



# ***PRIMAX***

**POWER THE FUTURE !**



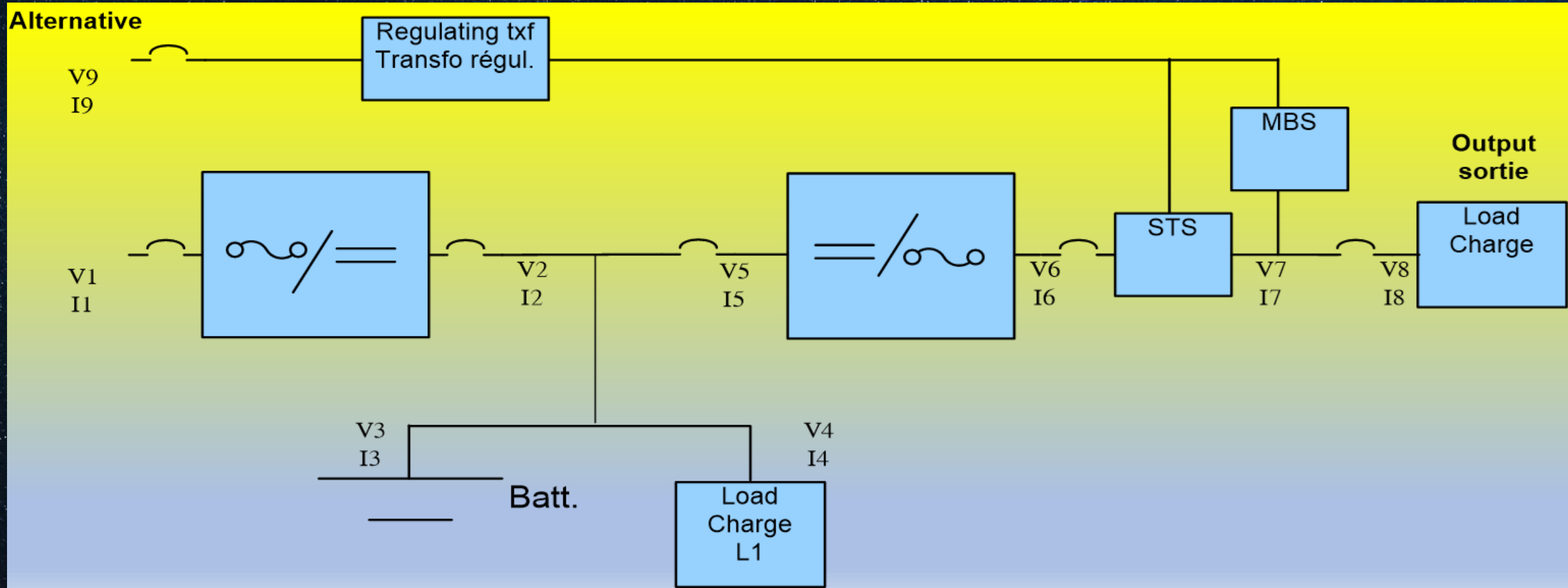
The background of the entire image is a night sky featuring the Milky Way galaxy, which appears as a bright, hazy band of light stretching diagonally from the upper left towards the lower right. The sky is filled with numerous small, distant stars. At the bottom of the image, the dark, silhouetted outlines of trees are visible against the starry background.

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**P850 Series of  
Industrial Grade UPS & Inverters**



## Typical hybrid industrial UPS layout







# Sizing a UPS: Critical items

1. Define the mix of Linear and non linear loads and their specifics:
2. Non linear loads: VFD (motor drives) with or without harmonic compensation, Scada systems... Require in your spec a crest factor of 3:1 based on the rms current reading not on the peak current to prevent load transfers.
3. Cold start inrush currents: Depending on the size of the Inverter versus the size of the load creating start-inrush currents, the load may need to be started via the static switch and the bypass line. The static switch shall have a minimum of 1000% rating for one cycle based on the inverter's full load capacity.
4. Load harmonics: Non-linear loads 3<sup>rd</sup>, 5<sup>th</sup>, 7<sup>th</sup> harmonic contents are very considerable. UPS output transformers and bypass transformers shall be capable to support such load. Preferably K-20 rated transformers should be specified. Class 105 transformers (50C temperature rise) is recommended for long term reliability.
5. Black start capability: Loads can be required to be powered before the utility being connected to site. i.e. UPS will be started with battery only or with temporary generator which can be a not very well stabilized source.





## Other critical considerations

1. 3ph input with 1ph output: Single phase output design can help into clearing downstream faults better than 3 phase design. Plus the fact that with single phase you should not be concerned about phase balancing. Unbalanced 3 phase output will reflect ripple current on the battery
2. External maintenance bypass switch (MBS): We do not recommend having the MBS integral within the UPS. For safety issues, the MBS shall be external.
3. Regulating bypass transformer: We recommend using electronic type regulating transformer to help protecting the critical load when it's fed by the unregulated bypass line.
4. Emergency Power Off switch (EPO): Terminal blocks shall be provided to be connected to a remote EPO for safety, ideally next to entrance door far away from the UPS. The EPO function shall shunt trip all energy sources breakers: AC in, battery, bypass in.
5. Communication: Modbus communication is recommended. Events log shall also be include locally (on the LCD) and remotely.
6. Alarm relays: rated 120Vac/240Vac-10A, (Time constant ( $L/R$ ) to be specified if needed)
7. Alarm terminal blocks: Shall be of the DIN rail type for #14GA wire.
8. 4-20mA signals: Should be provided for output voltage and current.



# UPS battery considerations

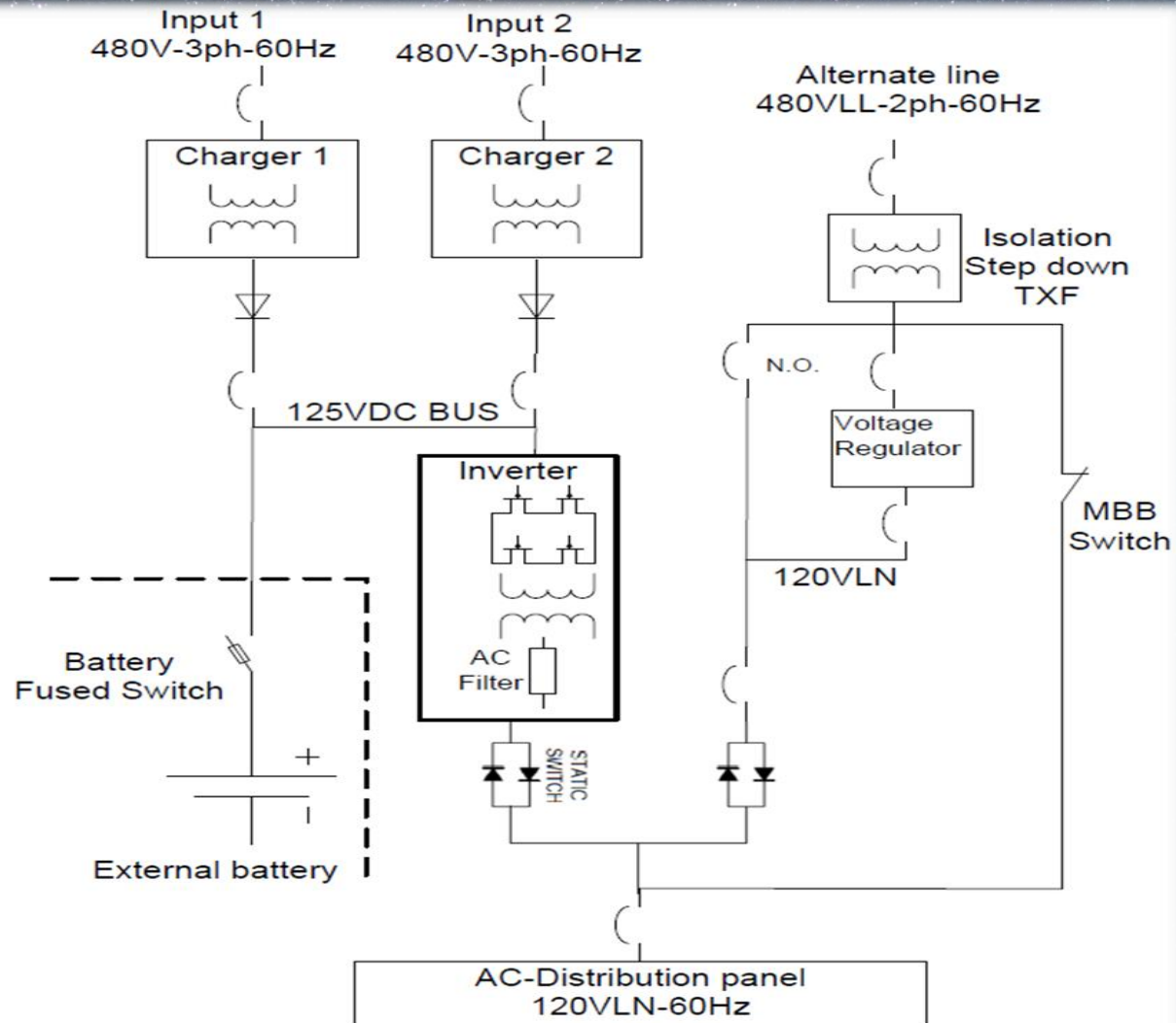


- Bandwidth limited filtering to minimize the effects of both the inverter and charger ac ripple (current and voltage) on battery life.
  - At full UPS load, total ripple energy imposed on the battery from the charger and the inverter shall be a maximum of 1 Watt below 4000Hz
- Battery continuity test: To insure that the battery is available
- Lead-Acid batteries.
  - Vented are more reliable and provide a longer life (Tubular lead Selenium OPzS type) recommended
  - If VRLAs are necessary:
    - OPzV (Tubular Gel) are recommended.
    - AGM are the least reliable type on the market; Short life, tendency to fail open
- Nickel Cadmium:
  - The Ni-Cad battery does not fail open.
  - The battery electrolyte specific gravity is stable throughout the discharge cycle.
  - In a cold environment, the Ni-Cad freezing temperature is very low when battery is fully discharged.
  - In a hot environment they will resist longer than Lead-Acid
- Lithium-Ion:
  - Very good option for N+1 redundancy, space & weight savings, drastically reduced maintenance, imbedded electronics provide battery management and state of health reporting. Charger capable of communicating with battery management module insures proper battery charging and operation.
- Lower number of cells to help service and prevent cell unbalancing over the life of the system:
  - 125Vdc battery for systems up to 60kVA (Available up to 100KVA)
  - 250Vdc for systems up to 250kVA.
- Battery end voltage: 1.75Vpc for lead acid and 1.14Vpc for Ni-Cd. Lower voltages are not acceptable.



## TYPICAL INDUSTRIAL UPS WITH REDUNDANT CHARGERS

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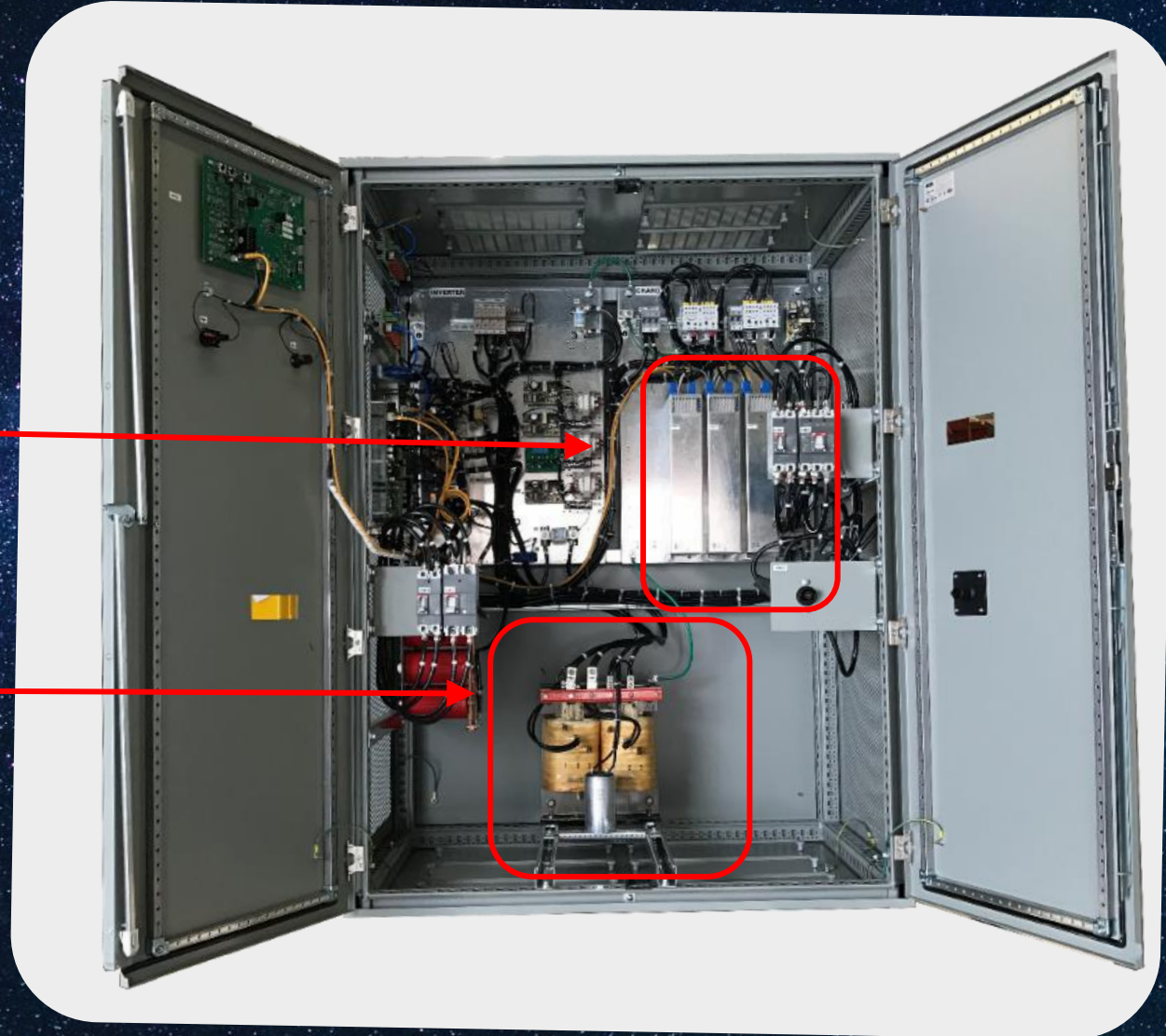


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**10kVa Ups  
n+1  
EZ-SWAP  
chargers**

N+1 Modular  
EZ-Swap chargers

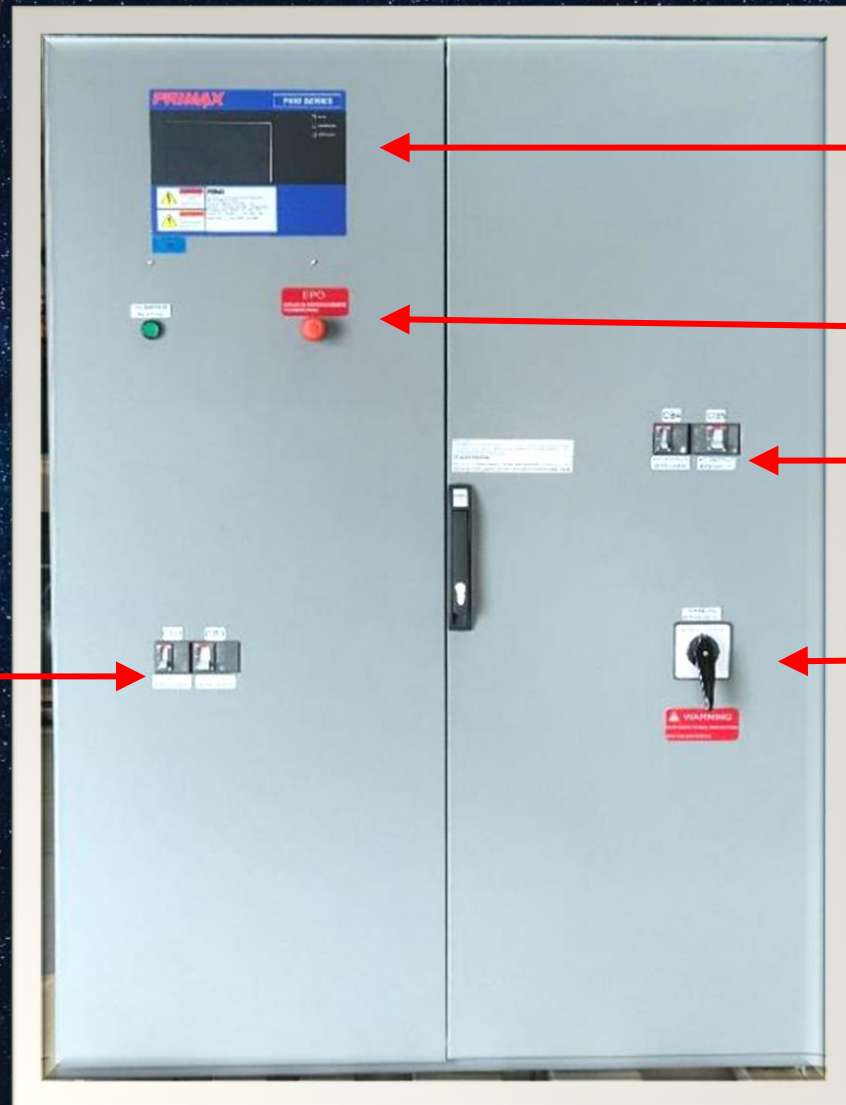
O/P transformer





**10kVa Ups  
n+1  
EZ-swap  
charger**

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User interface screen

Emergency Power Off

Output & battery CBs

MBS

AC input & bypass CBs



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**15KVA  
INVERTER  
IN  
NEMA 12  
ENCLOSURE  
WITH LIFTING  
LUGS**

Lifting lugs

Glass window to  
prevent dust and  
particles from entering

Completely welded  
NEMA 12 enclosure  
With NEMA 12 filters

Sealed light and  
buttons

Sealed Manual bypass



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5KVA UPS  
N+1 HOT-SWAP  
CHARGER

240V-1PH IN  
120V-1PH OUT  
125VDC  
BATTERY

I/P & O/P CBs  
EPO & MBS

Drip shield

Customer connections  
compartment

19" Enclosure

2 x 5.5 KW  
Hot-Swap modules





# Chargers

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## SCR

### Advantages:

- Very robust and high fault tolerant
- Easy available for high power applications
- Can be designed to operate with no cooling fans
- Overload capability

### Disadvantages:

- Bulky transformer and dc filter components
- Higher THDi on input: needs extra filtering
- Redundancy: N+N only

## High Frequency-Switchmode

### Advantages:

- N+1 capability
- Native 0.99 pf and  $\leq 4\%$  THD
- High level dc filtering
- Very compact
- Swappable modules

### Disadvantages

- Limited overload capabilities compared to SCR
- Limited current contribution to clear protection devices
- Higher number of components





# What makes the P850 industrial grade?

## GENERAL

1. 30 year design life
2. 125V dc bus with lower number of cells
3. Oversized power components to operate at 50°C
4. Halogen free (SIS) grade wiring
5. Circuit breakers for specific disconnection needs such as: AC mains and alternate line inputs, rectifier output, battery input, inverter input and output





## What makes the P850 industrial grade?

### **Inverter & Power electronics**

- Inverter to supply high THD loads without transferring to bypass (variable frequency drives with no THD treatment)
- Inverter to support higher than standard lagging and leading power factors loads: inductive (ex. motors, transformers) vs. Capacitive (ex. electronic ballasts, computers, servers, dc-dc converters and all modern electronic loads)
- Inverter to clear fast acting fuses having 25% inverter output current without transferring to bypass
- Black start capable

### **STS, MBS, transformers & distribution**

- SCR static transfer switch (STS) on inverter and alternate line
- MBB Rotary switch (Cam) bypass maintenance switch
- Shielded transformers and high surge and EMI filters
- Integrated distribution panels to optimize space and on-site labor





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**Thank you for your time and interest !**

**Let's discover tomorrow together...**