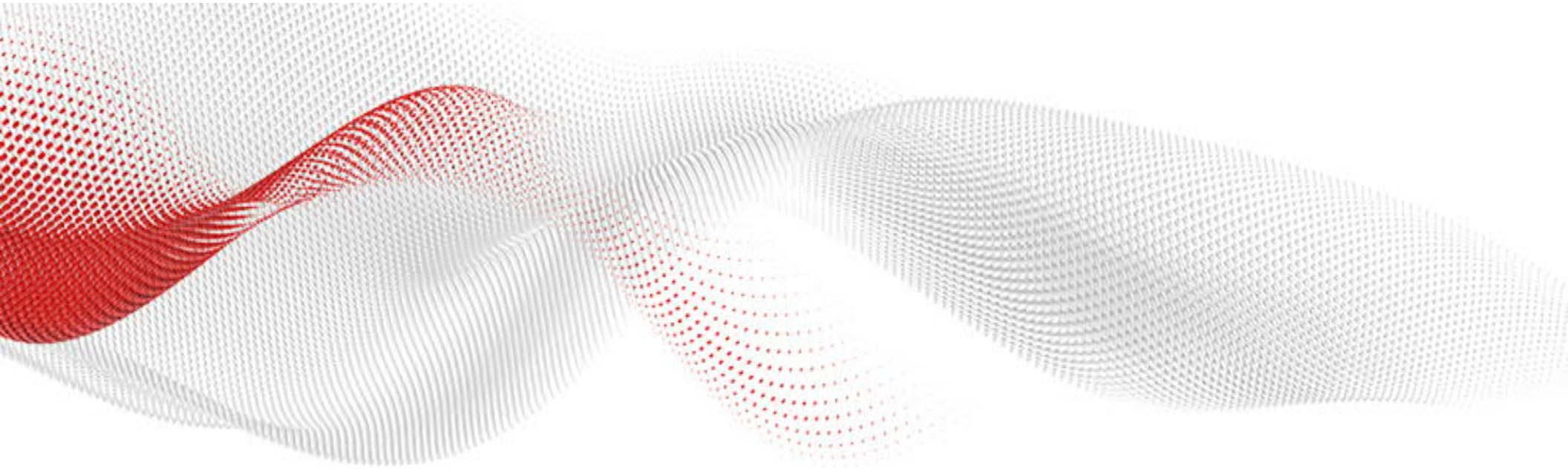


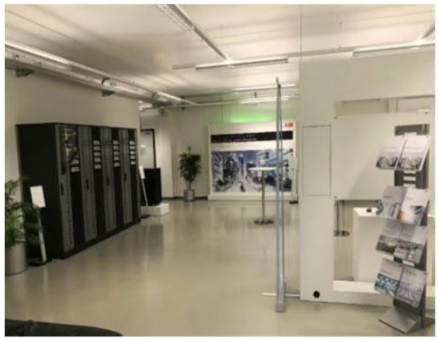
MAY, 2020

ABB DPA UPS intelligent solutions in Data Center

Intelligent UPS solutions in the Modern Data Center

LONG LeQuang – ABB Power Protection

PG Power Protection – UPS Business



Local product group Quartino, Switzerland

- Former Newave
- Established in 1993, acquired by ABB in 2012
- Headquartered in Quartino, Switzerland
  - 5'000 sqm shop floor with flow assembly lines and automated test infrastructures (up to 16'000 units/year capability)
  - Short throughput time (1-5 days)
- Pioneering advanced double conversion UPS technologies: modularity, transformerless
- Recognized as a premium supplier with more than 20 years UPS experience
- Launched first modular UPS in the market in 1998!
- Introduced unique Decentralized Parallel Architecture (DPA™) in 2005

UPS for Modern Datacenter

DPA Architecture for High Availability in Critical Applications

ABB Power Protection – UPS offering

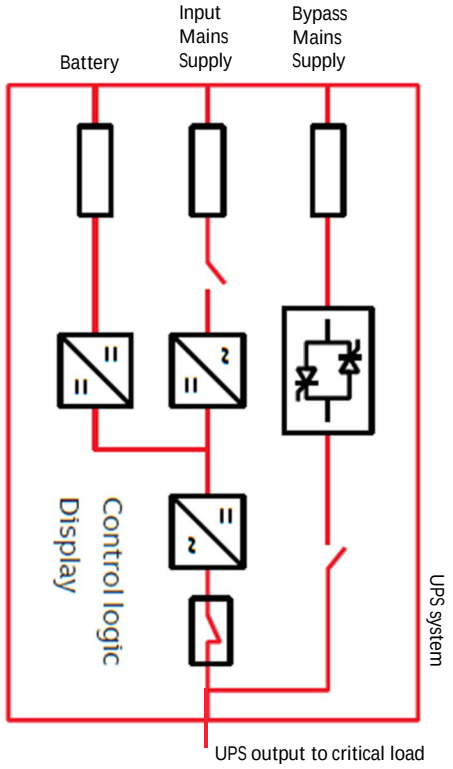
	UPS for general purpose commercial applications			UPS for medium voltage and industrial applications	
	1ph UPS	**3ph UPS - Standalone**	**3ph UPS - Modular**	**UPS – Medium Voltage**	**UPS and DC chargers– Industrial applications**
IEC offering	PowerValue 11LI 600-2000 VA PowerValue 11T G2 1-10 kVA PowerValue 11RT 1-10 kVA PowerValue 11/31T 10-20 kVA	PowerScale 10-50kVA PowerWave 33 60-500 kW TLE Series 160 – 800 kW SG Series 10-600 kVA (trafo based UPS)	DPA UPScale 10-200 kW DPA 250 S4 50-250 kW DPA 500 100 – 500kW	PCS120 MV UPS 2.25 MW 7.2 kV IEC (6 - 6.6 kV) 12 kV IEC (10 – 11 kV) 24 kV IEC (20 – 22 kV)	PowerLine DPA 20-120 kVA PCS100 UPS-I (single conv. process UPS)
UL listed offering	PowerValue 11LI Pro UL 1100 – 3000 VA GT series UL 5-10 kVA	TLE Series 40 – 1000 kW SG Series 10-300 kVA (trafo based UPS)	DPA 120 20-120 kW DPA 500 100-500 kW	15 kV ANSI (12.47 – 13.8 kV)	PowerBuilt UPS (40-80 kVA) RBE II IDM
Segments/ applications	Small IT Rooms Building infra-structure ATM	IT / server rooms Data centers Telecomm. Building infrastructure Healthcare & medical Light industries	IT / server rooms/ edge Data centers Telecom Building infrastructure Transportation	Data centers Oil, gas and chemicals Mining Critical process & automation Semiconductor Manufacturing	Oil, gas and chemicals Mining Critical process & automation Semiconductor Manufacturing
Pictures					
Power range	600 VA – 20 kVA Parallel systems: up to 80 kVA	10 kVA – 800 kW Parallel systems: up to 5 MW	10 kW – 500 kW Parallel systems: up to 3 MW	2.25 MVA Parallel systems: up to 10 units Ring bus systems : up to 20 units	20-150 kVA Parallel systems: up to 600 kVA (UPS-I up to 3MVA)

Modular, DPA™, transformerless

UPS Fundamentals: where ABB technology makes excellence.

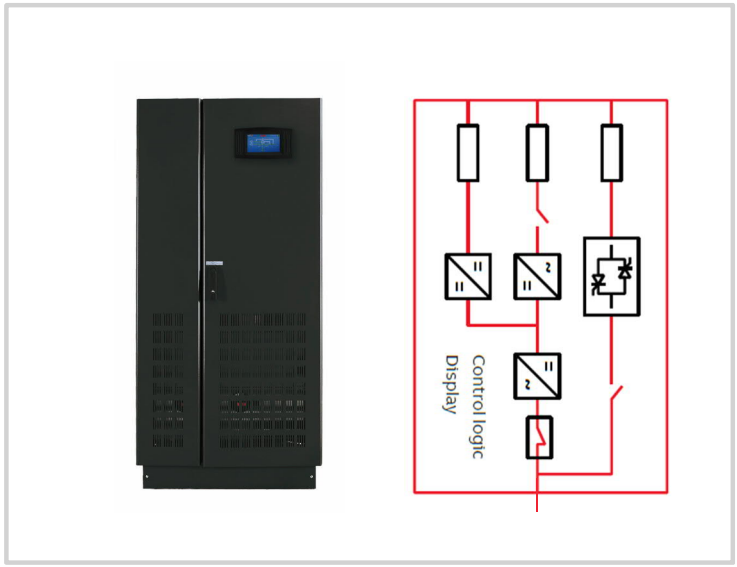
Technology insights 1: The DPA concept

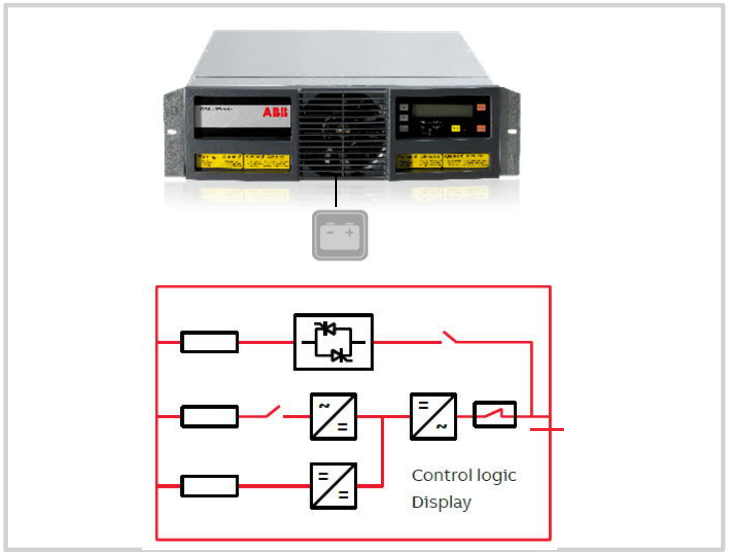
Traditional standalone UPS concept / main functional elements



Technology insights 1: The DPA concept

The DPA concept mirrors the traditional UPS concept: single UPS



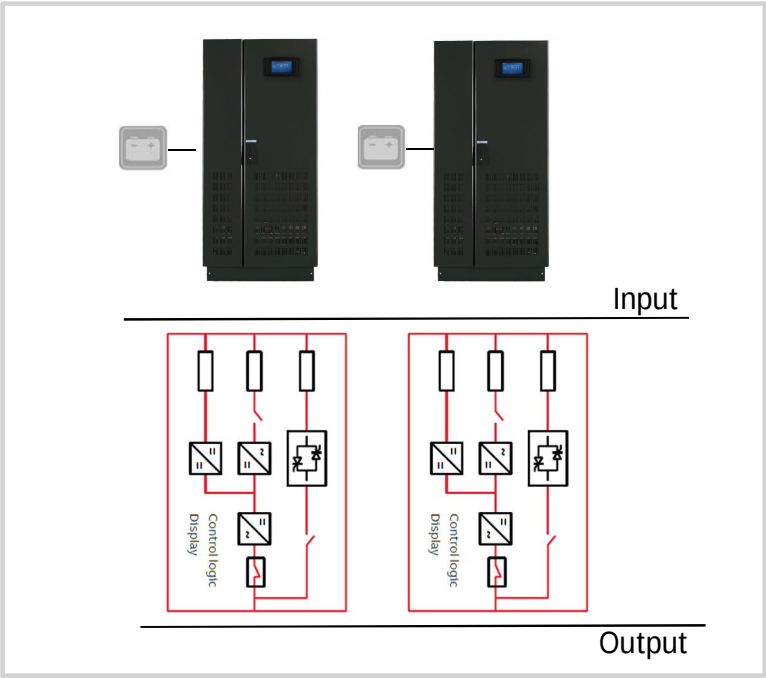


Each DPA module is a complete UPS system

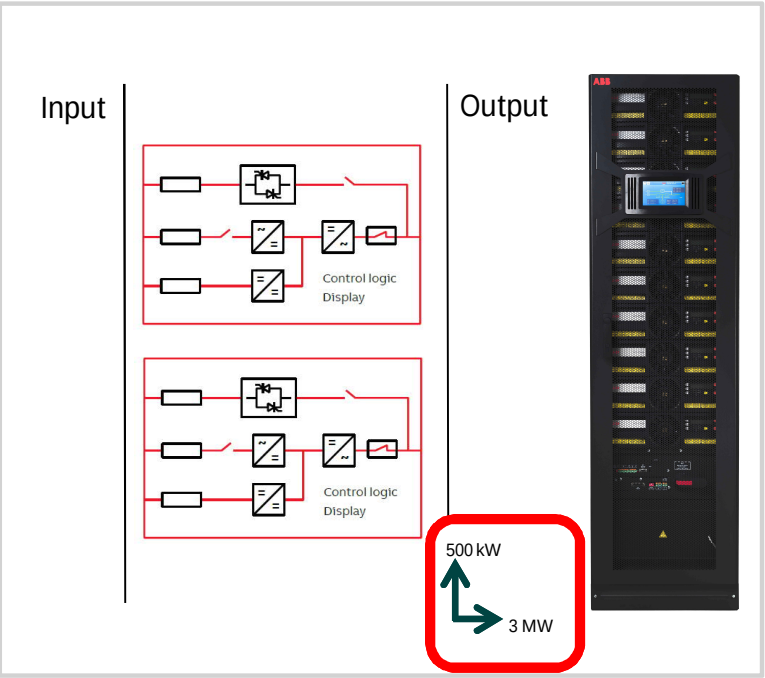
A modular UPS is considered a TRUE modular only when each UPS module is equipped with all functional blocks (rectifier, inverter,static by-pass, LCD display, microprocessor (CPU)) and with dedicated battery capability in order to avoid Single Point of Failure

Technology insights 1: The DPA concept

The DPA concept mirrors the traditional UPS concept: parallel UPSs



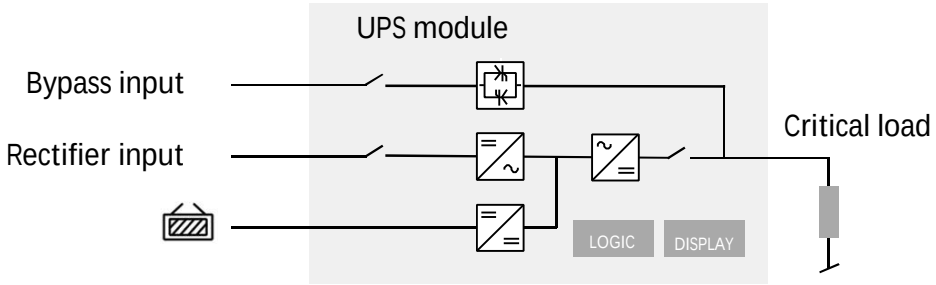
Horizontal scalability for capacity and redundancy



Vertical and horizontal scalability for capacity and redundancy

UPS module

Each DPA module is a complete UPS



Each module embraces

- Static bypass switch
- Input and output filters
- Back-feed protection
- IGBT rectifier, booster and inverter
- Independent battery charger
- Independent control logic and display
- User interface

Technology insights 1: The DPA™

UPS topologies

Centralized Parallel Architecture (CPA)

System composed of common system blocks:

- Central system logic
- Control Panel (Display)
- Static Bypass
- Battery

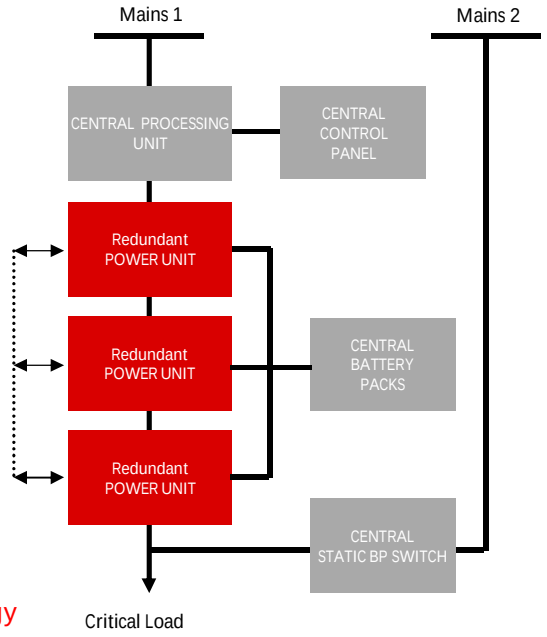
The only decentralized parts are the power units without intelligence

→

that compromise system Reliability – and availability!

State of the art technology

Single point of failure



Decentralized Parallel Architecture (DPA ™)

Modularity

There are no common components to the system.

All essential functions are independent and De-centralized:

- System logic
- Control Panel (Display)
- Static Bypass
- Power Units
- Separate Battery connection

– The single module is a complete UPS

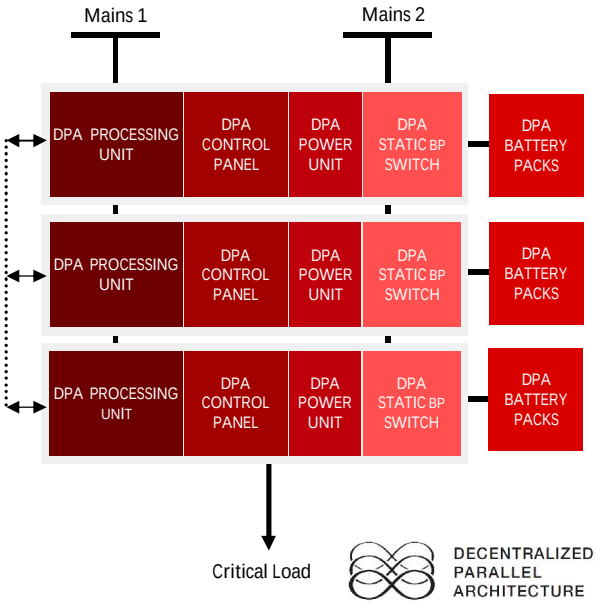
– True redundancy

– Hot swappable

– Easy and safe maintenance

NO single point of failure

Increased reliability and availability!

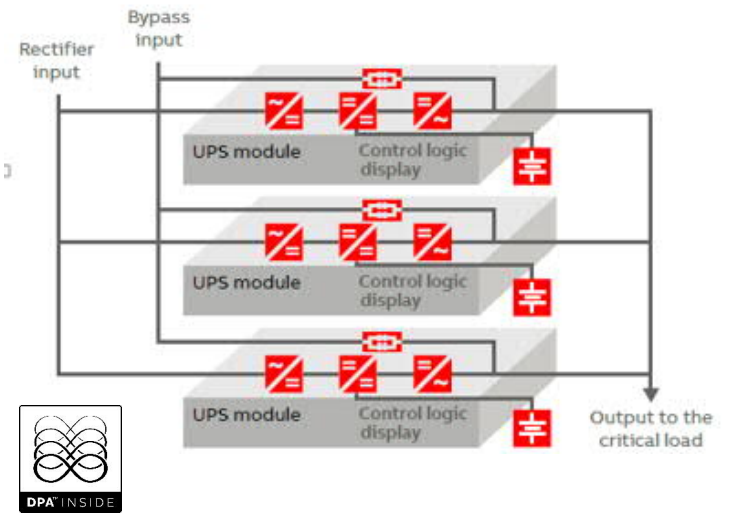


This is unique to ABB

Technology insights 1: the DPA™

What is DPA ?

Decentralized Parallel Architecture (DPA™)



Decentralized critical components

Redundancy

No Single Point of Failure

Each critical component is redundant

Independent engine

Secured load

Each module in case of any component failure can be isolated from the parallel system in a secured manner

Battery separate

Minimum battery

Separate battery per module allows to exchange minimum quantity of battery

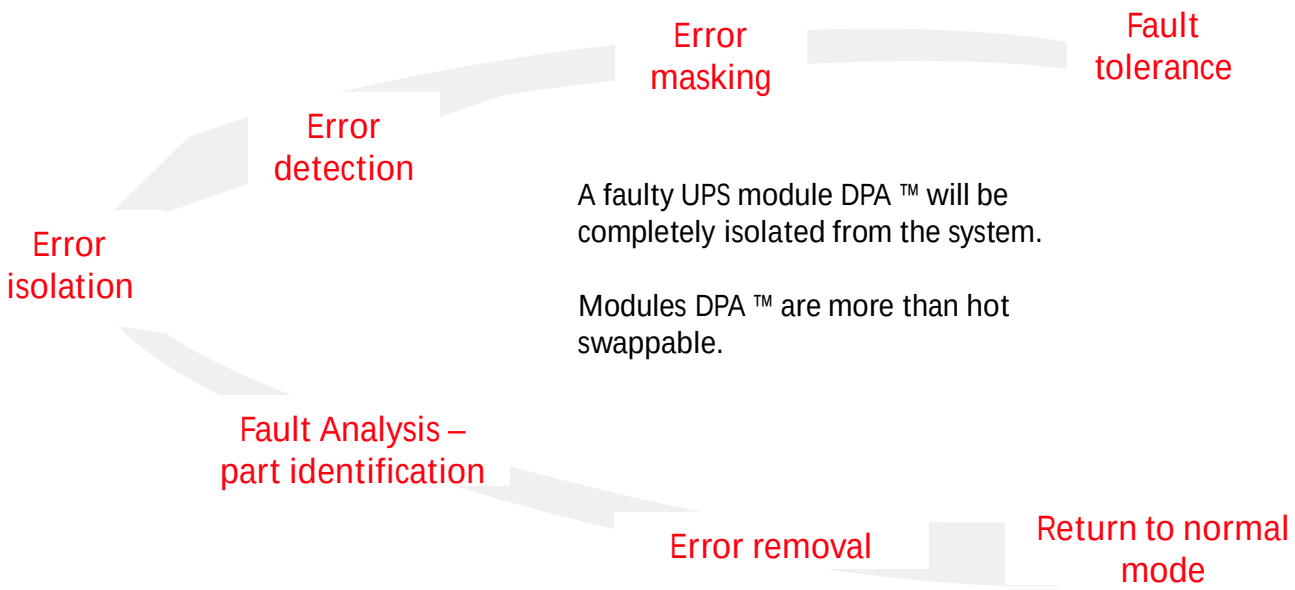
Decentralized control logic

Multi Master/Slave system

Any UPS can be the logic leader (MultiMaster/Slave system)

Technology insights 1: the DPA™

Enhanced Hot Swappable modularity (OSM):



A faulty UPS module DPA ™ will be completely isolated from the system.

Modules DPA ™ are more than hot swappable.

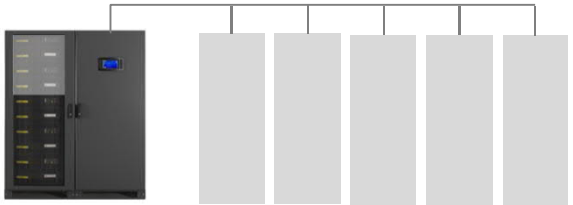
Online Swappable Modularity (OSM)

Data center application

Scalability example – distributed end-of-row concept

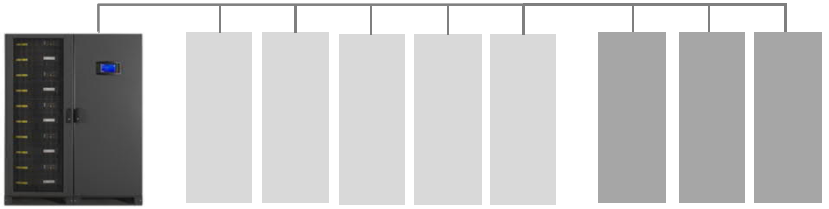
Conceptpower DPA 500 200 kW (N+1)

Starting with small server load



Conceptpower DPA 500 400 kW (N+1)

With increased number of modules for capacity



Typical one-rack-row power demand can vary from 20 kW to hundreds of kilowatts.
Only a modular UPS is capable of adapting to changes of power demand in a growing infrastructure.

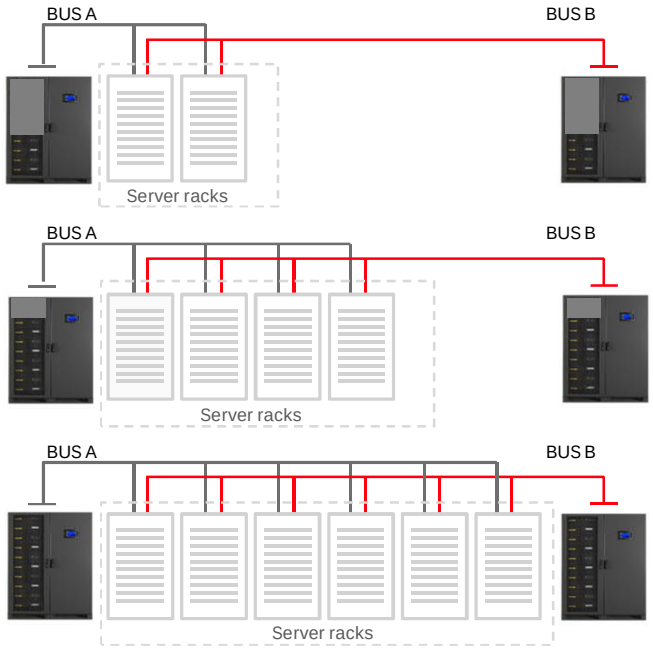
Conceptpower DPA 500

Scalability example – distributed end-of-row Tier IV

Typical Tier 4 arrangement:

Typical Tier 4 one-rack-row built using decentralized power protection concept.

Only a modular UPS is able to adapt to changes of power demand in a growing infrastructure!



DPA 250 S4

Inside the modular UPS

ABB POWER PROTECTION

DPA 250 S4 – Modular UPS

High efficiency solution to medium size critical applications

LONG LEQUANG

DPA 250 S4 50 – 1500 kW

High efficiency, modular UPS, for medium power applications

50 kW power in one UPS module
Truly scalable power featuring DPA

300 kW or 250 kW N+1 redundant power, Increasing the power capacity by 15% one UPS frame cabinet

1500 kW power in one system

By paralleling up to 5 frames reducing the foot print by 15%

97,6 % module efficiency
Top-of-the market performance

> 30 % reduced power losses
Compared to similar products in the market

< 10 min service time
All it takes to exchange one UPS module

DPA 250 S4 – modular three phase UPS system

The most energy-lean UPS on the market

When your business requires the best quality

Tested and approved according to :

IEC 62040-1	Safety
IEC 62040-2	EMC
IEC 62040-3	Performance

by authorized IEC agency

DPA 250 S4 UPS Module

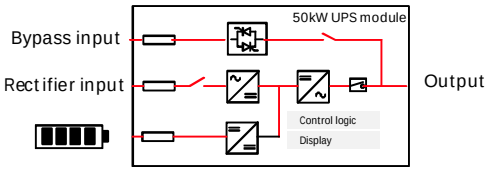
At the first glance

62kg

Compact design [mm]		
H	W	D
175	706	825

Secured uptime and reliable performance

with decentralized paralleling architecture (DPA), where every UPS module has all essential functions eliminating singe point of failures



Online swappable module for continuous uptime

If one UPS module needs to be removed or added to the system, this can be man-aged fast and seamlessly. The DPA 250 S4 has a very robust design and features strong and practical handles. It is only possible to insert modules into the rack in the correct orientation and the slide rails have mechanical stoppers to stop the module from sliding out too far, thus preventing an unintentional drop

Easy of controlling and monitoring

The DPA display allows fast data access and module management

< 10 min service time

It takes only 10 minutes to extract a module, replace consumable parts, insert it back to the system and turn it back online

DPA 250 S4 grows with your infrastructure

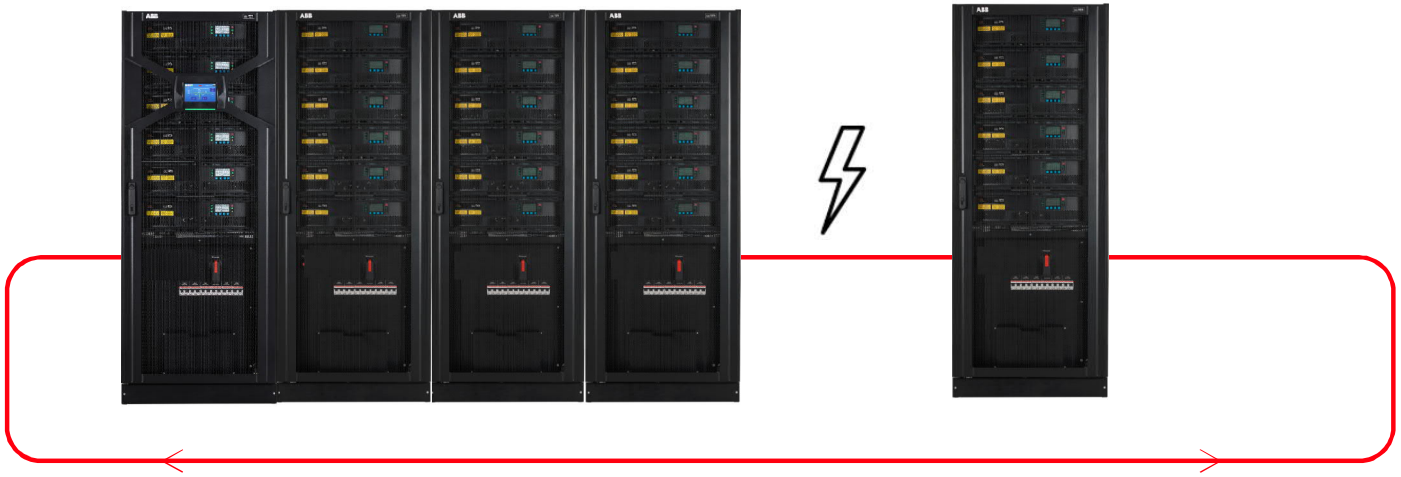
250 kW N+1 redundant power in one UPS cabinet

DPA INSIDE

Scalability with one to six 50 kW modules in one frame cabinet for 300kW or 250 kW (N+1) power

Secure ring communication technique

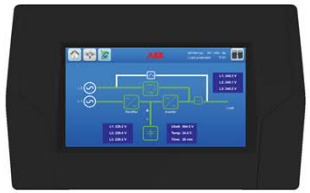
Fail-safe operation of extended parallel systems

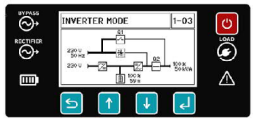


Fail-safe operation for high power applications
When multiple DPA 250 S4 cabinets are connected in parallel for capacities beyond 250 kW, secure ring communication ensures system reliability is maintained, and that there is no single point of failure.
The ring technique loops back the parallel communication cable from the last frame in the system. This introduces an alternative communication path in case one cable in between two frames is disconnected for some reason.

PA 250 S4 User interface

Easy of monitoring at system and module level



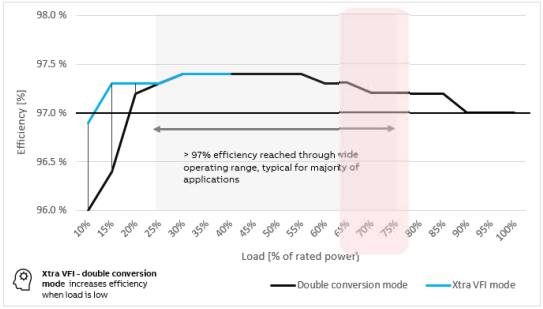


Touchscreen system graphical display (HMI)
enabling the operator to perform monitoring and measuring of the power flow through the UPS system, individual UPS modules and batteries, monitoring of UPS operational status, 1'000 events and alarm history, UPS setting configuration and UPS data.

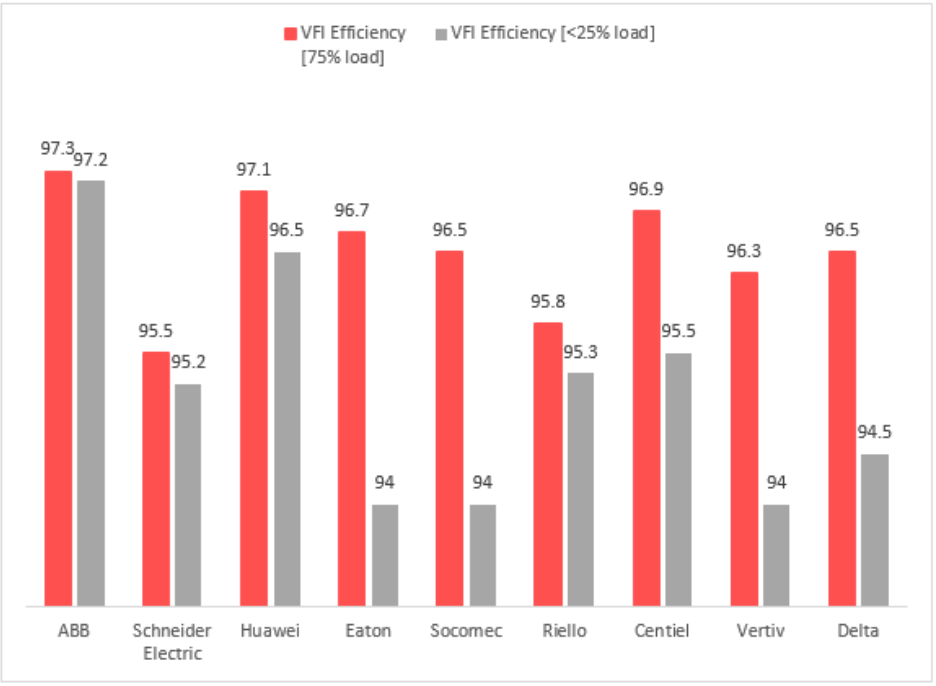
DPA control panel
Enable the operator to manage and monitor the UPS module. The LCD display shows the power flow, UPS module status and local measurements.

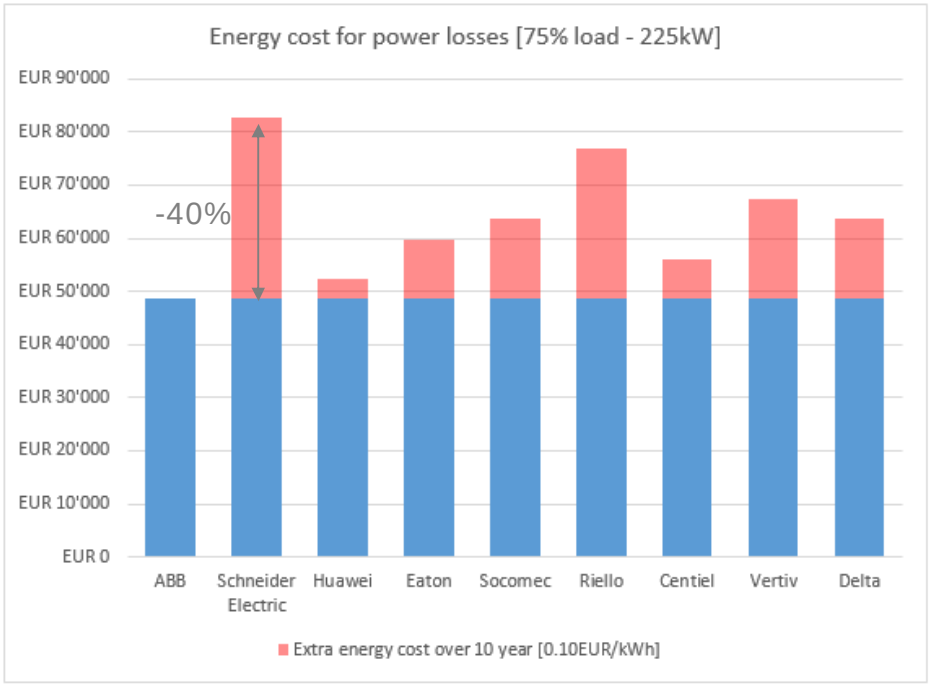
DPA 250 S4 – VFI Mode

Reduce your operational costs over time up to 40% against co



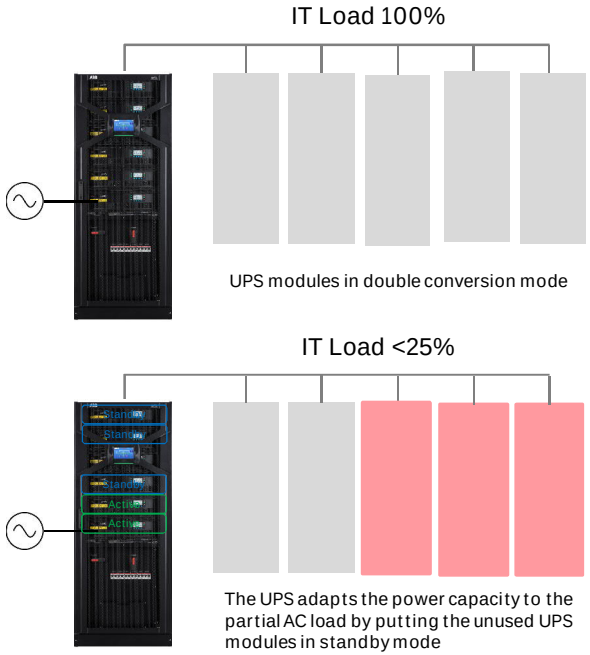
DPA™ INSIDE

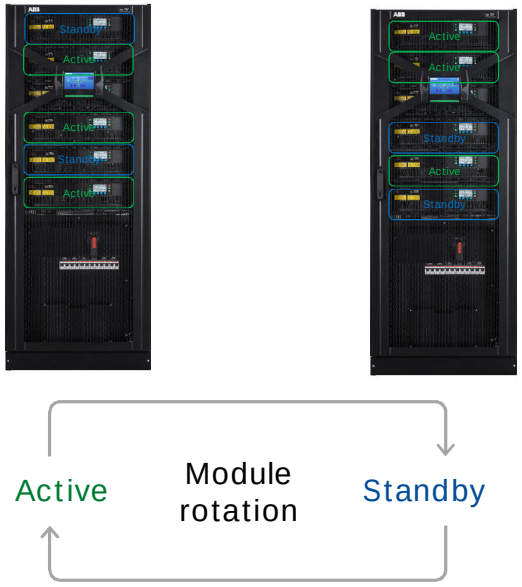




Xtra VFI – double conversion mode

Maximizes efficiency





The UPS system autonomously decides which UPS module goes into stand-by mode. The system shall rotate/swap the UPS modules between the double conversion mode and the stand-by mode to extend the operating life and equalize aging.

DPA 250 S4

Scalable and redundant power with the best efficiency for your DC infrastructure

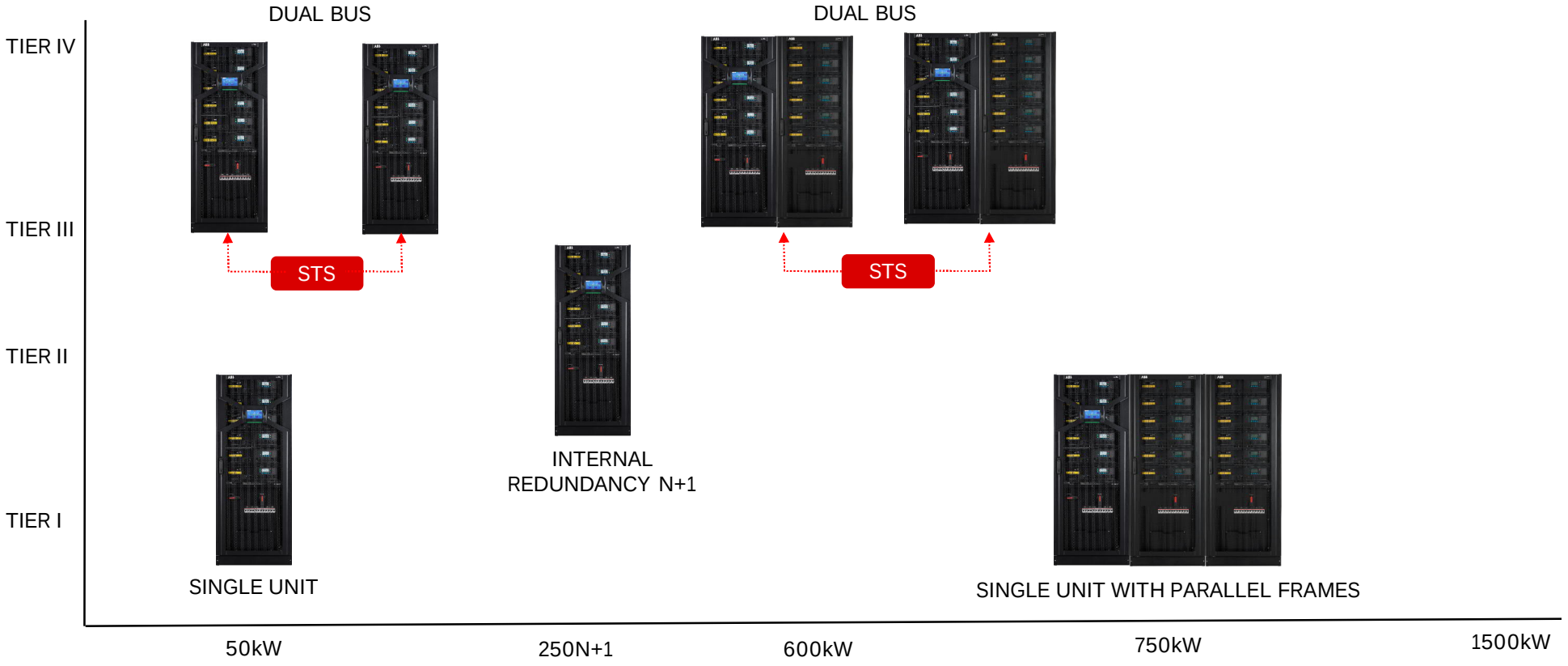


ABB POWER PROTECTION

Conceptpower DPA 500

The true modular UPS for high-power applications

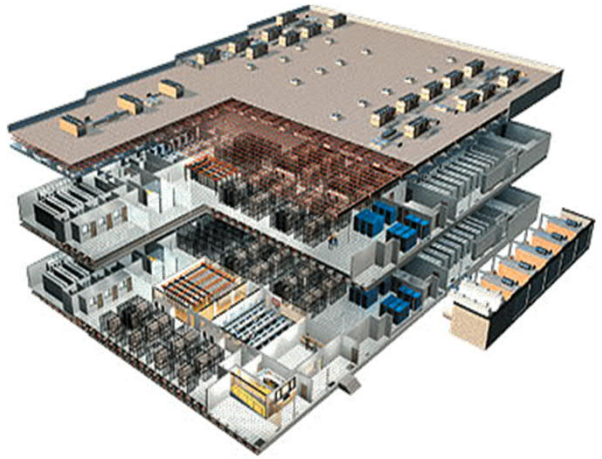
LONG LEQUANG

UPS solutions for data centers

As of today

Every data center has a business running in it – or it is the business

1. The business defines the white space: servers, data storage, network gear, etc
2. The servers (size and number) and the criticality of the processes running on the servers define the powering concept, gray space
3. The powering concept defines the UPS



As of today:

– Central UPS concept is common in large data centers ranging from hundreds of kW to 3-4 MW - defined by available power feed, LV transformer and size of generator set

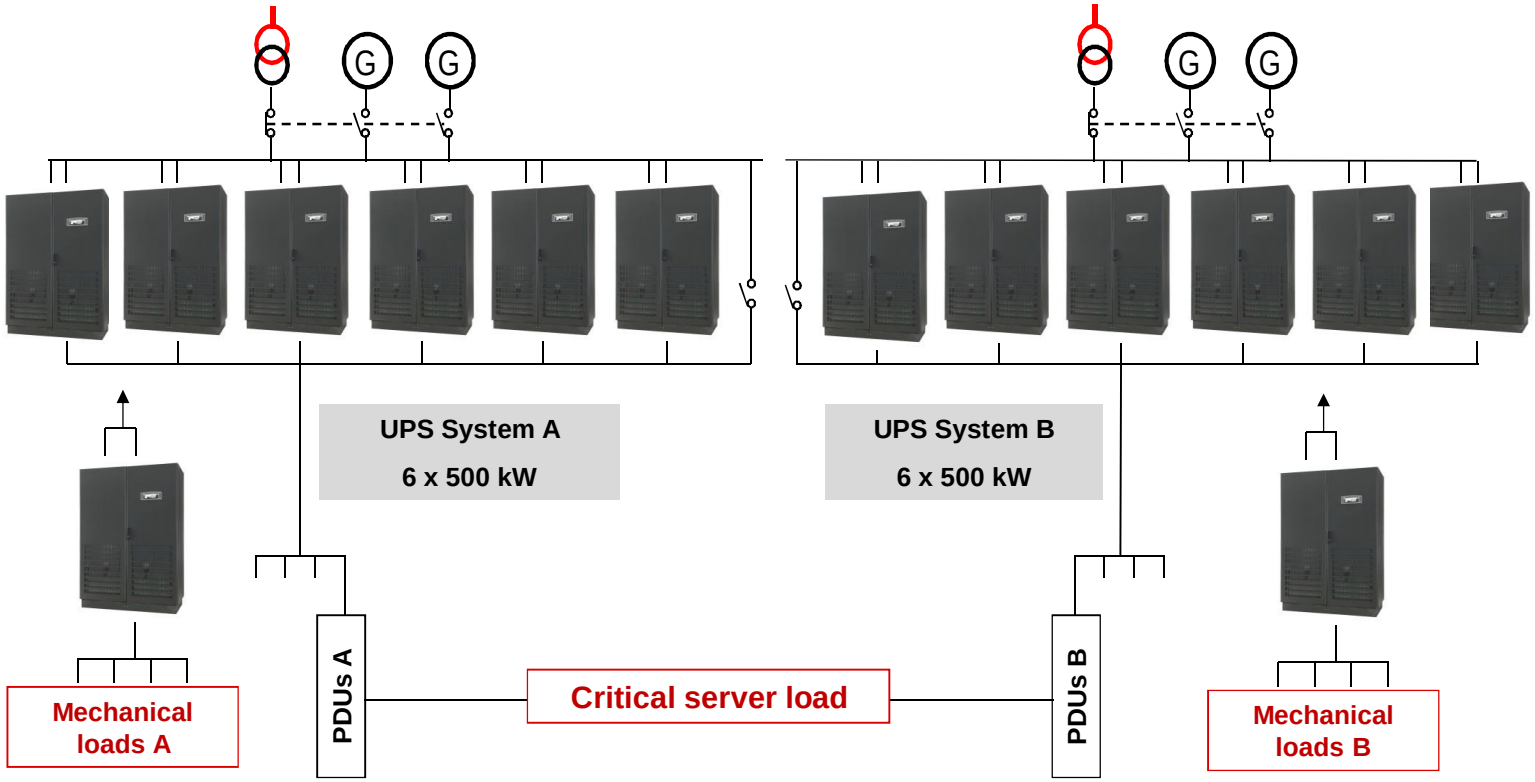
– Distributed (end-of-row) UPS concept is common in smaller data centers – typically from 1 rack up to 300-400 kW but can be used in larger facilities too

– Other variations increasing their share

– Both centralized and distributed can be built to any Tier rank (1-4)

Typical solution for high-power application

Centralized large Tier 4 system using monoblock UPS in parallel



Conceptpower DPA 500

100 – 3000 kW uninterruptable power in one system

Six frames can be connected in parallel for amazing 3 MW total system power!

- Multiple benefits follow from the advanced scalability
- Scaling the UPS capacity to match the load power is simple
- Adding redundancy to increase availability and reliability is easy
- Standardizing UPS system to serve load segments of different sizes is a reality

Conceptpower DPA 500

True modularity with fault tolerant DPA™ architecture

The 100 kW power module

– Each module can operate fully independently, thanks to ABB's Decentralized Paralleling Architecture (DPA™)

The 500 kW UPS frame

– 500 kW secured power in only 1.5 m²
– All modules are fully redundant with each other

The frame completes the system

– Bypass input breaker, battery fuse and output isolation switch for each module, dedicated
– System maintenance bypass switch as option
– Single and dual input feed supported
– Top and bottom cable entry supported
– The frame supports both separate and common battery arrangement

Top-of-the-line performance

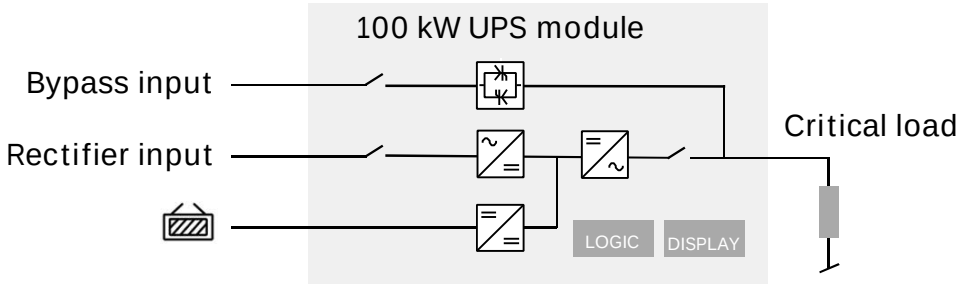
Technical specifications

Technical highlights

Classification IEC / EN 62040-3	VFI-SS-111
Module power rating	100 kW
Maximum power per frame	500 kW
Paralleling	6 frames (30 modules)
System power range	100 kW – 3 MW
Maximum power (N+1)	2.9 MW
Output power factor	1
Efficiency in double conversion	up to 96%
Efficiency in eco-mode	>99%
Power density per m²	up to 335 kW / m²
Input current distortion THDI	< 3.5%
Input power factor (PF)	0.99
Overload on inverter	20 minutes @ 110% load 5 minutes @ 125% load

UPS module

Each 100 kW module is a complete UPS



Proven technology for increased uptime

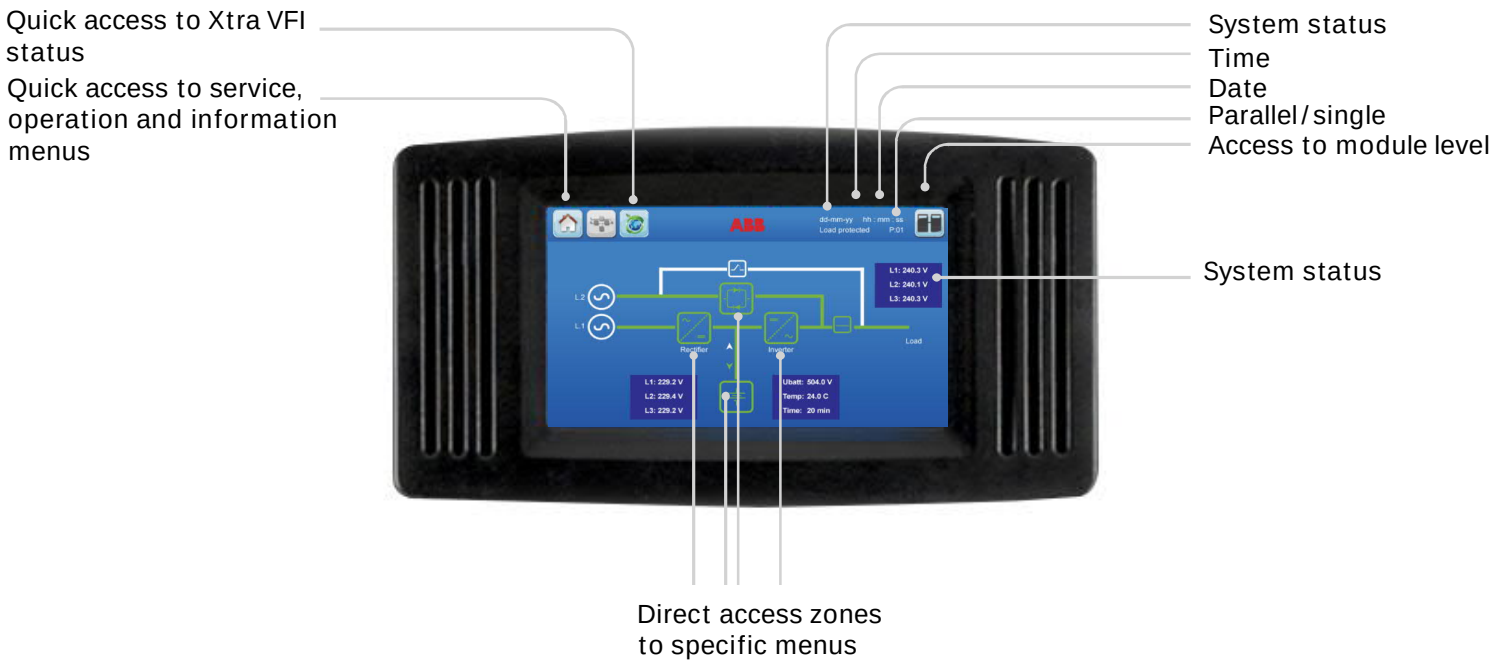
- Decentralized paralleling architecture (DPA™) minimizes central point of failures in the UPS and maximizes system availability

Each module embraces

- IGBT rectifier and inverter
- Independent control logic and display
- Battery converter
- Static bypass switch
- Inbuilt back-feed protection

User interface

Graphical, touch screen system display

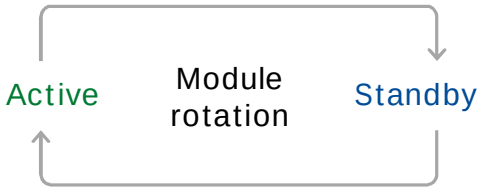


Xtra VFI – double conversion mode

Set up once, the rest is automatic

Working principle and main features

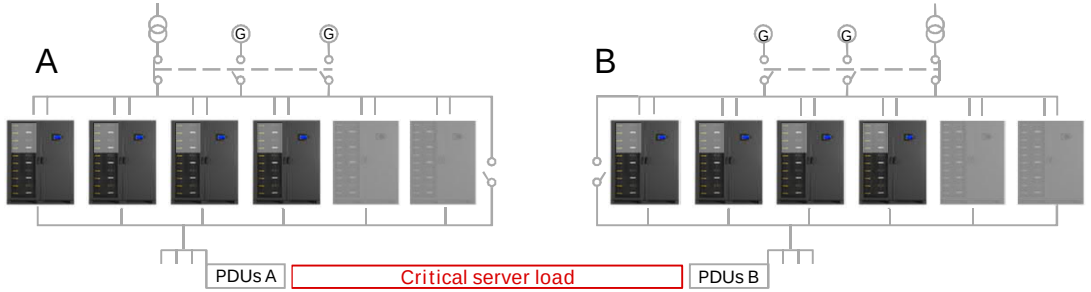
- Module rotation keeps aging of the modules balanced over time
- The feature scales, automatically and continuously, the UPS system active capacity according to the load power
- Desired redundancy level and the highest expected load step (both set by user) guarantee highest protection level for the load
- Works only if there are no alarms within the system. In case of an alarm, Xtra VFI is deactivated automatically → all modules switch to “Active” status
- Friendly user interface, fast and easy setup
- kWh counter records the total saved energy



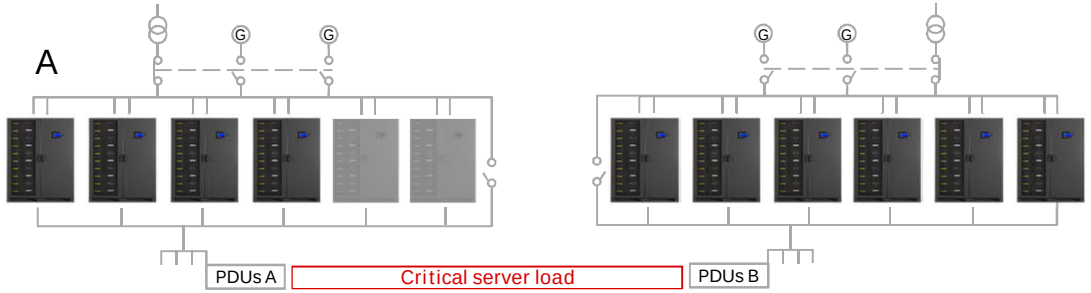
Conceptpower DPA 500

Scalability example – centralized Tier 4

Stage 1
4 x 300 kW
(A and B feed)



Stage 2
6 x 500 kW
(A and B feed)



Power demand can vary greatly, from 500 kW up to 3 MW and above.
Only a modular UPS is able to adapt to changes in power demand in a changing infrastructure!

Conceptpower DPA 500

Straightforward service concept

Benefits of modularity for maintenance and service

- Simplified spare parts inventory and minimized total value means minimized investment.
- Standardized service practices means minimized risk of human errors!
- Fast and easy service: one module is swapped/replaced in 15 min while the rest of the system remains in online mode!
- Concurrent repair possible simply by swapping a module.
- Front access and easy wiring allows fast and safe installation.

Operator training can be standardized and simplified since the UPS system is a standard solution.

Conceptpower DPA

Energy storage

Conceptpower DPA 500 – energy storage

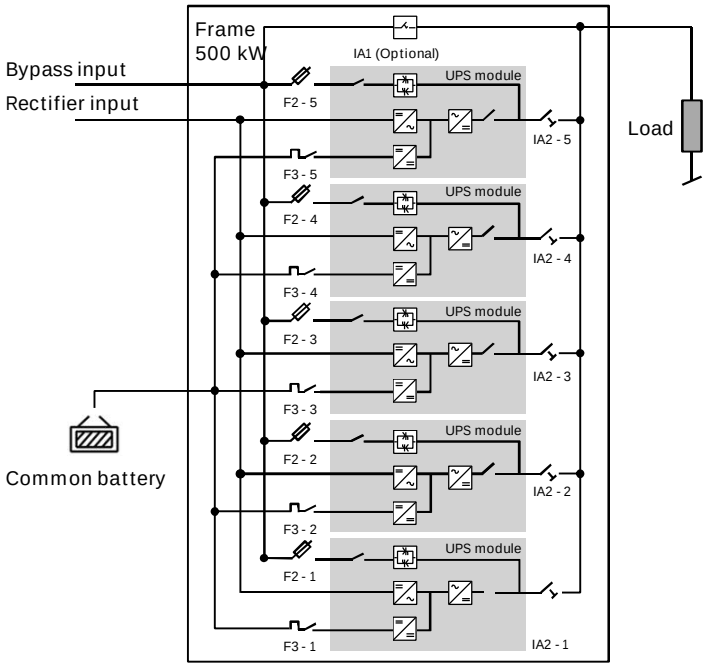
The choice is yours

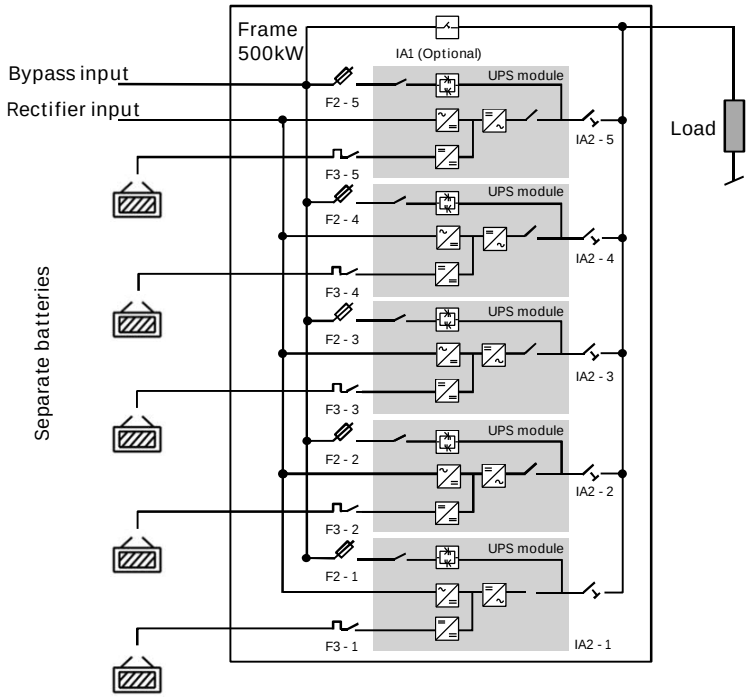
Variety of different energy storage solutions can be applied

- VRLA batteries
- Nickel cadmium batteries
- Lithium-ion batteries [1]
- Flywheel solutions
- Etc.

[1] Please consult with your local ABB sales support or reselling partner for details and validated configurations

SLD input / battery configuration





High Availability for Tier 3 & 4 Datacenter

With Decentralized Parallel Architecture

Source: Giga Information Group

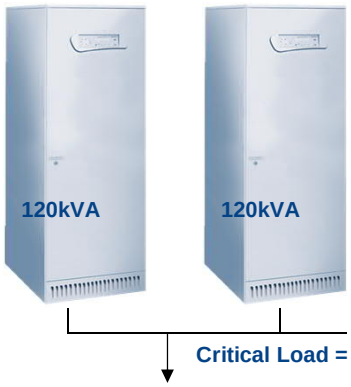
Availablility	Downtime	OK for
99.5%	3.7 days	Homes
99.9%	8.[illegible] hours	Homes
99.9[illegible]%	52.[illegible] minutes	Factories
99.999%	5.3 minutes	Hospital, Airports
99.9999%	32 seconds	Banks
99.9999999%	30 milliseconds	On-line market

99.999%

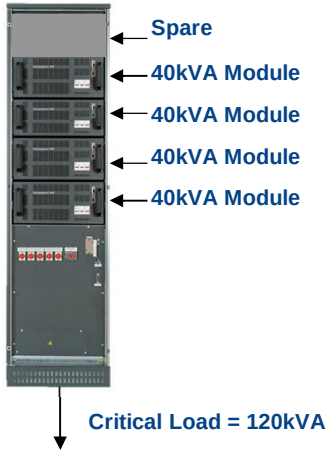
Formula for AVAILABILITY = MTBF / (MTBF + MTTR)

Availabilty – Impact of Mean Time to Repair

Traditional Free Standing 2 x 120kVA
(1+1) – Redundant Configuration



Advanced Modular 4 x 40kVA
(3+1) – Redundant Configuration



Availability: A = MTBFUPS / (MTBFUPS + MTTRUPS)

Example 2	Non - Modular (1+1) Redundant Configuration	Modular (3+1) Redundant Configuration
MTBF	1,250,000h	625,000h
MTTR	6h	0.5h
Availability	0,999990 (5 nines)	0,9999990 (6 nines)

"Availability improved by an order of 10"


Amway 安利
MOTOROLA
南方报业网 nfmedia.com
CSC
RISING+
中国华能集团公司 CHINA HUANENG GROUP
资拓科技
中国电信 CHINA TELECOM
中国移动 China Mobile
China unicom中国联通
THE VENETIAN Macao~Resort~Hotel 澳門威尼斯人·渡假村·酒店
swisscom
vodafone
SAMSUNG 三星电子
hp invent
IBM
中国农业银行 AGRICULTURAL BANK OF CHINA
中国银行 BANK OF CHINA
辽宁省农村信用社 Liaoning Rural Credit Cooperatives
HSBC
UBS
ORACLE
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哈尔滨出入境检验检疫局 HARBIN ENTRY-EXIT INSPECTION AND QUARANTINE BUREAU
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YINGLI SOLAR 中国英利
福建省石狮热电有限责任公司
HYUNDAI
SKODA AUTO
Lloyds TSB
EADS
VONTOBEL
宁波市信息中心 宁波市宏观经济预测监测中心
龙岩信息化
YAN'AN PEOPLE'S HOSPITAL
12306
Coca-Cola
BARCLAYS
Le MERIDIEN
HILTI
ROHDE&SCHWARZ
EDEKA
中国海油 CNOOC
上海先进半导体制造股份有限公司 asmc
RBS The Royal Bank of Scotland
SmarTone 數碼通
Deutsche Bank
Deutsche Post
Williams.
rtve
Huizhou International Container Terminals HICT
上海柯斯软件 SHANGHAI COS SOFTWARE
Danfoss
Williams. Leading Energy Solutions.
BLAUPUNKT
sacon 帅康
Honeywell
SIEMENS
Nuffield Hospitals
CORREOS
Basler Versicherungen
Metropolitano de Lisboa
Hilton
AEG
eltra
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Nestlé

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