

UPSaver®

4.0 UPS dedicated to ICT
the best innovative green technology
for unmatched energy savings



BORRI®



www.upsaver.info



Saving energy is one of the main focuses in the data centre industry, due to rising energy bills and environmental constraints.

Improving a data centre PUE (Power Usage Effectiveness) is therefore a target for owners and managers, whilst being flexible to cope with such a fast changing market.

Regarding UPS, all these needs must translate into:

- High efficiency
- Modularity
- Low total cost of ownership

Since the early stage involvement in the designing and building of Eni Green Data Center Borri has committed to fulfilling the needs developing innovative customized technologies for high efficiency power supply solutions dedicated to ICT.

4.0 UPS:
 UPSaver® by Borri,
 100 kW to 12.8 MW
 a new modular series
 for the ICT industry,
 totally configurable,
 quickly scalable,
 with high efficiency
 and low TCO.

Applications

- Cloud
- Data servers
- Networking services
- Telco equipment

The UPSaver® philosophy

UPSaver® is a complete, very high efficiency, multi-function and fully adaptable power protection system. The flexibility of the system is achieved by using power modules, which can configure both stand-alone units and modular systems. From Uninterruptible Power Supply to Uninterruptible Power Saver, a permanent saving system continuously monitoring the mains to guarantee high quality power to your ICT equipment at minimum energy usage.



UPSaver® versus conventional UPS

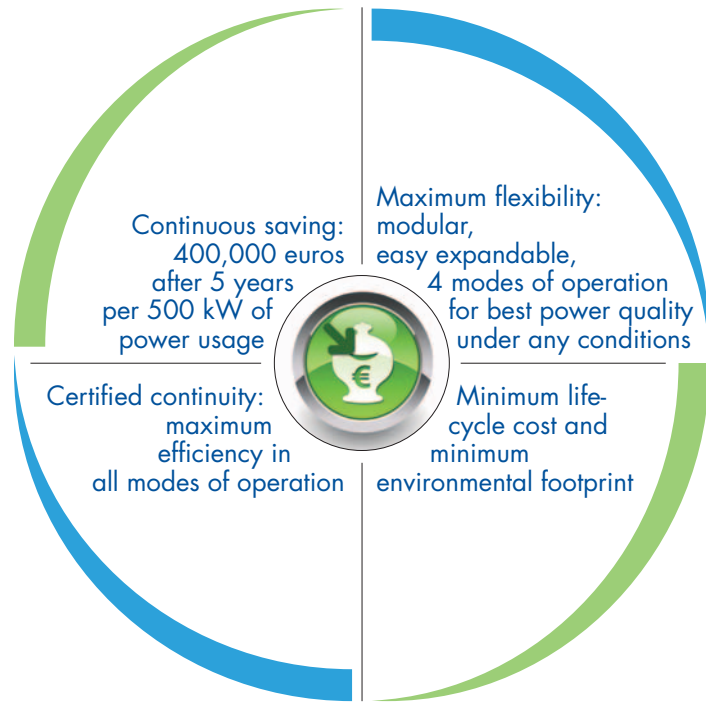
Conventional UPS

- Up to 95% efficiency
- Few system configuration options
- Low system expandability
- No hot maintenance or system resizing
- Low power density

UPSaver®

- 99.5% maximum efficiency
- Any system configuration option
- High system expandability
- Hot maintenance and system resizing, no need to switch to bypass line
- High power density

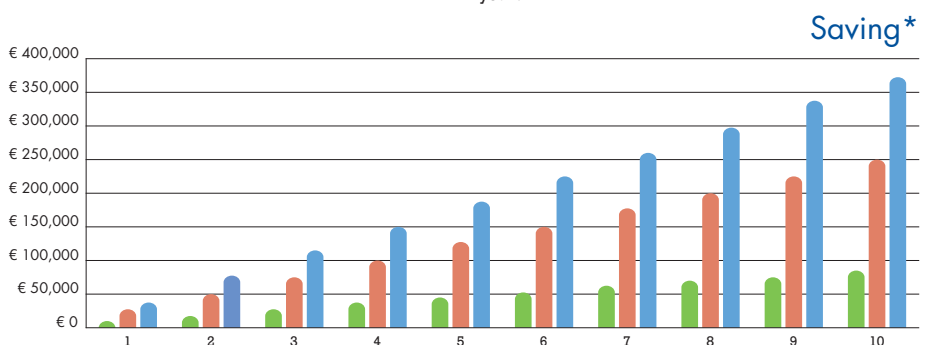
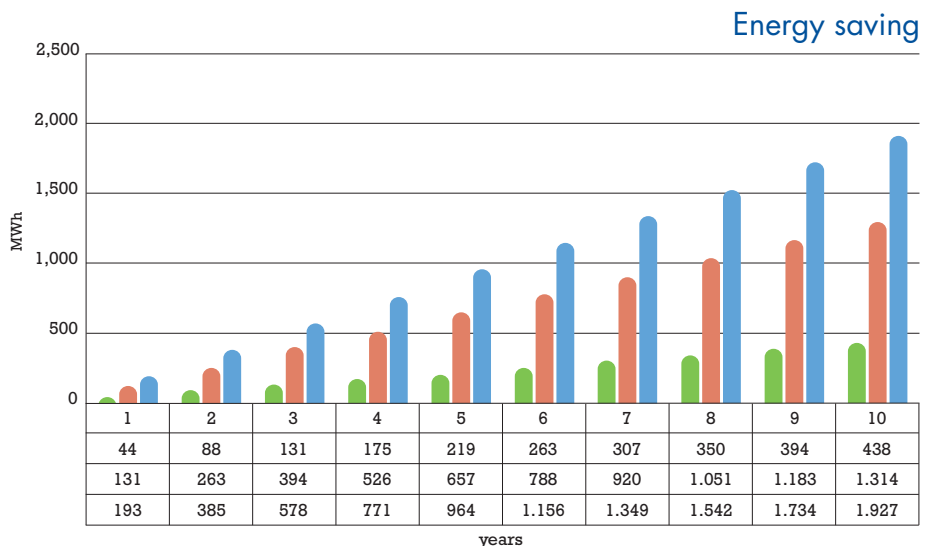
4 benefits for your business



Benefits of Borri green innovative technology.

Save energy to empower your business: with UPSaver® dynamic mode of operation you choose how much you save

10 years' savings per 500 kW load using UPSaver® instead of a common double conversion UPS



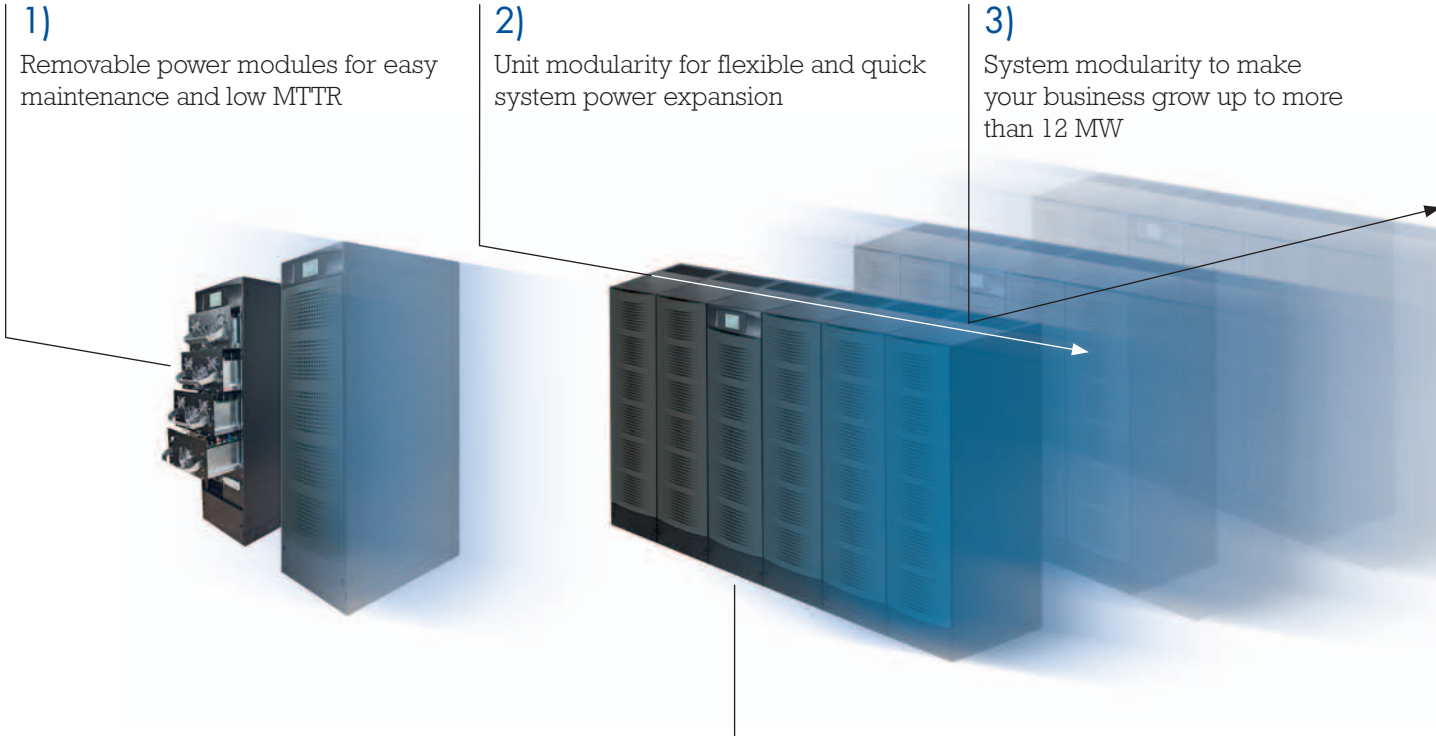
* based on European average electricity price

- UPSaver® Green Conversion
- UPSaver® strategy (Green Conversion/UHE technology)
- UPSaver® pure Ultra High Efficiency

This study has been done in collaboration with the Measurement, Reliability and Quality Laboratory of the Information Engineering Department at University of Florence

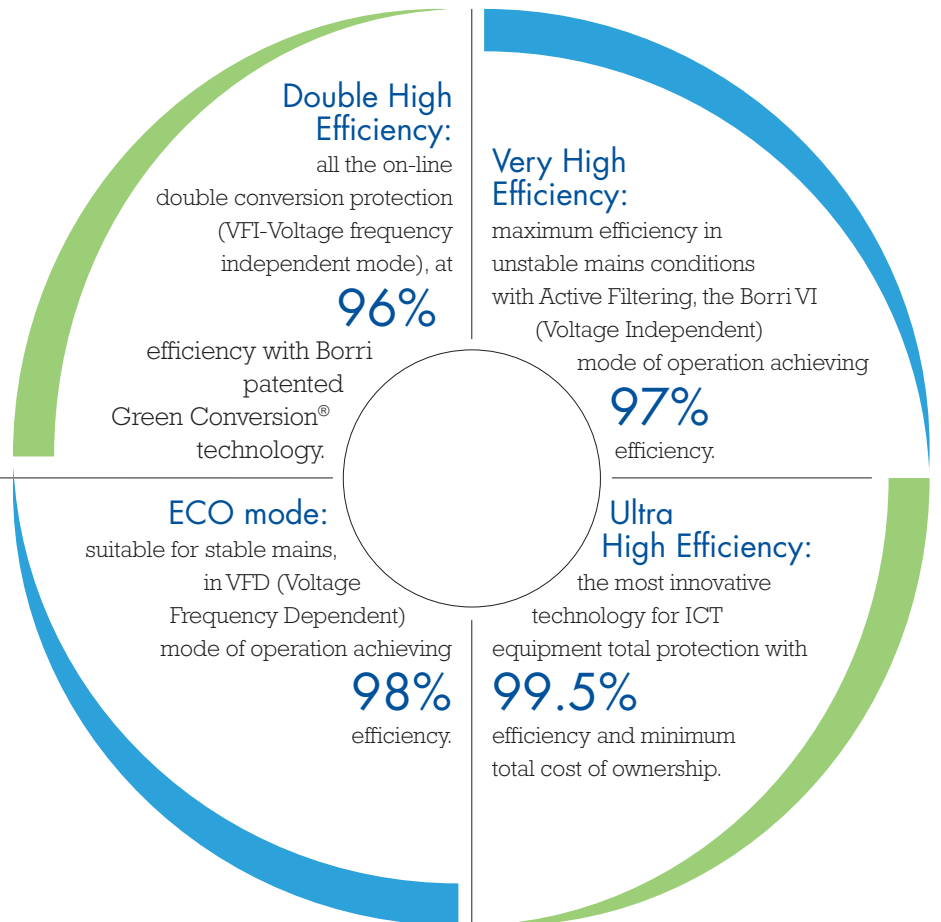
UNIVERSITÀ DEGLI STUDI FIRENZE
DIPARTIMENTO DI INGEGNERIA DELL'INFORMAZIONE

4 level modularity



4 modes of operation

UPSaver® can function in all IEC EN 62040-3 classified modes of operation.



Set the best mode of operation for your application or enable the UPSaver® strategy algorithm to monitor the mains and switch between its modes of operation to always feed the load with the highest quality power at the highest efficiency.

4)

Synchronized systems
modularity for seamless
transfer between two
independent power lines



A line

B line

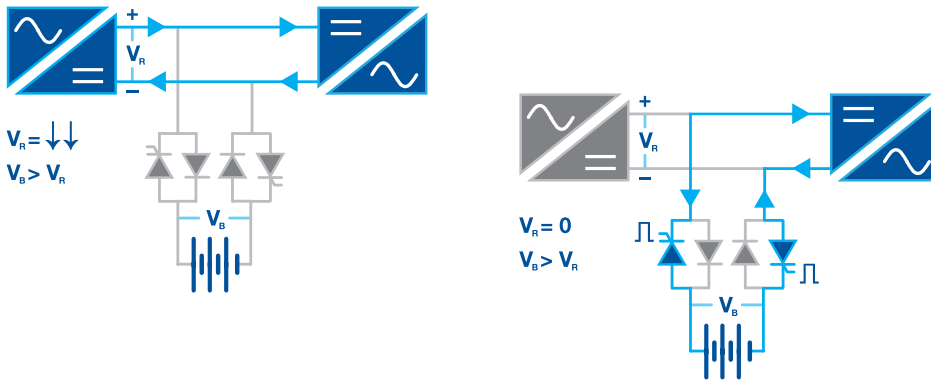


- Easy connection system:
with UPSaver® I/O module any
maintenance or system configuration
operation is easy, safe and can be
carried out without switching to
bypass line.
- Configuration options:
 - Centralized static bypass
 - Distributed static bypass
 - Centralized battery
 - Modular battery.
- Easy installation even where there is
no raised floor thanks to top or
bottom cable entry and included
base frame.
- The connection of the modules to the
I/O module is made with flexible
cables, allowing customised system
layout, whilst ensuring maximum
connection reliability.



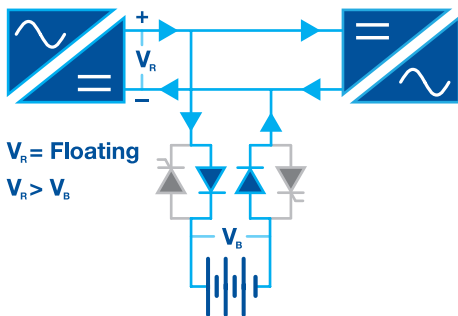
Borri patented Green Conversion technology and battery control techniques

Green Conversion technology is based on a patented control algorithm, managing the battery-inverter subsystem in order to enhance double conversion efficiency and extend battery life.



When a battery is charged and the mains are stable, it is protected from the DC-link ripple by a Green Conversion solid state dynamic battery switch, acting as a digital filter eliminating the chief cause of battery ageing.

Green Conversion inverter control enhances system efficiency by reducing IGBTs commutation losses. During mains outages Green Conversion controls the dynamic battery switch SCRs and the battery feeds the inverter.

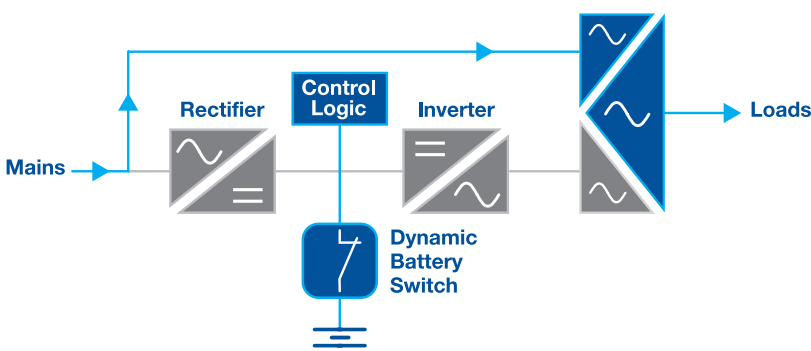


A battery is charged controlling the dynamic battery switch diodes on an intermittent basis, as per battery manufacturers recommendations, or after a discharge has occurred.

UHE technology for maximum efficiency

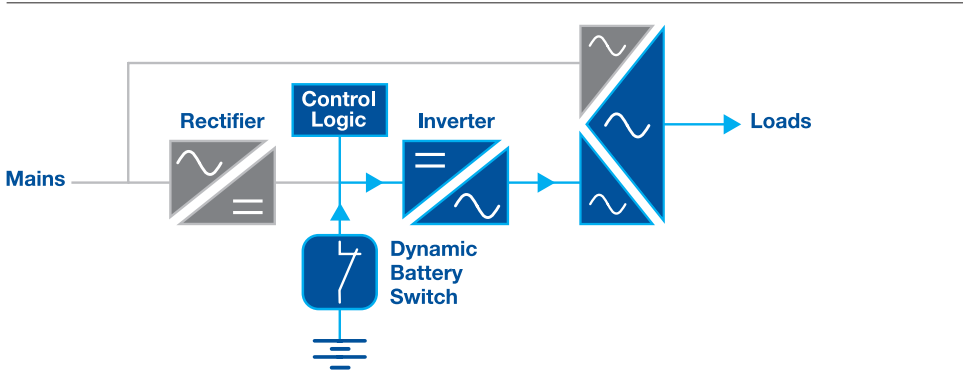
Ultra High Efficiency (UHE) technology is the Borri off-line mode.

Based on a sophisticated control technique, in UHE mode 99.46% efficiency is achieved, whilst protecting ICT loads from power quality loss.

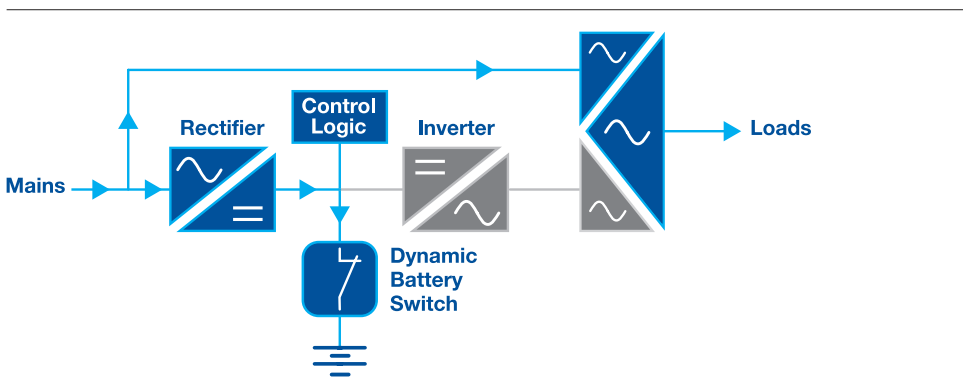


Ultra High Efficiency normal mode of operation: UHE control logic protects critical loads by monitoring power mains quality, while feeding them via the static bypass line.

Rectifier and inverter are in "deep stand-by". Efficiency is 99.46% .



Ultra High Efficiency on-line mode: the inverter feeds power to critical loads whenever mains quality is outside tolerance limits.



Ultra High Efficiency interactive mode (VHE): If input mains stability and reliability is outside preset limits, this mode of operation is activated. Loads are fed by the mains and the inverter is turned on and off by the control logic to stabilize UPS output and the rectifier keeps full battery capacity. That's what we call Very High Efficiency (VHE) mode. Efficiency is 97%, due to the transient inverter and rectifier contribution to overall losses.



ICT loads have to have a grade of immunity to power disturbances to be compliant with EMC international standards and product development guidelines (i.e. ITIC/CBEMA curve). Borri UHE technology protects ICT loads by monitoring mains quality, enabling on-line operation whenever disturbances approach load immunity limits. The maximum of system efficiency is thus achieved taking advantage of ICT load's built-in immunity to power quality issues, whilst ensuring them the protection they actually need.

Borri innovative technologies maximise environmental sustainability and minimise TCO (Total Cost of Ownership) in ICT dedicated UPS.

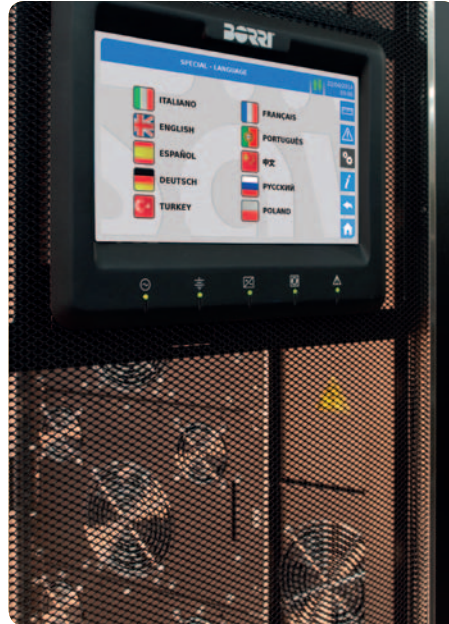
Thanks to its high energy efficiency solutions and the reduction of maintenance costs, Borri is proving to be the ideal partner wherever PUE reduction is a primary goal.

Long battery life

Green Battery Management and Green Conversion technology save battery life, by mitigating the major root causes of battery ageing, such as ripple current and floating charge micro currents.

Full power factor

Thanks to its IGBT-based technology UPSaver® has both an input and output unit power factor, thus acting as a power factor correction system for the upstream source feeding any



power factor load up to its maximum rated power.

Advanced connectivity

Touch screen display, access to UPS data via the most common communication protocols, telemonitoring and teleservice make UPSaver® a ready-to-use solution in any modern data center monitoring and preventive maintenance program.

General Data

Input

Connection type	Hardwired 4w (rectifier), 4w (bypass)
Nominal voltage	400 Vac 3-phase with neutral (rectifier), 380/400/415 Vac 3-phase with neutral (bypass)
Voltage tolerance	-20%, +15% (rectifier), ±10% (bypass)
Frequency and range	50/60 Hz, 45÷65 Hz
Power factor	0.99
Current distortion (THDi)	<3%

Output

Connection type	Hardwired 4w
Nominal voltage	380/400/415 Vac 3-phase with neutral
Frequency	50/60 Hz
Voltage regulation (VFI)	±1% static; dynamic: IEC/EN 62040-3 Class 1
Power factor	Any power factor (leading or lagging) up to 1, without power derating
Overload capability	Inverter: 101÷125% for 10 min; 126÷150% for 1 min; bypass: 150% continuous, 1000% for 1 cycle
AC/AC efficiency certified by TÜV	Up to 99.5%
Classification as per IEC/EN 62040-3	VFI-SS-111

Environmental

Operating temperature	0°C ÷ +40°C
Storage temperature	-10°C ÷ +70°C
Altitude (AMSL)	< 1000 m without power reduction, > 1000 with reduction of 0.5% per 100 m
Audible noise at 1m (dBA)	<50 (UHE)

System

Protection degree	IP 20
Colour	RAL 9005
Installation layout	Wall, back to back and side by side installation allowed
Accessibility	Front and top access, bottom and top cable entry
Parallel configuration	Up to 8 UPS, for a total of 12.8 MW

Standards and certifications

Quality assurance, environment, health and safety	ISO 9001:2008, ISO 14001:2004, BS OHSAS 18001:2007
Safety	IEC/EN 62040-1
EMC	IEC/EN 62040-2
Test and performance	IEC/EN 62040-3
Protection degree	IEC 60529
Marking	CE

Fully configurable

The system is based on 100 or 200 kW power modules (named Basic Power Unit: BPU) that can be configured either as stand alone units or as modular systems. A stand alone unit, named Fixed Power Unit (FPU) is formed by a BPU, circuit breakers and the control logic, while a modular system, named Growing Power Unit (GPU), is formed by N BPU modules and an I/O module.



Smart parallel

Smart-parallel function continuously monitors load power requirements and maximises system efficiency, by turning off all unnecessary power modules.

Safe expandability

CPM (Current Parallel Mode) ensures reliable and efficient expansion up to full power eliminating circulating currents between UPS.

UPSaver® stand alone units FPU (Fixed Power Unit) *

Rating	100	200
Nominal power (kW)	100	200
UPS dimensions WxDxH (mm)	460x920x1690	800x950x2100
UPS weight (kg)	360	720

* A Fixed Power Unit (FPU) is made of a 100 kW or 200 kW Basic Power Unit (BPU) plus all circuit breakers and control logics for use in stand alone configuration

UPSaver® 100 modular units GPU (Growing Power Unit) ◆

Rating	200	300	400	500	600
N nominal power (kW)	200	300	400	500	600
N+1 nominal power (kW)	100	200	300	400	500
UPS dimensions WxDxH (mm) □	1420x920x1690	1880x920x1690	2340x920x1690	2800x920x1690	3260x920x1690
UPS weight (kg) □	800	1150	1500	1850	2200

◆ A 100 kW Growing Power Unit (GPU) is made of many 100 kW Basic Power Units (BPU) plus an I/O module including all circuit breakers and control logics required for use in modular configuration

□ Data refer to distributed static bypass configuration with modular battery

UPSaver® 200 modular units GPU (Growing Power Unit) ◆

Rating	400	600	800	1000	1200	1400	1600
N nominal power (kW)	400	600	800	1000	1200	1400	1600
N+1 nominal power (kW)	200	400	600	800	1000	1200	1400
UPS dimensions WxDxH (mm) □	2350x970x2100	2950x970x2100	3900x970x2100	4500x970x2100	5100x970x2100	6800x970x2100	7400x970x2100
UPS weight (kg) □	1660	2260	2920	3590	4190	4960	5560

◆ A 200 kW Growing Power Unit (GPU) is made of many 200 kW Basic Power Units (BPU) plus an I/O module including all circuit breakers and control logics required for use in modular configuration

□ Data refer to distributed static bypass configuration with modular battery

Ask our technical documentation for customised layout of UPSaver 100 and 200

Connectivity and function extensions

Front panel	Touch screen display for UPSaver GPU, LCD display (optional touch screen display) for UPSaver FPU
Remote communication	Included: serial RS232 and USB; input terminal block for remote emergency power off (REPO), battery circuit breaker aux. cont., external maintenance bypass circuit breaker aux. cont. Optional: input terminal block for diesel mode aux. cont., ModBus-TCP/IP (Ethernet); ModBus-RTU (RS485); ModBus-RTU to PROFIBUS DP adapter; SPDT contact relay board
Optional function extensions	Isolation transformer, custom battery cabinets, wall-mounted battery fuse switch box, battery thermal probe, parallel kit, load-sync for single UPS and load-sync box (2 UPS systems), tripping coil for bypass disconnecter for UPSaver FPU

UPSaver options

	Description	When do I use it
	Parallel kit	When the unit is to be paralleled for load sharing
	Load-sync for single units	To synchronize single units' output for no-break load transfers by downstream static transfer switches
	Load-sync box for two sets of paralleled UPS	To synchronize the output of two paralleled UPS systems for no-break load transfers by downstream static transfer switches
	Backfeed protection bypass contactor for UPSaver GPU	To be fully protected against backfeed energy upon static bypass failure
	Tripping coil for bypass disconnecter for UPSaver FPU	To be fully protected against backfeed energy upon static bypass failure. Detection circuit is included
	Isolation transformer	To galvanically isolate UPS from load or to change system's earthing arrangement
	Battery temperature probe	For charging voltage compensation with temperature (10 m cable length)
	Touch screen display (Included in UPSaver GPU)	To access UPS information, measure, alarms and control menu by touch screen advanced graphic user interface. To send UPS status by Ethernet connection and ModBus over IP protocol. To add teleservice and telemonitoring features
	Dry contact relay card	To send UPS status to PLC's, SCADA's or AS400's by voltage free SPDT contacts
	RS485 ModBus-RTU port	To send UPS status to BMS's by RS485 connection and ModBus-RTU protocol. For telemonitoring and teleservice
	Input terminal block for remote EPO	When the Emergency Power Off (EPO) has to be commanded by a remote control button
	Input terminal block for external manual bypass switch auxiliary contact	When there is an external maintenance bypass switch, for state monitoring
	Input terminal block for external battery switch auxiliary contact	When there is an external battery switch, for state monitoring
	Input terminal block for diesel mode contact	When battery recharge has to be inhibited over genset operation

Who we are

Borri is a company specializing in the custom design, manufacturing and servicing of power supply protection systems in key sectors such as ICT, industrial processes and service, oil & gas and energy, utilities, also of static conversion for renewable energy sources. The Borri research and development department is among the most complete regarding the coverage of the various disciplines involved in power conversion. On the strength of proven expertise in product customization and a continuous quest for excellence, Borri is named in more than 40 vendor lists and enjoys a position of prominence in the oil & gas sector.

Similarly, with extensive experience in various branches of power electronics such as UPS systems for data centers, inverters for renewable energy projects and storage systems.

Borri is a dependable partner able to offer power supply solutions used in ICT applications, in the process industry and for services, with numerous installations to its credit UPSaver®, the most recent three-phase solution, based on Green Conversion patent technology, is able to guarantee unparalleled energy savings, and the best PUE for data centers with lower environmental impact, proof of the ongoing company commitment to innovation.

Under the Astrid brand, Borri offers a wide range of renewable energy solutions, reflecting its commitment to our pursuit of sustainable development.

Headquartered in Italy, with 15,000 m² of production area and a fully equipped inspection and testing area, the company is able to count on more than 80 years of experience, multidisciplinary R&D and a highly application specialized custom engineering capability.

Borri has a presence on all 5 continents with thousands of installations worldwide, professional staff and a network of partners able to provide you value added technical support and services.



**Borri S.p.A.**

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