Powerhouse Systems®

an R&D Technology Group Company

DC POWER SYSTEMS

Phase Control DC Systems

Modular DC Systems

Modular Inverters

Modular Static Switches

Modular DC/DC Converters

PHASE CONTROL DC SYSTEMS

Powerhouse's Phase Control DC systems are of constant voltage and current limited type. Utilising SCR phase control design they provide a rugged and highly reliable DC supply.

Available with single and three phase inputs, the Powerhouse Phase Control series are ideal for charging sealed lead acid, vented lead acid and lithium phosphate batteries.

Phase Control DC systems are in widespread usage throughout Australia to supply LV & HV switchboards, DC substations, emergency power and lighting systems, and switch tripping. As a result, HILITE chargers are found in both commercial and industrial operations, in areas such as hospitals, airports, utilities, communications, mining and petrochemical industries.

Dependant upon rating, DC systems can be housed in wall-mount or free standing enclosures, which will normally accommodate optional equipment and batteries without increased

SPECIFICATIONS

Input Voltage	220/240 Single Phase +/- 10% 380/400/415 Three Phase +/- 10%
Input Frequency	50-60Hz ± 3Hz
Output Voltage	24, 32, 48, 110, 125 VDC
Charging Voltages	**Sealed Lead Acid:** Float 2.2-2.25V per cell, Boost: 2.3-2.4V per cell **Vented Lead Acid:** Float 2.2-2.25V per cell, Boost: 2.3-2.5V per cell **Lithium Iron Phospate ($LiFePO_4$):** 3.6V per cell The above settings will vary with cell manufacturer, cell type, duty and ambient conditions.
Output Power	Single Phase < 6KW Three Phase > 6KW
Ripple Voltage	RMS ripple voltage across the battery will not exceed 2% of the nominal system voltage when a battery of Ah capacity of 4 times that of the charger nominal current rating is connected.
Regulation	Output voltage regulation of +/- 0.5% and current regulation of ± 1%, providing the mains input variations do not exceed ± 10% Voltage, ± 5% frequency and for load changes 0-100%.
Temperature Range	Operational: -10°C to +40°C +40°C to +65°C (de-rate current by 1% per °C)
Cooling	Air Convection (fan assist - high power units)
Efficiency	80-93% dependant on system voltage and power rating.
Alarms	Charger Fail, Low Volts, High Volts, Low Electrolyte and Earth Fault with audible warning.
Meters	Charge Current, Load Current and Battery/Charger Voltage.
Indicators	LED Panel: Power On, Boost, Float, Charger fail, Low Volts, High Volts, Low Electrolyte and Earth Fault.
Controls	Input and Output Circuit Breakers, Alarm Reset and Boost Initiation Push buttons.
Options	Voltage free contacts for all alarms, Battery Test, Low Voltage Disconnect and Mains Failure alarm contact.
Enclosure	Suitable for operation in industrial environments and tropical conditions. Sheet steel to IP42 with powercoat finish (colour to customer requirements). Alternative materials and IP ratings available on request. Batteries can be housed within the enclosure in a separate compartment.
AS Standards	AS1939, 1955, 2293, 2374, 2735, 3000, 3108, 3901 & 4044
Factory Testing	Full System test including Load Banks & Thermal imaging Report

Powerhouse's Modular DC power system (1UDC+) provides clean DC power to sensitive equipment while simultaneously charging the battery bank, supplying backup power during mains failure.

The 1UDC+ contains a 19" 1U subrack that can house up to 3 hot-plugged rectifiers, or 2 rectifiers & controller and an ELVD device.

Max system capacity: up to 13 subrack (38 rectifiers + controller), 1266A with height of 13U

Basic shelf:
1U DC + type II – includes a 19" 1U shelf (subrack) with up to 3 rectifiers

Electronic Shelf:
1U DC+ type I – includes a 19" 3U shelf with up to 2 rectifiers + SC 1UDC + controller and an electronic ELVD device

FEATURES:

- Very high efficiency: 96%
- 100A for each 1U shelf
- Intelligent power module, digitally controlled
- One to three hot-swap rectifiers in each shelf
- Active current sharing among rectifiers
- Universal input voltage
- A built-in dual 70 A Electronic Low Voltage Disconnect device (ELVD) for battery protection
- Option to connect 2 external LVD contactors of up to 1600 A
- A high-performance, hot-swap system controller (SC 1UDC+) to measure, monitor and control voltages, current, power, battery, temperature, etc.
- USB (SC1U DC+) or TCP/IP+USB communication (SC 1UDC+ NET)
- Advanced battery management
- Up to two battery sets handled in one system
- Automatic and pre-programmed battery test (for each battery set)
- Automatic and pre-programmed equalize charging mode
- Breaking alert by modem (option)

MODULAR DC SYSTEMS

Powerhouse Systems
an R&D Technology Group Company

MODULAR DC SYSTEMS

The PS1UDC+ power system is comprised of four main subsystems:

- **Shelf Unit: Type I:**
  1U DC+ type I – includes a 19" 3U shelf with up to 2 rectifiers + SC 1UDC + controller and an electronic ELVD device

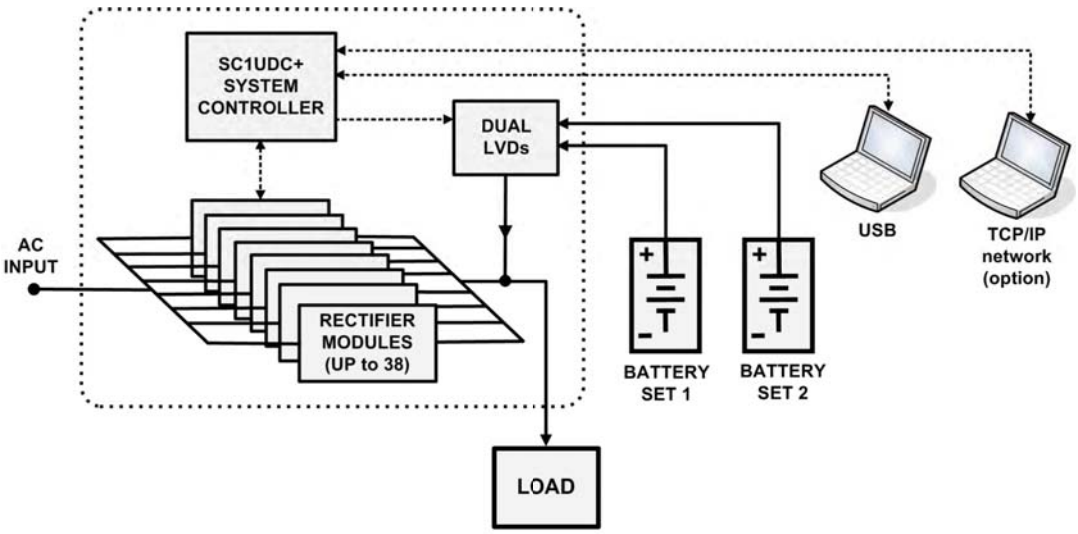
  Type II:
  1U DC + type II – 19" 1U shelf (subrack) with up to 3 rectifiers

- **System controller:** Monitors and controls the system and also communicates with an external PC or network. This is done by an RS232 serial port (standard) or via PPP/SNMP/TCP-IP protocol (optional).

- **Rectifier module(s):** Convert(s) ac input to dc output.

- **Electronic Low Voltage Disconnect (ELVD) device:** Disconnects the battery from the load, preventing the damage to the battery that results from over-discharging. The PS1UDC+ has a true semiconductor-based LVD with no moving parts (such as relays or contactors). This ensures reliable operation and a long MTBF. The ELVD of the PS1UDC+ uses power MOSFETs to perform the switching. The ELVD has two branches that can handle two independent battery sets. (For loads higher than 120 A, battery disconnection is performed by a dc contactor (LVD).)

BLOCK DIAGRAM OF PS1UDC+



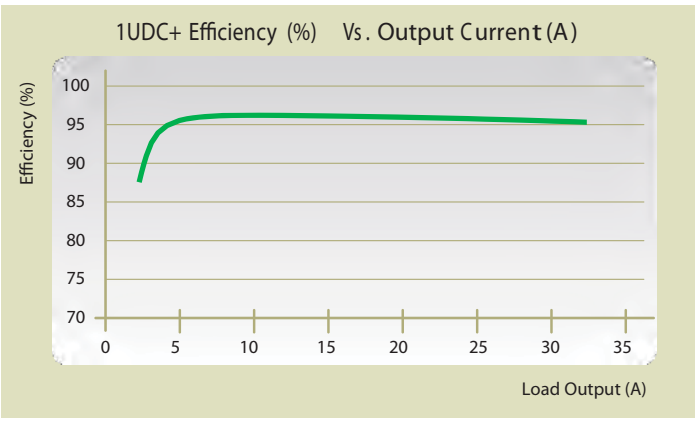
The rectifiers are "hot pluggable" and operate in parallel. This means the rectifiers can be added or replaced with no impact on the power supply to the load devices and with no impact on the battery charging current. The parallel configuration of the rectifiers also enables the user to define an "N+1" or "N+2" redundant system.
Each rectifier has its own current sharing system, and provides complete, precise current sharing among rectifiers.
Output terminals for connecting the load and battery sets are mounted on the connecting busbars of the motherboard, located behind the removable metal rear panel.
OPTION: On customer request, the the PS1UDC+ power system can include a special additional rack containing dc–dc converters.

1UDC+ SPECIFICATIONS

INPUT	1UDC 24V	1UDC 48V	1UDC 48V EE
Nominal Voltage	230V		
Voltage Range	85Vac - 285Vac, with derating		
Maximum Current1 (@ full load)	Nx6A	Nx10A	
Frequency	47Hz - 63Hz		
Power Factor (@ Full Load)	$\geq$ 0.99		
Protection	Relay disconnects input for >300V	Fused	Relay disconnects input for >300V
OUTPUT			
Voltage (default)	27 ± 0.2Vdc	54 ± 0.2Vdc	
Adjustable Range	23Vdc - 30Vdc	47Vdc - 58Vdc	
Regulation (line & load)	±1%, ±0.25% with controller		
Nominal Current1	Nx40A (Vin>195V) Nx20A (Vin=110V) (max 38 modules)	Nx33.3A (Vin>195V) Nx16A (Vin=110V) (max 38 modules)	
Ripple & Noise @ BW=30MHz	200mVp/p, 20mVrms		
Psophometric Noise	-52dbm over 600 Ω (<2mV)		
Effieciency (nominal load)	94% @ 230Vac 92% @ 115Vac	92% @ 230Vac 88% @ 115Vac	96% @ 230Vac 94% @ 115Vac
Short circuit current, Vo=0	Nx20A (Vin=230V)	Nx14A (Vin=230V)	Nx20A (Vin=230V)
Over-voltage Protection	31V	59.5V	
Protection	Current limited, short circuit proof, output fuses		
Walk-in Time	10s		
Hold-up Time	20ms (90% load, output decays to 46V)		
Output Current Indication	4 LEDs bar-graph on the front panel		
Active Current Sharing	10% accuracy @ full load		
GENERAL			
Withstand Voltage (1 min)[2]	3000Vac INPUT/OUTPUT, 1500vAC INPUT/GND		
Operating ambient Temperature	-10°C - 70°C, output de-rated above 50°C by 5%°C		
Storage Temperature	-20°C - 80°C		
Humidity	<95% non-condensing, equipped with standard 1U DC+ rack		
EMC	EN300 386-2 V1.1.1.3 (1997), EN55022, EN61000-4-2,3,4,5,6,11, EN61000-3-2, EN61000-3-3 (certified)		
Safety	IEC950, EN60950 (certified)		
Dimensions (1 module)	146mm (W) x 44mm (H) x 260mm (D)		
Weight (1 module)	1.4Kg	1.2Kg	1.4Kg

Notes:

1. "N" denotes the number of power modules
2. Equivalent DC test voltage is applied to overcome Y-capacitors leakage current to ground. Output is floating (not grounded during test).



Powerhouse Systems
an R&D Technology Group Company

MODULAR DC SYSTEMS

Model IPU1000

MODULAR INVERTERS

Features

- Up to 30 units in parallel, 30kVA
- Employs high frequency PWM technology
- A microprocessor controls all diagnostics and operation
- Power density (2kVA in 1U 19" shelf;
- 1kVA in 1U 9.5" cabinet) Lightweight
- Standalone or parallel operation Parallel capability for N+1 redundancy High efficiency
- Continuous input DC curent
- Optional: bypass (for standalone operation)

SPECIFICATIONS

POWER	0.5kVA 24V	1kVA 48V
Topology	Dual high frequency conversion	
Control	Dual 8-bit RISC Microcontroller	
INPUT		
Voltage	24Vdc (nominal) 21- 30Vdc	48Vdc (nominal) 42 - 60Vdc
Current	21A (max.)	20A (max.)
Psophometric noise	< 2mV at full load, over 600 Ω	
Low voltage shutdown	21Vdc ± 0.5	42Vdc ± 0.5
OUTPUT		
Voltage	220/230Vac	
Power	500VA / 300W	1000VA / 700W
Efficiency (dc-ac)	88% @ 24VDC	90% @ 48VDC
Frequency	50/60Hz ± 0.1% (free-mode)	
Synchronization system	Active current sharing	
Waveform	Pure sinewave	
THD	1.5% max. for linear load 4% max. for non-linear load	
Crest factor	3:1 max. for non-linear load	
Voltage regulation (line & load)	±1% (static) recovery within 500mS	
GENERAL		
Parallel Configuration	Up to 30 units in parallel	
Isolation voltage	1500VAC input-output 1500VAC output-chassis 500VDC input-chassis	
Protection	Output over-voltage, output overload & short circuit (inherent by pulse-by-pulse) LVD (low input voltage disconnection), over-temperature	
Display	5 LEDs and load bar graph	
Safety	IEC 950 (EN 60950)	
EMC (including the shelf)	EN300-386-2, EN 50082-1, EN 55022	
Audible noise	< 50dBA @ 1.5m	
Temperature	-10°C - +50°C	-10°C - +45°C
Signalization	1 dry contact (fault indication)	
Dimensions WxHxD (mm)	202 x 44 x 243	
Weight (without shelf)	1.5Kg	

All specifications are typical and subject to change without prior notice

Features

- Automatic static switch to increase reliability and overload capability
- Zero time load transfer from inverters to bypass and vice-versa
- Clear, user-friendly colored LED indicators on the static switch panel
- Audible alarm if failure detected or load on bypass
- Protect load against illegal bypass voltages

THREE PHASE STATIC SWITCH (Wall Mounted)
10 -250 kVA

AC input and output	Three phase with a common neutral is available
Nominal power	10 ~ 250 kVA
Input voltage range	196 V ~ 253 V (Phase to Neutral), other values are available
Input frequency range	46 Hz ~ 64 Hz, other values are available
Transition time in synchronized mode1	< 3 msec
Transition time in non-synchronized mode	< 200 msec
Signals and indicators	5 LEDs, 3 keys, audible alarm
Efficiency	99.90%
Regulations	Complies with the IEC950 standard

SINGLE PHASE STATIC SWITCH 3U
3 – 30 kVA

AC input and output	Single phase with common neutral
Nominal power	3 to 30 kVA
Input voltage range	187–253 Vac, other ranges also available
Input frequency range	46 Hz–64 Hz, other ranges also available
Signals and indicators 6	6 LEDs, 3 keys, audible alarm, RS232 interface
Efficiency	99.90%
Size in mm (H × W × D)	132 × 483 × 250 (3U)
Weight	<10 kVA: ~10 kg ; 10–30 kVA: ~15kg
Regulations	Complies with IEC950 standards

SINGLE PHASE STATIC SWITCH 1U
3 kVA / 6 kVA

Ac inputs and output	Single phase with common neutral	
Nominal power	3kVA	6kVA
Input voltage range	196 V~253V (Phase to Neutral), other values are available	
Input frequency range	50 ±3Hz	
Maximum current	13A	30A
Signals and indicators	6 LEDs, 3 keys, audible alarm, RS232 interface	
Efficiency	99.90%	
Size in mm (W × D× H)	485 × 280 × 44 (1U)	
Weight	3.7kg	
Safety	Complies with IEC60950	

MODULAR DC/DC CONVERTERS

48/24 600W Modules

This dc-dc converter module simply converts a nominal 48 V (42 V-61.5 V) into 24 V (25 A maximum) accurate voltage at the output.
The unit comes with the option to parallel several similar modules in order to gain more power and redundant operation (N+1).

INPUT	SINGLE DC-DC 48-24 MODULE
Voltage range	42 - 61.5VDC
Current	17A (max)
Efficiency	>88%
Protection	Against reserve polarity connection
Low Voltage Protection	Stops at Vin < 42VDC
Restart operation	Automatic at Vin > 46VDC
OUTPUT	
Voltage	24VDC
Current limit	25A (folds back to 9A at short circuit)
Voltage adjustment	±5%
Voltage regulation	±1%
Ripple	50mVrms
Protection	Over load, output OVP, Over-temperature
Display	4 LED bar-graph display the load level
Parallel operation	Active current-sharing
General	
Ambient temperature	-10°C - 50°C
Humidity	0-95 %
Dimensions (mm) Weight (Kg)	146 (W); 44 (H); 260 (D) 0.8
Withstand voltage	Input – Output: 1500VDC Input – chassis: 1500VDC Output – chassis: 1500VDC
Cooling	Forced, fan speed control
Safety	IEC950, EN60950
EMC	EN55022, EN6100-4-2 2,3,4,5,6,11 EN61000-3-2 EN6100-3-2, EN61000-3-3

- All specifications are subject to change without prior notice
- All images are for illustration only

Powerhouse Systems
an R&D Technology Group Company