

## How to balance Power Continuity Resilience with Energy Efficiency Ratios and Total Cost of Ownership measurements





For some time now, energy consumption by **Data Centers** has been the focus of attention of a number of international organizations, given their significant impact on energy and in particular the predicted increase in large, medium and small Data Center installations.

It is also clear that the global communications era in which we live, with the enormous amounts of data processed each day that will inevitably continue to grow, will necessarily require greater numbers of installations and even higher performance servers, which in turn will consume ever-increasing amounts of energy.

What is more, IT managers in charge of hosting servers, etc. are seeing an exponential increase in **TCO (Total Cost of Ownership)** due to utilities bill costs. In fact, estimates show that within the 10-year span in the operative life of a Data Center, operational costs of functioning will represent 50% of the TCO, with capital costs for the purchase and activation of the site representing the remaining 50%. On average, utilities bill costs represent 20% of the TCO.

A number of initiatives have therefore been undertaken, first in the United States and more recently in Europe, for the purpose of improving the energy efficiency of Data Centers. In particular, towards the end of 2008, the European Union (acting members, objectives, etc.) disseminated a Code of Conduct for improving the energy efficiency of Data Centers (original definition).

The European Union issued an analogous document in 2007 with regard to UPS devices (who, how, objectives), prepared in collaboration with the CEMEP, the European Committee of Manufacturers of Electrical Machines and Power Electronics, of which Riello UPS is a member. UPS systems are essential devices that on average represent 18% of energy consumed in Data Centers. **Riello UPS** received the classification of **ECO ENERGY LEVEL** on the basis of this document.



With a concern for the environment, Riello UPS has taken an active role in developing a culture of sustainable development and reduced energy consumption. It has established a number of environmentally friendly projects and made substantial R&D investments into new technologies.

These are targeted at the generation of 'clean energy' products and the development of even more efficient UPS in the future. This is a social commitment, which will benefit the present and have a positive impact on the future; the Riello UPS Environmental Management System was recently accredited to ISO14001 as testament to the Riello commitment to the environment.

## RIELLO UPS AND ENVIRONMENT

Riello UPS has a company-wide initiative to become the most environmentally friendly power protection company in Europe. As a company, Riello UPS is a major contributor to the European Commission – Code of Conduct on Energy Efficiency and Quality of AC Uninterruptible Power Supplies - and the first European manufacturer to rate its products for ECO Energy Level efficiency.

The European Commission Code of Conduct is a document signed by the major UPS manufacturers in Europe which outlines the efficiency levels to reach for specific size bands from 10-800kVA, from 25% to 100% loading. For a 200kVA UPS at full load the benchmark is 93% in full on-line mode.

In addition to making its products achieve the highest possible operating efficiencies, Riello UPS has also focused its research and development efforts on other aspects that impact the environment.

- Adaptive battery management to lengthen the period between battery replacement and disposal programmes and reduce the wear on other consumables such as fans and capacitors.
- Low Total Harmonic Distortion on the input side (THDi) of (3%) to reduce the impact on upstream equipment and a high input power factor (0.99).
- Adaptive "Smart Mode" operation in which the UPS selects a mode of operation that matches the electrical characteristics of the mains power supply to the power protection performance required by the load.

## ECO ENERGY LEVELS

Riello UPS powers some of the most critical data centres in use today. Within such environments, energy management is critical. Running costs must be minimised without compromising resilience and the capabilities to withstand a mains power supply interruption and disruption of service. Efficiency levels must be at the highest possible levels to reduce the stress on critical power supplies and minimise the effect on local ambients.

The ECO Energy Level ratings used within this guide identify how Riello UPS products comply with the European Commission Code of Conduct. There are six levels, with level 6 being the highest that can be achieved by a UPS in full on-line mode as defined by VFI-SS-111. 'Smart Mode' is an intelligent economy mode at which even higher levels of efficiency can be achieved.

The Riello UPS ECO Energy Levels rating system demonstrates the Riello commitment to the environment and promotes an open-way for users to identify potential cost-savings from reduced operational energy usage, lower heat outputs and carbon-footprints.

Riello UPS is the first UPS manufacturer to differentiate its products using the ECO Energy Levels guide. The rating system has been applied from 3kVA (below the 10kVA threshold limit applied by the European Commission) because Riello UPS is committed to the environmental impact of its entire product range.



Energy Level	Comparison between UPS efficiency with CoC	"Smart Mode" availability
ECO 6	Higher	Yes
ECO 5	Higher	-
ECO 4	Matches	Yes
ECO 3	Matches	-
ECO 2	Lower	Yes
ECO 1	Lower	-



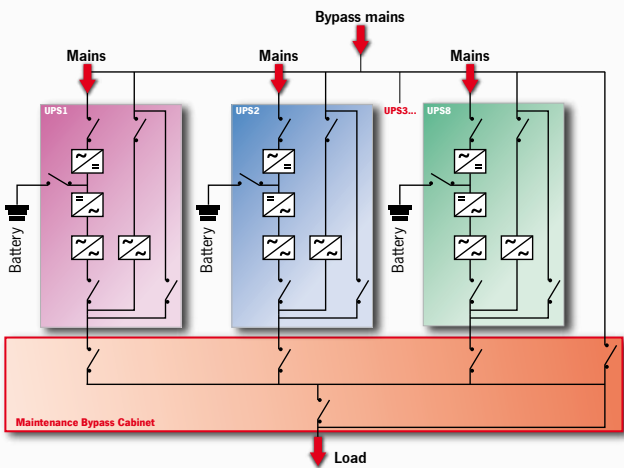
## **HIGH EFFICIENCY**

The development of static conversion technology has facilitated improvements in the area of energy loss, and thus also in the area of energy efficiency for UPS applications. Today, high-performance power switching devices (IGBT), increasingly powerful and faster control systems capable of processing more data in less time (microprocessors, DSPs) and innovative structures make it possible to reach production levels that were unimaginable in the recent past. This progress came at the cost of enormous investments in research and development for new solutions, and of a noticeable increase in product costs due to the presence of high-performance components.

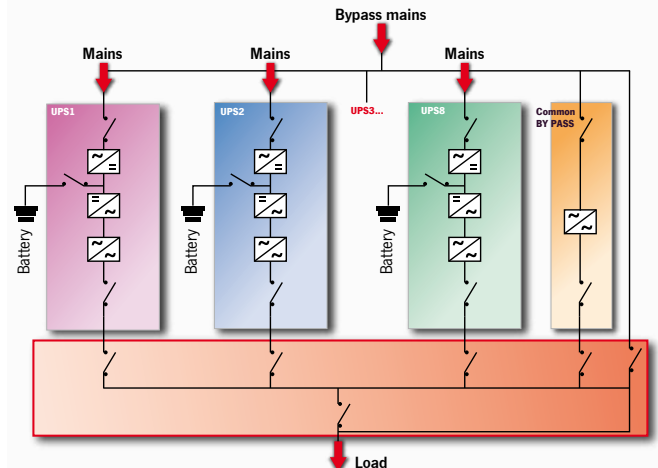
This commitment and dedication has paid off, as the results achieved demonstrate, with efficiency values of up to 96.5% in double conversion VFI-SS-111 online mode, thereby providing researchers with the conviction and strength to take on further challenges.

Riello UPS has demonstrated its commitment to this cause in the past and remains committed today, in the conviction that we must face up to environmental challenges if we are to overcome them.





Configurazione parallelo fino a 8 unità con by pass distribuito



Configurazione parallelo fino a 8 unità con by pass comune

### POWER CONTINUITY

High-efficiency solutions cannot, however, neglect the essential requirement of ensuring the continuous operation of the Data Center and of critical applications in general.

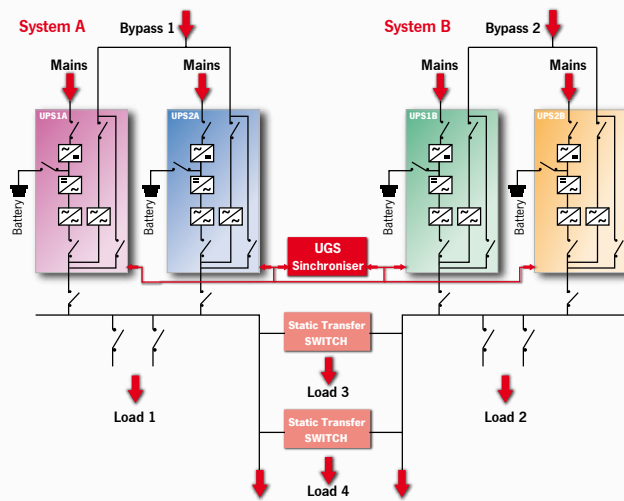
For this reason, over the past several years, Riello UPS has been developing and offering a range of solutions responding to the various needs and problems that inevitably arise in the most critical applications. Riello UPS offers flexible solutions that are highly available and highly resilient, capable of adapting to the various installation structures and to varying degrees of critical urgency.

Riello UPS produces resilient continuity systems, capable of tolerating a number of component or subsystem breakdowns while continuing to function normally and provide uninterrupted service.

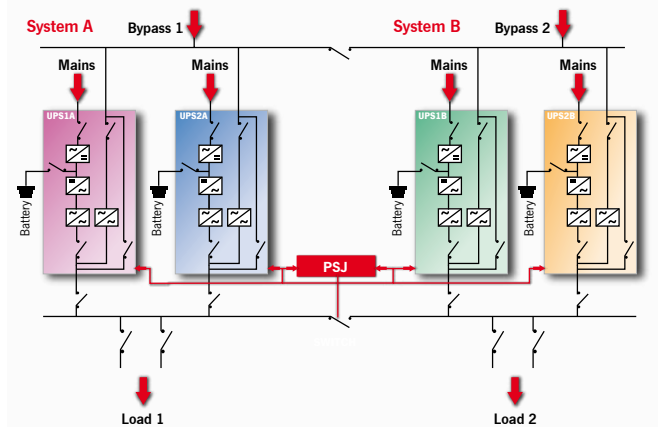
This has been achieved by installing redundant elements in accordance with careful planning, eliminating common breakdown nodes, scheduling maintenance activities, and controlling and supervising the functional parameters of both the system and the environment.

TEC department personnel is prepared to provide directions and advice regarding projects.

Configurazione dynamic dual bus



Configurazione dual bus system





**SUPERVISION AND MAINTENANCE**

Advanced Supervision and Control systems are becoming increasingly essential in ensuring Business Continuity.

Data Centers must be controlled in order to continuously verify equipment functioning conditions, in addition to environmental conditions such as temperature, humidity, fumes, etc.

Supervision systems have also made it possible to change the approach to Maintenance: it is no longer a case of interventions performed at set intervals; rather, accurate statistical analyses of conditions have made a predictive approach possible, allowing for more efficient activity planning and the prevention of system shutdowns.

In the worst case, the absence of a Maintenance activity schedule can cause the shutdown of an entire Data Center, and in the best of case, it increases a Center's TCO. In fact, Maintenance makes it possible to extend the useful life of equipment by maintaining it in state-of-the-art condition, thereby increasing the availability and integrity of the overall system.



<b>MDM MODELS</b>	<b>MLT 10</b>	<b>MLT 12</b>	<b>MLT 15</b>	<b>MLT 20</b>	<b>MLT 30 X</b>	<b>MLT 40 X</b>	<b>MLT 60<sup>(1)</sup></b>	<b>MLT 80<sup>(1)</sup></b>	<b>MLT 100</b>	<b>MLT 120</b>
<b>INPUT</b>										
Rated voltage	380-400-415 Vac Three-phase + N									
Rated frequency	50/60 Hz									
Power factor	0.99									
Current distortion	THDI ≤ 3%									
<b>OUTPUT</b>										
Rated power (kVA)	10	12	15	20	30	40	60	80	100	120
Active power (kW)	9	10.8	13.5	18	27	36	54	72	90	108
Rated voltage (V)	380-400-415 Vac (selectable)									
Static stability	± 1%									
Dynamic stability	± 3%									
Voltage distortion	≤ 1% with linear load / ≤ 3% with non-linear load									
Frequency	50/60 Hz									
<b>ENVIRONMENTAL</b>										
Weight (kg) with internal batteries	180 Kg	182 Kg	190 Kg	195 Kg	335 Kg	350 Kg	200 Kg (2)	200 Kg (2)	460 Kg (2)	480 Kg (2)
Dimensions (HxWxD) (mm)	930 x 320 x 840 1320 x 440 x 850 (MLT X version)				1320 x 440 x 850		1600 x 500 x 850		1900 x 750 x 855	
Noise	< 52 dBA at 1 m				< 48 dBA at 1 m		< 52 dBA at 1 m		< 65 dBA at 1 m	
Efficiency Smart Mode	fino a 99%									

(1) Disponibile da fine 2009

(2) Peso senza batterie

<b>MODELS</b>	<b>MP 100-HIP</b>	<b>MP 120-HIP</b>	<b>MP 160-HIP</b>	<b>MP 200-HIP</b>	<b>MP 250-HIP</b>	<b>12 MP 300</b>	<b>12 MP 400</b>	<b>12 MP 500</b>	<b>12 MP 600</b>	<b>12 MP 800</b>	
<b>INPUT</b>											
Rated voltage	380 - 400 - 415 Vac Three-phase										
Frequency range	45 ÷ 65 Hz										
Power factor	> 0,99					> 0.95 in HC version		> 0.93 in HC version			
Current distortion	<3% THDi					< 3% THDi in HC version					
<b>OUTPUT</b>											
Rated power (kVA)	100	120	160	200	250	300	400	500	600	800	
Active power (kW)	80	96	128	160	200	240	320	400	480	640	
Nominal Voltage	380 - 400 - 415 Vac Three-phase + N										
Static stability	± 1%										
Dynamic stability	± 5% in 10 ms										
Voltage distortion	≤ 1% with linear load / ≤ 3% with non-linear load										
Frequency	50 o 60 Hz (selectable)										
<b>INFO PER L'INSTALLAZIONE</b>											
Weight (kg)	656	700	800	910	1000	2200	2600	3600	4000	5300	
Dimensions (HxWxD) (mm)	1900 x 800 x 850		1900 x 1000 x 850			1900 x 1630 x 850	1900 x 1630 x 1000	1900 x 3200 x 1000		1900 x 4400 x 1000	
Noise	63 ÷ 68 dBA at 1 m					< 70 dBA at 1 m		< 77 dBA at 1 m		< 80 dBA at 1 m	
Efficiency Smart Mode	until at 98,5%					until at 98%					

MODELS	DLD 330	DLD 400	DLD 500	DLD 600	DLD 650 TM	DLD 800	DLD 800 TM	DLD 1000	DLD 1000 TM
<b>INPUT</b>									
Rated voltage	220-230-240 Vac				400 Vac three-phase + N	220-230-240 Vac	400 Vac three-phase + N	220-230-240 Vac	400 Vac three-phase + N
Rated frequency	50/60 Hz ± 5 Hz								
<b>OUTPUT</b>									
Potenza nominale (VA)	3300	4000	5000	6000	6500	8000	8000	10000	10000
Potenza attiva (W)	2300	2400	3500	4200	5200	6400	6400	8000	8000
Rated voltage	220-230-240 Vac selectable								
Voltage distortion	< 3% with linear load / < 6% with non-linear load								
Frequency	50/60 Hz selectable								
Static variation	1,5%								
Dynamic variation	≤ 5% in 20 ms								
<b>ENVIRONMENTAL</b>									
Weight (kg)	38	40	62	64	64	80	80	85	85
Dimensions (HxWxD) (mm)	455 x 175 x 520 tower 175(4U) x 483 x 520 rack		455 x 175 x 660 tower 175(4U) x 483 x 660 rack		2 x 455 x 175 x 660 tower 2 x 175(4U) x 483 x 660 rack				
Noise	< 40 dBA at 1 m			< 45 dBA at 1 m					
Efficiency (Smart Active Mode)	98%								

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