Schneider new UPS “V and Easy Series”

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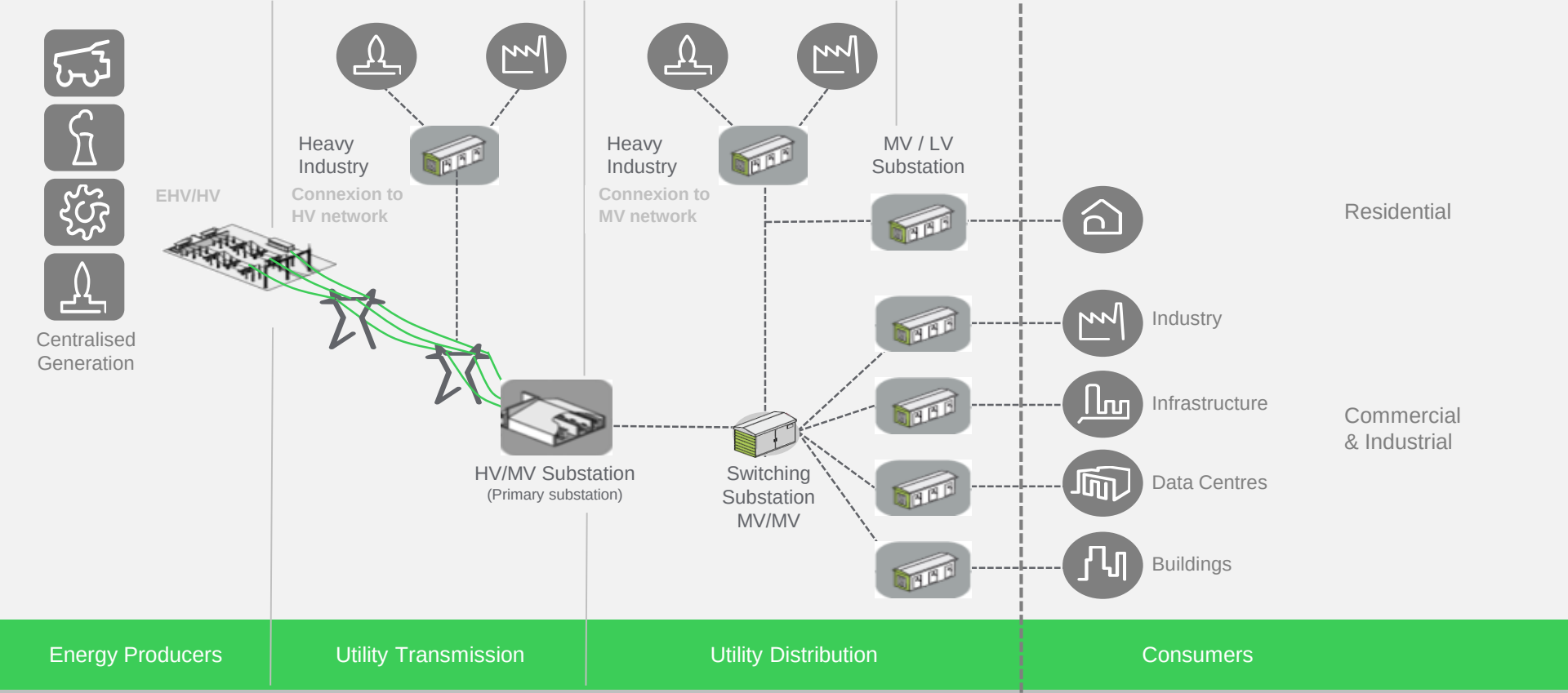
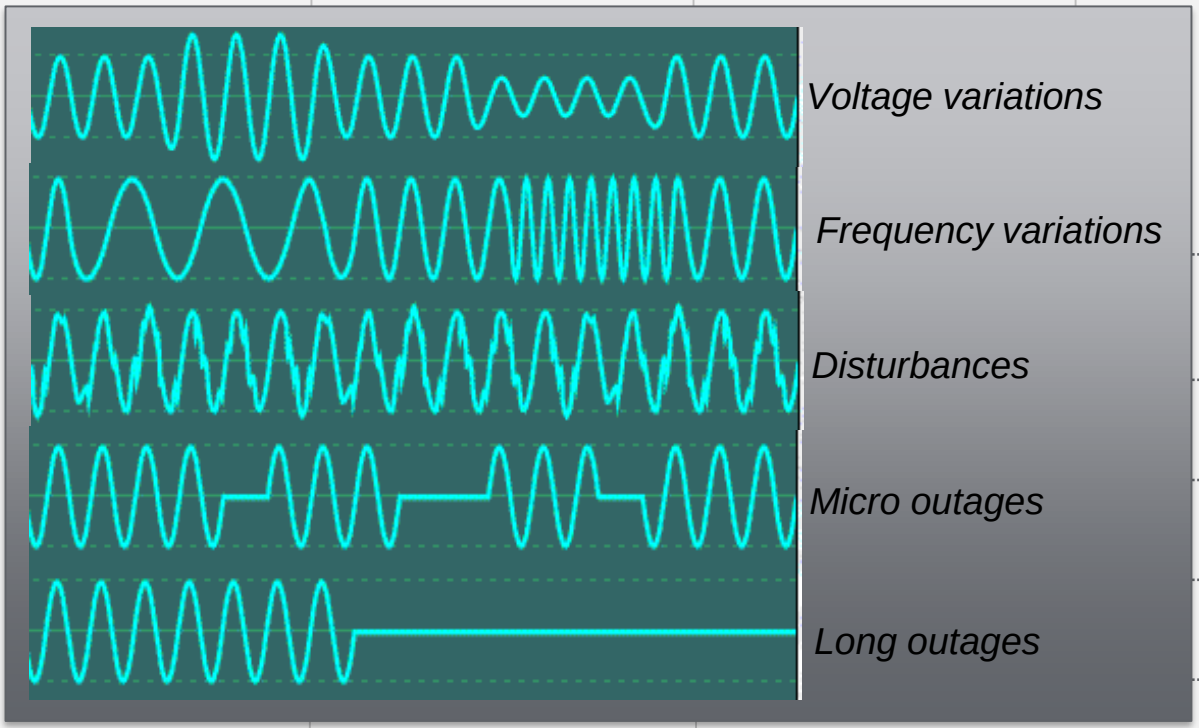
Life Is On APC by Schneider Electric

3Ph UPS Agenda

- **Secured Power Introduction**
- UPS topologies
- Offer positioning
- Easy UPS series
- Galaxy V series
- Architecture capabilities
- Lithium Ion battery


Centralised Generation
EHV/HV
Heavy Industry
Connexion to HV network
Heavy Industry
Connexion to MV network
MV / LV Substation
HV/MV Substation
(Primary substation)
Switching Substation MV/MV
Residential
Industry
Infrastructure
Data Centres
Buildings
Commercial & Industrial
Energy Producers
Utility Transmission
Utility Distribution
Consumers



Voltage variations

Frequency variations

Disturbances

Micro outages

Long outages

Residential

Industry

Infrastructure

Data Centres

Buildings

Commercial & Industrial

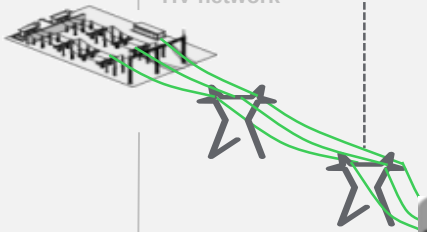
Energy Producers | Utility Transmission | Utility Distribution | Consumers

Power failure, Voltage spikes, Under voltage, Frequency variations

Harmonics, Power Factor

Centralised Generation

EHV/HV



Heavy Industry

Connexion to HV network

HV/MV Substation
(Primary substation)

Heavy Industry

Connexion to MV network

Switching Substation MV/MV

MV / LV Substation

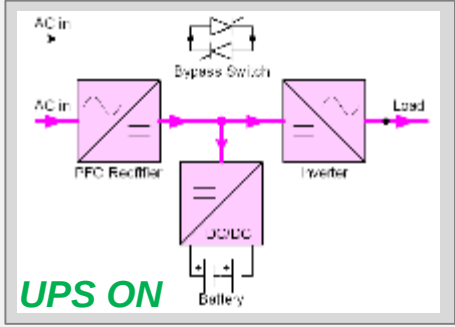
Industry

Infrastructure

Data Centres

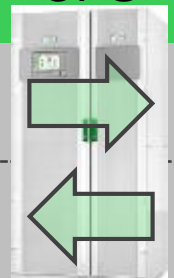
Buildings

Commercial & Industrial



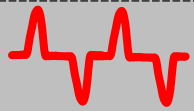
Energy Producers | Utility Transmission | Utility Distribution | UPS | Consumers

Power failure, Voltage spikes, Under voltage, Frequency variations



Reliable & safe Power

Harmonics created by the load is reduced by the UPS



Harmonics, Power Factor

3Ph UPS Agenda

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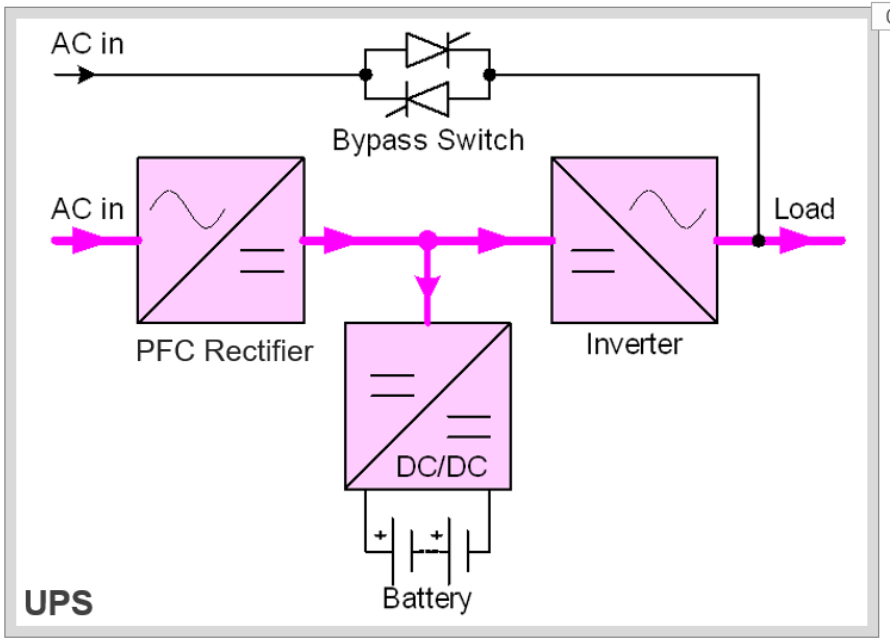
3Ph UPS offer

A comprehensive and wide offer for all types of needs.

Double conversion topology, VFI

- Double Conversion (On-Line): (Apparent Power from 1kVA to 4.0MW)
- VFI (Voltage Frequency Independent) according to IEC62040-3



Single phase & three-phase UPS

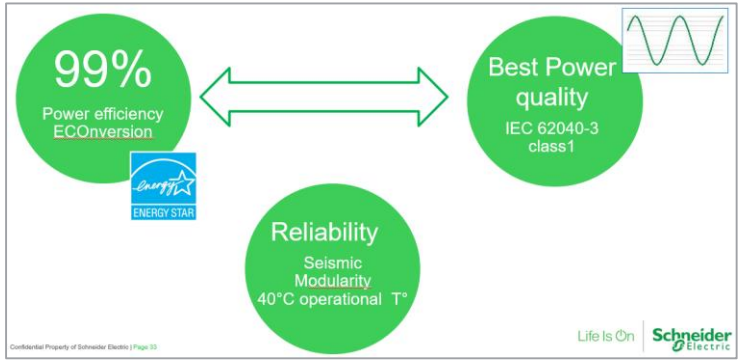
Voltage fluctuation	Frequency fluctuation	Disturbances	Micro outages	Long outages
●	●	●	●	●

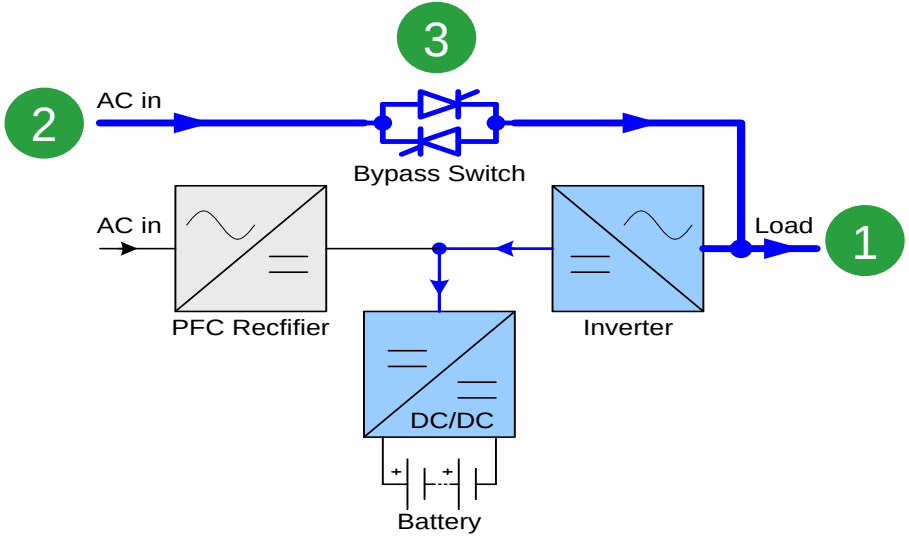
3Ph UPS offer

ECOnversion mode.

Multimode operation

Voltage fluctuation	Frequency fluctuation	Disturbances	Micro outages	Long outages
●	●	●	●	●





ECOnversion is the most efficient mode to supply sensitive loads.

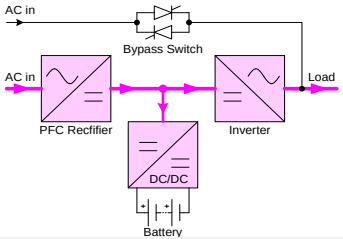
1. IEC 62040-3 Class 1
   No break during transfer phases
2. Power Factor correction on main 2
   Ease Genset operation
3. Controlled static switch like a diode (patent)
   Guaranty to isolate the load from upstream shot circuit

Galaxy V series – 99% efficiency with ECOnversion mode

Multimode topology

Double Conversion

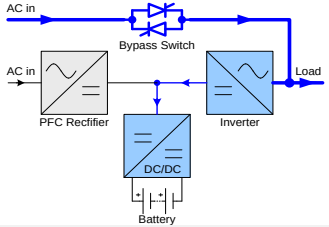
Load is supplied through the double conversion path



Regulate Voltage	***
Regulate frequency	***
Recharge batteries	***
“No” transfer time	***
R1 Pf Corr.	***
R2 Pf Corr.	
Efficiency :	97.0%

ECOnversion mode

Load is supplied directly on the utility through the main2 static switch, but inverter is kept operating in parallel



Regulate Voltage	**
Regulate frequency	**
Recharge batteries	***
“No” transfer time	***
R1 Pf Corr.	***
R2 Pf Corr.	***
Efficiency :	99.0%

Benefits

- Ultrahigh efficiency up to 99% (third-party certified)
- Keeps excellent load protection
- Input power factor correction and no harmonics
- Continuously charged batteries
- No break transfer: Compliant with IEC 62040-3 Class 1 output voltage of UPS standard

3Ph UPS Agenda

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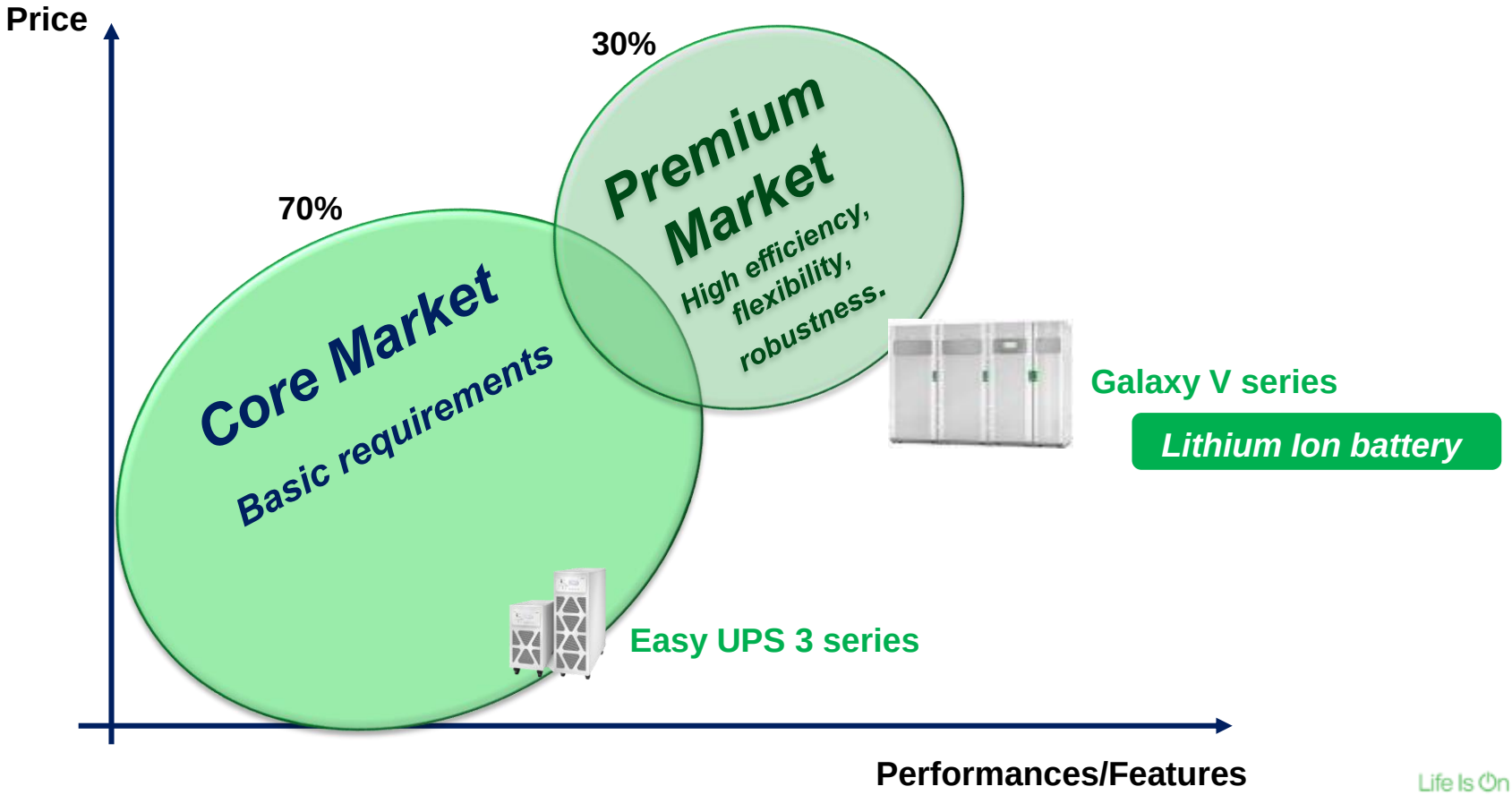
- UPS topologies
- **Offer positioning**
- Easy UPS series
- Galaxy V series
- Architecture capabilities
- Lithium Ion battery

The most comprehensive offer to cover al corners of the UPS business

UPS types	Data Center	Industry	
		Clean environment	Harsh environment
Modular	 Symmetra		
Premium Market	 Galaxy V series		Gutor PXC
Core Market	 Easy UPS		

3Ph UPS Market segmentation



Multiple offer strategy

Galaxy V series

Premium Market

- **Lead through innovations**
  - ECOnversion 99%
  - High density
  - Robustness (seismic, 40°C)
  - Modular concept
  - Li-ion & NiCd compatibility

+ Very high power efficiency

+ Advanced Power protection

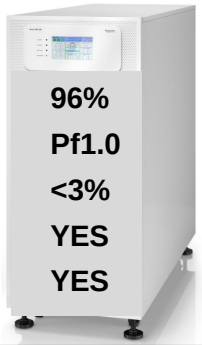
+ Risk management

Low operational costs (OPEX)

Easy UPS 3 series

Core Market

- **Market requirements**
  - Efficiency 94%
  - Pf 0.9
  - THDI <5%
  - Parallel up-to 4 units
  - ECO mode



Easy UPS over the Market

Easy

SE quality & Services

Performances

Competitive prices

Low costs (CAPEX)

3Ph UPS Agenda

- Secured Power Introduction
- UPS topologies
- Offer positioning
- **Easy UPS series**
- Galaxy V series
- Architecture capabilities
- Lithium Ion battery

New Easy UPS 3 series

Easy UPS 3S 3:1 10-15-20-30kVA
Stand alone with integrated modular battery
Up to 4 units in parallel

Easy UPS 3S 3:3 10-15-20-30-40kVA
Stand alone with integrated modular battery
Up to 4 units in parallel

Easy UPS 3M 3:3 60-80-100-120-160-200kVA
Stand alone with external battery
Up to 6 units in parallel
Modular fault tolerant

EASY UPS 3S to gain Market shares

Easy to stock
Battery cartridges can be stocked separately

Easy to install
Very light weight. UPS on wheels and easy connection

Easy to select
Only 10 SKUs to cover 80% of requests

Easy to operate
Intuitive HMI and integrated MBP

Symmetra series

Galaxy V series

Easy UPS series

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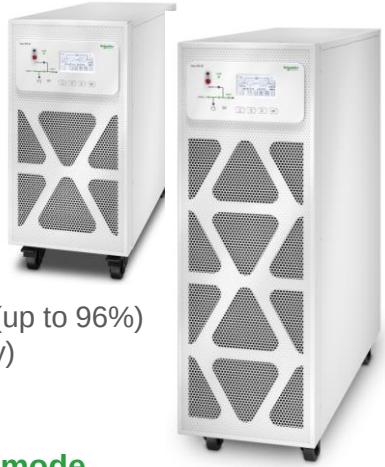
Value Features

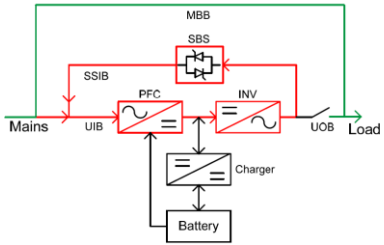


- ✓ **Optimize Efficiency**
  - Double Conversion Mode (up to 96%)
  - ECO Mode (99% efficiency)
- ✓ **KVA = KW**
- ✓ **THDI <3%**
- ✓ **Common battery under 1+1 mode**
- ✓ **Parallel up to 4**
- ✓ **EPO (Emergency Power Off)**
- ✓ **Backfeed protection:** Dry contact
- ✓ **Robustness against Harsh Environment**
  - Conformal coating on PCBA
  - In-build replaceable dust filter
  - 60s@150%overload, 10min@125%overload
  - Operating temperature up to 40C
- ✓ **Flexibility for wider application**
  - Breaker box/kit, empty battery cubic for long autonomy
  - SNMP / Modbus TCP/IP / Dry contacts for connectivity
  - 7AH & 9AH battery modules
  - Frequency Converter

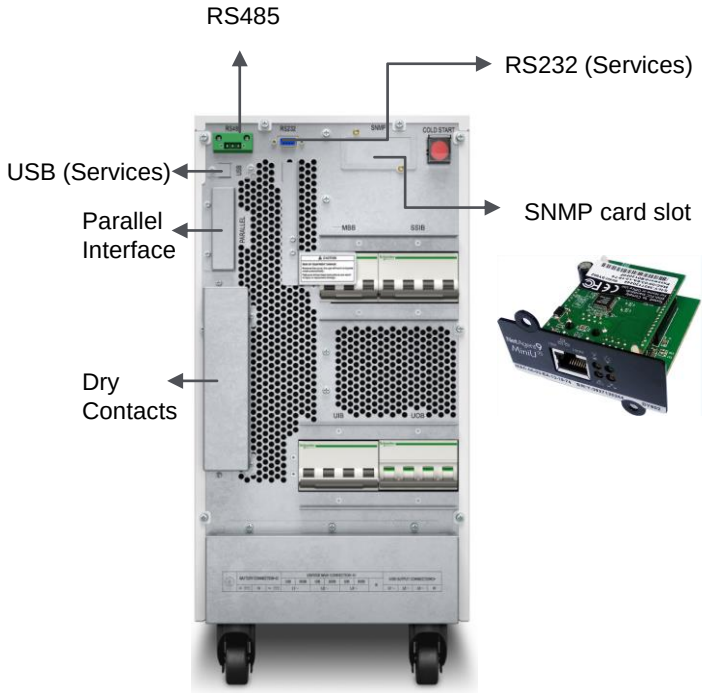
Combo design concept for Easiness

- Easy All-In-One solution:
  - ✓ Transparent battery installation to be handled by non-Schneider electricians
  - ✓ Easy expansion of backup time – Pay as you grow
  - ✓ Easy stock management in warehouse
- Easy System configuration:
  - ✓ With input/output/bypass breaker build in makes it no need for external breaker cabinet . Less system complexity and Capex investment plus saving on footprint
  - ✓ Schneider brand breaker for best in class quality and serviceability
- Easy Service :
  - ✓ Easy installation and replacement of dust filter with special magnetic front door design
  - ✓ Easy *Plug in and use* / *Plug out and replace* cartridge battery solution.

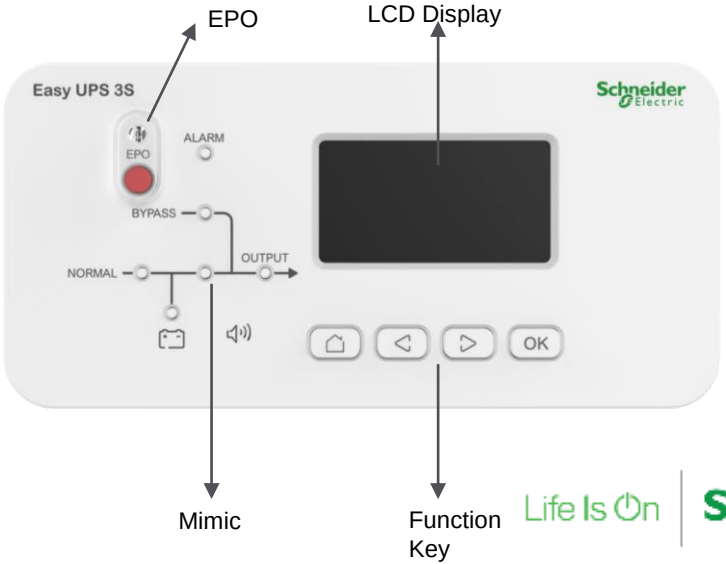
- Easy Test function for quick commissioning (No load bank required for loop test)



Communication interfaces



- 10 dry contacts (configurable)
- Modbus TCP/IP (RS485)
- SNMP (Optional)
- Parallel cards are embedded in standard
- RS232 & USB share 1 port (Services)



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Auxiliaries

3Ph to 3Ph:
10/15/20/30/40kVA
- High Tower AIOB
- Lower Tower 0 min

3Ph to 1Ph
10/15/20/30kVA
- High Tower AIOB
- Lower Tower 0 min

UPS 0 min
3:3 10/15/20/30/40kVA
3:1 10/15/20/30kVA

UPS AIOB
3:3 10/15/20/30/40kVA
3:1 10/15/20/30kVA

Auxiliaries

External bypass system

Empty battery Cabinet 700mm

Battery Breaker Box

Battery Breaker Kit

Network card

Parallel kit

Temperature sensor

Battery Modules
- **7AH**
- **9AH**

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New Easy UPS 3 series

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Stand alone with integrated modular battery
Up to 4 units in parallel

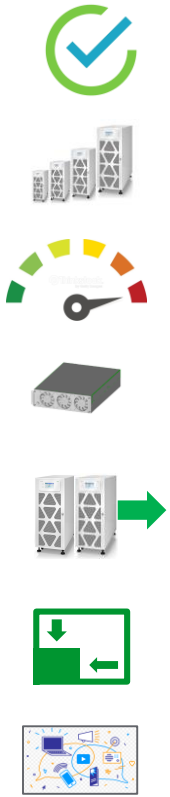
Easy UPS 3S 3:3 10-15-20-30-40kVA
Stand alone with integrated modular battery
Up to 4 units in parallel

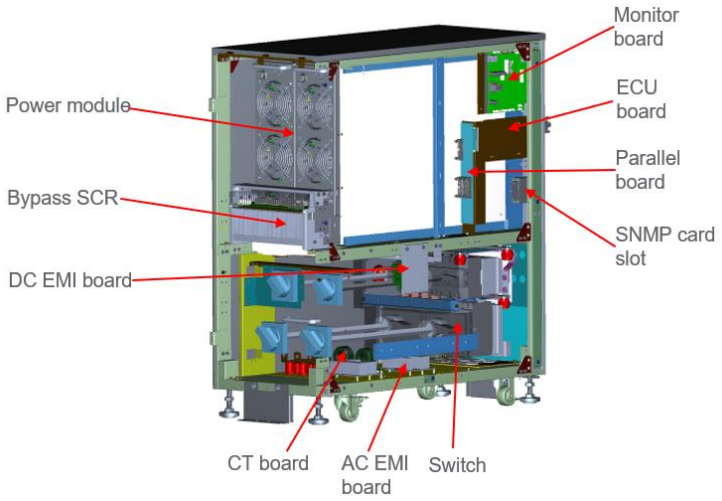
Easy UPS 3M 3:3 60-80-100-120-160-200kVA
Stand alone with external battery
Up to 6 units in parallel
Modular failt tolerant

Easy UPS 3M – TOP 7 features

Easy to place, to stock, to select, to set-up, to operate

1. **Over Core Market requirements**
    1. Pf1.0, THDI <3%, efficiency 95.5%, ECO mode 99%, parallel capabilities up to 6 units
2. **Full and consistent offer from 10kVA to 1.2MW**
    1. Same look, same performances, same features…
3. **kVA = kW => output Pf1.0**
    1. Provide more power
4. **Modular architecture, with redundant Power Modules**
    1. Power Modules for fault tolerance and shorter mean time to repair (Except for 60kVA)
5. **Parallel up to 6 units**
    1. Safe maintenance allowed, load supplied and protected.
6. **Very compact design**
    1. E3M 100kVA vs G55 100kVA -54% footprint -75% volume
    2. E3M 200kVA vs GVM 200kVA -42% footprint -62% volume
7. **Communication interfaces (Optional)**
    1. All standard protocols are available





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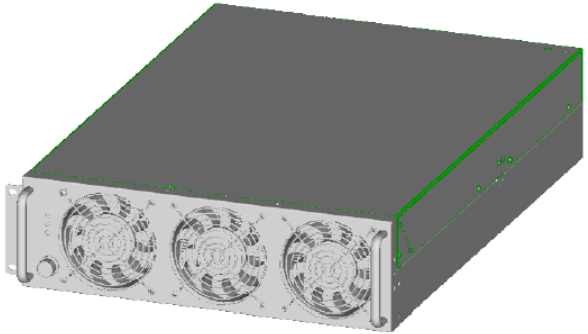
Easy UPS 3M – Power Modules

Easy to place, to stock, to select, to set-up, to operate

- Power Module defines most of the system performance: PFC, Inverter, Charger
- High power density, up to 60 kW with 3U size
- Flexible battery voltage: 32-50 blocks supported
- Integrated Input, Output and Battery fuses
- Temperature monitoring on PFC, Inverter, charger
- Advanced FAN speed control contributes to less loss
- Weight < 33kg



UPS model	60 kVA	80 kVA	100 kVA	120 kVA	160 kVA	200 kVA
Module types	60 kVA*1	40 kVA*2	50 kVA*2	60 kVA*2	54 kVA*3	50 kVA*4
Module size	3U	3U	3U	3U	3U	3U

Static switch and control boards are not modular

Easy UPS 3M – Auxiliaries

Standard UPS offerings:

- 60 kVA
- 80 kVA *May*
- 100 kVA
- 120 kVA
- 160 kVA *Sept*
- 200 kVA

Standard Aux. items:

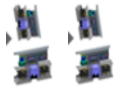
Classical Battery Cabinets

Config. 7A | Config. 7B | Config. 10A | Config. 10B | Config. 10C | Config. 10D | Config. 10E

Battery Breaker

60-80 kW | 100-200 kW

Battery Breaker Kit



60-80 kW
100-200 kW

Empty Battery Cabinets

700mm | 1100mm

AUX Cabinet

700mm

Option Kits

Parallel Comm. Kit

Network Card

Maintenance System Bypass Panels

60-200 kW

3rd Party:
Custom parts or Customer supplied parts

3rd party battery solution

3rd party battery solution

3rd party batteries

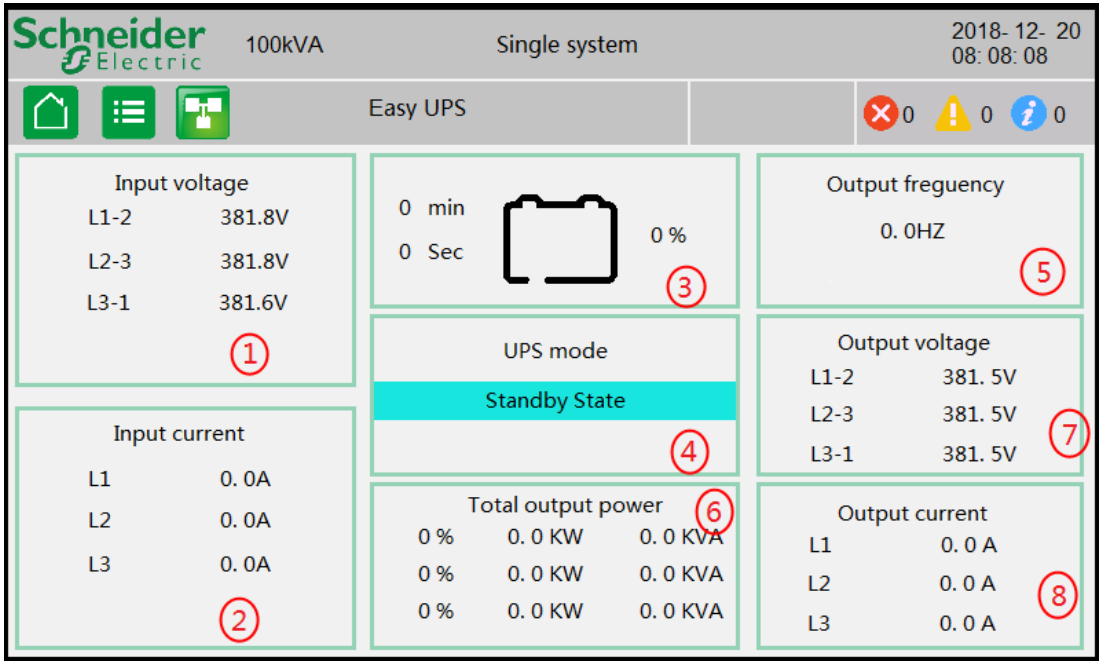
3rd party transformer

ETO parts:
Engineering To Order

Easy UPS 3M 60-200kW

Color touch screen – Home screen

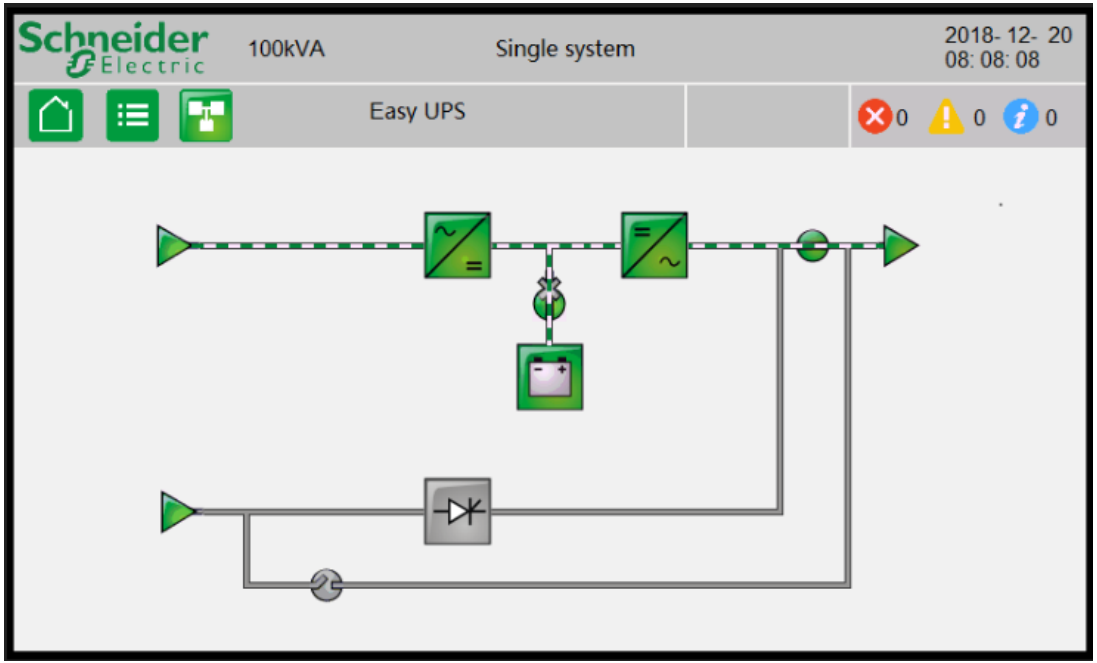
1. Input three-phase line voltage
2. Input three-phase current
3. Battery backup time, battery capacity rate
4. Operating mode of UPS
5. The output frequency
6. Phase load rate, active power, apparent power
7. Output 3-phase line voltage
8. Output 3-phase current



Easy UPS 3M 60-200kW

Color touch screen – Mimic diagram

- Indicates UPS and system operation modes
- Green-white line shows power flow through the UPS system
- Active modules are framed in green, inactive modules are framed in grey



3Ph UPS Agenda

- Secured Power Introduction
- UPS topologies
- Offer positioning
- Easy UPS series
- **Galaxy V series**
- Architecture capabilities
- Lithium Ion battery

New Galaxy V series

Galaxy VS 3:3 20-30-40-60-80-10-120-150kVA (Pf1.0)

Stand alone with external battery
Up to 3+1 units in parallel
ECOnversion mode

Galaxy VM 3:3 160-200kVA (Pf 0.9)

Stand alone with modular or traditional battery
Up to 4 +1 units in parallel
ECOnversion mode

Galaxy VX 3:3 500-750-1000-1250-1500kW

Stand alone with external battery
Up to 4+1 units in parallel with GVX 1.0MW
Modular with 250kW PM
ECOnversion mode

Galaxy VS – TOP 7 features

Increased availability. Reduced operating costs. First class power protection for critical infrastructure.

1. **New patented hybrid technology provides up to 97% efficiency with Double Conversion mode**
   Electricity savings in full protection mode at every load level

2. **99% efficient with patented ECOnversion mode**
   Recover your initial investment within two years through energy savings

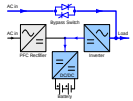
3. **Possible Redundancy of Power Modules**
   With GVS 100kW the 2 x 50kW PM can be redundant if the load level is below 50kW

4. **Compact design**
   High-density technology and full front access make Galaxy VS a footprint saver well suited for confined spaces

5. **Maximum availability thanks to modular architecture**
   Critical system components built as modules, for fault tolerance and shorter mean time to repair

6. **Ready for Lithium-ion and NiCd types of battery**
   Long-life, compact, and reliable energy storage

7. **EcoStruxure ready**
   Anytime, anywhere monitoring and service support via Smartphone app



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Offer Spec - Galaxy VS 20-100kW Standalone

Galaxy VS Features:

- Standalone version from 20kW up to 100kW To be installed with external Batteries
- **Multi-mode operation** for best performance for a given environment (Double conversion, ECOnversion mode™)
- **4.3" Touch Colour Display** - feel and features like Galaxy VM & VX.
- **20 display languages** available
- Up to **4 UPS's in parallel**
- **30% less footprint** compact vs. G5500
- Low MTTR and **light modules** ~35kg
- Supports **VRLA, NiCd & Li-Ion** batteries
- Supports **common battery strings (3+1 UPS units)**
- **Connection terminals via the front** in the bottom section
- **Build-in Back feed** contactor
- **Start-up 5x8** included
- **EcoStruxure IT App** ready
- Look and feel like the Galaxy VM & Galaxy VX

Galaxy VS Spec:

- Commercial ratings: **20, 30, 40, 50, 60, 80, 100kW**
- **Small footprint**: 521 x 1485 x 847mm (WxHxD)
- **97% Efficiency in double conversion**
- **99% Efficiency in ECOnversion**
- **65kA** Input short-circuit level
- **PF 1.0** "kVA = kW" 0.7 leading to 0.7 lagging without derating
- Supported **Variable Battery Voltages** / Battery Blocks:
  - Galaxy VS 20kW, 30kW, 40kW, 60kW & 80kW Voltages Nom. 192V to 288V **(Blocks 32 to 48)**
  - Galaxy VS 50kW & 100kW supported Battery Voltages Nom. 240V to 288V **(Blocks 40 to 48)**
- **Charge capacity from 20-40%** depending of output load level
- **Design life: 10 years** (Service life fans: 5 years)

Design Benefits - Galaxy VS 20-100kW Standalone

Intelligence Module
"System Controller" interfacing with all critical modules in the UPS

Power Modules
Safe-swap slide in/out Power Module.
Fans in module for easy replacement.
Superb core performances PF1, Hight 3U, Efficiency 97%, ECOnversion 99%

Static Switch Module
With its modular design, it can be replaced without installing an external Bypass

Large cabling section
Installation and cabling work particularly simple.
Supports both Copper or Alu. cables
Suitable for 3- or 4-wire installation (with or without neutral) for more flexibility.

Casters & Lightweight design
Allows for easy maneuverability

Network management
Ethernet and modbus connection included in standard. 8 dry contacts permit to monitor the system.

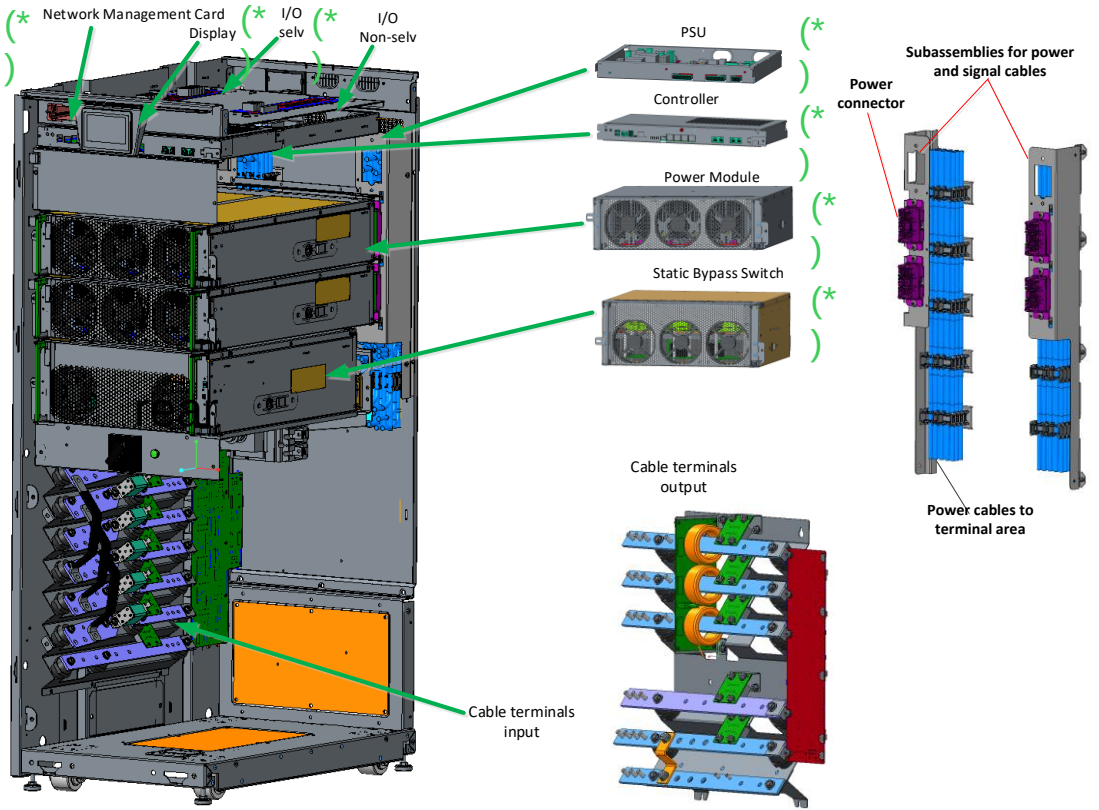
Powerful Charger (in the Power Module)
Recharge batteries 2 to 3x faster by using up to 40% of the system power for the charging

Internal Maintenance Bypass
Simplifies service operations, eliminates risk of error

Reinforced design
Full Front access for Installation and maintenance
No rear access needed, no shadow footprint
Replaceable dust filter in the front door
Conformal-coated boards, (PM, SSW, IM)
Short-circuit: 65kAIc protection
Interferences: EMC category C2
Seismic (with option kit)

Galaxy VS UPS – overview and service concept

- Front access service and installation
- Robustness for quality:
  - Cables instead of busbars
  - New design of rear power interface
  - No openings in top

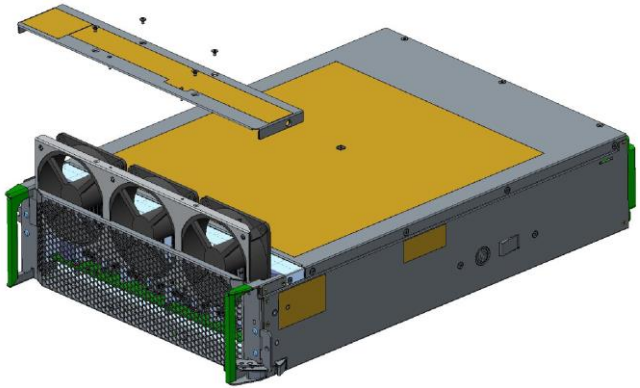


* All modules and many PCBs can be serviced simply using the internal bypass

Power Module highlights

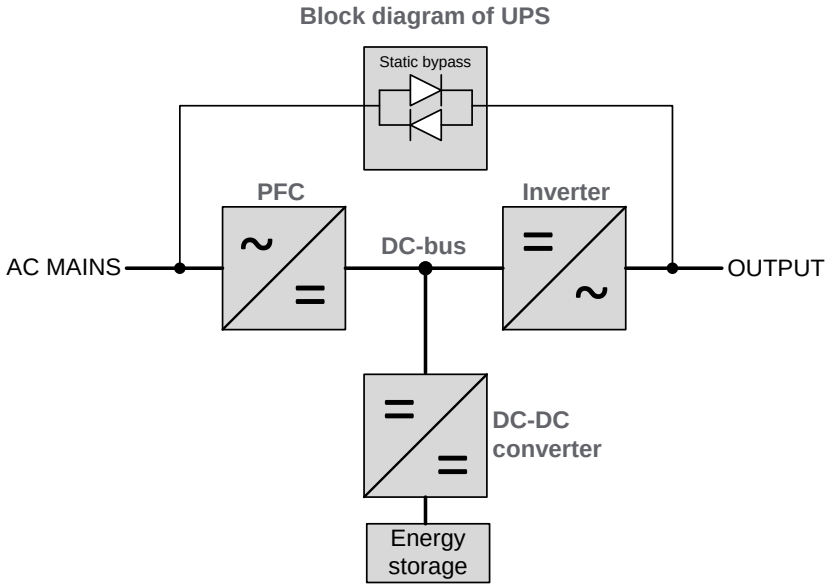
Easy service and low MTTR

- Power Module can be replaced while in maintenance bypass in less than one minute
  - No on-site Power Module repair
- Touch proof connector in back → Eliminate risk of arc flash or electric shock during service
- Weight < 37kg
- Generic worldwide spare-part SKU
- FAN module in front for easy replacement, while module is still placed in frame



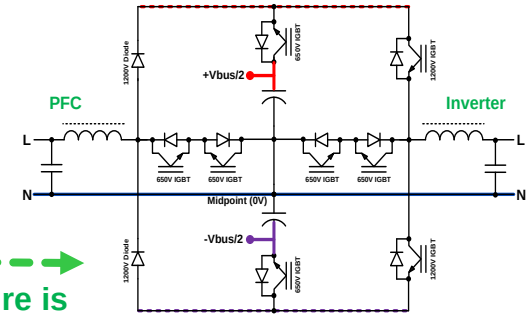
Topology evolution

- Galaxy VS target efficiency was **97%** in Double Conversion mode
  - Efficiency of each converter (PFC, Inverter) must be around **97.4%** to obtain target!
- Preferred PWM switching frequency ≥16kHz to be non-audible

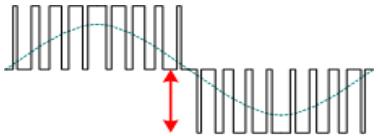


Galaxy VS – 97% efficiency with patented hybrid technology

Galaxy VS Soft-switch hybrid architecture

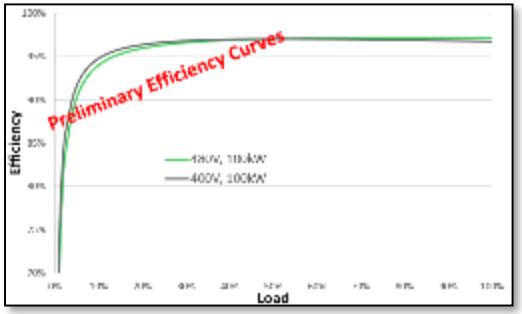


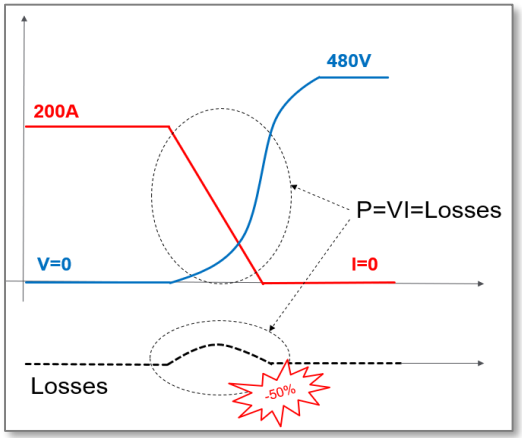
Future is now



”Switching voltage” = 50% x Vbus (e.g. 450V) Lossless switching for 50% of the time

=> Lowest switching losses (25%)



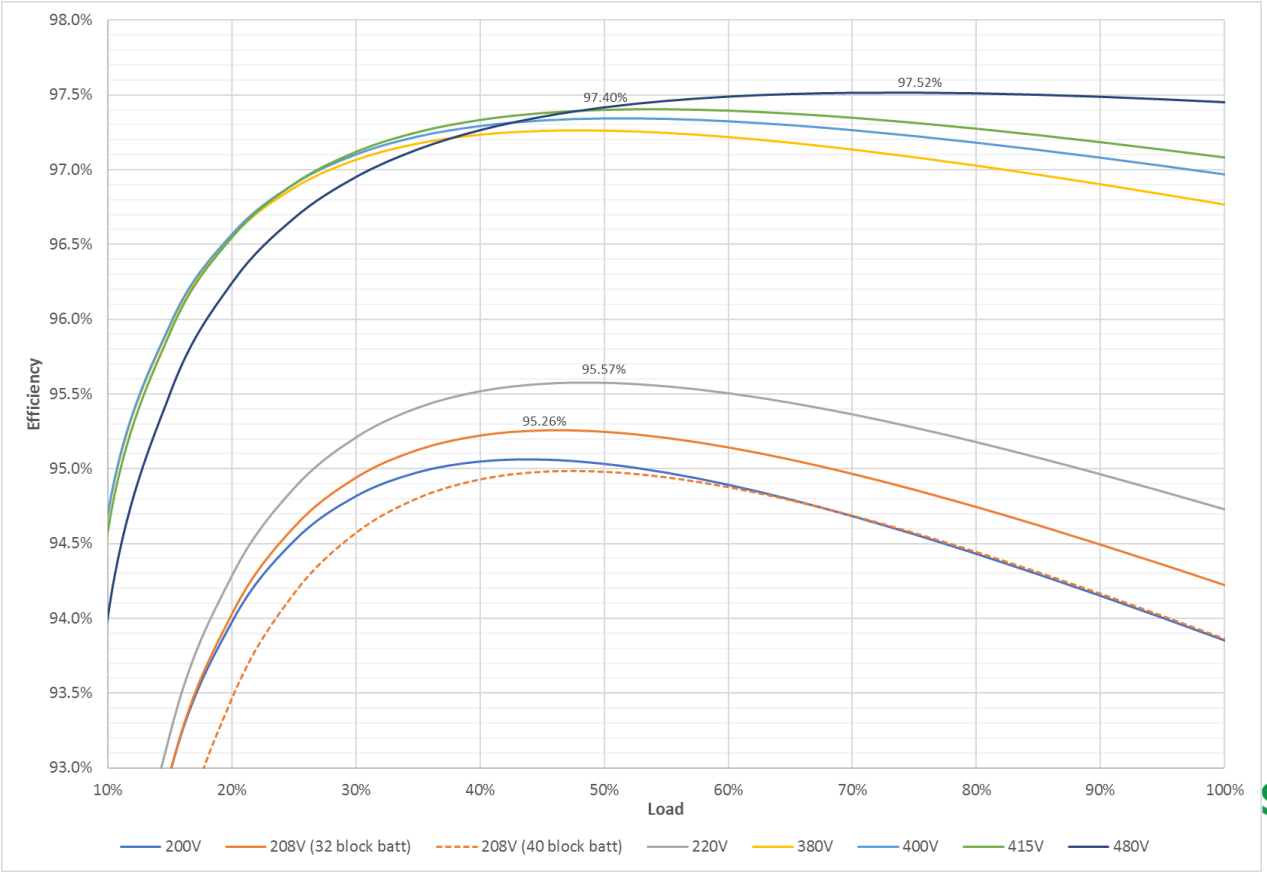


How is it possible?

- Uses soft-switch method to reduce losses during Double Conversion
- Switching losses reduced by 50% compared to conventional 3-level due to zero-voltage-switching
- Ultra high efficiency with standard components
- 3 patents on power topology

Efficiency

Efficiency of 50kW Power Module (double conversion)



Conditions:

380,400,415V: 40 block batt, 50Hz

Galaxy VS – Multimode UPS

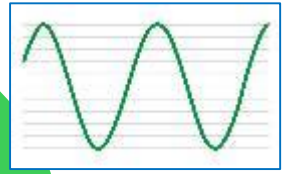
Benefits

99%

Power efficiency
ECOnversion

Best Power quality

IEC 62040-3
class1



Reliability

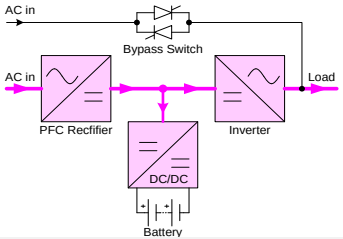
Seismic
Modularity
40°C operational T°

Galaxy VS – 99% efficiency with ECOnversion mode

Features

Double Conversion

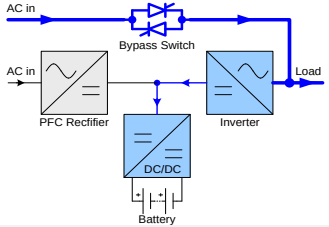
Load is supplied through the double conversion path



Regulate Voltage	***
Regulate frequency	***
Recharge batteries	***
“No” transfer time	***
R1 Pf Corr.	***
R2 Pf Corr.	
Efficiency :	97.4%

ECOnversion mode

Load is supplied directly on the utility through the main2 static switch, but inverter is kept operating in parallel



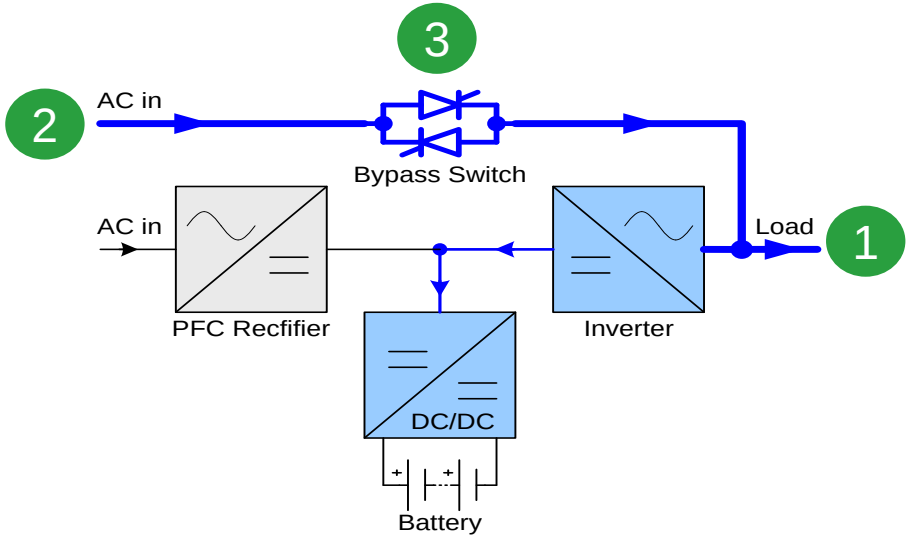
Regulate Voltage	**
Regulate frequency	**
Recharge batteries	***
“No” transfer time	***
R1 Pf Corr.	***
R2 Pf Corr.	***
Efficiency :	99.0%

Benefits

- Ultrahigh efficiency up to 99% (third-party certified)
- Keeps excellent load protection
- Input power factor correction and no harmonics
- Continuously charged batteries
- No break transfer: Compliant with IEC 62040-3 Class 1 output voltage of UPS standard

Galaxy VS – 99% efficiency with ECOnversion mode

Features



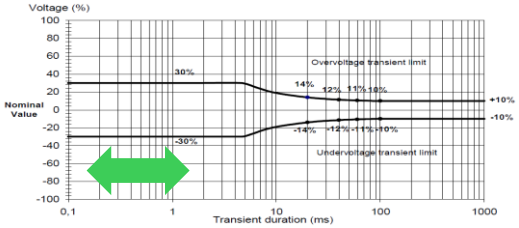
1. IEC 62040-3 Class 1
2. Power Factor correction (Pf1)
3. Controlled static switch like a diode (patent)

ECOnversion:
This mode provides efficiency up to 99%, certified by ENERGFY STAR

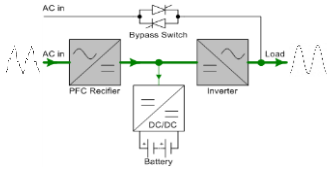
1 Galaxy VS – 99% efficiency with ECOnversion mode

Galaxy VX has a bi-directional inverter, which ensure a transfer from ECOnversion™ to double conversion mode WITHOUT any break (IEC62040-3 classe 1)

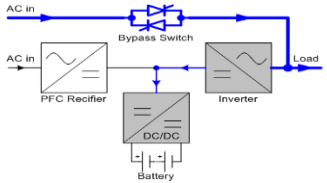
Class 1 IEC 62040-3 (without break)



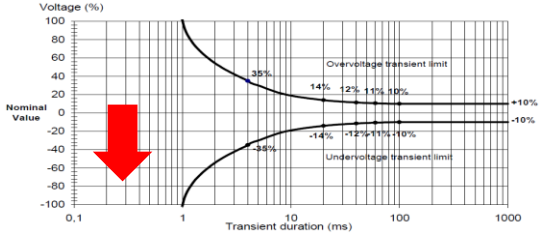
Double Conversion Mode



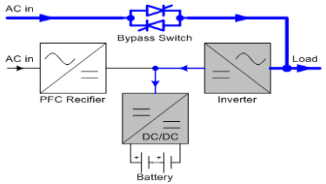
ECOnversion™



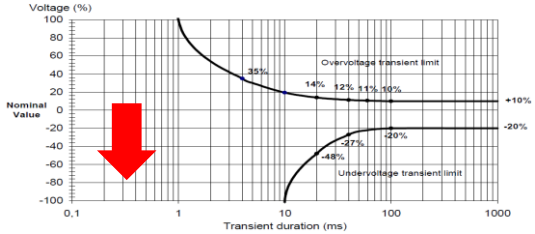
Class 2 (possible break)



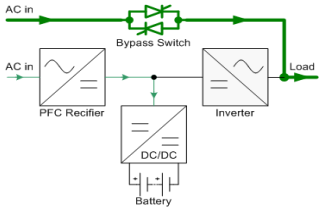
Advance ECO Mode (Sophisticated control)



Class 3 (Possible break)

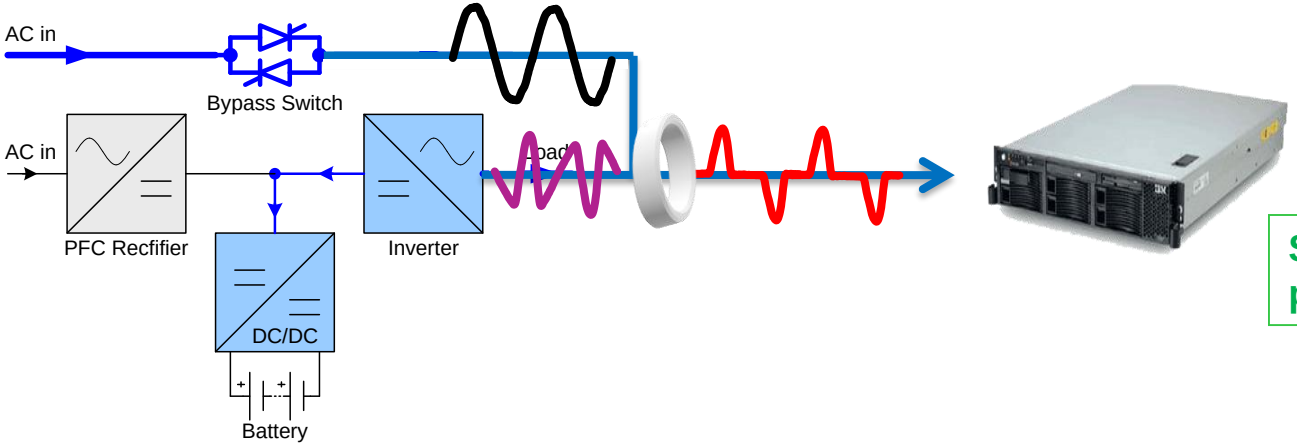


Simple ECO Mode (Bypass)



2

Galaxy VS – 99% efficiency with ECOnversion mode



Schneider Electric patent: 2012/0181871

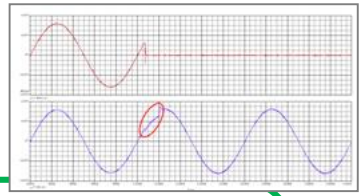
ECOnversion[tm] a new high end feature for sensitive loads

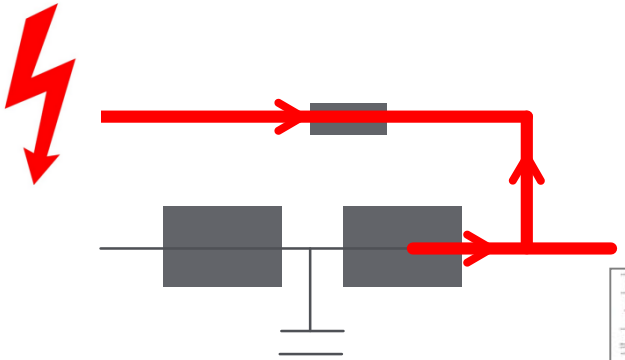
- Input current conditioning => Inverter acts as an active harmonic filter and correct the Power factor – (Genset, TFO, capacitor bank)
- Inverter can perform either as a Capacitive or Inductive load
  - *If Load is Capacitive, will act as Inductive load and thereby compensate for re-active power*

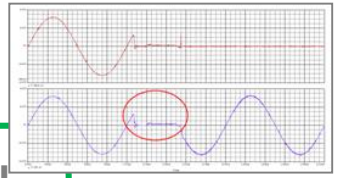
3

Galaxy VS – 99% efficiency with ECOnversion mode

SCR Static Switch control





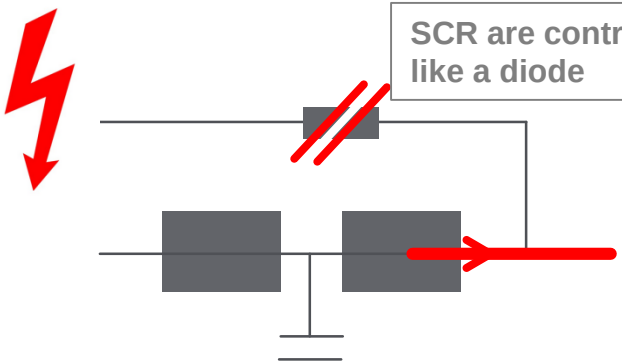


ECOnversion™ mode

- SCRs are controlled like a diode and “isolates” the fault.
- In case of upstream short circuit the load will be supplied by the inverter
- Inverter will supply only the load
- Load is protected

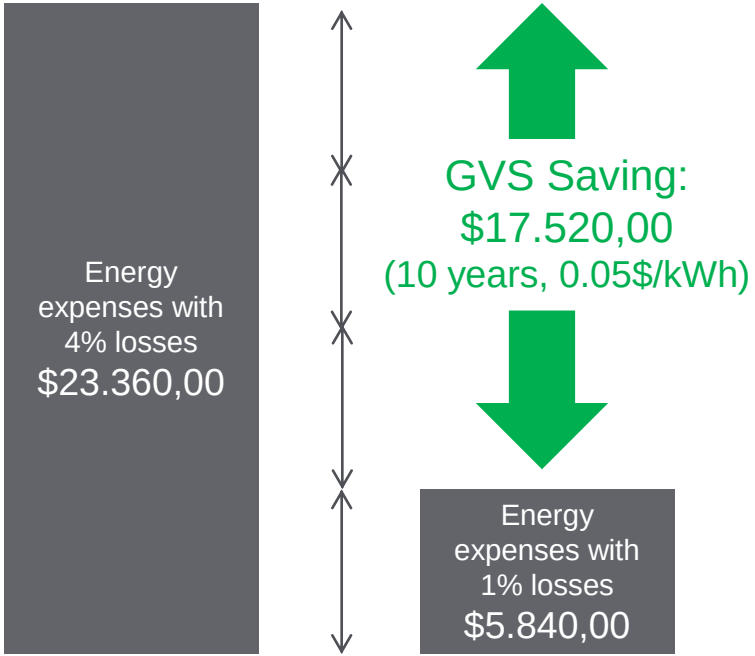
ECO mode: No SCR control

- Static switch is not controlled. Current will go through the by-pass.
- Inverter supplies also the grid…current will increase
- Load can see the fault



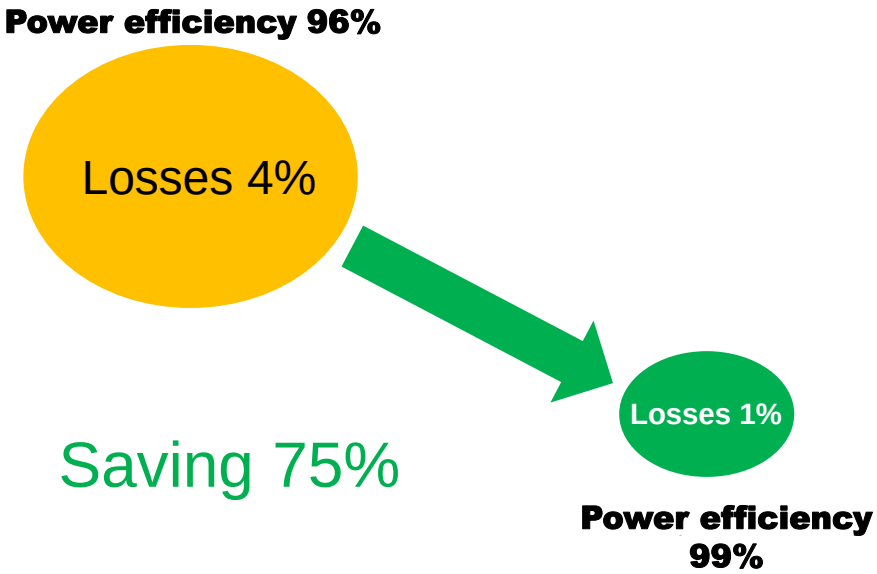
Galaxy V series to drive the Market through innovations.

Best Power Efficiency combined with high Power quality



ECOnversion efficiency:

Galaxy V series 100KVA can improve by 3pts Power Efficiency in comparison to a double conversion product.



Offer Catalog – Galaxy VS 20-100 kW Standalone

IEC

Standard UPS offerings:

GVS 20-100 kW Standalone

- 100 kW
- 80 kW
- 60 kW

2 Power Modules

- 50 kW
- 40 kW
- 30 kW
- 20 kW

1 Power Module

Standard Aux. items:

Classical Battery Cabinets

Config. 7A | Config. 7B | Config. 7C | Config. 10A | Config. 10B

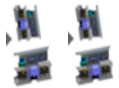
Li-ion

Type. E

Battery Breaker

20-80 kW | 100 kW

Battery Breaker Kit



20-80 kW 100 kW

Empty Battery Cabinets

700mm | 1100mm

AUX Cabinet

700mm

Option Kits

- Parallel Comm. Kit
- Temp. sensor

Maintenance Bypass Panels

20-60 kW | 80-100 kW

System Bypass Panels - 2 UPS's

10-30 kW
40-50 kW
60-100 kW

Third Party:
Custom parts or Customer supplied parts

- 3rd party battery solution
- 3rd party battery solution
- 3rd party batteries
- 3rd party transformer

ETO parts:
Engineering To Order

System Bypass Panels for 3 or more UPS's in parallel is available via ETO team

UPS Options

Air Filter Kit	Seismic Kit	Parallel Com kit	Temperature Sensor	Cold Start Board
GVSOPT001	GVSOPT002 and GSVSOPT003	GVSOPT006	0J-0M-1160	0J-0P6506AA
Galaxy VS Air Filter Kit for Wide UPS	Galaxy VS Seismic Kit for Wide UPS or Modular Battery Cabinet Permits to obtain Seismic Level 1	Galaxy VS Parallel Communications Kit 1 kit for 2 UPS Contains cables and 2 AUX contacts for 1+1 parallel config. Cables length : 25m	Additional Temperature Sensor Cables length : 2,8m	Trip Board with Shunt Trip function for Cold start

Additional Network management card

AP9644

Optional smartslot card with Ethernet (SNMP) and Modbus.
For Customers requesting a 2nd network connection.

3Ph UPS Agenda

- Secured Power Introduction
- UPS topologies
- Offer positioning
- Easy UPS series
- Galaxy V series
- **Architecture capabilities**
- Lithium Ion battery

UPS architectures

We have different types of UPS

Galaxy 300/5500/7000
Smart UPS VT/G3500
Easy UPS 3S
Galaxy VM

Stand alone UPS

Up to 800kVA with 4+1 GVM200kVA

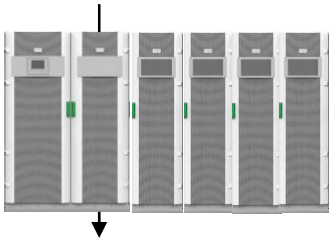
Easy UPS 3M (Basic)
Galaxy VS
(Advanced)

Modular Fault tolerant

Up to 1.2MW with 6 x E3M200kW

Galaxy VX

Horizontal modularity



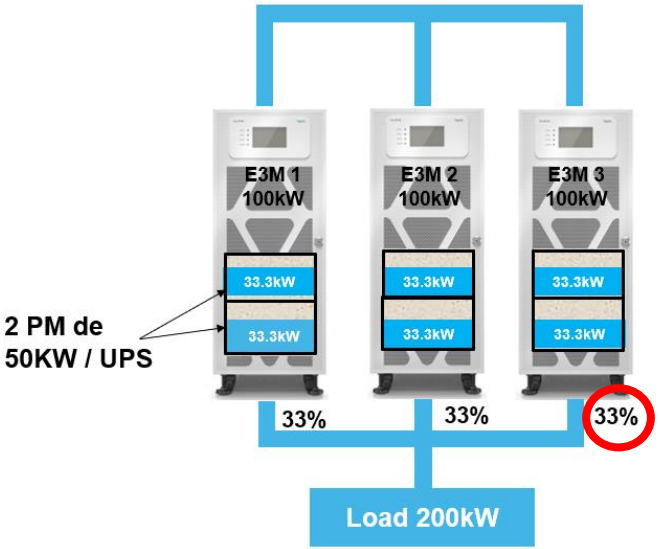
Up to 4MW with 4+1 GVX 1MW

Easy UPS 3M & Galaxy VS – Redundant fault tolerant

In normal mode

2+1 Easy UPS 3M (Basic)

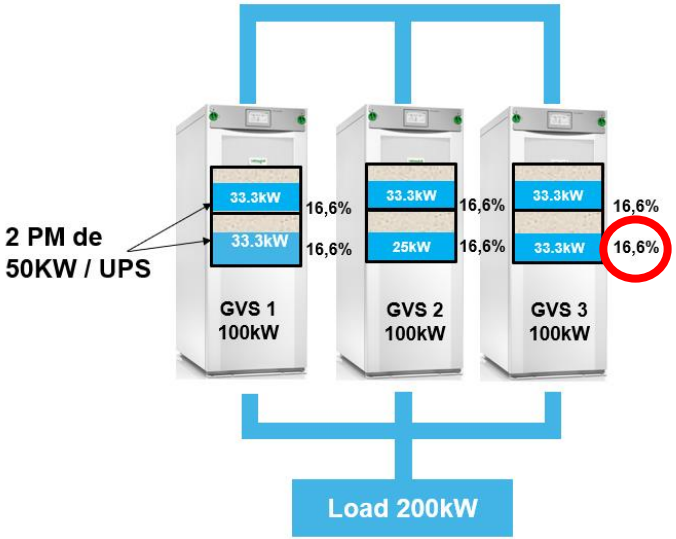
In normal operation load will be shared at UPS level



Load is shared at UPS level

2+1 Galaxy VS (Advanced)

In normal operation load will be shared at 50kW PM level



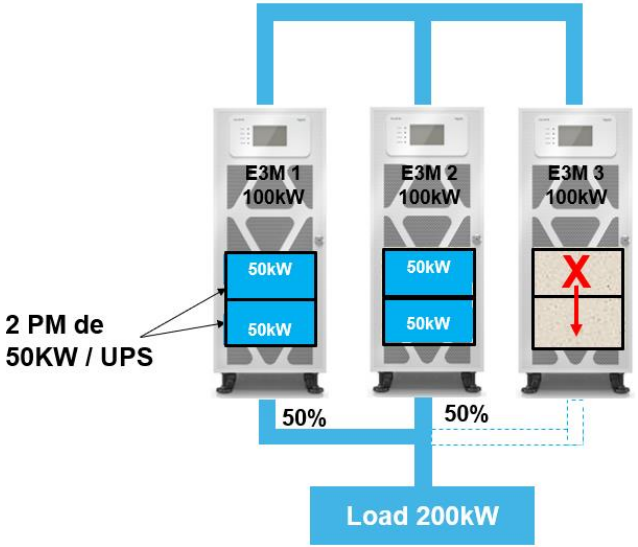
Load is shared at PM level

Easy UPS 3M & Galaxy VS – Redundant fault tolerant

In case of failure of one of 50kW PM

2+1 Easy UPS 3M (Basic)

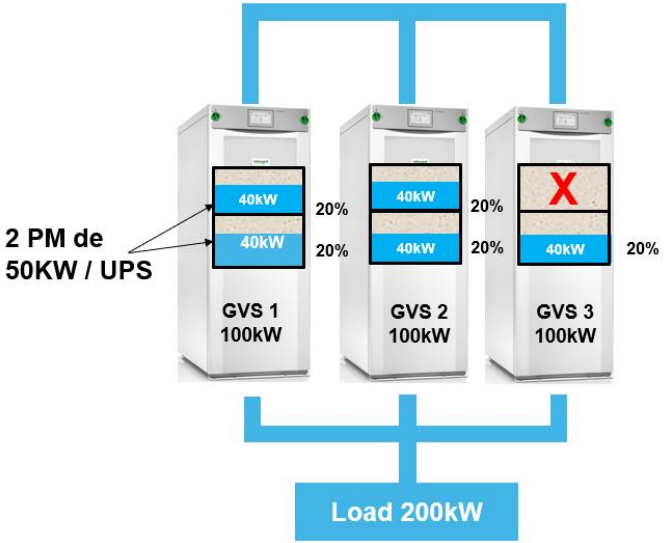
If 1 x PM fails the faulty UPS will stop, the remaining 50kW PM being too small to supply 66.6kW



Load is shared at UPS level

2+1 Galaxy VS (Advanced)

If 1 x PM fails the load will be shared equally between the remaining PM



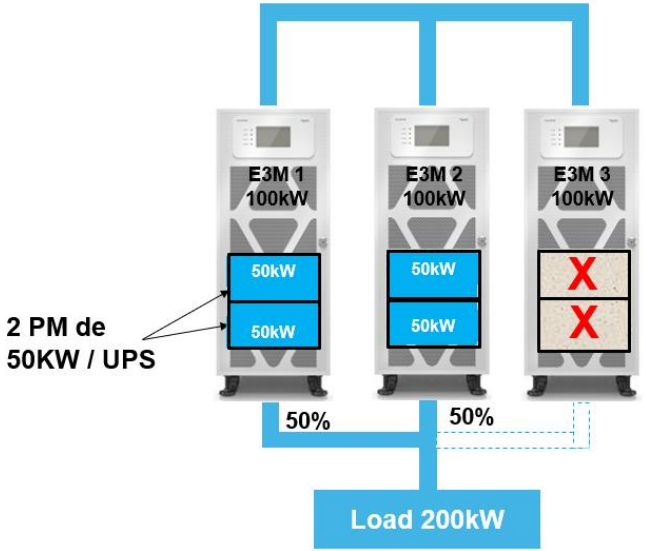
Load is shared at PM level

Easy UPS 3M & Galaxy VS – Redundant fault tolerant

In case of failure of 2 x 50kW PM

2+1 Easy UPS 3M (Basic)

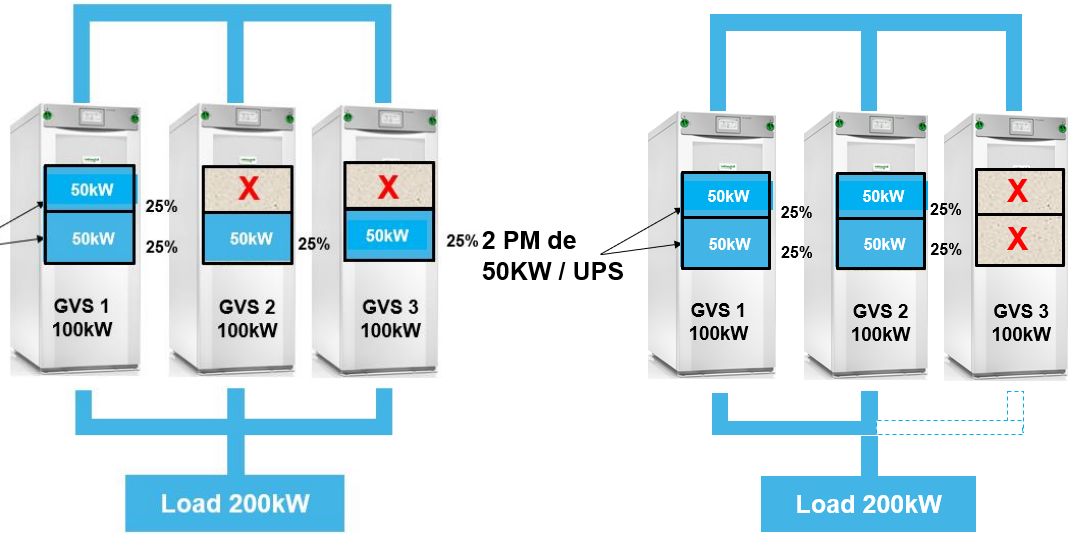
UPS configuration can run with 2 x faulty PM if they are in the same UPS



Load is shared between the 2 remaining UPS

2+1 Galaxy VS (Advanced)

2 x 50kW PM can fail whatever the UPS. The load will be shared between the remaining PMs



Load is shared at PM level

3Ph UPS Agenda

- Secured Power Introduction
- UPS topologies
- Offer positioning
- Easy UPS series
- Galaxy V series
- Architecture capabilities
- **Lithium Ion battery**

New LIB offer

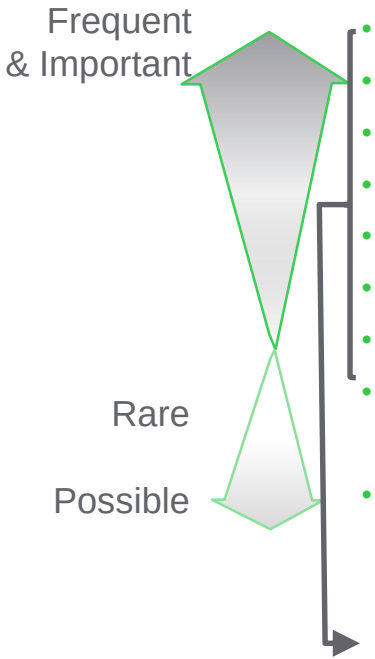
LIB offer Type E
Lithium Ion battery in rack (Samsung)
Combination with Galaxy VS

LIB offer type G
Lithium Ion battery in rack (Samsung)
Combination with Galaxy VM & VX

LIB offer type S
Lithium Ion battery in rack (Samsung)
Combination with Symmetra PX 250/500 & MW

Li-ion Battery Technology vs. VRLA

Comparison with other types of energy storages



Customer Needs:

- Footprint (m^2)
- Life time (year)
- Operating temp. (°C)
- Reliability/predictability
- Maintenance
- Weight (kg)
- High # of cycles (>3,000)
- Fast recharge time
- Extremely high # of cycles (>50,000)
- CAPEX ($)
- TCO (10-year) ($) (**)

Example: « need 2min » 600KW

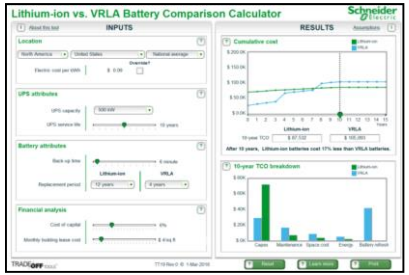
VRLA (EMEA) (5 min)	Li-ion (7 min)	Flywheel (20s)	Flywheel (2min)	Ultracaps (20s)	Ultracaps (2min)
4.3	1.6	2.3	8.1	1.8	9.0
5	12	15	15	15	15
20-25 °C	0-35 °C	-20-40 °C	-20-40 °C	-40-40 °C	-40-40 °C
Medium	High	High	High	High	High
Medium	Low	Medium	Medium	Low	Low
10,500	1,920	3,400	11,900	3,000	15,000
500	>5,000	>30,000	>30,000	>100,000	>100,000
Low	Medium	High	High	High	High
500	>5,000	>30,000	>30,000	>100,000	>100,000
1X	1.9X	8.5X	29.6X	6.7X	33.4X
1X	0.75X	3.1X	10.0X	2.2X	11.0X

Key Difference between Li-ion Battery Technologies

	Cell phone	Industrial (ours)
Chemistry	LCO	LMO/NMC
Form factor	Pouch cell	Prismatic cells (sealed aluminum can)
Number of battery	1	Over 100 (104 or 136) per cabinet
BMS system	Very simple	Three layers of sophisticated BMS system (module, rack, system level)
R&D Period	3-6 months	2-3 years
Design Priority	High energy density	Safety (considering car accidents)
Experience	Industry average	Long time leader

Publications and Tools (released)

- Website: http://www.schneider-electric.com/b2b/en/solutions/system/s4/data-center-and-network-systems-lithium-ion-battery/index.jsp
- Blogs:
  - **4 Big Benefits of Lithium Ion Batteries for UPS Systems – and 2 Key Challenges**
  - **Lithium-ion Batteries Are Poised to Bring Big Changes to the Data Center UPS Paradigm**
  - **How Lithium-ion Batteries Stand to Transform UPSs for Large Data Centers and Facilities**
  - **Are Lithium-ion Batteries "GREENER" than Lead Acid?**
  - **Are Lithium Batteries Safe?**
  - **What's Lithium Got to Do with It?**
- White papers and tools:
  - WP 229: Lithium-ion Batteries vs. Lead-acid Batteries
  - WP 231: FAQs for using LIB with a UPS
  - TradeOff Tool #19



Questions?

Thank you!

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