

# UPSaver®

**Modular UPS  
for large data centers  
400 kW to 1.6 MW**

with innovative green technology  
for unmatched energy savings



**BORRI®**



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

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

With respect to UPS systems, all these needs must translate into:

- High efficiency
- Modularity
- Low total cost of ownership

Borri's commitment for the data center industry is to develop innovative customized technologies for delivering high efficiency power supply solutions.

UPSaver® by Borri, 400 kW to 12.8 MW modular series for the data center industry, totally configurable, quickly scalable, with high efficiency and low TCO.

## The UPSaver® philosophy

UPSaver® is a complete, very high efficiency, multi-functional and fully adaptable power protection system for mission critical applications. The flexibility of the system is achieved by using power modules, which can configure a wide range of modular systems.

UPSaver® is a permanent saving system that continuously monitors the mains to guarantee high quality power to your data center equipment at minimum energy usage.

### Applications

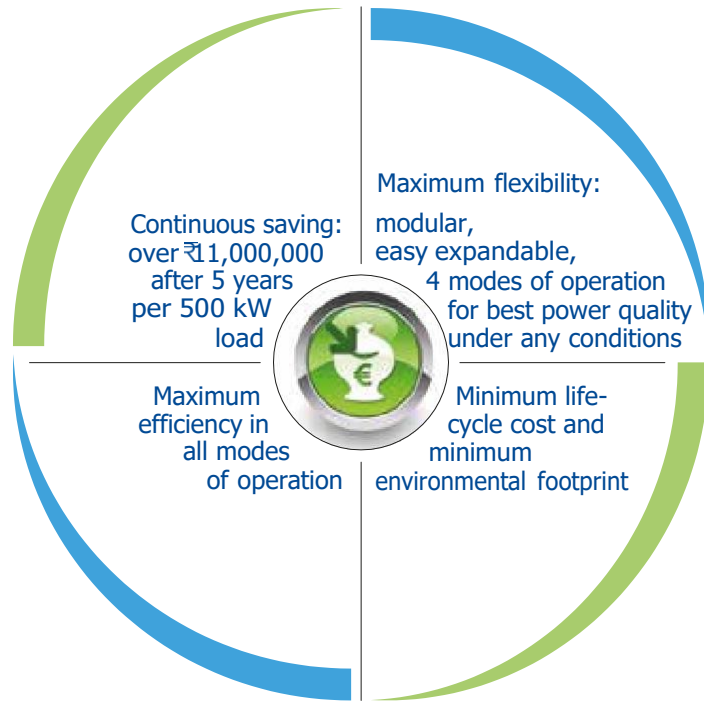
- Cloud
- Data servers
- Networking services
- Telecommunication equipment
- Critical cooling



## The UPSaver® system

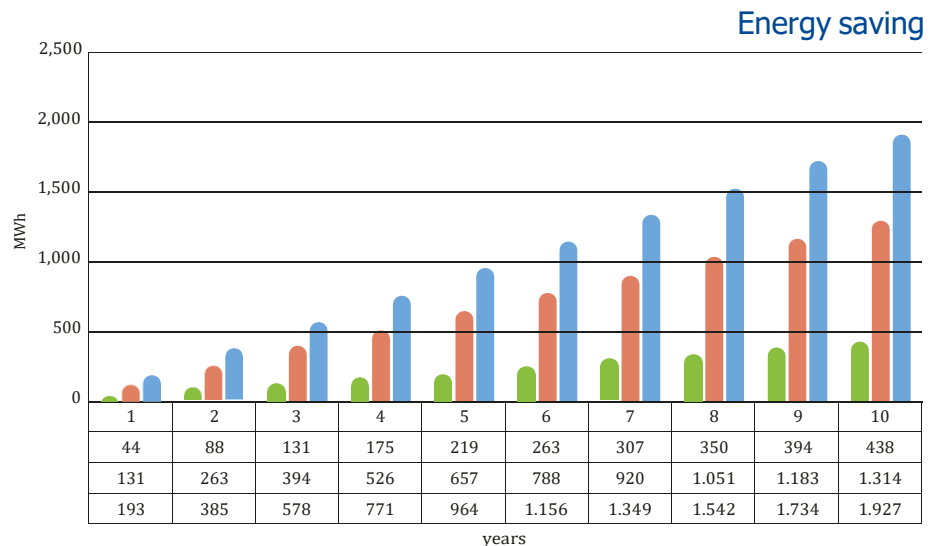
- 99.5% maximum efficiency
- Comprehensive set of configuration options
- High system expandability
- Hot maintenance and system resizing, no need to switch to bypass line
- High power density
- Flexible mechanical installation

## 4 benefits for your business

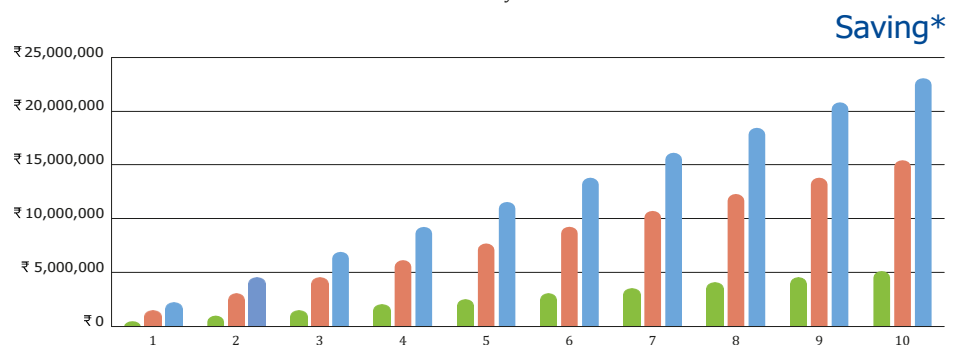


Save energy to empower your business: with UPSaver® dynamic mode of operation you choose how much you save

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



\* based on Indian 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

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## 4 level modularity

1)

Removable power modules for easy maintenance and low MTTR



2)

Unit modularity for flexible and quick system power expansion

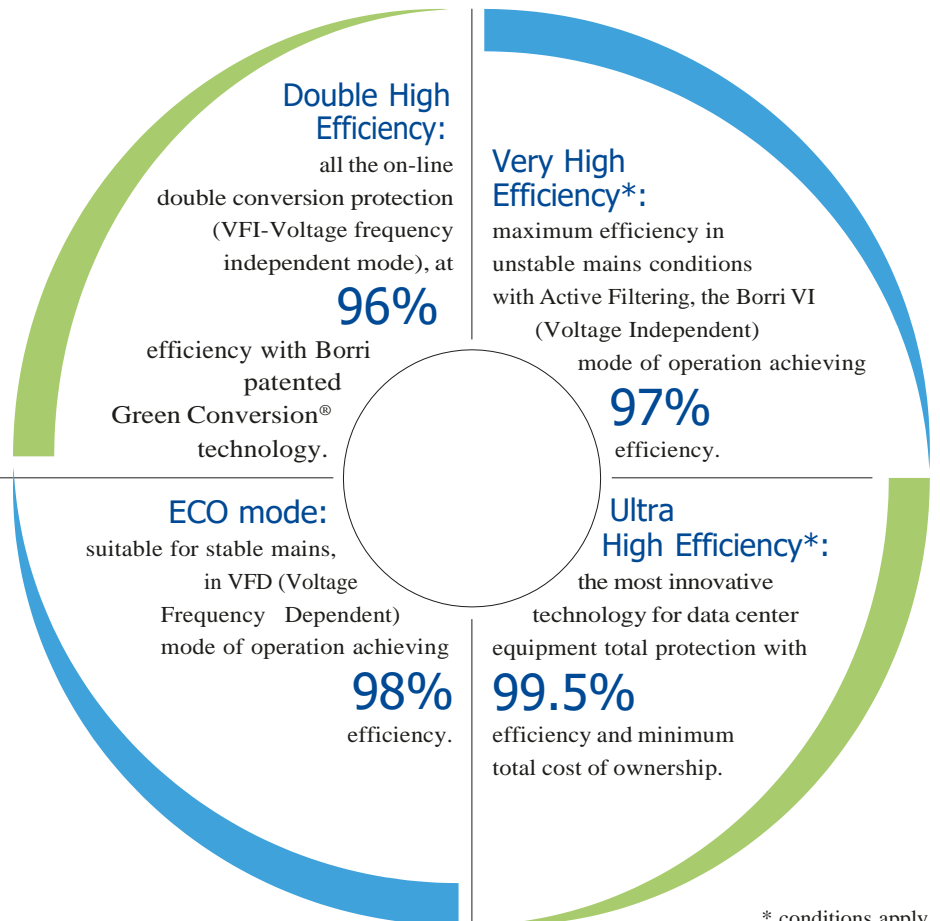
3)

System modularity to make your business grow more than 12 MW



## 4 modes of operation

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



UPSaver Mode to always feed the load with the highest quality power at the highest efficiency.

\* conditions apply

4)  
Synchronized systems  
modularity for seamless  
transfer between two  
independent power streams



A stream

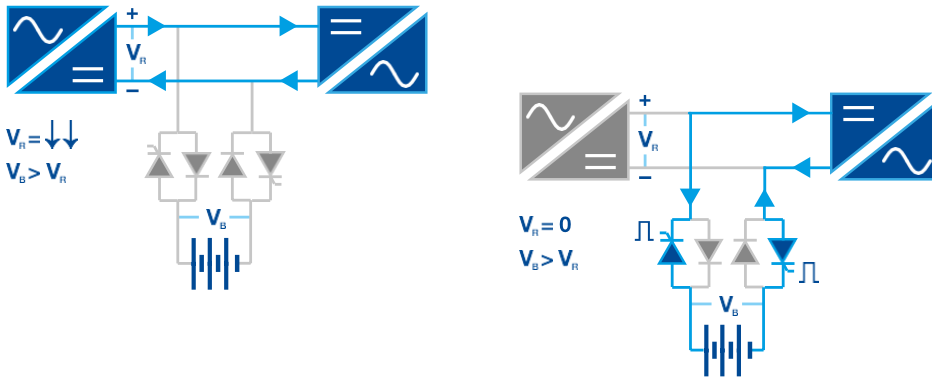
B stream



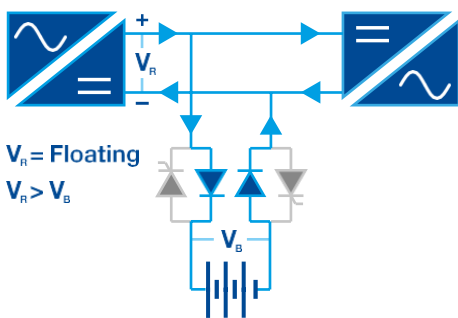
- Easy connection system:  
with UPSaver® I/O module any  
maintenance or system configuration  
operation is easy, safe and can be  
carried out without switching to  
bypass line.
- Configuration options:
  - Centralized static bypass
  - Distributed static bypass
  - Centralized battery
  - Modular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



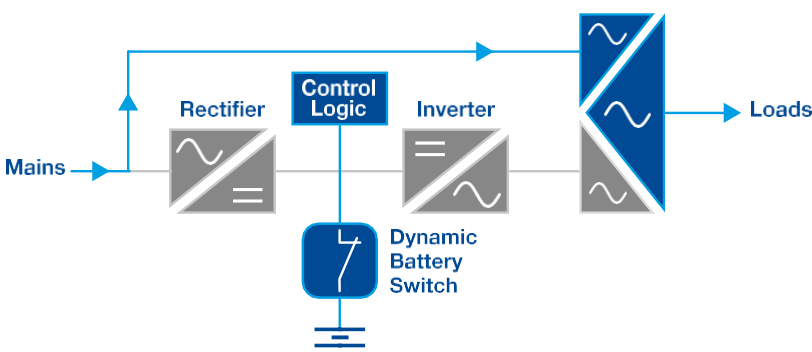
When battery is charged and mains are stable, it is protected from the DC-link ripple by a Green Conversion solid state dynamic battery switch, acting as a digital filter eliminating the chief cause of battery ageing. Green Conversion inverter control enhances system efficiency by reducing IGBTs commutation losses. During mains outages Green Conversion controls the dynamic battery switch SCRs and the battery feeds the inverter.



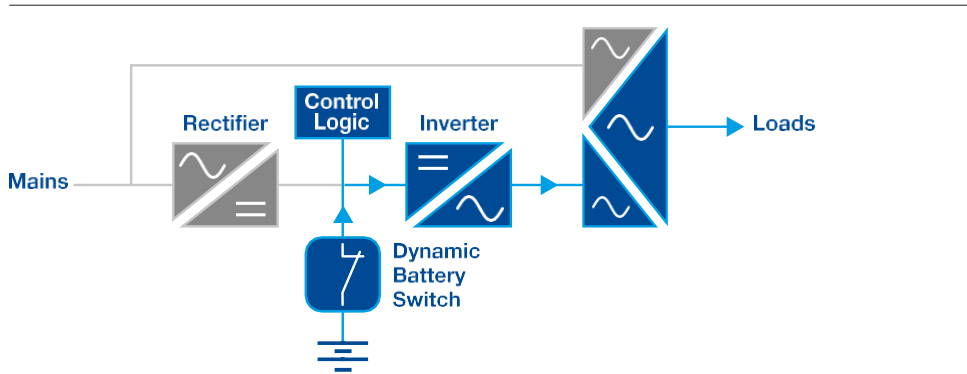
Battery is charged controlling the dynamic battery switch diodes on an intermittent basis, as per battery manufacturers recommendations, or after a discharge has occurred.

**UHE technology for maximum efficiency**

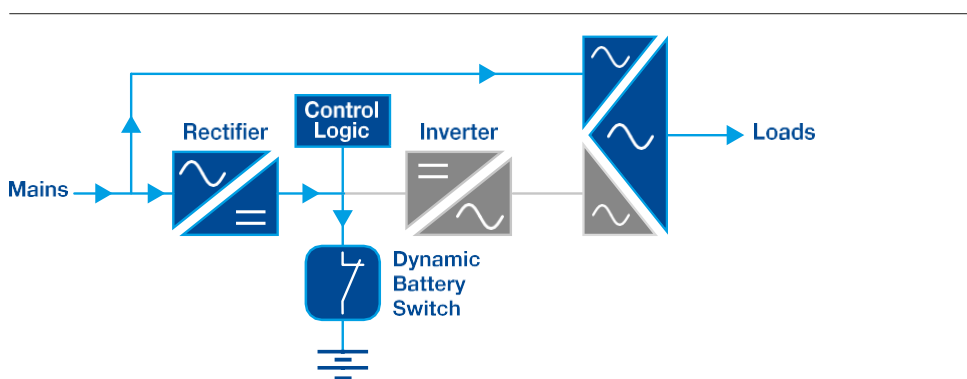
Ultra High Efficiency (UHE) technology is the Borri off-line mode. Based on a sophisticated control technique, 99.46% efficiency is achieved in UHE mode, whilst protecting data center loads from power quality loss.



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: if input mains stability and reliability is outside preset limits, Ultra High Efficiency interactive 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.



Data center loads must 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 data center 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 data center load's built-in immunity to power quality issues, whilst ensuring them the protection they actually need.

Borri innovative technologies maximize environmental sustainability and minimize TCO (Total Cost of Ownership) in data center 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.

## Features and benefits

- Patented Green Conversion providing high efficiency and battery care technology for continuous savings on operating and maintenance expenditure.
- Current Parallel Mode (CPM) cancelling circulating currents between the power modules, thus enhancing system's efficiency and ensuring reliable expansion up to full power.
- UPSaver Mode providing best efficiency in all conditions: DHE double conversion 96% efficiency, VHE\* active filtering 97%, ECO mode 98%, UHE\* highest efficiency 99.5%.
- Four modularity levels for maximum flexibility and quick maintenance.
- I/O unit specific design providing real hot expandability and maintainability, with no downtime and no bypass operation.
- Load based module shutdown for highest efficiency at light load.
- Backfeed bypass contactor for complete protection and operators' safety without additional installation costs. \*
- Minimum TCO (Total Cost of Ownership) and best PUE (Power Usage Effectiveness) for low environmental footprint data centers.

\*conditions apply

## Main options

- Centralized static bypass.
- Modular battery.
- Transformers/autotransformers for isolation or voltage adjustment.
- Battery voltage temperature compensation.
- Associated battery cabinets for long autonomy times.
- Parallel kit for load sharing.
- Load-sync for single UPS units. Load-sync box for two sets of paralleled UPS.

## Battery life care

Preserving battery's health is a key to capital expenditure protection and full availability of mission critical applications. UPSaver® comes with advanced charging and battery managing features, allowing for best battery performance and extended battery lifetime:

- Green Conversion Battery Care with adjustable cyclic charge (14-2 typical) providing 100% battery service life and maximum energy savings.
- Dynamic Charging Mode (DCM): automatic setting of battery charging current, with feeding priority to output loads, ensuring low charging times for long autonomy applications.
- Battery charging voltage temperature compensation to prevent excess battery charging and overheating.
- Automatic and manual battery test to detect any deterioration in battery performance.



## Advanced connectivity and remote diagnostics

- Touch screen display with easy to use interface and guided set up procedures.
- Access to UPS data via the most common communication protocols.
- Remote diagnostics and preventive monitoring by Borri Guardian Net, preventing unpredictable anomalies to become failures, by warning and alarm notification and status reports.

UPSaver® is a ready-to-use solution in high availability data center maintenance programs.





## UPSAVER technical data

Rating (kVA)	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
Battery configuration	External 360 to 372 cells, VRLA (other options)						

### 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 to 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)	Static: ±1%; dynamic: IEC/EN 62040-3 Class 1
Power factor	Any power factor (leading or lagging) up to 1, without power derating
Overload capability	Inverter: 125% for 10 min, 150% for 1 min; bypass: 150% continuous, 1000% for 1 cycle
AC/AC efficiency**	Up to 99.5%
Classification as per IEC/EN 62040-3	VFI-SS-111

### Connectivity and function extensions

Front panel	10" color touch screen display, 1024x600 pixels
Remote communication	Included: serial RS232 and USB; input terminal block (remote emergency power off, battery circuit breaker aux. cont., external maintenance bypass circuit breaker aux. cont., diesel mode aux. cont., external output circuit breaker aux. cont., remote transfer to bypass mode); SPDT contact relay board; ModBus-RTU (RS485); Optional: ModBus-TCP/IP (Ethernet); ModBus-RTU to PROFIBUS DP adapter
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); other options on request

### System

Protection degree	IP 20
Color	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

\* referred to distributed battery, distributed static switch, bottom cable entry. For other configurations contact our sales team \*\* according to IEC/EN 62040-3

## Other features

### Environmental

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

### 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
Environmental aspects	IEC/EN 62040-4
Test and performance	IEC/EN 62040-3
Protection degree	IEC 60529
Marking	CE

## UPSAVER series 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
<p style="text-align: right;"><b>Included</b></p>	Backfeed protection bypass contactor (distributed static bypass version)	To be fully protected against backfeed energy upon static bypass failure
	Isolation transformer in extended cabinet	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)
<p style="text-align: right;"><b>Included</b></p>	Dry contact relay card	To send UPS status to PLC's, SCADA's or AS400's by voltage free SPDT contacts
<p style="text-align: right;"><b>Included</b></p>	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
	Input terminal block for external output circuit breaker	When there is an external output breaker, for status monitoring
	Input terminal block for remote bypass transfer	When the transfer to bypass mode can be commanded by an external contact

## Who we are

Borri Group is a global provider of power electronics systems and solutions for harsh industrial and demanding commercial and ICT secure power requirements merging eighty years of experience in developing, manufacturing and supplying uninterruptable power systems and solutions.

The Research and Development Team's expertise combines AC and DC power technologies spanning the worlds of both conventional and renewable energy, to provide innovative solutions for tomorrow's problems.

The company is comprised of three business units: Industrial Power, Critical Power and Renewable Power, headquartered in Bibbiena, Italy.

Borri's latest products, based on Green Conversion operation, guarantee the best PUE for green data centers: proof of the ongoing company commitment to innovation.

Thanks to its highly skilled custom engineers Borri controls in-house the entire process: from feed studies to design, production and after-sales service guaranteeing state-of-the-art solutions.

Based in Italy with over 15,000 m<sup>2</sup> production area and a large high power test field, Borri can depend on its more than 80 years of experience and multidisciplinary research and development to serve our customers best.



Borri Headquarters and Factory

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