the MPX 15 PM power module from:
• 15 to 75 kW in one single Power Cabinet (MPX 130 PWC) and up to 300 kW with four cabinets in parallel.

The available UPS power and redundancy level can expand vertically using the MPX 25 PM power module from:
• 25 to 125 kW in one single Power Cabinet (MPX 130 PWC) and up to 500 kW with four cabinets in parallel.

Also, the power solution can expand vertically using the MPW 42 PM power module from:
• 42 to 294 kW in one single Power (MPW 300 PWC) and up to 1176 kW with four cabinets in parallel.

For the nature of this design as a modular UPS, Multi Power should not be not sized to work with the *n* modules at full capacity, but at design stage with at least one PM running as redundant unit for each power cabinet.
Battery backup time can expand according with the higher demand of business.
The user may decide to build up the back-up time with Multi Power full controlled modular Battery Units or selecting conventional battery block batteries housed in a free-standing framework following the 20+20 blocks architecture with neutral point.

Note: It is not possible to build back up time combining together conventional battery cabinet either with Multi Power modular Battery Cabinet or Multi Power Combo Cabinet populated with BU.
Refer to dedicated Battery Cabinet paragraph for further details.

Power Cabinet solutions based on MPX 15 PM:

Power Requested (without Battery)	MPW Power Cabinet part description
15 kW	1x MPX 130 PWC + 1x MPX 15 PM – 0 Min
30 kW	1x MPX 130 PWC + 2x MPX 15 PM – 0 Min
45 kW	1x MPX 130 PWC + 3x MPX 15 PM – 0 Min
60 kW	1x MPX 130 PWC + 4x MPX 15 PM – 0 Min
75 kW	1x MPX 130 PWC + 5x MPX 15 PM – 0 Min
Power Requested (with Modular Battery)	**MPW Power Cabinet part description (*)**
15 kW + 10 min	1x MPX 130 PWC + 1x MPX 15 PM + 1x MPW 170 BTC + 4x BU
15 kW + 25 min	1x MPX 130 PWC + 1x MPX 15 PM + 1x MPW 170 BTC + 8x BU
30 kW + 10 min	1x MPX 130 PWC + 2x MPX 15 PM + 1x MPW 170 BTC + 8x BU
30 kW + 17 min	1x MPX 130 PWC + 2x MPX 15 PM + 1x MPW 170 BTC + 12x BU
45 kW + 5 min	1x MPX 130 PWC + 3x MPX 15 PM + 1x MPW 170 BTC + 8x BU
45 kW + 10 min	1x MPX 130 PWC + 3x MPX 15 PM + 1x MPW 170 BTC + 12x BU
60 kW + 5 min	1x MPX 130 PWC + 4x MPX 15 PM + 1x MPW 170 BTC + 12x BU
60 kW + 10 min	1x MPX 130 PWC + 4x MPX 15 PM + 1x MPW 170 BTC + 16x BU
75 kW + 7 min	1x MPX 130 PWC + 5x MPX 15 PM + 1x MPW 170 BTC + 16x BU
75 kW + 10 min	1x MPX 130 PWC + 5x MPX 15 PM + 1x MPW 170 BTC + 20x BU

Power Cabinet solutions based on MPX 25 PM:

Power Requested (without Battery)	MPW Power Cabinet part description
25 kW	1x MPX 130 PWC + 1x MPX 25 PM – 0 Min
50 kW	1x MPX 130 PWC + 2x MPX 25 PM – 0 Min
75 kW	1x MPX 130 PWC + 3x MPX 25 PM – 0 Min
100 kW	1x MPX 130 PWC + 4x MPX 25 PM – 0 Min
125 kW	1x MPX 130 PWC + 5x MPX 25 PM – 0 Min
Power Requested (with Modular Battery)	**MPW Power Cabinet part description (*)**
25 kW + 5 min	1x MPX 130 PWC + 1x MPX 25 PM + 1x MPW 170 BTC + 4x BU
25 kW + 10 min	1x MPX 130 PWC + 1x MPX 25 PM + 1x MPW 170 BTC + 8x BU
50 kW + 5 min	1x MPX 130 PWC + 2x MPX 25 PM + 1x MPW 170 BTC + 12x BU
50 kW + 10 min	1x MPX 130 PWC + 2x MPX 25 PM + 1x MPW 170 BTC + 16x BU
75 kW + 5 min	1x MPX 130 PWC + 3x MPX 25 PM + 1x MPW 170 BTC + 16x BU
75 kW + 10 min	1x MPX 130 PWC + 3x MPX 25 PM + 1x MPW 170 BTC + 20x BU
100 kW + 5 min	1x MPX 130 PWC + 4x MPX 25 PM + 1x MPW 170 BTC + 20x BU
100 kW + 10 min	1x MPX 130 PWC + 4x MPX 25 PM + 1x MPW 170 BTC + 28x BU
125 kW + 5 min	1x MPX 130 PWC + 5x MPX 25 PM + 1x MPW 170 BTC + 24x BU
125 kW + 10 min	1x MPX 130 PWC + 5x MPX 25 PM + 1x MPW 170 BTC + 36x BU

Power Cabinet solutions based on MPW 42 PM:

Power Requested (without Battery)	MPW Power Cabinet part description
42 kW	1x MPW 300 PWC + 1x MPW 42 PM – 0 Min
84 kW	1x MPW 300 PWC + 2x MPW 42 PM – 0 Min
126 kW	1x MPW 300 PWC + 3x MPW 42 PM – 0 Min
168 kW	1x MPW 300 PWC + 4x MPW 42 PM – 0 Min
210 kW	1x MPW 300 PWC + 5x MPW 42 PM – 0 Min
252 kW	1x MPW 300 PWC + 6x MPW 42 PM – 0 Min
Power Requested (with Modular Battery)	**MPW Power Cabinet part description (*)**
42 kW + 5 min	1x MPW 300 PWC + 1x MPW 42 PM + 1x MPW 170 BTC + 8x BU
42 kW + 10 min	1x MPW 300 PWC + 1x MPW 42 PM + 1x MPW 170 BTC + 12x BU
84 kW + 5 min	1x MPW 300 PWC + 2x MPW 42 PM + 1x MPW 170 BTC + 16x BU
84 kW + 10 min	1x MPW 300 PWC + 2x MPW 42 PM + 1x MPW 170 BTC + 24x BU
126 kW + 5 min	1x MPW 300 PWC + 3x MPW 42 PM + 1x MPW 170 BTC + 24x BU
126 kW + 10 min	1x MPW 300 PWC + 3x MPW 42 PM + 1x MPW 170 BTC + 36x BU
168 kW + 5 min	1x MPW 300 PWC + 4x MPW 42 PM + 1x MPW 170 BTC + 32x BU
168 kW + 10 min	1x MPW 300 PWC + 4x MPW 42 PM + 2x MPW 170 BTC + 48x BU
210 kW + 5 min	1x MPW 300 PWC + 5x MPW 42 PM + 2x MPW 170 BTC + 40x BU
210 kW + 10 min	1x MPW 300 PWC + 5x MPW 42 PM + 2x MPW 170 BTC + 60x BU
252 kW +5 min	1x MPW 300 PWC + 6x MPW 42 PM + 2x MPW 170 BTC + 48x BU
252 kW +10 min	1x MPW 300 PWC + 6x MPW 42 PM + 2x MPW 170 BTC + 68x BU

> 5.2 COMBO CABINET

Combo Cabinet is the combined solution to offer power quality and battery backup; Riello UPS offers two different solutions:
MPX 100 CBC can accommodate up to four MPX 15 PM or MPX 25 PM (including redundancy) and six battery shelves suitable to house up to twenty-four Battery Units.
MPW 130 CBC can accommodate up to three MPW 42 PM (including redundancy) and five battery shelves suitable to house up to twenty Battery Units.

In both solutions, all the relevant building blocks which make up the cabinet are hot swappable to ensure easy, safe, non-intrusive and quick maintenance operations.
Up to four complete Combo Cabinets can be connected in parallel, increasing the capacity including redundancy.
The parallel logic is “loop type” which ensures continuous and secure UPS operation even if one communication link fails. If this condition does occur, a warning is immediately raised to the user, so that all corrective actions can be taken in order to restore the full communication link.

The available UPS power and redundancy level can expand vertically using the MPX 15 PM power module from:
• 15 to 60 kW in one single Combo Cabinet (MPX 100 CBC) and up to 240 kW with four cabinets in parallel.

The available UPS power and redundancy level can expand vertically using the MPX 25 PM power module from:
• 25 to 100 kW in one single Combo Cabinet (MPX 100 CBC) and up to 400 kW with four cabinets in parallel.

Also, the power solution can expand vertically using the MPW 42 PM power module from:
• 42 to 126 kW in one single Combo Cabinet (MPW 130 CBC) and up to 504 kW with four cabinets in parallel.

As for the Power Cabinet, the nature of this design as a modular UPS, Multi Power should not be not sized to work with all the modules at full capacity, but at design stage at least one PM should be set to run as a redundant unit within each of the Combo cabinets.
The MPX 100 CBC with a full battery arrangement (**24xBU**) can back up a 100 kW load (5x MPX 25 PM) maximum.

The MPW 130 CBC with a full battery arrangement **(20xBU)** can back up an 84 kW load (2x MPW 42 PM) maximum.
With the load level higher than 84 kW the user shall extend the battery backup by adding Multi Power Battery Cabinets (refer to the dedicated Paragraph) or initially selecting a tailor made conventional battery box sized for the nominal power and in accordance with the 20+20 blocks architecture plus neutral point.

Note: It is not possible to build back up time combining together conventional battery cabinet either with Multi Power modular Battery Cabinet or Multi Power Combo Cabinet populated with BU.
Refer to dedicated battery cabinet paragraph for further details.

Combo Cabinet solutions based on MPX 15 PM:

Power Requested (without Battery)	**MPW Power Cabinet part description**
15 kW	1x MPX 100 CBC + 1x MPX 15 PM – 0 Min
30 kW	1x MPX 100 CBC + 2x MPX 15 PM – 0 Min
45 kW	1x MPX 100 CBC + 3x MPX 15 PM – 0 Min
60 kW	1x MPX 100 CBC + 4x MPX 15 PM – 0 Min
Power Requested (with Modular Battery)	**MPW Power Cabinet part description (*)**
15 kW + 10 min	1x MPX 100 CBC + 1x MPX 15 PM + 4x BU
15 kW + 25 min	1x MPX 100 CBC + 1x MPX 15 PM + 8x BU
30 kW + 10 min	1x MPX 100 CBC + 2x MPX 15 PM + 8x BU
30 kW + 17 min	1x MPX 100 CBC + 2x MPX 15 PM + 12x BU
45 kW + 5 min	1x MPX 100 CBC + 3x MPX 15 PM + 8x BU
45 kW + 10 min	1x MPX 100 CBC + 3x MPX 15 PM + 12x BU
60 kW + 5 min	1x MPX 100 CBC + 4x MPX 15 PM + 12x BU
60 kW + 10 min	1x MPX 100 CBC + 4x MPX 15 PM + 16x BU

Combo Cabinet solutions based on MPX 25 PM:

Power Requested (without Battery)	**MPW Power Cabinet part description**
25 kW	1x MPX 100 CBC + 1x MPX 25 PM – 0 Min
50 kW	1x MPX 100 CBC + 2x MPX 25 PM – 0 Min
75 kW	1x MPX 100 CBC + 3x MPX 25 PM – 0 Min
100 kW	1x MPX 100 CBC + 4x MPX 25 PM – 0 Min
Power Requested (with Modular Battery)	**MPW Power Cabinet part description (*)**
25 kW + 5 min	1x MPX 100 CBC + 1x MPX 25 PM + 4x BU
25 kW + 10 min	1x MPX 100 CBC + 1x MPX 25 PM + 8x BU
50 kW + 5 min	1x MPX 100 CBC + 2x MPX 25 PM + 12x BU
50 kW + 10 min	1x MPX 100 CBC + 2x MPX 25 PM + 16x BU
75 kW + 5 min	1x MPX 100 CBC + 3x MPX 25 PM + 16x BU
75 kW + 10 min	1x MPX 100 CBC + 3x MPX 25 PM + 20x BU
100 kW + 5 min	1x MPX 100 CBC + 4x MPX 25 PM + 20x BU
100 kW + 10 min	1x MPX 100 CBC + 4x MPX 25 PM + 28x BU

Combo Cabinet solutions based on MPW 42 PM:

Power Requested (without Battery)	**MPW Combo Cabinet part description**
42 kW	1x MPW 130 CBC + 1x MPW 42 PM – 0 Min
84 kW	1x MPW 130 CBC + 2x MPW 42 PM – 0 Min
126 kW	1x MPW 130 CBC + 3x MPW 42 PM – 0 Min

Power Requested (with Modular Battery)	**MPW Combo Cabinet part description (*)**
42 kW + 5 min	1x MPW 130 CBC + 1x MPW 42 PM + 8x BU
42 kW + 10 min	1x MPW 130 CBC + 1x MPW 42 PM + 12x BU
84 kW + 5 min	1x MPW 130 CBC + 2x MPW 42 PM + 16x BU
84 kW + 8 min	1x MPW 130 CBC + 2x MPW 42 PM + 20x BU

Note:

(*)= Autonomy is given at 75% of nominal UPS power and BU equipped with **CSB BATTERY** model **UPS12460F2** or equivalent for dimensions/performances.

If back up time is built up with modular batteries (BU) and load level for the configured system is higher than 75%, the total amount of BU should grant minimum 5 minutes back up time at UPS system full load.

Redundancy level should be taken in consideration during sizing (min 1 PM).

> 5.3 OPERATING CONFIGURATION

Multi Power either in Combo or Power cabinet architecture can operate in the following different main operating modes: ON LINE, FREQUENCY CONVERTER, ECO, ENERGY SAVING and in their main variants described in following paragraph.

Working in ON LINE and FREQUENCY CONVERTER operating modes Multi Power grants an overall efficiency greater than 96%, and from a load level of just 20% the efficiency is higher than 95% ensuring the best performances at any load condition.

Mode: ON LINE

Normal Operation: The rectifier, drawing power from the mains power supply, supplies the Inverter and charges the batteries; the load is powered by the Inverter which provides a clean and secure supply, synchronised to the bypass supply.

Emergency Operation: if the mains power supply wanders outside the permitted input range (voltage and frequency), the rectifier shuts down and the Inverter is automatically powered by the battery for the preset backup time, without disruptions to the load. When the mains power supply returns, the rectifier gradually starts, charging the batteries and eventually powers the Inverter.

Operation from By-pass: if an Inverter overload exceeds permitted limits (or it stops due to a fault), the load automatically transfers to the emergency bypass supply via the static switch, without disruption to the load.

Note: ON LINE operating mode is set by default in the factory. Any other operating mode selection is licensed to authorised service personnel only.

Mode: FREQUENCY CONVERTER

The UPS can be configured as a frequency converter (with “Service SW”), therefore when the input frequency is 50 Hz the output frequency can be 60 Hz and vice versa. During this mode of operation, the automatic by-pass is disabled. The UPS can work in frequency converter mode with or without the batteries (must be set up with “Service SW”).

Mode: ECO

If the user determines that the load conditions are not so critical to accept lower power protection (voltage fluctuations within certain limits), the UPS can be set in this operating mode to increase the overall system efficiency and increase the lifespan for those components subjected to wear such as capacitors and fans that are not energized in this operating selection.
In this mode of operation, the UPS system input stage and battery charger are active, inverter circuits are on idle mode with inverter contactor close, while the static bypass path supplies the load.
With this arrangement, in ECO mode any mains power abnormalities or absence will force the UPS to switch quickly between bypass and inverter typically within 2 milliseconds.
Once the utility supply returns within the tolerances, the UPS will return back to the bypass line five minutes later.
During ECO operation the load is exposed to the mains disturbances from the utility; it will be possible to adjust the ECO mode sensitivity (three levels) and therefore the inverter will be activated more or less frequently according with the mains disruptions.
ECO activation as well as sensitivity adjustment is granted to authorized personnel only (via “Service SW”).

Mode: ENERGY SAVING

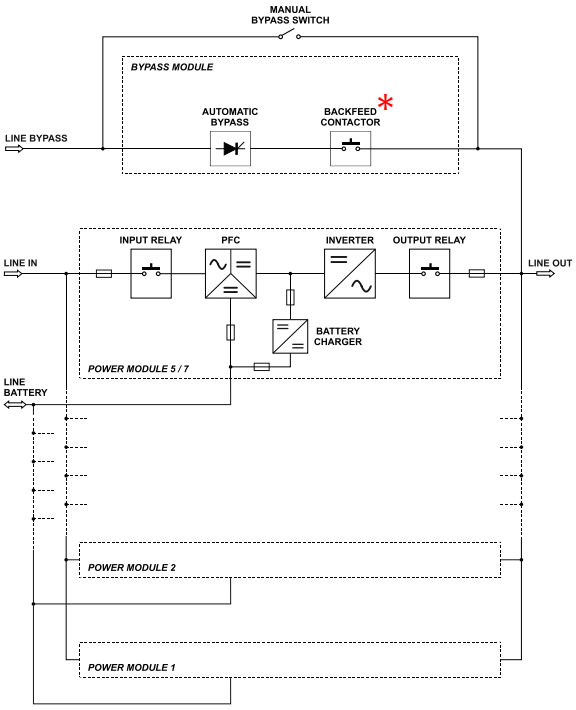
With ENERGY SAVING operating mode active, the UPS provides the highest level of power protection keeping the system in ON LINE operation (Inverter supplying the load) and granting the redundancy level set.
In accordance with the load level, the control will automatically activate the required number of PM's to supply the load, ensuring the highest level of efficiency.
ENERGY SAVING constantly monitors the load level to ensure that as the load varies the load applied to the active PM's is maintained between 45 to 75%.
If just one PM in the entire system is no longer available (internal fault or manual shutdown) or the PM load level is higher than 85%, the system will immediately turn on all power modules.
During ENERGY SAVING operation, the PM is kept in idle mode with the inverter contactor closed, while the charger is not active. Each individual PM is kept in ENERGY SAVING operation for 15 consecutive hours, then under the same load conditions another PM will take over the role in order to age the systems at the same rate.
If the load increases suddenly then the system is granted by means of a temporary change over to bypass line.
ENERGY SAVING mode selection is available to authorized personnel only (via "Service SW").

The UPS system operating mode selection, whether ON LINE, ECO, FREQUENCY CONVERTER, and ENERGY SAVING is shown in the "System status" LCD screen home page.
Furthermore, during ENERGY SAVING operation, the PM's in such condition are represented with dedicated green icon rather than blue.

6- MULTI POWER PARTS DESCRIPTION

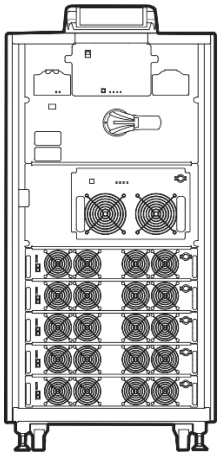
MULTI POWER block diagram is as follows:

Power Cabinet layout:

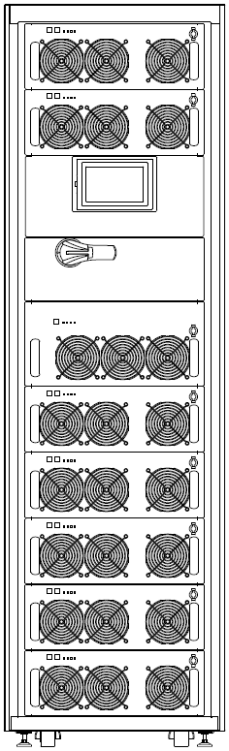


**Backfeed contactor is optional for MPX 130 PWC*

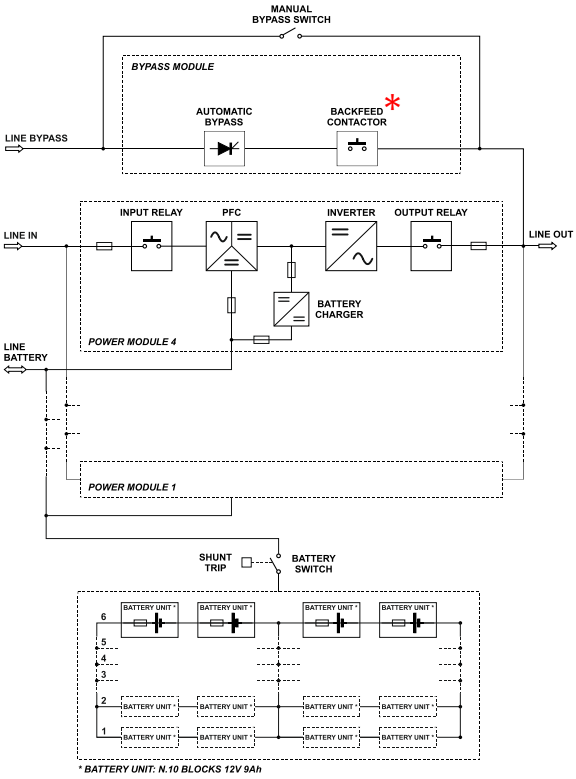
MPX 130 PWC



MPW 300 PWC

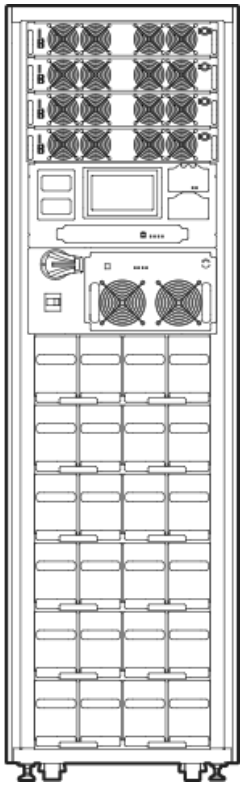


Combo Cabinet layout:

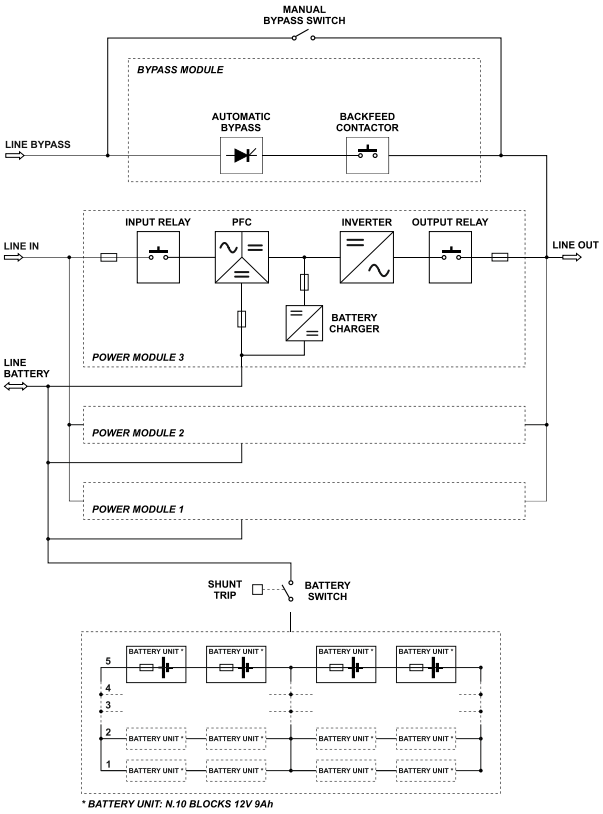


**Backfeed contactor is optional for MPX 100 CBC*

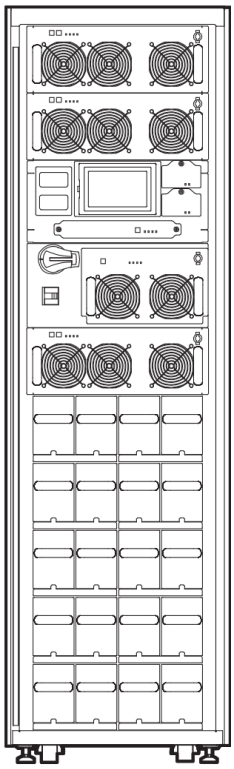
MPX 100 CBC



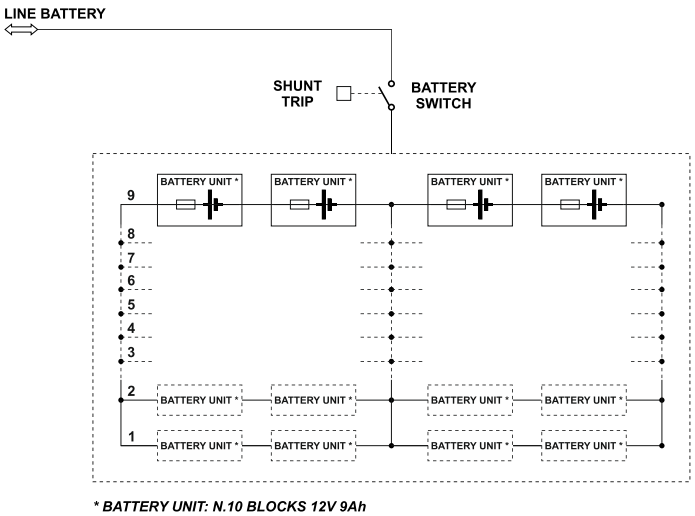
Combo Cabinet layout:



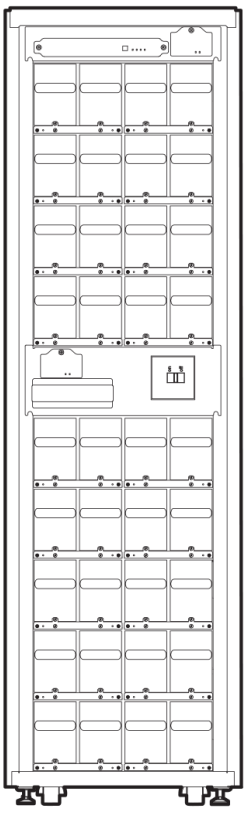
MPW 130 CBC



Battery Cabinet layout:

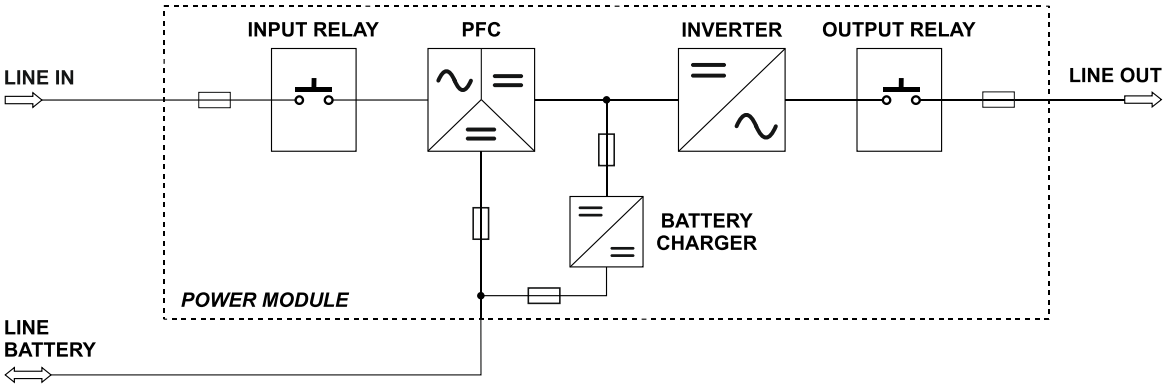


MPW 170 BTC



> 6.1 POWER MODULE (PM)

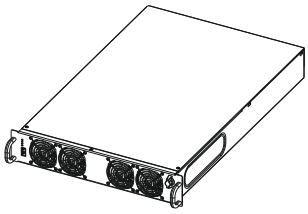
All the performance details as described below are referenced to MPX 15 PM, MPX 25 PM, MPW 42 PM (here in after identified as PM) unless otherwise stated.



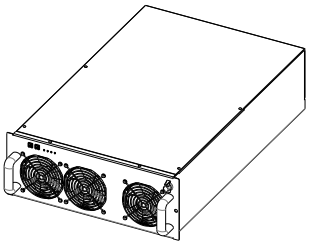
The fundamental part of either Power or Combo Cabinet is the Power Module. PM is a three phase double conversion UPS equipped with:

- Full IGBT PFC rectifier;
- Battery charger;
- Three level NPC Inverter;
- Dedicated protections to prevent major failures and isolate the faulty module in case of an internal fault.

MPX 15 PM, MPX 25 PM



MPW 42 PM



> 6.1.1 OVERALL MODULE CONTROL

The UPS PM has been developed with the most reliable and innovative technologies using power components at the cutting edge of technology and multi microprocessor architecture to ensure utmost system control, reliability and power density ensuring 15/25/42 kW at unity power factor with no de-rating up to 40°C operating temperature.
Three microprocessors oversee all of the UPS PM operations each having different and dedicated tasks.
Furthermore, all major power components are continually temperature monitored, with up to nine temperature points constantly monitored. It means that all devices may operate in the most optimized conditions granting STEADY and EFFICIENT operations.
The UPS PM is equipped with three (four for MPX 15 PM and MPX 25 PM) fans which are speed controlled, therefore there is no waste of energy to supply them if the load level does not require high ventilation.
At the same time each fan is equipment with a third 'control' wire which immediately warns the microcontroller in case of a fault; subsequently the user is immediately informed so that necessary actions can be taken to restore the complete system to correct operations.

> 6.1.2 PFC INPUT CONVERTER

The PFC Converter (AC/DC) converts the AC voltage into a DC supply to power the Inverter; if the mains or alternative power supply fails, the Converter will raise the battery voltage to a value suitable to power the Inverter.
The input converter is a three phase plus neutral type; if utility supply phase rotation is not correct, the converter will continue to operate but warn the user of the error via a dedicated alarm.
In addition, if one or two of the supply input phases are missing the system may continue taking power from the mains (not absorbing energy from the batteries) depending on the load level (refer to the technical table).
The PFC control technology using Digital Signal Processor (DSP) microprocessors and IGBT power semiconductors provisions, ensure a low impact on the power supply source and meantime outstanding performance as below described:

- **Negligible Input Harmonics:** upstream generators and transformers (including distribution) can be reduced due to the negligible input harmonic distortion and high input power factor > 0.99.
- **Progressive rectifier start-up (Power Walk-in duration):** With the UPS working in battery mode when the mains power supply returns, absorption of the mains power supply progressively reaches the nominal value within a time period that can be set from 1 to 125 seconds. This function is normally disabled.

> 6.1.3 INVERTER

The DC/AC Converter (Inverter) converts the direct current into a stabilised sinusoidal alternating current to power the load. When the UPS is in ON LINE mode, the load is always powered by the Inverter.
The Inverter is an IGBT (Insulated Gate Bipolar Transistor) based three-level design; the IGBT is a transistor that allows high commutation frequencies (16 kHz) and, as a result, the Inverter provides a high-quality output voltage, with low noise levels and high operating efficiency. In addition, the DSP microprocessor controls, guarantee static and dynamic excellent performances under any operating condition:

Voltage adjustment
The output voltage can be adjusted using the independent phase control and DSP microprocessor; this enables a better static and dynamic response. In detail:

a) **static condition:** the Inverter output voltage remains within ±1% for all variations of the input voltage within the accepted limits;
b) **dynamic condition:** for load variations from 0 to 100%, the output voltage remains within the most stringent limits defined by class 1 of the EN 62040-3 standard.

Frequency adjustment
The Inverter output frequency is generated autonomously by an internal oscillator, in synchronisation with the bypass supply. Frequency stability is operating condition dependent:

a) **Frequency stability**
With mains power present: the internal oscillator follows any frequency variations in the bypass supply and in relation to the preset value - normally ±5% (configurable from ±0.25% to ±10%).
With no supply present: the Inverter autonomously generates the frequency of the output voltage with a stability of ± 0.01%.
b) **Frequency variation speed**
The maximum Inverter output frequency variation (to lock to that of the bypass supply) is 1 Hz/s (adjustable from 0.5 to 2 Hz/s).

Distortion of the output voltage

Inverter output waveform distortion with a linear load is maintained within ±2%. Within a non-linear load, as defined by the EN 62040-3 standard, output voltage distortion does not exceed ±5%.

Overload and Short circuit current

If a current surge occurs whilst the UPS is operating, the Inverter will carefully analyse the output voltage and current in order to distinguish if the short circuit is genuine or an overload.

As for the overload limits refer to the technical data table. If the UPS detects a short circuit (VOUT <100 Volt):

- During battery operation (bypass power supply failure), the Inverter can supply a fault current (current limited) up to 250% for 200 ms (100 ms for MPX 15 PM and MPX 25 PM) and after that, (if the short circuit has not been cleared) an additional 150% for 300 ms (400 ms for MPX 15 PM and MPX 25 PM).
- When the mains power supply is present, the Inverter will switch to bypass; if the current is greater than 150%, the UPS will continue to feed the load for one minute. During this time the upstream or downstream protections devices outside UPS should be able to disconnect.

The table below recommends the sizing of the various protection devices located downstream of the UPS in order to guarantee their selectivity even in the event of a power failure:

Output protections (values recommended for selectivity)	
Rapid fuses (GI / gG)	In (Nominal current)/4
Magneto thermal switches (Curve C)	In (Nominal current)/4

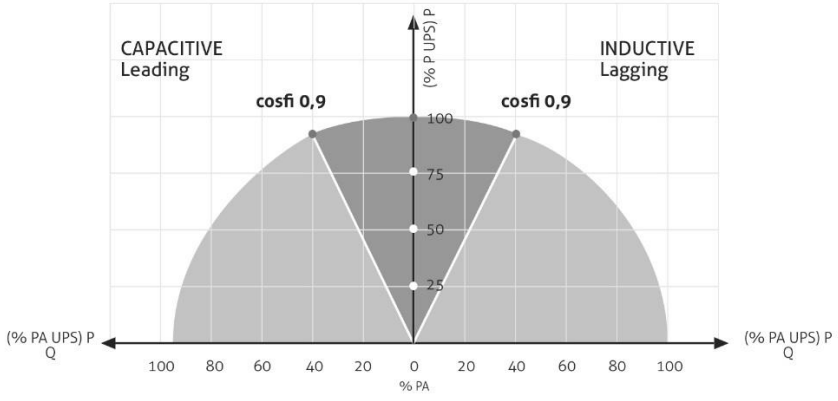
Output voltage symmetry

Under all conditions, output voltage symmetry is maintained within ±1%, for balanced loads and ±2% for unbalanced loads of 100% (e.g. one phase with nominal load and the other two with no load).

Phase shift angle

The three-phase Inverter output voltages have a guaranteed phase separation angle of 120° ± 1° for balanced loads and for 100% unbalanced loads.

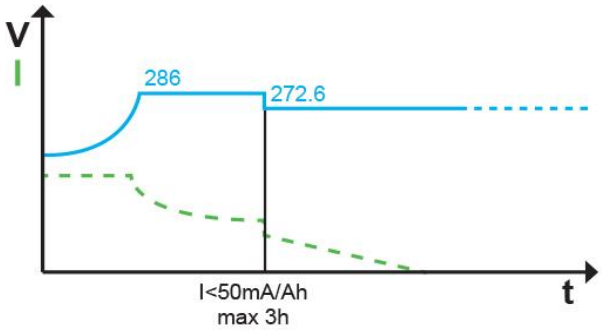
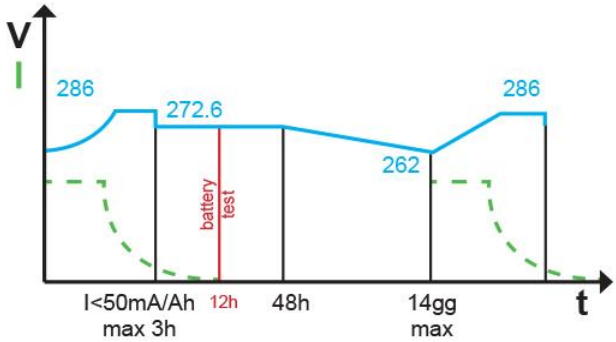
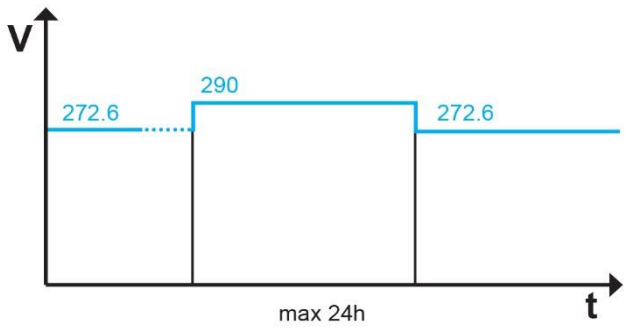
Performance of Multi Power PM Inverter with reactive loads



> 6.1.4 BATTERY CHARGER (Battery Care System)

The "Battery Care System" is a set of functions arranged to help extend the working life of the battery set and optimise its performance.
Each Power Module is equipped with an 8 Amperes (6 Amperes for MPX 15 PM) charger. All chargers combine to recharge the systems common batteries.

Battery recharging: the UPS can be used with sealed lead batteries (VRLA), AGM, open-vented and NiCd batteries. According to the type of battery used three recharge methods are available:

Recharging modes (selectable by "Service SW")	MULTI POWER configurations
	**Floating (configurable):** the charge state of the battery is continuously monitored; when the mains power supply is present, the batteries are charged at a preset voltage level and limited current relative to the recharge time required and the capacity of the battery itself.
	**Two-level (standard configuration):** this recharge is at limited current with two levels of voltage. In the first instance, the process uses a quick charge voltage, whilst in the second stage a float charge. This type of charging is mainly used with open-vented batteries or other types when an accelerated recharge time is required.
	**Cyclical (configurable):** this recharge is sometimes recommended by battery manufacturers to prolong the battery life. It consists of battery charge and discharge cycles as indicated in the diagram.
	**"Commissioning" (configurable):** this charge method is useful every time new batteries are installed in the UPS. By increasing the voltage to 290 Volt for a maximum of 24 hours, perfect equalisation of the battery charge is assured, thus guaranteeing a uniform discharge and wear of the battery monoblocks.

The various recharge methods and the preset voltage values are defined using “Service SW”.
The presence of the external temperature sensor option will activate compensation of the voltage depending on the temperature (The sensor shall be enabled through UPS System configuration). When the Battery backup time is supplied by Multi Power Modular Battery cabinets, the temperature sensor which fits inside the battery cabinet automatically enables the voltage compensation.

a) **Battery test:** during normal operation the battery is automatically tested at regular intervals. The battery test can also be manually activated. The test is performed to ensure a limited battery discharge and impact on overall life expectancy. If the test returns a negative result a warning is displayed on the UPS panel (or remote panel, if installed).

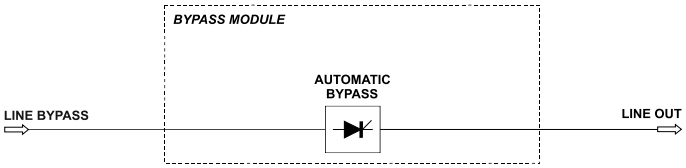
b) **Protection against slow discharges:** for long runtimes and low load discharges, the end of discharge voltage is raised to approximately 1.8 V/el as recommended by the battery manufacturers to avoid a deep discharge state.

c) **Ripple current:** recharge ripple current (residual AC component) is one of the most important causes of poor battery reliability and reduced operating life. The UPS battery charger is a high-frequency design with a negligible level of ripple current.

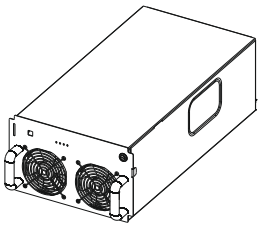
d) **Battery recharge limit current:** The battery recharge current is limited to a prefixed value of Cnom/8 (i.e. 12.5% Cnom).

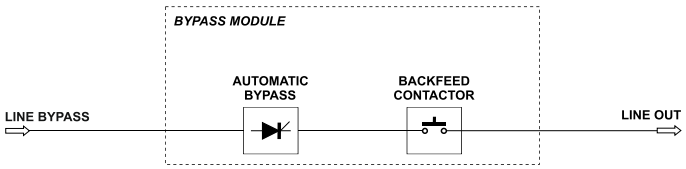
e) **UPS without batteries:** the UPS must always operate with the batteries connected; if they are not connected alarms will be generated and the UPS will not be able to perform to specification ensuring business continuity. However, if the system is to operate as a frequency converter or voltage stabilizer a battery is not mandatory.

> 6.2 BYPASS MODULE (BM)

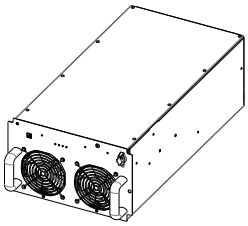


MPX 130 BM

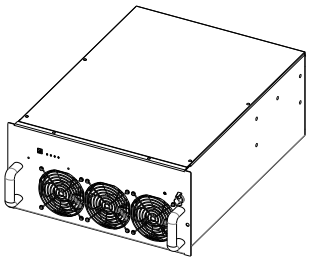




MPW 130 BM



MPW 300 BM



The UPS ON LINE double conversion layout is achieved by means of a bypass static transfer switch. The bypass static switch is a high speed, solid-state transfer device rated for continuous duty operation. Transfer operations will be provided by the electronic static switch which take place automatically in the event of:

- Output voltage outside the limits
- Over-temperature
- Inverter failure
- DC voltage goes outside the permitted range

As soon as the mains supplies the load (via bypass) all the disturbances such as voltage and frequency variations effect the load.

The uninterrupted automatic transfer may be inhibited in the following situations:

- If at the time of switchover, the Inverter voltage is not synchronized with that of the bypass line power supply. The transfer will take place with a delay of around 20 ms; in consideration of the various types of loads, this delay can be set with “Service SW” (10÷100 ms) or the switchover can be inhibited if there is no synchronization.
- Manual switching to bypass supply via the maintenance switch.

If the system operates as frequency converter.

Multi Power comes with two specific hot swappable Bypass Modules power ratings, according with the cabinet type (Power or Combo). Unlike PM, BM are always included as part of the UPS system.
(Refer to the technical table for details)

Backfeed protection:
Backfeed protection is a safety control circuit which prevents any potential risk from electric shock on the UPS bypass input terminals, in the event of a failure of the bypass static switch SCR.

The control circuit includes an isolation device (Mechanical separation) immediately activated upon backfeed detection.

The backfeed contactor is standard within the MPW 300 BM, whilst it is an option within the MPX 130 PWC and MPX 100 CBC, therefore the user can specify the correct UPS solution either with or without the built in backfeed contactor (EX-works only)

Bypass power supply limits

Transfer to the bypass line takes place if the voltage and the frequency are considered 'suitable' for the load and the limits for transfer can be set on-site by the UPS user.

- Voltage range: ±10% (configurable from -20% to +15%);
- Frequency range: ±5% (configurable from ±0.25% to ±10%)

Overload

The static switch has no over voltage protection devices. Appropriate protection shall be arranged outside the UPS by protective devices within the overall installation to ensure UPS compatibility.

The UPS static switch is sized to support the following overload periods:

- 125% for 10 minutes
- > 125% for 1 minute

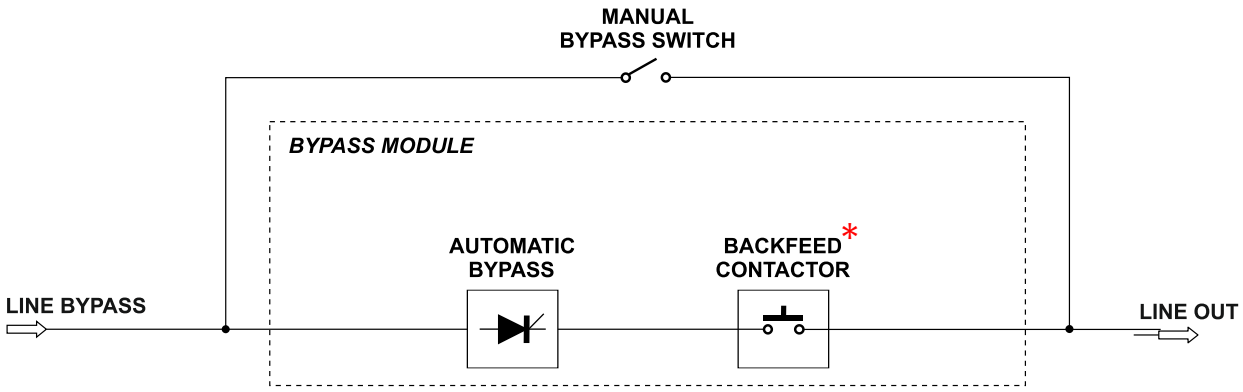
Thyristors with I^2t (Tj=25°C) is as follow=

- 1 805 000 A^2S for MPW 300 BM (252 kW)
- 145 000 A^2S for MPW 130 BM and MPX 130 BM (126 kW)

Dedicated Power Supply for the BM

BM unit is equipped with a dedicated power supply to allow the automatic bypass to operate independently from other system power supplies (PSU); this will grant higher bypass system reliability and system operation in case of major fault within the PSU.

> 6.3 MANUAL BYPASS



**Backfeed contactor is optional for the MPX 130 PWC and MPX 100 CBC*

Multi Power Power and Combo Cabinet types are equipped with an embedded manual bypass switch which grants continuous supply to the output terminals should there be a requirement for bypassing the system. This can be used in case of a major fault, due to bad environment, unforeseen events such as lightning and flooding which may affect system operation, or a large site upgrade. Please note that when activated the bus bars and connection terminals remain live with dangerous voltages inside the system, therefore a competent engineer should take preventive actions to prevent dangerous contact. In order to ensure complete safe operations inside the unit an external manual bypass is highly recommended together with the system input/output isolating devices.

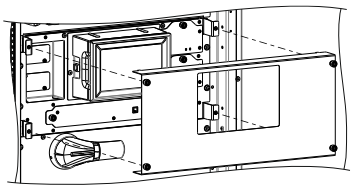
> 6.4 SYSTEM ADDITIONAL UNITS

CONNECTIVITY PANEL:

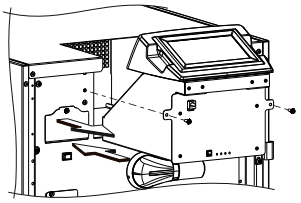
Connectivity Panel (CP) is the global interface for both user and service personnel to access UPS parameters, configurations and commands with dedicated and hierarchical organization for display and ports access.

All components within the CP are hot swappable and their replacement can be achieved without the need for any power interruption or system manual bypass operation.

Refer to the dedicated Monitoring and control paragraph for further details.



Connectivity Panel (CP)

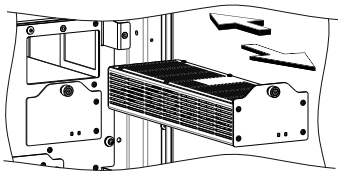


Connectivity Panel for MPX 130 PWC, ONLY (CP)

PSU:

Multi Power is equipped with redundant power supply units which grant utmost reliable power supply (PSU) for all auxiliary control circuits and Connectivity Panel (CP). In case of a fault the PSU immediately warns the user with a dedicated alarm and the unit can be easily removed and replaced with a new one with no effect for the overall system.

Note: The MPX 130 PWC *is delivered with a single PSU; a second redundant PSU can be ordered separately if required.*



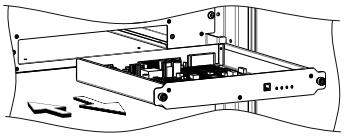
Power Supply Unit (PSU)

MU:

To easily and constantly monitor all accessory components such as the PSU, temperature sensors and external auxiliary switch status, Multi Power is developed with a microprocessor control unit named Monitoring Unit (MU).

Even this item in case of a fault immediately warns the user and the replacing procedure can be performed easily based on a hot swappable principle.

Note: Within the MPX 130 PWC, the MU is integrated within the Connectivity Panel

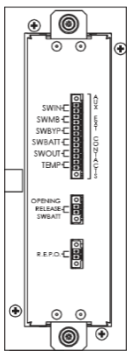


Monitoring Unit (MU)

ASB:

ASB board is located behind the cabinet which enables the UPS to monitor the status of the switches placed outside the Power cabinet; therefore, it will be possible to check and warn the user via the alarm and dedicated graphic indication display either for Input, Output, Battery, Bypass line, or Manual Bypass, switch status. Furthermore, the terminal strip receives the information related to the temperature sensor placed in a battery room or battery cabinet not within Multi Power family.

In addition, this card receives the REPO command signal for emergency system shut down.



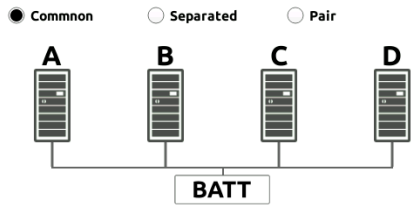
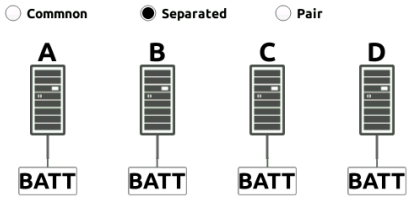
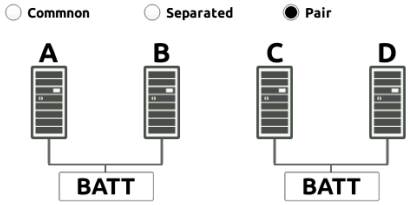
Auxiliary Signal Board (ASB)

In case of parallel systems installation, each cabinet must have an individual isolated Auxiliary Signal Board connection, therefore any common system switches should include a number of independent auxiliary switches according to the number of power cabinets installed.

7- BATTERY CABINET DESCRIPTION

Battery back-up is arranged following the 20+20 battery block plus neutral point design and assuming each PM can deliver up to 8 Amps (6 Amps for MPX 15 PM) of recharging current.

Each Cabinet (whether Power or Combo type) shall be associated to a battery bank.
If multiple Cabinets are to be connected in parallel (from two to four Power/Combo Cabinets) the user may decide to have a common battery bank for the parallel system or a dedicated battery bank assigned to each of the Power/Combo Cabinets.
During the installation and commissioning the authorised engineer can select and configure the system to operate with a Common or Separated battery in addition to any related settings (refer to the advance configuration manual).

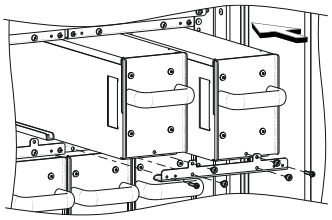
Common Battery Configuration	Separated Battery Configuration	Paired Battery Configuration
		
➢ Default configuration ➢ Compatible with Conventional and Modular Battery types ➢ Applicable from 1 to 4 Cabinets	➢ Service configuration ➢ Compatible with Conventional and Modular Battery types ➢ Applicable from 2 to 4 Cabinets	➢ Service configuration ➢ Compatible with conventional and Modular Battery types ➢ **Applicable with 4 Cabinets, only**

> 7.1 MULTI POWER MODULAR BATTERY CABINET

Multi power comes with a specific modular battery cabinet designed to grant secured back up time.
Battery Cabinet is the battery modular back up solution which easily grows together with user requirements.
Each battery string consists of an array of four Battery Units (BU) lined up in each shelf of the battery cabinet. The cabinet itself can be populated with up to nine battery shelves; finally up to ten modular battery cabinets can operate together in parallel. Back up time can be scaled assuming that a minimum of two battery shelves are fitted per PM to grant the minimum back up time.

BU:

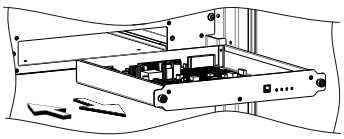
Battery Unit (BU) is the key elements of the battery cabinet. This box contains ten 12 Volt battery blocks arranged to build the back up time. Each BU is equipped with dedicated internal protection (fuse type) and a control circuit to monitor the module status. This makes it possible to check the voltage/current supplied by each single battery module and therefore identify and warn the user if one of them is defective.



Modular Battery Unit

MU:

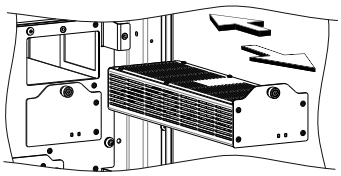
To easily and constantly monitor all accessory components such as the PSU, temperature sensors and collect all BU information data (Voltage, Current, status) Multi Power Battery Cabinet is equipped with a dedicated microprocessor control unit Monitoring Unit (MU).
This makes it possible to easily identify the faulty unit amongst the different BU installed and quickly arrange for replacement.



Monitoring Unit (MU)

PSU:

As with the Power and Combo Cabinet, even the Battery Cabinet is equipped with two redundant Power Supplies (PSU) to feed the control circuit units inside the cabinet and grant seamless communication between the Power/Combo Cabinet and Battery Cabinets.



Power Supply Unit (PSU)

> 7.2 CONVENTIONAL BATTERY CABINET ARRANGEMENT

The user may decide to select the suitable battery configuration according with the backup time to grant the specific requirements by means of a conventional battery cabinet capable of accommodating the necessary number of batteries (20+20 configuration) and properly rated protective devices (fuse or MCCB).
Note: It is not possible to build back up time combining together conventional Battery Cabinet either with Multi Power modular Battery Cabinet or Multi Power Combo Cabinet populated with BU.

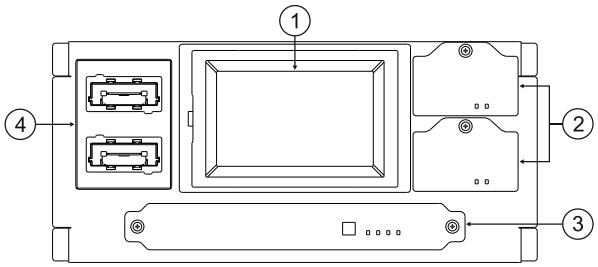
8- MONITORING AND CONTROL

Connectivity Panel is at the heart of the Multi Power information system for the User (not the controlling system), therefore if a fault occurs within any part of the monitoring system this does not affect the control panel global operation and above all the business continuity.

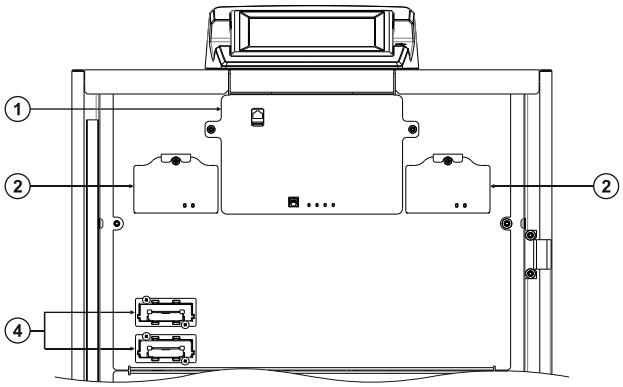
CP is the user and service interface to monitor and control the system status, parameters, configuration as well as environment conditions such as input voltage, load level, temperature, power breaker status and single Battery Unit operation (if Multi Power Battery Cabinet is combined with Combo or Power Cabinet).

Thanks to the display (as part of MCU) multiple access level control is possible to protect the access to UPS system configuration and control menu, preventing undue operations from non-authorised personnel and therefore threatening UPS system operations.

Connectivity interfaces
(Power and Combo except MPX 130 PWC)



Connectivity interfaces MPX 130 PWC



① Main Communication Unit (MCU)

② Redundant Power Supply Units (PSU)
Note: Within the MPX 130 PWC*, the PSU located at the righthand side is optional*

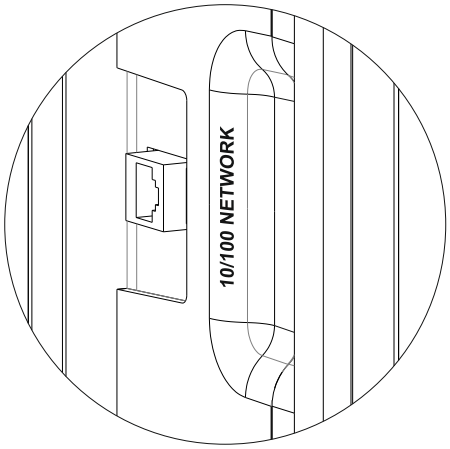
③ Monitoring Unit (MU)
Note: With the MPX 130 PWC*, the MU is integrated within the MCU as part of connectivity panel*

④ Communication Slots

MCU Details:

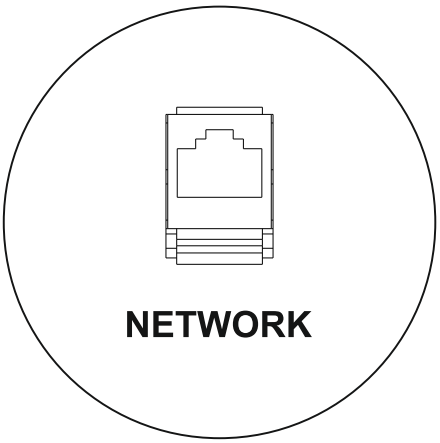
MCU arrangement for the Power and Combo Cabinets except MPX 130 PWC

Left side MCU



MCU arrangement for the MPX 130 PWC ONLY

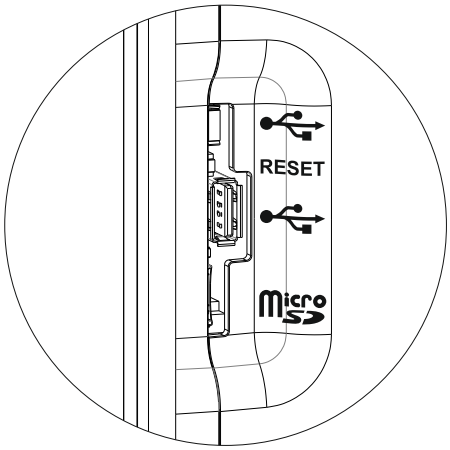
Under the MCU



Ethernet connection via RJ45 connector to monitor system status remotely through the WEB using Power Shield Riello UPS software.
Ethernet port supports different protocols such as: http, SMTP, ntp, udp.

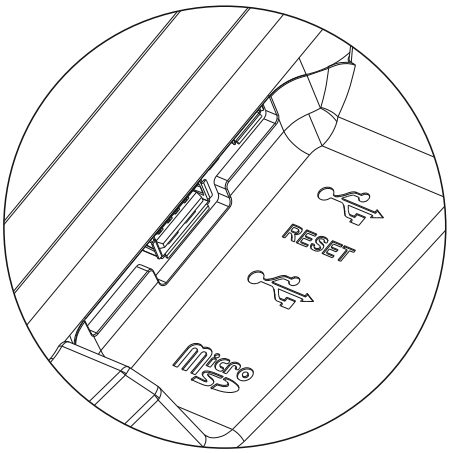
MCU arrangement for the Power and Combo Cabinets except MPX 130 PWC

Right side MCU



MCU arrangement for the MPX 130 PWC ONLY

Right side MCU



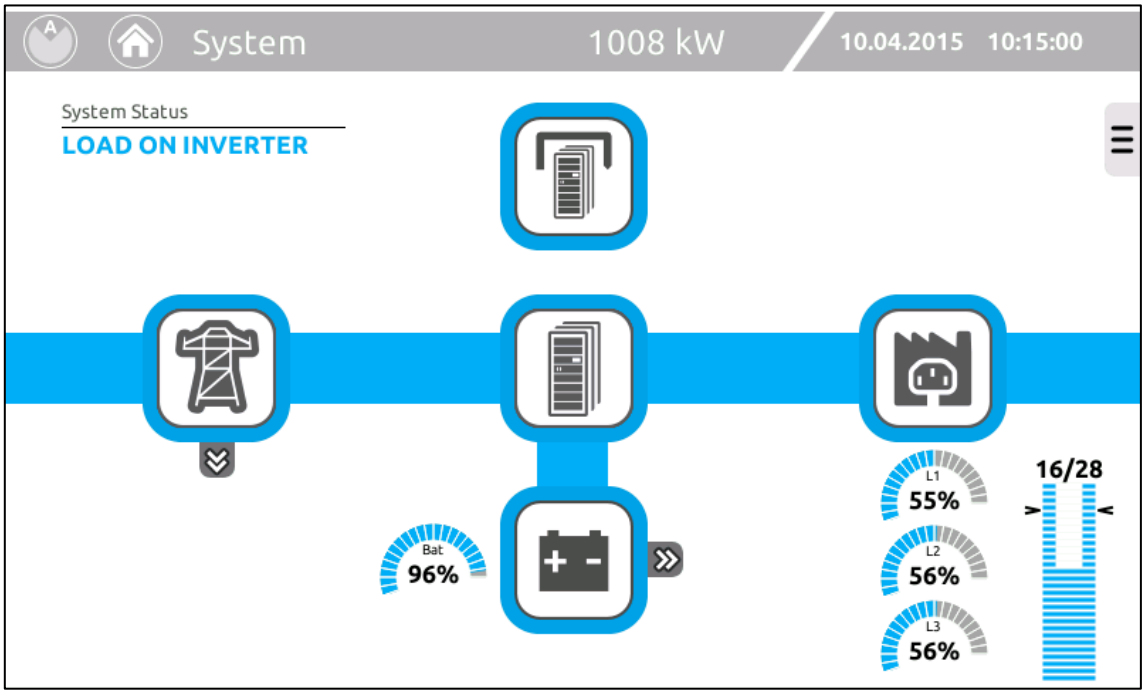
Service access ports (SA).
Access to these ports is reserved for authorised personnel. (*)

(*) From the USB host port the user can export to USB memory device, the event and data log file and send them to the Riello service team or local representative for further analysis (refer to the operating manual for details).

Power Cabinets and Combo Cabinets are equipped with a 7” touch screen colour display as the main part of MCU which allows the user to easily:

- Monitor the overall system status and module status (PM, BU, BM).
- Send start /stop, battery test, bypass command.
- Set up the system: parameter configuration, operating functions, web and mail services, access levels.

The main page shows the System status giving at glance the information regarding the status of the major parts and the energy flow path; from the main page the user can easily get system information and monitor access to details for each individual block.



Measurements

- Input voltage and frequency
- By-pass voltage and frequency
- Output voltage, current and frequency
- Output power (VA, W and %, pf)
- Output peak current
- Battery voltage
- Battery current (charge/discharge)
- Battery Unit status
- Internal temperature
- External battery temperature
- Back-up time

Note: Refer to the operating manual MCU details

In addition, the Multi Power display home page provides a graphic bar showing the load level and the system redundancy.

Load level: The bar is a comprehensive representation of the number of PM set including their status in terms of load level and operational conditions.

Redundancy: To increase the system reliability the customer can add a number of additional PM (redundant PM) rather than just fit those strictly necessary to supply the load.
All PM, including the redundant units operate together sharing the load.
It is highly recommended to set one or more redundant PM according with the power needed and the installation type; hence with any Power or Combo cabinet fully equipped at least one unit should be set as a redundant unit.

Note: Refer to the operating manual for all details related to the different bar status and colors.

> 8.1 COMMUNICATION PORTS

Communication Slots
Behind the connectivity panel Multi Power has two panel expansion slots for slot-in interface accessories that can be used for a variety of communications options including:

NetMan 204: the NetMan network agent allows UPS management across a LAN using any of the main network communication protocols TCP/IP, HTTP, HTTPS and network interface SNMP v1 and v3. NetMan enabled the UPS integrate easily into medium and large sized networks and provide reliable communications between the UPS and management systems employed.

MultiCom 302: a Modbus/Jbus protocol converter through an RS232 or RS485 output for monitoring the UPS, for example, from a BMS (Building Management System). It also provides a second independent RS232 serial line that can be used by other devices such as a NetMan or PC.

MultiCom 352: it is a serial duplexer that allows two devices to be connected to a single serial port on a UPS. It can be used where numerous serial connections and multiple UPS polling are required, and is ideal for LAN networks with a firewall.

MultiCom 411: it is an external accessory with which you can connect a UPS to a Profibus DP network. With this device management and monitoring of the UPS can be integrated in a control system based on one of the field buses most widely used in industry for communication between control/automation systems and distributed I/O.

Multi I/O: Multi I/O has configurable input and output signal contacts to allow UPS integration with control systems. It can be used to connect two devices to a single UPS serial communication port. It can also communicate using the MODBUS/JBUS protocol on RS485 lines.

MultiCom 372: MultiCom 372 provides a UPS with an additional RS232 serial interface port. The card has Emergency Power Off (EPO) and Remote Shutdown (RSD) inputs with terminal connections.

For further accessory information please visit our website or contact your sales representative.

Relay cards

On the rear side of the cabinet an additional slot is provided for the installation of a dry contact signal card. According with specific needs and applications. The user may decide to fit either:

MultiCom 384: it provides a set of relay contacts (250 Vac, 3 A, 4 programmable contacts) to give UPS alarm and status indication. The contacts are connected through terminal connections. Signal contacts include Emergency Power Off (EPO), Remote Shut Down (RSD), On Battery, On Bypass, Alarm and Low battery. The contacts are normally closed or normally open.

MultiCom 392: Multi Power range includes another specific relay card (MultiCom 392) having 8 programmable relay alarms (25 Volt, 1 Amp) and 3 programmable inputs.
Input/output configurations might be adjusted through the advanced configuration software available for authorised engineers (Service SW).

In order to carry out card installation and configuration refer to the dedicated manual.

9- ACCESSORIES

Multi Power comes together with various options to make it suitable for any UPS installation and customer requirements.

Air filter

On site installation kit to enable the fitting of a dust filter to the front door of any compatible Multi Power cabinet type whenever the installation requires air filtering if the system is located within a dusty environment.
The Air filter kit includes a replaceable filter and gasket to position around the edge of the MPW cabinet front door.

IP X1

On site installation kit to protect any cabinet type against vertical falling drops of water; It is suitable for single and parallel cabinet installation whether IP20 (standard cabinet) or IP30. (Not applicable for MPX 130 PWC)

COLD START

Cold Start function is available EX-Works as an additional operational feature; If the Cold Start feature is required, the PM shall be "Cold Start" type when used within the Power or Combo cabinets.

BACKFEED contactor

As covered within point §6.2, the MPX 130 PWC and MPX 100 CBC are delivered with a Bypass Module which does not include a backfeed contactor as standard; if required the user can order (EX-works) a cabinet version with the built in backfeed contactor.

Second PSU

As covered within point §6.4, the MPX 130 PWC is supplied as standard with a single PSU; if required, a second redundant PSU can be ordered as an option (EX-Works) or be installed and configured (using “Service SW”) later on site.

Parallel kit

In order to parallel two or more Power or Combo cabinets (cabinet types cannot be mixed), a parallel kit must be ordered (the MPX 130 PWC requires an additional kit to make it possible for parallel installation).

External Battery temperature sensor

Power and Combo cabinets have the ability to monitor the temperature within a separate battery room via the terminals located on the ASB card identified as “TEMP”.

This ISOLATED input can also be used to measure the temperature inside a remote Battery Box (Maximum placed 25 meters away from Combo or Power Cabinet) and adjust the battery voltage in accordance with the ambient temperature.

It is essential that only the kit provided by the manufacturer is used. The use of a temperature sensor that does not comply with the specifications may cause faults or breakdowns of the equipment.

Only authorised personnel can install and activate the temperature sensor.

Switching Cabinet

The user may install up to 4 Multi Power cabinets in a line next to one another and arrange locally the input and output cabling/switchgear. Riello UPS offers as an alternative a 500 kVA turn-key solution which consist of two Power Cabinets (tipo MPW 300 PWC) and a Switching Cabinet which enables easy connection of the two Power Cabinets. The Switching Cabinet includes the AC input and output terminals for site power distribution connection, associated connection flexible bars and communication links between the Power Cabinets and the Switching Cabinet. The Switching Cabinet is also supplied with the AC input, output and bypass supply breakers in addition to an integral wrap around maintenance bypass. The bypass line is protected with fuses to ensure fault discrimination and load protection in case of short circuit downstream. The breaker set enables the user to galvanically insulate the single Power Cabinets and to carry out specific maintenance. The Switching Cabinet cable entry is arranged so that the user may decide whether to route the cables through the bottom front, rear side or top.

10-ENVIRONMENTAL DATA

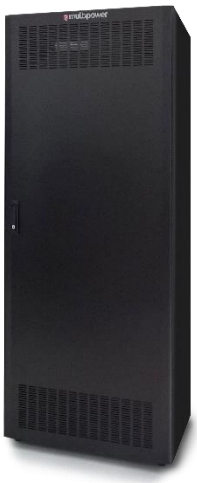
Operating temperature (continuous)	0÷40° C			
Recommended working temperature for optimum battery performance	20 to 25° C			
Storage temperature	- 25° up to +60°C (UPS) - 15° up to +40°C (UPS with battery)			
Relative humidity range	5÷95% non-condensing			
Altitude operations	Full power up to 1000 meters ASL; 1% power downgrading every 100 m between 1000 and 4000 m			
Power Cabinet system acoustic noise level at one meter and full load [dBA±2]	**Power Cabinet MPX 130 PWC**	**Power Cabinet MPW 300 PWC**	**Combo Cabinet MPX 100 CBC**	**Combo Cabinet MPW 130 CBC**
	<65	<68	<64	<64

11-TECHNICAL DATA

Subassemblies:

	PM 15 kW (MPX 15 PM)	**PM 25 kW (MPX 25 PM)**	**PM 42 kW (MPW 42 PM)**	**Battery Unit (BU)**
Mechanical Characteristics				
Power [kW]	15	25	42	4.6
Weight [kg]	24	25	40	32
Dimensions [mm] • Width • Depth • Height	• 448 (for 19”) • 703 • 88 (2U)	• 448 (for 19”) • 703 • 88 (2U)	• 448 (for 19”) • 703 • 177 (4U)	• 109 • 749 • 158
Ventilation	Forced	Forced	Forced	Natural
Cabinet IP rating	IP20 finger proof (either with cabinet doors open or closed)			
Cable input	Rear plug in connectors			
Colour	RAL 9005			

Cabinets:

	Power Cabinet MPX 130 PWC	**Power Cabinet MPW 300 PWC**	**Combo Cabinet MPX 100 CBC**	**Combo Cabinet MPW 130 CBC**	**Switching Cabinet MPW 500 SWC**
Mechanical Characteristics					
Nominal Power [kW]	15 ÷ 75[(1)] or 25 ÷ 125[(1)]	42 ÷ 294[(1)]	15 ÷ 60[(1)] or 25 ÷ 100[(1)]	42 ÷ 126[(1)]	504
Bypass Power [kW]	126	252	126	126	504
Cabinet layout description	5x MPX 15 PM or 5x MPX 25 PM	7x MPW 42 PM	4x MPX 15 PM +24xBU or 4x MPX 25 PM +24xBU	3x MPW 42 PM +20xBU	Coupling cabinet 2x MPW 300 PWC
Cabinet expandability	Up to four MPX 130 PWC in parallel	Up to four MPW 300 PWC in parallel	Up to four MPX 100 CBC in parallel	Up to four MPW 130 CBC in parallel	N.A
Weight [kg]	145 (w/o PM)	300 (w/o PM)	350 (w/o PM/BU)	340 (w/o PM/BU)	320
Dimensions [mm]					
• Width	• 600	• 600	• 600	• 600	• 800
• Depth	• 1050	• 1050	• 1050	• 1050	• 1200
• Height	• 1200	• 2000	• 2000	• 2000	• 2000
Ventilation	Forced				Natural
Cabinet IP rating	IP20 finger proof (either with cabinet doors open or closed)				
Cable input	Top or bottom				
Colour	RAL 9005				

(1) *Including Redundancy*

Note: All MPW cabinets come with front/rear doors; the pictures shown do not include the doors in order to display the internal component layout.

12-ELECTRICAL DATA – Solutions based on MPX 15 PM

INPUT		Multi Power – MPW System	
Nominal voltage	[V]	380-400-415 Vac Three-Phase plus neutral	
Voltage range (without switching to battery power)	[V]	320 to 480 V at 100% of the load 240 to 480 V at 50% of the load	
Maximum load applicable with ONE input phase missing (2)	-	66%	
Maximum load applicable with TWO input phases missing (2)	-	33%	
Nominal frequency	[Hz]	50 or 60	
Input frequency tolerance	[Hz]	40 to 72	
Maximum Input Current (3)	[A]	**Power Cabinet MPX 130 PWC**	**Combo Cabinet MPX 100 CBC**
		155	124
Total Harmonic distortion (THDi) with full load and source THDv <1%	[%]	< 4%	
Power factor	-	0.99	
Rectifier progressive start-up (Power Walk-in duration)	[sec]	Programmable from 1 to 125 seconds in steps of 1 second (standard disable)	
Adjustable delay for the rectifier start up (Power Walk-in start delay)	[sec]	Programmable from 1 to 120 seconds in steps of 1 second (3 seconds by default)	

(2) From system OFF it will only start up from one phase if L1 is present.

(3) The input current is stated for the following general conditions:

- Input voltage at 346 Volt
- Battery charging current of about 5 A (each module)

DC CIRCUIT		Multi Power – MPW System							
Battery arrangement	-	Common battery regardless number of PM and Power/Combo cabinets in parallel							
Number of battery cells	-	120+120							
Float voltage (2.27 V/el. adjustable)	[V]	273+273							
Boost voltage (2.38 V/el. adjustable)	[V]	286+286							
End of discharge voltage - load dependent (1.6 V/el. adjustable)	[V]	192+192							
Battery Maximum recharging current (4)	[A]	Number of modules							
		1	*2*	*3*	*4*	*5*	*6*		
		6	12	18	24	30	…		
Maximum current drawn from batteries with UPS working at nominal power	[A]	39	78	117	156	195	…		
Voltage compensation (if temperature sensor active)	[V]	18 mv/°C (12 Volt block)							

(4) The currents refer to input voltages ≥ 346 Volt

INVERTER		Multi Power – MPW System				
Nominal power	[kVA]	15	30	45	60	75
Nominal active power	[kW]	15	30	45	60	75
Nominal power with load power factor from 0.8 inductive to 0.8 capacitive - without power downgrading (0÷40°C)	[kVA]	15	30	45	60	75
Nominal voltage	[V]	380/400/415 Vac Three-Phase plus neutral				
Downgrading for output voltage different set up	[%]	220 Volt [Ph-N]: -4% 208 Volt [Ph-N]: -10% 200 Volt [Ph-N]: -13%				
Nominal frequency	[Hz]	50 or 60				
Static stability	[%]	± 1				
Dynamic stability	-	Resistive load and non-Linear Load: EN62040-3 class performance 1				
Voltage distortion with linear and non-linear load (EN 62040-3)	[%]	≤ 1.5% with linear resistive load ≤ 3.5% with 100% non-linear load				
Inverter frequency stability without by-pass supply synchronisation	[%]	0,01				
Rate of Frequency variation	[Hz/sec]	1 Hz/sec (adjustable from 0.5 to 2)				
Voltage phase Dissymmetry with balanced and unbalanced loads	[%]	± 1 / ± 2				
Voltage phase shift with balanced and unbalanced loads	[°]	120 ± 1				
Inverter Overload (@25°C)	[min] / [sec]	>101% ÷ ≤125% 10 min. >125% ÷ ≤150% 1 min. >150% ÷ ≤ 180% 0.5 sec >180% 0.2 sec.				
Short circuit current (Ph-N)	[n x ms]	2.5 x In for 100 ms + 1.5 In for 400 ms				
Efficiency on battery-operation	[%]	94.3 max (Load rate >25% ÷ <40%) 95.2 max (Load rate >40% ÷ <70%) 95.7 max (Load >70% ÷ 100%)				

BYPASS		Multi Power – MPW System	
		Power Cabinet MPX 130 PWC	Combo Cabinet MPX 100 CBC
Nominal power (5)	[kW]	126	126
Nominal voltage	[V]	380-400-415 Vac Three-Phase plus neutral	
Output maximum nominal current (5)	[A]	187	187
Bypass voltage range	[V]	from 180 V (adjustable 180-200) to 264V (adjustable 250-264V)	
Nominal frequency	[Hz]	50 or 60	
Bypass input frequency range	[%]	± 5 (adjustable from 0,25 to 10%)	
Transfer time bypass to Inverter (UPS in "ECO mode")	[ms]	2 typical	
Max current in short circuit for: 20 ms (Tj 25°C)	[A]	5400	5400
Max energy passing through [Tj 25°C]	[A^2S]	145 000	145 000
Overload capability on bypass line		> 101% ÷ ≤125% 10 min. > 125% 1 min.	

(5) The power and current shown are the maximum values according with Cabinet type; the real value is associated to the type and number of PM installed.

AC/AC Efficiency, Losses		MPX 15 PM Module (15 kW)
25% load	[%]	94.3
50% load	[%]	95.7
75% load	[%]	96.0
100% load	[%]	96.0
Power dissipated with resistive nominal load (pf=1) and with battery charged *	[kW kcal/h B.T.U./h]	0.625 kW 537 kcal/h 2132 B.T.U./h

* 3.97 B.T.U. = 1 kcal

System Auto consumption and ECO Mode efficiency (With MPX 15 PM)		Power Cabinet MPX 130 PWC	Combo Cabinet MPX 100 CBC
Auto-consumption: UPS System populated with all PM's in ON LINE mode w/o load	[W]	920	730
Auto-consumption: UPS System populated with all PM's in STANDBY mode w/o load	[W]	143	130
Efficiency: UPS System ECO Mode at 50% load rate	[W]	98.9	98.8
Efficiency: UPS System ECO Mode at 100% load rate	[W]	99.0	99.0

13-ELECTRICAL DATA – Solutions based on MPX 25 PM

INPUT		Multi Power – MPW System	
Nominal voltage	[V]	380-400-415 Vac Three-Phase plus neutral	
Voltage range (without switching to battery power)	[V]	320 to 480 V at 100% of the load 240 to 480 V at 50% of the load	
Maximum load applicable with ONE input phase missing (6)	-	33%	
Maximum load applicable with TWO input phases missing (6)	-	66%	
Nominal frequency	[Hz]	50 or 60	
Input frequency tolerance	[Hz]	40 to 72	
Maximum Input Current (7)	[A]	**Power Cabinet MPX 130 PWC**	**Combo Cabinet MPX 100 CBC**
		245	196
Total Harmonic distortion (THDi) with full load and source THDv <1%	[%]	< 3%	
Power factor	-	0.99	
Rectifier progressive start-up (Power Walk-in duration)	[sec]	Programmable from 1 to 125 seconds in steps of 1 second (standard disable)	
Adjustable delay for the rectifier start up (Power Walk-in start delay)	[sec]	Programmable from 1 to 120 seconds in steps of 1 second (3 seconds by default)	

(6) From system OFF it will only start up from one phase if L1 is present.

(7) The input current is stated for the following general conditions:

- Input voltage at 346 Volt
- Battery charging current of about 5 A (each module)

DC CIRCUIT		Multi Power – MPW System							
Battery arrangement	-	Common or separated battery							
Number of battery cells	-	120+120							
Float voltage (2.27 V/el. adjustable)	[V]	273+273							
Boost voltage (2.38 V/el. adjustable)	[V]	286+286							
End of discharge voltage - load dependent (1.6 V/el. adjustable)	[V]	192+192							
Battery Maximum recharging current [8]	[A]	Number of modules							
		1	*2*	*3*	*4*	*5*	*6*		
		8	16	24	32	40	…		
Maximum current drawn from batteries with UPS working at nominal power	[A]	66	132	198	264	330	…		
Voltage compensation (if temperature sensor active)	[V]	18 mv/°C (12 Volt block)							

[8] The currents refer to input voltages ≥ 346 Volt

INVERTER		Multi Power – MPW System				
Nominal power	[kVA]	25	50	75	100	125
Nominal active power	[kW]	25	50	75	100	125
Nominal power with load power factor from 0.8 inductive to 0.8 capacitive - without power downgrading (0÷40°C)	[kVA]	25	50	75	100	125
Nominal voltage	[V]	380/400/415 Vac Three-Phase plus neutral				
Downgrading for output voltage different set up	[%]	220 Volt [Ph-N]: -4% 208 Volt [Ph-N]: -10% 200 Volt [Ph-N]: -13%				
Nominal frequency	[Hz]	50 or 60				
Static stability	[%]	± 1				
Dynamic stability	-	Resistive load and non-Linear Load: EN62040-3 class performance 1				
Voltage distortion with linear and non-linear load (EN 62040-3)	[%]	≤ 1.5% with linear resistive load ≤ 3.5% with 100% non-linear load				
Inverter frequency stability without by-pass supply synchronisation	[%]	0.01				
Rate of Frequency variation	[Hz/sec]	1 Hz/sec (adjustable from 0.5 to 2)				
Voltage phase Dissymmetry with balanced and unbalanced loads	[%]	± 1 / ± 2				
Voltage phase shift with balanced and unbalanced loads	[°]	120 ± 1				
Inverter Overload (@25°C)	[min] / [sec]	>101% ÷ ≤125% 10 min. >125% ÷ ≤150% 1 min. >150% ÷ ≤ 180% 0.5 sec >180% 0.2 sec.				
Short circuit current (Ph-N)	[n x ms]	2.5 x In for 100 ms + 1.5 In for 400 ms				
Efficiency on battery-operation	[%]	95.1 max (Load rate >25% ÷ <40%) 95.6 max (Load rate >40% ÷ <70%) 95.7 max (Load >70% ÷ 100%)				

BYPASS		Multi Power – MPW System	
		Power Cabinet MPX 130 PWC	Combo Cabinet MPX 100 CBC
Nominal power (9)	[kW]	126	126
Nominal voltage	[V]	380-400-415 Vac Three-Phase plus neutral	
Output maximum nominal current (9)	[A]	187	187
Bypass voltage range	[V]	from 180 V (adjustable 180-200) to 264 V (adjustable 250-264 V)	
Nominal frequency	[Hz]	50 or 60	
Bypass input frequency range	[%]	± 5 (adjustable from 0.25 to 10%)	
Transfer time bypass to Inverter (UPS in "ECO mode")	[ms]	2 typical	
Max current in short circuit for: 20 ms (Tj 25°C)	[A]	5400	5400
Max energy passing through [Tj 25°C]	[A^2S]	145 000	145 000
Overload capability on bypass line	[min] / [sec]	> 101% ÷ ≤125% 10 min. > 125% 1 min.	

(9) The power and current shown are the maximum values according with Cabinet type; the real value is associated to the type and number of PM installed.

AC/AC Efficiency, Losses		MPX 25 PM Module (25 kW)
25% load	[%]	95.0
50% load	[%]	96.1
75% load	[%]	96.1
100% load	[%]	96.0
Power dissipated with resistive nominal load (pf=1) and with battery charged *	[kW kcal/h B.T.U./h]	1.042 kW 896 kcal/h 3557 B.T.U./h

* 3.97 B.T.U. = 1 kcal

System Auto consumption and ECO Mode efficiency (With MPX 25 PM)		Power Cabinet MPX 130 PWC	Combo Cabinet MPX 100 CBC
Auto-consumption: UPS System populated with all PM's in ON LINE mode w/o load	[W]	1190	950
Auto-consumption: UPS System populated with all PM's in STAND BY mode w/o load	[W]	143	130
Efficiency: UPS System ECO Mode at 50% load rate	[W]	98.9	98.8
Efficiency: UPS System ECO Mode at 100% load rate	[W]	99.0	99.0

14-ELECTRICAL DATA – Solutions based on MPW 42 PM

INPUT		Multi Power – MPW System	
Nominal voltage	[V]	380-400-415 Vac Three-Phase plus neutral	
Voltage range (without switching to battery power)	[V]	320 to 480 V at 100% of the load 240 to 480 V at 50% of the load	
Maximum load applicable with ONE input phase missing (10)	-	66%	
Maximum load applicable with TWO input phases missing (10)	-	33%	
Nominal frequency	[Hz]	50 or 60	
Input frequency tolerance	[Hz]	40 to 72	
Maximum Input Current (11)	[A]	**Power Cabinet MPW 300 PWC**	**Combo Cabinet MPW 130 CBC**
		558 (7x MPW 42 PM)	239 (3x MPW 42 PM)
Total Harmonic distortion (THDi) with full load and source THDv <1%	[%]	< 3	
Power factor	-	0.99	
Rectifier progressive start-up (Power Walk-in duration)	[sec]	Programmable from 1 to 125 seconds in steps of 1 second (standard disable)	
Adjustable delay for the rectifier start up (Power Walk-in start delay)	[sec]	Programmable from 1 to 120 seconds in steps of 1 second (3 seconds by default)	

(10) From system OFF it will only start up from one phase if L1 is present

(11) The input current is stated for the following general conditions:

- Input voltage at 346 Volt
- Battery charging current of 7 Ampere (each module)

DC CIRCUIT		Multi Power – MPW System						
Battery arrangement	-	Common battery regardless number of PM and Power/Combo cabinets in parallel						
Number of battery cells	-	120+120						
Float voltage (2.27 V/el. adjustable)	[V]	273+273						
Boost voltage (2.38 V/el. adjustable)	[V]	286+286						
End of discharge voltage - load dependent (1.6 V/el. adjustable)	[V]	192+192						
Battery Maximum recharging current (12)	[A]	Number of modules						
		1	*2*	*3*	*4*	*5*	*6*	*7*
		8	16	24	32	40	48	56
Maximum current drawn from batteries with UPS working at nominal power	[A]	110	220	330	440	550	660	770
Voltage compensation (if temperature sensor active)	[V]	18 mv/°C (12 Volt block)						

(12) The currents refer to input voltages ≥ 346 Volt

INVERTER		Multi Power – MPW System						
Nominal power	[kVA]	42	84	126	168	210	252	294
Nominal active power	[kW]	42	84	126	168	210	252	294
Nominal power with load power factor from 0.8 inductive to 0.8 capacitive - without power downgrading (0÷40°C)	[kVA]	42	84	126	168	210	252	294
Nominal voltage	[V]	380/400/415 Vac Three-Phase plus neutral						
Downgrading for output voltage different set up	[%]	220 Volt [Ph-N]: -4% 208 Volt [Ph-N]: -10% 200 Volt [Ph-N]: -13%						
Nominal frequency	[Hz]	50 or 60						
Static stability	[%]	± 1						
Dynamic stability	-	Resistive load and non-Linear Load: EN62040-3 class performance 1						
Voltage distortion with linear and non-linear load (EN 62040-3)	[%]	≤ 1.5% with linear resistive load ≤ 4.5% with 100% non-linear load						
Inverter frequency stability without by-pass supply synchronisation	[%]	0.01						
Rate of Frequency variation	[Hz/sec]	1 Hz/sec (adjustable from 0.5 to 2)						
Voltage phase Dissymmetry with balanced and unbalanced loads	[%]	± 1% / ± 2%						
Voltage phase shift with balanced and unbalanced loads	[°]	120 ± 1 °						
Inverter Overload (@ 25°C)	[min] / [sec]	>101% ÷ ≤125% 10 min. >125% ÷ ≤150% 1 min. >150% ÷ ≤ 180% 0.5 sec >180% 0.2 sec.						
Short circuit current (Ph-N)	[nx ms]	2.5 x In for 200 ms + 1.5 In for 300 ms						
Efficiency on battery-operation	[%]	95.5 (Load rate >50% ÷ <80%) 95.3 (Load rate >25% ÷ <50% and >80% ÷ <100%)						

BYPASS		Multi Power – MPW System	
		Power Cabinet MPW 300 PWC	Combo Cabinet MPW 130 CBC
Nominal power (13)	[kW]	252	126
Nominal voltage	[V]	380-400-415 Vac Three-Phase plus neutral	
Output maximum nominal current (13)	[A]	373	187
Bypass voltage range	[V]	from 180 V (adjustable 180-200) to 264 V (adjustable 250-264 V)	
Nominal frequency	[Hz]	50 to 60	
Bypass input frequency range	[%]	± 5% (adjustable from 0.25 to 10%)	
Transfer time bypass to Inverter (UPS in "ECO mode")	[ms]	2 ms typical	
Max current in short circuit for: 20 ms (Tj 25°C)	[A@20ms]	19 000	5400
Max energy passing through [A^2S @ tj 25°C]	[A^2S]	1 805 000	145 000
Overload capability on bypass line	[min] / [msec]	> 101% ÷ ≤125% 10 min. > 125% 1 min.	

(13) The power and current shown are the maximum values according with Cabinet type; the real value is associated to the type and number of PM installed.

Efficiency, Losses, Ventilation		Multi Power – MPW 42 PM Module (42 kW)
AC/AC Efficiency @ Full load	[%]	96.3
AC/AC Efficiency @ 75% load	[%]	96.5
AC/AC Efficiency @ 50% load	[%]	96.6
AC/AC Efficiency @ 25% load	[%]	96.1
Power dissipated with resistive nominal load (pf=1) and with battery charged *	[kW kcal/h B.T.U./h]	1.62 kW 1393 kcal/h 5530 B.T.U./h

* 3.97 B.T.U. = 1 kcal

System Auto consumption and ECO Mode efficiency (With MPW 42 PM)		Power Cabinet MPW 300 PWC (252 kW)	Combo Cabinet MPW 130 CBC (126 kW)
Auto-consumption: UPS System populated with all PM's in ON LINE mode w/o load	[W]	1715	752
Auto-consumption: UPS System populated with all PM's in STANDBY mode w/o load	[W]	180	94
Efficiency: UPS System ECO Mode at 50% load rate	[W]	99.2	98.9
Efficiency: UPS System ECO Mode at 100% load rate	[W]	99.2	99.0

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