2019 / 20

PHD POWERHOUSE

Reliable Power Solutions

AEC

COMPANY PROFILE

Powerhouse Distributions (PHD) specialises in backup and alternative power, surge protection and power conditioning products and solutions. The company offers state of the art technologies and services and is largely considered to be a leader in its field.
In the modern electronic era with constant evolution toward "micronisation" and where the vast majority of electronic malfunctions arise from power related anomalies PHD is uniquely positioned to provide comprehensive solutions.
.
PHD's comprehensive offering spans diverse disciplines, from the basic design of distribution board layouts to the implementation of turnkey power solutions. Combined with this we provide extensive service back-up on all our products and services, ensuring a holistic approach to all power conditioning problems.

Key to PHD's success is the flexibility to supply solutions to small and large businesses, private residences, offices, mines and manufacturing facilities ensuring that customers have access to clean and stable power.

Ongoing and in-depth training ensures that PHD's highly competent staff are capable of providing training assistance to agents and end-users for the servicing and sizing of the full range of power conditioning products sold by the company.
Included in PHD's product range is a wide range of technologically superior power protection devices which serve to support and protect users' sensitive equipment and data in critical applications across a wide range of industries.

Company History and Structure

PHD was founded in 1999 by Mario Pires who, as a veteran of the UPS industry has more than 25 years experience in power conditioning products and solutions. In 1981 Mario was one of the founding members of MLA Power Systems (Pty) Ltd which became one of the leading manufacturers of Uninterruptible Power Supplies (UPS) in South Africa.
Managing Director, Warren Botten brings substantial sales, marketing and technical expertise into the mix.

Allis Electric Company's recent acquisition of shares in PHD means that PHD is now a truly international organisation with access to engineering resources spanning several continents. This coupled with Mario, and Warren's local knowledge and experience ensures that PHD's product offering is of the highest quality and reliability which underpins our objective of total customer satisfaction.

PHD's head office and manufacturing facility is located in Kew, Johannesburg and applies ISO 9002 standards to all of its operations. All products are CE (Community of Europe) certified.

POWER LINE DISTURBANCES

Dip (Sag): is a short term decrease in line voltage.
Usually it results from a short circuit in the power line or a sudden increase in electrical load on the line (start up of large loads), utility switching or equipment failure.

Surge: is the exact opposite of a dip. It is a temporary increase in line voltage that lasts at least one cycle (approx. 16mS).
It can be triggered off by rapid reduction in power loads or by utility switching.

Spike (transient): is similar to a surge except that it lasts less than a full cycle (often only a few milliseconds).
It can be 100% or more above nominal voltage.

Electrical Noise: probably the most common type of disturbance, which is a random high voltage, or high frequency interference on the power line caused mostly by non-linear loads. There are two types of noise, usually referred to as common mode (noise between power connection and ground) and transverse mode (noise between power connections).

Brownout: is a deliberate reduction in AC line voltage by the utility company during periods of unusual high demand or insufficient load capacity. The power line supply does not have the full capacity to supply the load which results in load sharing.

Blackout: this is the ultimate power disturbance. It is a complete cut in the power line supply (power failure). Typically described as “zero-volt” condition lasting longer than half a cycle.
Can be caused by utility equipment failure, lightning etc . . . the list is long.

Businesses are becoming more and more reliant on a utility power supply that is pushed beyond its capacity. Despite advances in the capabilities of modern personal computers, a momentary power outage is still all it takes to lose your data.

More dangerous is the loss of previously written files, or even an entire hard disk, which can occur should a power problem strike while your computer is saving a file. Network file-servers constantly writing to disk are particularly susceptible.

Some African countries, including South Africa, have resorted to power rationing as a way to meet increasing demand.
In these cases, the question of whether or not to use power conditioning, is no longer a choice.

HOW POWER PROBLEMS CAN BE AVOIDED

Below is a table of power problems and how to solve them.

Equipment Available	Automatic Voltage Regulator (AVR)	Line Conditioner	Offline UPS	Line Interactive UPS	True Online UPS	Frequency Converter
Surges	Limited Protection (MOV)	Full Protection	None or Limited Protection (MOV)	Limited Protection	Good Protection	Good Protection
Spikes	Limited Protection	Full Protection	None or Limited Protection (MOV)	Limited Protection	Good Protection	Good Protection
Sags	Good Protection	Full Protection	None or Limited Protection	Limited Protection	Full Protection	Full Protection
Noise	Limited Protection	Good Protection	None or Limited Protection	Limited Protection	Good Protection	Full Protection
Blackout (Power Failure)	No Protection	No Protection	Good Protection 4ms-8ms Changeover	Good Protection	Full Protection (no break)	No Protection
Frequency Variation	No Protection	Good Protection	No Protection	Limited Protection	Full Protection	Full Protection
Waveform Distortion	No Protection	Good Protection	No Protection	Limited Protection	Full Protection	Full Protection

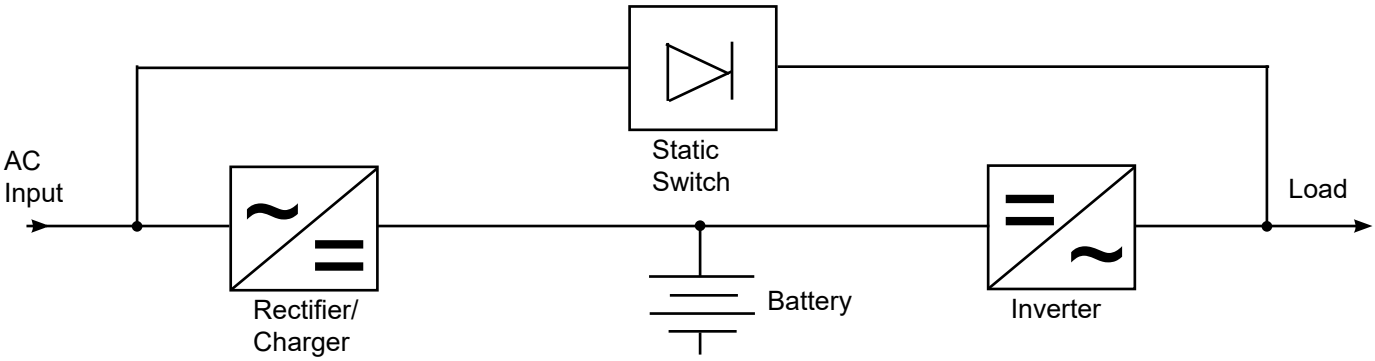
CABLE SELECTION CHART

Cable Size	Armoured Cable Free Air Wired	Unarmoured Cable Free Air Wired
2.5mm2	27 Amps	24 Amps
4.0mm2	35 Amps	32 Amps
6.0mm2	43 Amps	41 Amps
10mm2	60 Amps	55 Amps
16mm2	70 Amps	72 Amps
25mm2	100 Amps	94 Amps
35mm2	125 Amps	115 Amps

Cable Size	Armoured Cable Free Air Wired	Unarmoured Cable Free Air Wired
50mm2	150 Amps	140 Amps
70mm2	180 Amps	175 Amps
95mm2	225 Amps	215 Amps
120mm2	260 Amps	250 Amps
150mm2	290 Amps	280 Amps
185mm2	340 Amps	330 Amps
240mm2	400 Amps	385 Amps

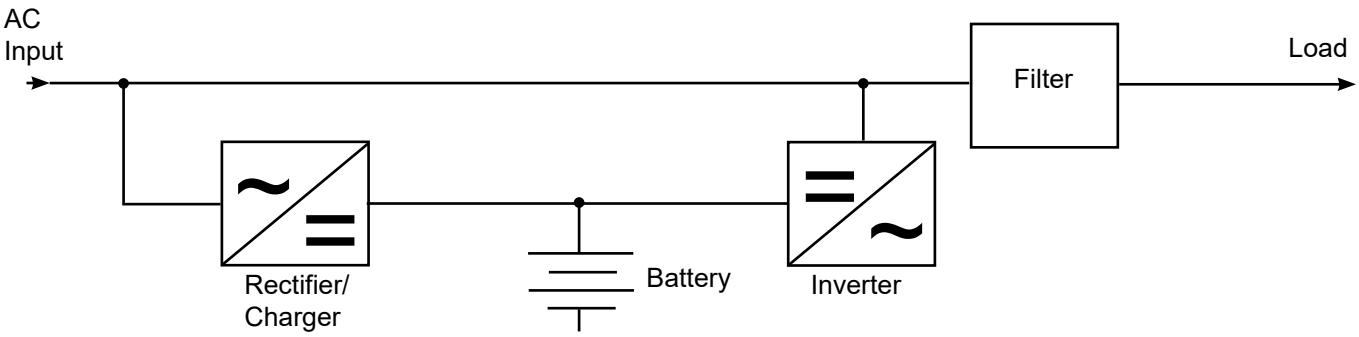
POWER CONDITIONING & UPS
OVERVIEW OF DIFFERENT UPS TYPES

Most of the critical applications in data processing and other industries are now protected by Uninterruptible Power Supplies (UPS).
It is essential that the different types and performance levels are covered by international standards (IEC).
UPS systems are intended to improve the quality of AC power and provide a redundant (back-up) power source.
Power quality defects which may be improved by a UPS include surges, noise or sags.



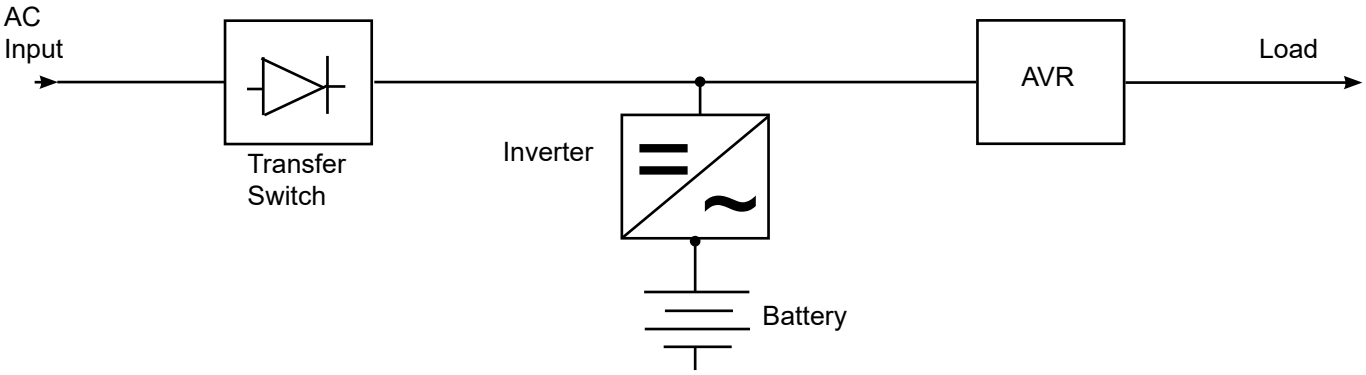
In this type of UPS the load is isolated from the mains, hence all the power to the load flows through the inverter, offering continuous protection and full isolation against surges, noise and sags. It offers true on line protection.

Simplified Diagram of an "Offline" UPS



This type of UPS is not suitable for all applications because it does not use a static switch bypass and the switching times are longer.
There is no isolation between the load and the mains. There is also no output frequency control.

Simplified Diagram of an "Line-Interactive" UPS



This type of UPS does not provide isolation between the mains and the load. There is poor protection against spikes and poor efficiency.
There is no output frequency control but it has voltage regulation on the output.

UPS - ACCESSORIES

SNMP CARDS

- Internal units to be used with UPS's equipped with an intelligent slot
- External units to be used with UPS's already equipped with RS232 communications
- Web server interface
- Linux, MAC and Windows compatible
- Remotely control UPS's
- Battery management features for UPS's being monitored
- SMS and Email capable for several UPS alarms and statuses
- Shut down multiple PC's and/or servers during a power outage.

GSM INTERFACE CARD

- Easy setup with any terminal
- Emulator software
- Flexible messages
- Dedicated standalone operation
- 10 SMS alarm recipients
- No need to use a PC.

REMOTE ALARMS PANEL FOR UPS

- LED Indications for Mains Present, Mains Fail, Low Battery and UPS on Bypass
- To be used with UPS's equipped with potential free alarm contacts
- Audible alarm
- Alarm can be cancelled with a push button.

BATTERY CABINETS

- Used for all battery types
- In 7 different sizes, selection matrix below for battery size and cabinet sizing requirements.

Code	Dimensions	Weight
A1	275mm x 375mm x 200mm	5kgs
A2	275mm x 375mm x 405mm	9kgs
A4	335mm x 810mm x 430mm	18kgs
A8	670mm x 810mm x 430mm	36kgs
A12	1005mm x 810mm x 430mm	54kgs
A16	1340mm x 810mm x 430mm	72kgs
A20	1675mm x 810mm x 430mm	90kgs
A35	1620mm x 1340mm x 440mm	150kgs

Code	7.2/9Ah	12Ah	17Ah	20Ah	24Ah	28Ah	33Ah	45Ah	45Ah Semi Sealed	65Ah	65Ah Semi Sealed	100Ah
A1	6	4	4	4	2	3	2	2	1	1	1	1
A2	12	8	8	8	4	6	4	4	2	2	2	2
A4	30	20	20	20	8	12	12	8	9	4	6	4
A8	60	40	40	40	16	24	24	16	18	8	12	8
A12	90	60	60	60	24	36	36	24	27	12	18	12
A16	120	80	80	80	32	48	48	32	36	16	24	16
A20	150	100	100	100	40	60	60	40	45	20	30	20
A35	240	160	175	175	80	120	100	80	75	40	50	35

UPS - LINE INTERACTIVE
MODIFIED SINEWAVE

T1X SERIES (650VA-2kVA)

- Compact size
- Excellent microprocessor control guarantees high reliability
- Boost and buck AVR for voltage stabilisation
- Auto restart with AC recovery
- Simulated sinewave inverter output
- Off-mode charging
- Cold start function
- USB comm. standard with RJ11 telephone protection.

Model	ST1006X	ST1010X	ST1015X	ST1020X
Capacity	650VA/360W	1000VA/600W	1500VA/900W	2000VA/1200W
Input				
Voltage	110/120VAC or 220/230/240VAC			
Voltage Range	81-145VAC or 162-290VAC			
Frequency Range	50Hz or 60Hz (auto-sensing)			
Output				
Ac Voltage Regulation (Batt. Mode)	± 10%			
Frequency Range (Batt. Mode)	50Hz or 60Hz ± 1Hz			
Transfer Time	Typical 1-6ms, 10ms Max			
Battery				
Battery Type & Number	12V/7Ah x 1	12V/7Ah x 2	12V/9Ah x 2	
Backup Time (1 PC @ 120W load)	10 min.	30 min.	40 min.	42 min.
Typical Recharge Time	4-6 hours recovery to 90%			
Indicators				
AC Mode	Green LED on		The right green LED is on and LED's 2-5 indicate load level	
Battery Mode	Green LED Flashes	Yellow LED Flashes	The right green LED flashes and LED's 2-5 indicate battery capacity	
Fault	Red LED Flashes			
Protection				
Full Protection	Overload, discharge and overcharge protection			
Alarm				
Battery Mode	Sounds every 10 seconds			
Low Battery	Sounds every second			
Overload	Sounds every 0.5 seconds			
Battery Replacement Alarm	Sounds every 2 seconds			
Fault	Continuously sounds			
Physical				
Dimension, D x W x H (mm)	287 x 100 x 142	315 x 120 x 180	315 x 120 x 180	
Net Weight (kg)	4.25	8.0	11.1	11.5
Operating Environment				
Humidity	0-90% RH @ 0-40^{0}C (non-condensing)			
Noise	Less than 40dB			

UPS - LINE INTERACTIVE
PURE SINEWAVE

T2 SERIES (1kVA-3kVA)

Launched in 2005 and superseding the highly regarded PHD IP Series UPS, the T2 Series benefits from the latest microprocessor Control Unit (MCU) technology, and now offers even greater value for money. The T2 is aimed at users that require protection from line voltage fluctuations and require a reliable and constant power source. The T2 is a sophisticated unit utilizing full digital control technology. Available with power rating of 1kVA, 2kVA and 3kVA each with LCD display and audible alarm keeping you quickly updated on mains and battery status. The T2 is also fitted with an intelligent test button enabling a self-test routine which also prevents the UPS from being inadvertently switched off.

FEATURES:

- Extensive log files
- Scheduled battery and inverter testing
- Scheduled system shutdown/restart
- User-Customisable commands and messages
- Multiple UPS control from a single computer
- Remote Console Command module for remote multiple server shutdown
- Internal SNMP sub-agent for integration into existing NMS (e.g. HP OpenView, CA).

Model	ST2010	ST2020	ST2030
Capacity			
Maximum Capacity	1000VA/700W	2000VA/1400W	3000VA/2100W
Input			
Input Voltage Range	220/230/240VAC ± 25% Singe Phase w/Ground		
Input Frequency	44Hz ~ 56Hz		
Output			
Output Voltage	220/230/240VAC ± 2%		
Output THD	< 3%		
Efficiency (Battery Mode)	82%		
Output Frequency (Battery Mode)	50 ± 0.1Hz		
Overload Capability (Normal Mode)	Sustaining 5 min @ 100 – 200%; 3 sec @ > 200%		
Overload Capability (Battery Mode)	Sustaining 30 sec @ > 100%; 1 sec @ 150%		
Battery			
Number of Batteries	2 cells	4 cells	6 cells
Recharge Time to 90%	< 8 hours (adjustable)		
Charge Current of Long Standby Model *	10A		
Indication			
LCD	AC Mode, Battery Mode, Output Status, Battery Capacity, Overload, UPS Fault		
Audible Alarm			
Battery Mode, Low Battery, Overload	Long beeping, Continuous beeping, Short beeping		
Physical			
W x H x D (mm), Weight	150 x 220 x 460, 19kg	220 x 330 x 487, 32kg/24	220 x 330 x 487, 42kg/30
Environmental			
Operating Temperature	-5 ~ 40^0 C		
Relative Humidity	< 95% (Non-Condensing)		
Audible Noise	<45dBA @ 1 meter		
Communication Port	Standard RS232; USB or SNMP/HTTP (optional)		

* All T2 models have a long standby option with no built in batteries, this is the charge current of the long standby models. For long standby models, add "-L" to the part number.

UPS - ONLINE (TRANSFORMERLESS)
1 PHASE INPUT, 1 PHASE OUTPUT

T3RT SERIES (1kVA-10kVA)

The T3RT is a rack tower online double conversion UPS. It is a physically small On-Line double conversion UPS but retains all the features normally associated with On-Line technology, but what is On-Line double conversion technology and why does it matter? Simply put “double conversion” is where the mains supply is rectified to a clean DC voltage and rebuilt into a very clean and regulated AC voltage, at all times your critical load runs from this clean no break supply.

Line-Interactive and Off-Line UPS’s are single conversion, put in its crudest form your computer runs on semi regulated mains and will always suffer a small break in supply whilst the UPS moves from mains mode to battery mode in a mains fail situation.

- TRUE ON-LINE DOUBLE CONVERSION TECHNOLOGY FOR HIGH LEVEL OF PROTECTION
- DSP TECHNOLOGY
- PARALLEL REDUNDANCY CAPABILITY (FOR 6 & 10KVA MODELS)
- INTEGRATED SMART CARD SLOT PROVIDING A CHOICE OF COMMUNICATIONS INTERFACES
- WIDE INPUT VOLTAGE
- FREQUENCY CONVERTER MODE
- ECO MODE
- EMERGENCY POWER OFF FUNCTION FOR 6 & 10KVA MODELS
- LONG RUNTIME AVAILABILITY
- 0.8 POWER FACTOR ALLOWING YOU TO RUN MORE LOAD

PARALLEL (OPTIONAL)

A big advantage offered by the T3RT 6kVA to 10kVA is that by means of a simple cable the machines can be linked together to form a parallel N+1 system. This offers the client the opportunity to be either a fail safe system or the option to expand the power as the network grows. Up to three machines can be connected in this way making the T3RT a flexible and versatile solution.

SIMPLE NETWORK MANAGEMENT PROTOCOL (SNMP)

The T3R SNMP external agent can be located up to 5 metres away from the UPS. Initial configuration is carried out by serial comms using any suitable terminal application (e.g. Hyperterminal for Windows). The embedded HTTP server presents an HTML interface to the network, which can be accessed from any web browser. All system parameters can be configured from here including scheduled shutdown. A sophisticated JAVA applet provides full monitoring in real time, along with comprehensive events and history logs.

UPS MANAGEMENT SOFTWARE

The UPS management software is installed on a server or workstation connected to each UPS via the serial or USB port. Power failure, power restored, battery failure or eight events will be detected and the user informed. A shutdown will be initiated when the batteries are exhausted or a technical problem occurs with the UPS. The UPS management software disconnects, logs out users and closes open applications(subjet to app/os support) before shutting down the operating system itself.

UPS - ONLINE (TRANSFORMERLESS)
1 PHASE INPUT, 1 PHASE OUTPUT

Model	ST3010RT	ST3020RT	ST3030RT	ST3060RT	ST3100RT
Topology	True On-Line, Double Conversion				
On-battery Waveform	Pure Sine Wave				
Input					
Maximum Capacity (VA/W)	1000VA/800W	2000VA/1600W	3000VA/2400W	6000VA/4800W	10000VA/8000W
Nominal Input	208/220/230/240VAC				
Input Voltage Regulation	110~300VAC ± 3% at 50% load, 176~300VAC ± 3% at 100% load				
Frequency Range	46~54Hz or 56~64Hz				
Output					
Nominal Output	208/220/230/240VAC				
Output Regulation	± 1%				
Output T.H.D	≤3% (Linear Load), ≤5% (Non-linear Load)				
Crest Factor	3:1				
Transfer Time	0ms				
Frequency Range (Synchronised Range)**	46~54Hz or 56~64Hz				
Frequency Range (Batt. Mode)	50Hz ± 0.1Hz or 60Hz ± 0.1Hz				
Battery					
Battery Type	12VDC/9Ah per cell				
Number of Batteries	2 cells	4 cells	6 cells	16 cells	
Backup Time	5-10 minutes at full load				
Recharge Time to 90%	4 hours			9 hours	
Charge Current of Standard Model	1A			1A/2A (Adjustable)	
Long-Run Model*	1A/2A/4A/6A (Adjustable)				
LCD Display					
Front Panel Indication – LCD	Load level, Battery level, AC mode, Battery mode, Bypass mode and Fault Indicators				
Communication Interface					
Communication Port	RS232 & USB(Standard), AS400 or SNMP / HTTP (Optional)				
Environmental					
Audible Noise	< 50dBA @1 meter			< 55dBA @1 meter	< 58dBA @1 meter
Mechanical					
Dimensions (D x W x H mm) Standard Model	310 x 440 x 86 (2U)	410 x 440 x 86 (2U)	630 x 440 x 86	UPS:530 x 440 x 88 (2U)	UPS:580 x 440 x 130 (3U)
Batt. Cabinet	410 x 440 x 86	510 x 440 x 86	630 x 440 x 86	530 x 440 x 86 (2U)	690 x 440 x 86 (2U)
Dimensions (D x W x H mm) Long-Run Model	310 x 440 x 86	410 x 440 x 86	410 x 440 x 86	690 x 440 x 86 (2U)	580 x 440 x 130 (3U)
Weight (Net Weight with Battery) (kgs) Standard Model	12	19	29.3	UPS: 15, Batt: 48	UPS: 18, Batt: 48

* All T3R models have a long standby option with no built in batteries, this is the charge current of the long standby models. For long standby models, add "-L" to the part number.
** Derate to 80% of capacity in Frequency Converter Mode and when output voltage is adjusted to 208VAC.

UPS - ONLINE (TRANSFORMERLESS)
1 PHASE INPUT, 1 PHASE OUTPUT

ST3I SERIES (6kVA-20kVA)

ST3I (6kVA-20kVA) features true on line double conversion and zero sec. transfer time. The features include full digital control with DSP's for IGBT rectifier, inverter and battery charger.

LONG RUNTIME UNITS AVAILABLE

The series boasts both standard runtime units with internal batteries for the 6KVA and 10 KVA Models and long runtime across the range. The long run units have larger capacity chargers built in for charging larger battery banks, where several hours of runtime may be required.

COLD START FUNCTION

Due to a special current limiting circuit on the UPS, the user can start the UPS directly from the battery bank connected for emergency situations in a no mains situation. The UPS can run on cold start on full load.

FULL FUNCTION LCD DISPLAY

All ST3I series products above are equipped with a large LCD display, as well as LED Mimic panel.
They also feature real time
Surveillance on UPS running parameters and status, FE and daily maintenance.
The ST3I features an intelligent battery management system while batteries are being charged and discharged for longer operational life and higher reliability of the batteries.

FLEXIBLE NET PROJECT MONITORING

Independent digital remote control, supported by RS485, with a range of 1000 meters or OPTIONAL SNMP network adapter.

ADVANCED NON-MASTER-SLAVE SELF ADAPTIVE CONTROL TECHNOLOGY (PARALLEL TYPE)

ST3I series parallel UPS features a powerful parallel capacity. There is no need to set the parallel units. The user can extend the parallel capacity as needed for N+1 parallel redundancy. This increases the reliability of the power system.

UPS - ONLINE (TRANSFORMER)
1 PHASE INPUT, 1 PHASE OUTPUT

	ST3I-06S	ST3I-06L	ST3I-10S	ST3I-10L	ST3I-15L	ST3I-20L
INPUT						
Cold Start	YES, default frequency=50Hz or settable		YES, default frequency=50Hz or settable		YES, default	YES, default
Acceptable Input Voltage	50%~125%(220VAC/230VAC/240VAC) 100% load@80%~125% 90% load@70%~80% 80% load@60%~70% 65% load@50%~60%		50%~125%(220VAC/230VAC/240VAC) 100% load@80%~125% 90% load@70%~80% 80% load@60%~70% 65% load@50%~60%		50%~125%(220VAC/230VA 100% load@80%~125% 90% load@70%~80% 80% load@60%~70% 65% load@50%~60%	50%~125%(220VAC/230VA 100% load@80%~125% 90% load@70%~80% 80% load@60%~70% 65% load@50%~60%
Phase	Single phase in,single phase out		Single phase in,single phase out		Three phase in,single	Single phase in,single
Transfer Voltage Range -Line low transfer -Line low recovery -Line high transfer -Line high recovery	 110VAC/115VAC/120VAC 116VAC/122VAC/127VAC 275VAC/288VAC/300VAC 268VAC/279VAC/291VAC		 110VAC/115VAC/120VAC 116VAC/122VAC/127VAC 275VAC/288VAC/300VAC 268VAC/279VAC/291VAC		 110VAC/115VAC/120VAC 116VAC/122VAC/127VAC 275VAC/288VAC/300VAC 268VAC/279VAC/291VAC	 110VAC/115VAC/120VAC 116VAC/122VAC/127VAC 275VAC/288VAC/300VAC 268VAC/279VAC/291VAC
Input Power Factor	⩾0.99		⩾0.99		⩾0.98	⩾0.98
Input Frequency Range	40Hz - 70Hz		40Hz - 70Hz		40Hz - 70Hz	40Hz - 70Hz
Generator	Support Any Generator.		Support Any Generator.		Support Any Generator.	Support Any Generator.
OUTPUT						
Frequency adaptable	Settable		Settable		Settable	Settable
Power -Power(kVA) max -Power(kW) max	 6 5.4		 10 9		 15 13.5	 20 18
Output Voltage -Waveform -Nominal voltage -Voltage regulation -Transient response -Transient recovery -Voltage distortion	 Pure sine wave 220/230/240VAC ± 1 % ⩽5% (50% - 100% -50%) ⩽15ms (0% - 100% -0%) ⩽1% THD, linear load ⩽ 5% THD, non-linear load		 Pure sine wave 220/230/240VAC ± 1 % ⩽5% (50% - 100% -50%) ⩽15ms (0% - 100% -0%) ⩽1% THD, linear load ⩽5% THD, non-linear load		 Pure sine wave 220/230/240VAC ± 1 % ⩽5% (50% - 100% -50%) ⩽15ms(0% - 100% -0%) ⩽1% THD, linear load ⩽5% THD, non-linear load	 Pure sine wave 220/230/240VAC ± 1 % ⩽5% (50% - 100% -50%) ⩽15ms(0% - 100% -0%) ⩽1% THD, linear load ⩽5% THD, non-linear load
Output Frequency -Synchronization range -Slew rate -Battery mode	 settable,±3Hz default 0.5~5Hz/s,2 Hz/s default (50±0.05) Hz		 settable,±3Hz default 0.5~5Hz/s,2Hz/s default (50±0.05) Hz		 settable,±3Hz default 0.5~5Hz/s,2Hz/s default (50±0.05) Hz	 settable,±3Hz default 0.5~5Hz/s,2Hz/s default (50±0.05) Hz
Transfer Time -Line mode to battery mode -Inverter to bypass	 0 4ms		 0 0		 0 0	 0 0
Efficiency -Line mode with battery full -ECO mode -Battery mode	 93.0% 98.0% 92.0%		 93.0% 98.0% 92.0%		 93.5% 98.0% 92.0%	 93.5% 98.0% 92.0%
Noise	<48dB@<70%load,<58dB@>70%load;1m away		<48dB@<70%load,<60dB@>70%load;1m away		53dB@<70%load,<66dB@>	53dB@<70%load,<66dB@>
Overload Capability (Line Mode)	110%: Transfer to bypass after 10 mins. 130%: Transfer to bypass after 1 min 150%: Transfer to bypass after 30s, shutdown after 1		110%: Transfer to bypass after 10 mins 130%: Transfer to bypass after 1 min 150%: Transfer to bypass after 30s, shutdown after 1		110%: Transfer to bypass 130%: Transfer to bypass 150%: Transfer to bypass	110%: Transfer to bypass 130%: Transfer to bypass 150%: Transfer to bypass
Overload Capability (Battery Mode)	110%: Shutdown after 10mins (Battery mode) 125%:Shutdown after 10s(Battery mode) >125%: Shutdown after 1s (Battery mode)		110%: Shutdown after 10mins (Battery mode) 125%:Shutdown after 10s(Battery mode) >125%: Shutdown after 1s (Battery mode)		110%: Shutdown after 125%:Shutdown after >125%: Shutdown after 1s	110%: Shutdown after 125%:Shutdown after >125%: Shutdown after 1s
Crest Ratio	3:1		3:1		3:1	3:1
BATTERY						
Rating/Type	12VDC/7Ah	Depend on the capacity of external batteries	12VDC/9Ah	Depend on the capacity of external batteries	Depend on the capacity of external batteries	Depend on the capacity of external batteries
Quantity	16		16		16	16
DC Voltage	192VDC	192/240VDC	192VDC	192/240VDC	192/240VDC	192/240VDC
Back-up Time	4mins @80% load	Depend on the capacity of	3.5mins @80% load	Depend on the capacity of	Depend on the capacity of	Depend on the capacity of
Battery-Low Voltage	(176±3)VDC		(176±3)VDC		(176±3)VDC	(176±3)VDC
Charger -Charging voltage	 (220±1%)VDC		 (220±1%)VDC		 (220±1%)VDC	 (220±1%)VDC
_Charging current (max)	1A	5A	1A	5A	5A	5A
-Charging time	7h recharge to 90%	Depend on the capacity of external batteries	8h recharge to 90%	Depend on the capacity of external batteries	Depend on the capacity of external batteries	Depend on the capacity of external batteries
Leakage current	<1mA		<1mA		<1mA	<1mA
INDICATOR & ALARM						
Display	LED+LCD		LED+LCD		LED+LCD	LED+LCD
Alarm	Sounding once per second					
Fault	Continuous beeping		Continuous beeping		Continuous beeping	Continuous beeping
INTERFACE						
Smart RS232(standard) B type USB(optional)						
EPO	Remoted EPO function for customer. Short to activate					
Dry Contactor(optional)	DB9 type and phoenix terminal type for selection. (6 output ports, 1 input port) UPS fault alarm, general alarm, bypass mode, UPS normal mode, battery low voltage					
SNMP(optional)	Power Managment from SNMP Manager and Web Browser					
Option	SNMP, USB, Dry Contactor(AS400),Parallel Kit, ECO Kit, External Battery Cable(standard model), Maintenance Bypass, Maintenance Bypass Detecting Kit					
Reserved function	Can be designed as deffirent function according to customer's appliction					
MECHANICAL						
W× D×H (mm)	250x562x650	250x504x480	250x562x650	250x504x480	250x562x770	250x562x770
Net Weight (KG)	57	18	65	20	33	33

UPS - ONLINE (TRANSFORMERLESS)

1 PHASE INPUT, 1 PHASE OUTPUT

T3 SERIES (1kVA-10kVA)

The T3 is a physically small On-Line double conversion UPS but retains all the features normally associated with On-Line technology, but what is On-Line double conversion technology and why does it matter? Simply put “double conversion” is where the mains supply is rectified to a clean DC voltage and rebuilt into a very clean and regulated AC voltage, at all times your critical load runs from this clean no break supply.

Line-Interactive and Off-Line UPS’s are single conversion, put in its crudest form your computer runs on semi regulated mains and will always suffer a small break in supply whilst the UPS moves from mains mode to battery mode in a mains fail situation.

- TRUE ON-LINE DOUBLE TECHNOLOGY FOR HIGH LEVEL OF PROTECTION
- DSP TECHNOLOGY (FOR 6-10kVA MODELS)
- PARALLEL REDUNDANCY CAPABILITY (FOR 6-10kVA MODELS AS STANDARD)
- INTEGRATED SMARTCARD SLOT PROVIDING A CHOICE OF COMMUNICATIONS INTERFACES
- OPTIONAL SPECIALISED UPS MANAGEMENT SOFTWARE
- USER FRIENDLY LCD DISPLAY
- FAILSAFE INTERNAL BYPASS
- SWITCH WITH MANUAL CONTROL
- LONG RUNTIME AVAILABILITY.

PARALLEL

A big advantage offered by the T3 6kVA to 10kVA is that by means of a simple cable the machines can be linked together to form a parallel N+1 system. This offers the client the opportunity to be either a fail safe system or the option to expand the power as the network grows. Up to three machines can be connected in this way making the T3 a flexible and versatile solution.

UPS MANAGEMENT SOFTWARE

The UPS management software is installed on a server or workstation connected to each UPS via the serial or USB port. Power failure, power restored, battery failure or eight events will be detected and the user informed. A shutdown will be initiated when the batteries are exhausted or a technical problem occurs with the UPS. The UPS management software disconnects, logs out users and closes open applications(subject to application/ operating system support) before shutting down the operating system itself.

SIMPLE NETWORK MANAGEMENT PROTOCOL (SNMP)

The T3 SNMP external agent can be located up to 5 metres away from the UPS. Initial configuration is carried out by serial comms using any suitable terminal application (e.g. Hyperterminal for Windows).

The embedded HTTP server presents an HTML interface to the network, which can be accessed from any web browser.
All system parameters can be configured from here including scheduled shutdown. A sophisticated JAVA applet provides full monitoring in real time, along with comprehensive events and history logs.

UPS - ONLINE (TRANSFORMERLESS)

1 PHASE INPUT, 1 PHASE OUTPUT

Model	ST3010	ST3020	ST3030	ST3060	ST3100
Topology	True On-Line, Double Conversion				
On-battery Waveform	Pure Sine Wave				
Input					
Maximum Capacity (VA/W)	1000VA/800W	2000VA/1600W	3000VA/2400W	6000VA/4800W	10000VA/8000W
Nominal Input	230VAC				
Input Voltage Regulation	160~300 VAC Single Phase w/ Ground			170~285 VAC Single Phase w/Ground	
Nominal Input Frequency	50/60 ± 4Hz				
Input PFC	≥0.95			≥0.98	
Input Short Protection	Circuit Breaker				
Output					
Nominal Output	220/230/240 VAC nominal				
Output Regulation	± 2%			± 1%	
Output T.H.D	≤3% (Linear Load) ≤6% (Non-Linear Load)	≤4% THD (Linear Load) ≤7% THD (Non-Linear Load)		≤2% THD (Linear Load) ≤6% THD (Non-Linear Load)	
High Efficiency Mode (AC to DC)	85%	85%	88%	> 88%	
High Efficiency Mode (DC to AC)	83%	83%	83%	> 88%	
Crest Factor	3:1				
Start on Battery	Yes				
Output Frequency	50 Hz ± 0.2 Hz			50 Hz ± 0.5 Hz	
Battery					
Typical Backup Time (average)	9 minutes	12 minutes	8 minutes	10 minutes	8 minutes
Battery Type	Sealed Lead-Acid maintenance-free 12VDC/7Ah per cell				12VDC/9Ah per cell
Number of Batteries	3 cells	8 cells		20 cells	
Recharge Time to 90%	5 hours			7 hours	8 hours
Charge Current of Long Standby Model *	8A			4.2A **	
Advanced Warning Diagnostics					
Front Panel Indication – LCD	UPS Status, I/P Voltage & Frequency, O/P Voltage & Frequency, Battery Voltage, Battery Capacity, Loading %, Temperature, History Alarm.				
Front Panel Indication – LED	Normal (Green), Warning (Yellow), Fault (Red)				
Audible Alarms	Battery Mode, Low Battery, Overload, Fault				
Communication Interface					
Communication Port	RS232 (Standard), DB9 or USB or AS400 or SNMP / HTTP (Optional)				
Environmental					
Audible Noise	< 45dBA @1 meter	< 50dBA @1 meter		< 55dBA @1 meter	
Mechanical					
Dimensions (W x H x D mm)	160 x 220 x 400	200 x 352 x 450		260 x 717 x 570	
Weight (Net Weight with Battery) (kgs)	15	34	35	90	93

* All T3 models have a long standby option with no built in batteries, this is the charge current of the long standby models. For long standby models, add "-L" to the part number.

** 6 and 10kVA models can have up to 25A charging capabilities when connected in parallel with the ST-CHARGER external super charger.

UPS - ONLINE (TRANSFORMER)
1 PHASE INPUT, 1 PHASE OUTPUT

T3T SERIES (10kVA - 15kVA)

The T3T is a transformer isolated On-Line double conversion UPS but what is On-Line double conversion technology and why does it matter? Simply put “double conversion” is where the mains supply is rectified to a clean DC voltage and rebuilt into a very clean and regulated AC voltage, at all times your critical load runs from this clean no break supply and is isolated from the input.

Line-Interactive and Off-Line UPS’s are single conversion, put in its crudest form your computer runs on semi regulated mains and will always suffer a small break in supply whilst the UPS moves from mains mode to battery mode in a mains fail situation.

PARALLEL

A big advantage offered by the T3T is that by means of a simple cable the machines can be linked together to form a parallel N+1 system (only for 10kVA and 15kVA models). This offers the client the opportunity to be either a fail safe system or the option to expand the power as the network grows. Up to three machines can be connected in this way making the T3T a flexible and versatile solution.

UPS MANAGEMENT SOFTWARE

The UPS management software is installed on a server or workstation connected to each UPS via the serial or USB port. Power failure, power restored, battery failure or eight events will be detected and the user informed. A shutdown will be initiated when the batteries are exhausted or a technical problem occurs with the UPS. The UPS management software disconnects, logs out users and closes open applications(subject to application/operating system support) before shutting down the operating system itself.

SIMPLE NETWORK MANAGEMENT PROTOCOL (SNMP)

The T3T SNMP external agent can be located up to 5 metres away from the UPS. Initial configuration is carried out by serial comms using any suitable terminal application (e.g. Hyperterminal for Windows).

The embedded HTTP server presents an HTML interface to the network, which can be accessed from any web browser. All system parameters can be configured from here including scheduled shutdown. A sophisticated JAVA applet provides full monitoring in real time, along with comprehensive events and history logs.

- TRUE ON-LINE DOUBLE CONVERSION TECHNOLOGY FOR HIGH LEVEL OF PROTECTION
- DSP TECHNOLOGY
- PARALLEL REDUNDANCY CAPABILITY (OPTIONAL)
- INTEGRATED SMARTCARD SLOT PROVIDING A CHOICE OF COMMUNICATIONS INTERFACES
- OPTIONAL SPECIALISED UPS MANAGEMENT SOFTWARE
- USER FRIENDLY LCD DISPLAY
- FAILSAFE INTERNAL BYPASS
- SWITCH WITH MANUAL CONTROL
- LONG RUNTIME AVAILABILITY.

UPS - ONLINE (TRANSFORMER)
1 PHASE INPUT, 1 PHASE OUTPUT

Model*	ST3020T	ST3030T	ST3050T	ST3060T	ST3100T	ST3150T
Topology	True Online Double Conversion, Isolated Transformer Output					
Input						
Maximum Capacity (kVA/kW)	2/1.4	3/2.1	5/3.5	6/4.2	10/7	15/10.5
Input Voltage Regulation	220VAC ±25%					
Nominal Input Frequency	50Hz ± 5%					
Battery Voltage	48VDC	96VDC	192VDC			
Output						
Output Regulation	220VAC ± 2%					
Waveform	Sinewave, ≤3% THD					
Switch Time	0ms					
Overload Capacity	125% for 60 seconds, 150% for 0.5 seconds					
Crest Factor	3:1					
Start on Battery	Yes					
Output Frequency	Automatic synchronous tracing when power supply normal, at 50Hz ± 0.5% when power supply abnormal					
Battery						
Back up time**	15 mins	25 mins	10 mins	10 mins	Any backup time	
Battery efficiency	>80%	>87%			>89%	
Charging***	Intellectual MMBM battery control technique, unique multi-charging mode improving the reliability and lengthening the life of the batteries					
Other Features						
Panel Display	Input voltage, Output voltage, Load capacity, Battery voltage LED indicating lights show the working status					
Alarm	Mains supply abnormal, Low battery, Overload					
Protection Function	Protection for low battery, overload, over temperature, short circuit, output over voltage, output low voltage					
Parallel function*	N/A				Random extending or N+1 redundancy parallel connection	
Communication Interface						
Communication Function	RS232 communication port supports UPSilon 2000 software (standard). Supports SNMP adapter for network management (optional).					
Remote Control (Optional)	Independent digital remote control at the distance of 1000 meters supported by RS485, which supports remote monitoring					
Dry connection	The port allows a 2A current, convenient and safe					
Environmental						
Audible Noise	< 55dBA @1 meter				< 60dBA @1 meter	
Work Temperature, Relative Humidity	0~40°C, 0~95%(no condensation)					
Altitude	Meet GB/T 7260.3-2003 standard					
Mechanical						
Dimensions (W x L x H mm)	230 x 610 x 470	230 x 610 x 470			300 x 610 x 530	
Weight (with & without batteries) (kgs)	65/52	82/58	90/57	108/61	210/92	250/140

* T3T10kVA and 15kVA models have a parallel redundant option, add "-P" to the part number.
** T3T 2kVA-15kVA models have a long standby option with no built in batteries, add "L" to the part number for these models.
***5-15kVA models can have up to 15A charging capabilities when connected in parallel with the ST-CHARGER external super charger.

UPS - Online (Transformerless)
3 PHASE INPUT, 1 PHASE OUTPUT

T4 SERIES (10kVA-20kVA)

The T4 is a physically small On-Line UPS but retains all the features normally associated with double conversion technology. Simply put "double-conversion" is where the mains supply is rectified to a DC voltage and rebuilt into a very clean and regulated AC voltage, at all times your critical load runs from this clean no break supply.

- TRUE ON-LINE DOUBLE CONVERSION TECHNOLOGY FOR ULTIMATE POWER PROTECTION
- DSP TECHNOLOGY
- PARALLEL REDUNDANCY CAPABILITY AS STANDARD
- IGBT INVERTER TECHNOLOGY
- SNMP/HTTP OPTION FOR REMOTE MANAGEMENT & INTEGRATION INTO NMS
- SMART RS232 AS STANDARD
- INTEGRATED SMARTCARD SLOT PROVIDING A CHOICE OF COMMUNICATIONS INTERFACES
- OPTIONAL SPECIALISED UPS MANGEMENT SOFTWARE
- USER FRIENDLY LCD DISPLAY
- FAILSAFE INTERNAL BYPASS SWITCH WITH MANUAL CONTROL
- LONG RUNTIME AVAILABILITY.

PARALLEL

A big advantage offered by the T4 10kVA to 20kVA is that by means of a simple cable the machines can be linked together to form a parallel N+1 system. This offers the client the opportunity to either have a fail safe system or the option to expand the power as the network grows. Up to three machines can be connected in this way making the T4 a flexible and versatile solution.

ULTRA COMPACT

With a very small footprint you will find a ready home for the T4 in even the most hard-pressed data center. Installing such a compact free-standing UPS avoids taking up valuable rack space without significantly reducing the available floor area.

DISPLAY PANEL

LCD display and audible alarms actively let you know if the unit is on battery, the battery charge is low, or there is an overload condition. Loading and battery information via the LCD prevent you from exceeding the UPS capacity and allow you to assess the remaining runtime before battery reserves are depleted.

ADVANCED BATTERY MANAGEMENT

A variable boost charger ensures quick battery recharge. This means that the T4 UPS is fully prepared for duty with a minimum recovery time in the event of a power failure. Active battery management intelligently monitors the battery set with automatic battery and circuitry self-tests, this feature increases both battery life and system reliability.

UPS MANAGEMENT

One standard management tool can be used to monitor and control all your UPS's from one central location. This means power management can now be integrated into your existing network or building management strategy. Alarms ('traps') can be configured to ensure automatic notification of events such as low battery, mains failure or overload. Two such tools can be used with the T4: Simple Network Management Protocol (SNMP) and UPS Management Software via RS232.

UPS - ONLINE (TRANSFORMERLESS)
3 PHASE INPUT, 1 PHASE OUTPUT

Model	ST4100	ST4150	ST4200
Topology	True On-Line, Double Conversion		
On-battery Waveform	Pure Sine Wave		
Input			
Maximum Capacity (kVA/kW)	10kVA/8kW	15kVA/12kW	20kVA/16kW
Nominal Input Voltage	380VAC Three Phase (3 Φ 4W + G)		
Input Voltage Regulation	304 ~ 478 VAC		
Nominal Input Frequency	50/60 ± 4Hz		
Input PFC	≥0.95 @ full load		
Input Short Protection	50A Circuit Breaker	100A Circuit Breaker	
Output			
Nominal Output Voltage	220/230/240 VAC Single Phase (1 Φ 2W + G)		
Output Voltage Regulation	± 1%		
Output T.H.D	≤2% THD (Linear Load), ≤6% THD(Non-Linear Load)		
Efficiency – Normal Mode	88%		
Efficiency – Battery Mode	88%		
Crest Factor	3:1		
Start on Battery	Yes		
Overload Capability (Normal Mode)	Sustaining 10 min @ 105% ~ 130% load; 1sec @ > 130% load		
Overload Capability (Battery Mode)	Shut down UPS after 10 sec @ > 150% load		
Output Frequency	50/60 Hz ± 0.05 Hz (Battery Mode)		
Battery			
Battery Type	Sealed Lead-Acid maintenance-free 12VDC/7Ah per cell		
Number of Batteries	40 cells/240VDC	40 cells/240VDC	40 cells/240VDC
Typical Backup Time at Full Load	12 mins	8 mins	6 mins
Recharge Time to 90%	< 8 hours		
Charger Current (Max)	4.2A *		
Advanced Diagnostics			
Front Panel Indication – LCD	UPS Status, I/P Voltage & Frequency, O/P Voltage & Frequency, Battery Voltage, Battery Capacity, Loading %, Temperature, History Alarm.		
Front Panel Indication – LED	Normal (Green), Warning (Yellow), Fault (Red)		
Audible Alarms	Battery Mode, Low Battery, Overload, Fault		
Communication Interface			
Communication Port	RS232 (Standard), DB9 or USB or AS400 or SNMP / HTTP (Optional)		
Environmental			
Audible Noise	< 55dBA @ 1 meter		
Mechanical			
UPS Dimensions (W x H x D mm)	260 x 717 x 570		
Battery Cabinet Dimensions (W x H x D mm)	260 x 717 x 570		
UPS Weight (kgs)	39	55	55
Battery Cabinet (w/battery) (kgs)	143	143	143
Total Weight (kgs)	182	198	198

* All T4 models can have up to 25A charging capabilities when connected in parallel with the ST-CHARGER external super charger.

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UPS - ONLINE (TRANSFORMER)
3 PHASE INPUT, 1 PHASE OUTPUT

T4T SERIES (10kVA-50kVA)

The T4T Series UPS is an online sine wave UPS mainly designed for major equipment used in large-scaled data centers (such as measurement equipment, industrial automation equipment, etc.) with high performance. Its high reliability provides necessary protection on load for the users in finance, communication, traffic, tax, forces, security, power source, education, government and enterprise etc. The T4T Series UPS is true double conversion on-line UPS. With IGBT power units, SPWM inverter, intellectual multi modes battery management technique, advanced tech and power management software.

TRUE ONLINE DOUBLE CONVERSION UPS

Output is fully isolated by a transformer, with IGBT power units used to solve problems on the electric system such as lightning strikes, power blackouts, etc.

EMC COMPLIANT

All products are EMC compliant. Testing points include conducting disturbance, radiant disturbance, conducting ant-disturbance, radiant ant-disturbance, power fault, mass pules, ESD etc. Excellent EMC features make the T-UK Series capable of high frequency communication and video & audio broadcasting.

COLD START FUNCTION

Because of special current limiting circuits on the UPS, the user can start the UPS directly on its battery bank without mains being available. The UPS has a more powerful cold starting capability and is able to run on full load.

PERFECT PROTECTION MEASURES

Protection for over output voltage and current, low battery, quick current limit and short-circuit to avoid stoppages caused by the user's incorrect operation.

INTELLIGENT BATTERY MANAGEMENT TECHNOLOGY

Equipped with patented intellectual battery management technique. With proffessional management design on battery charging or discharging, the user can get high battery reliability and running life. At the same time the intellectual charging module can select the right charging power according to different battery configurations making sure that there is rapid power compensation on the battery bank.

FLEXIBLE NETWORK SUPERVISION

Flexible network supervising ability to realise intellectual monitoring of the UPS. Including close point-to-point communication supervising, middle range communication supervising, and remote network management. Based on these, there are many UPS functions such as real time supervising over running status and features, automatic call, sending e-mail, cell phone text messaging, voice function, remote on/off for the UPS etc.

CURRENT EQUALISATION CONTROL TECHNIQUE

Current equalisation control technique, for N units parallel redundancy or N+1 redundant parallel connection, digitized current equalisation control, reliability and redundancy of the system is higher than traditional parallel systems and field installation and debugging is simple. UPS unit can be switched on or be on line on standby mode, to enable hot maintenance on line of parallel system.

UPS - ONLINE (TRANSFORMER)
3 PHASE INPUT, 1 PHASE OUTPUT

Model	ST4100T	ST4150T	ST4200T	ST4300T	ST4400T	ST4500T
Input						
Voltage Range	400VAC (-25%~+25%)					
Frequency Range	50Hz / 60Hz ± 5%					
Phase	Three phases, five wires					
Battery Voltage	16 x 12Vdc = 192Vdc		29 × 12Vdc = 348Vdc			
Output						
Rated Power - kVA/kW	10/7	15/10.5	20/16	30/24	40/32	50/40
Voltage Range	230VAC ± 2%					
Frequency	50Hz ± 1%(battery mode)					
Waveform	THD ≤ 3%(linear load)					
Battery Efficiency	≥ 90% (100% linear load)					
Overload Capacity	10min at 105%, 1min at 125%, 0.5s at 150%					
Crest Factor	3:1					
Parallel Equal Current	≤ 5%(only applicable to the parallel models)					
Other						
Parallel Function	Random extending or N+1 redundancy parallel connection (only applicable to the parallel models)					
LCD Display	Input voltage, Output voltage, Load capacity, Battery voltage		Input voltage, Frequency, Output voltage, Battery voltage, Load, DC current etc.			
LED Display	Operation status					
Alarm Function	Mains supply abnormal, Low battery, Overload		Overload, AC input abnormal, Low battery, Failure, Over-temperature			
Communication Function	RS232/RS485, dry connection communication signal					
Protection Function	Low battery, Overload, Overheat, Output short circuit, Output over voltage					
Audible Noise	< 60dBA @ 1m					
Working Temperature, Relative Humidity	0^0C-40^0C, 0-95% (no condensation)					
Dimension (W x D x H) (mm)	300 x 780 x 720		400 x 800 x 1180			
Weight (kg)	135	160	205	225	280	305

10-15kVA models can have up to 15A charging capabilities when connected in parallel with the ST-CHARGER external super charger.

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UPS - ONLINE (TRANSFORMER)
3 PHASE INPUT, 3 PHASE OUTPUT

T5 SERIES (10kVA-500kVA)

ST5 (10kVA-400kVA) features true on line double conversion and zero sec. transfer time. Intellectual blocking design, adopts advanced power apparatus IGBT, predominantly a SPWM inverter. It also features MMBM intellectual multi-modes battery management and intellectual monitoring and management software. The parallel capacity can extend the on line parallel redundancy or N+1 for upgradeability.

TRUE ONLINE DOUBLE CONVERSION

Output is isolated by a transformer, with IGBT power units used, making sure a safe working environment for all equipment. Isolation between N and G, and anti-impact from all kinds of surgres and disturbances in power.

3 output phases can be adjusted independently, thus allowing 3 phase 100% unbalanced load, flexible load capacity and high system reliability. Especially fit for computer rooms, communication etc.

RELIABLE EMC FEATURES

All products have passed the EMC tests. Testing includes conducting disturbance, radiant disturbance, conducting anti-disturbance, radiant anti-disturbance, power fault, mass pulse, surge, ESD etc. Excellent EMC features allow the ST5 series to be capable of high frequency communication and video & audio broadcasting.

COLD START FUNCTION

Due to a special current limiting circuit on the UPS, the user can start the UPS directly from the battery bank connected for emergency stituations in a no mains situation. The UPS can run on cold start on full load.

FULL FUNCTION LCD DISPLAY

All ST5 series products above 20KVA are equipped with large LCD Displays. They also feature real time surveillance on UPS running parameters and status, FE and daily maintenance.

The ST5 features an Intelligent battery management system while batteries are being charged and discharged for longer operational life and higher reliability of the batteries.

FLEXIBLE NET PROJECT MONITORING (OPTIONAL)

Independent digital remote control, supported by RS485, with a range of 1000 meters or SNMP network adapter

ADVANCED NON-MASTER-SLAVE SELF-ADAPTIVE CONTROL TECHNOLOGY (PARALLEL TYPE)

ST5 series parallel UPS features a powerful parallel capacity. There is no need to set the parallel units. The User can extend the parallel capacity as needed for N+1 parallel redundancy. This increases the reliability of the power system.

UPS - ONLINE (TRANSFORMER)
3 PHASE INPUT, 3 PHASE OUTPUT

Model	ST5 010	ST5 020	ST5 030	ST5 040	ST5 050	ST5 060	ST5 080	ST5 100	ST5 120	ST5 160	ST5 200	ST5 300	ST5 400	ST5 500
Input														
Voltage	380/400/415VAC ± 25%													
Rectifier Frequency Range	40Hz~70Hz													
SYNC Frequency Tracking Range	50Hz ± 5% (± 10% option)													
Phase	3φ4W+PE													
Battery	12Vdc × 29 = 348Vdc / 12vDC x 30 = 360Vdc													
Charge Current (Max)	5~40A (adjustable)										5~80A (adjustable)			
Charge DC Voltage Regulation	395V ± 5Vdc													
DC Ripple Voltage	<1%													
Output														
Capacity (kVA)	10	20	30	40	50	60	80	100	120	160	200	300	400	500
Power Factor	0.9													
Phase	3φ4W+PE													
Voltage *	L-N: 220/230/240VAC ±1%, L-L: 380/400/415VAC ± 1%													
Frequency	Utility normal, follow in phase automatically, Utility fault, output frequency at 50Hz ± 0.1%													
Parallel mode (optional)	None-principle-subordinate Adaptive Control Technique, User can extend parallel capacity as needed for N+1 parallel redundancy													
3 phase 100% load unbalance voltage stability	≤2%, allows 100% unbalance													
Waveform	Sinewave THD ≤ 2% (linear load)													
Crest Factor	3:1													
Efficiency	90%													
Transfer Time	< 1ms (Swicth from inevrter to bypass), 0ms (Swicth from mains to battery mode)													
Overload Capacity	110% load for 30 min,125% load for 10 min,150% load for 1min, 170% and above switch to bypass immediatley													
Regulation no load to full load steady state	±2%													
Other														
Panel Display	LCD Display indicates 3 phase input voltage, input frequency, 3 phase output voltage, load, battery voltage, battery charging and discharging etc. LED indicates running status													
Warning Function	Mains abnormal, UPS fault, Battery low voltage, output overload, etc.													
Protection Function	Battery low voltage protection, overload protection, short circuit protection, over temperature protection, input low voltage protection													
Communication Inter-faces	MODBUS (RS485), SNMP and dry contact communications all are standard													
Operating Temp., Humidity	-5°C-40°C, 95% (non-condensing)													
Dimension (W x D x H) (mm)	500 x 600 x 1180			500 x 800 x 1600				700 x 800 x 1800			1400 x 1000 x 1850	1600 x 1000 x 1850		
Weight (kg)	230	260	300	400	430	450	520	600	650	825	1280	1830	2050	2270

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UPS - ONLINE (TRANSFORMERLESS)
3 PHASE INPUT, 3 PHASE OUTPUT

T6I SERIES (10kVA-500kVA)

ST6I (10kVA-400kVA) features true on line double conversion and zero sec. transfer time. The features include full digital control with DSP's for IGBT rectifier, inverter and battery charger.

COLD START FUNCTION

Due to a special current limiting circuit on the UPS, the user can start the UPS directly from the battery bank connected for emergency stituations in a no mains situation. The UPS can run on cold start on full load.

FULL FUNCTION LCD DISPLAY

All ST6I series products above 40KVA are equipped with a large touch screen LCD display. Units 40kVA and below have an LCD display with keyboard input. They also feature real time surveillance on UPS running parameters and status, FE and daily maintenance.

The ST6I features an Intelligent battery management system while batteries are being charged and discharged for longer operational life and higher reliability of the batteries.

FLEXIBLE NET PROJECT MONITORING

Independent digital remote control, supported by RS485, with a range of 1000 meters or SNMP network adapter.

ADVANCED NON-MASTER-SLAVE SELF ADAPTIVE CONTROL TECHNOLOGY (PARALLEL TYPE)

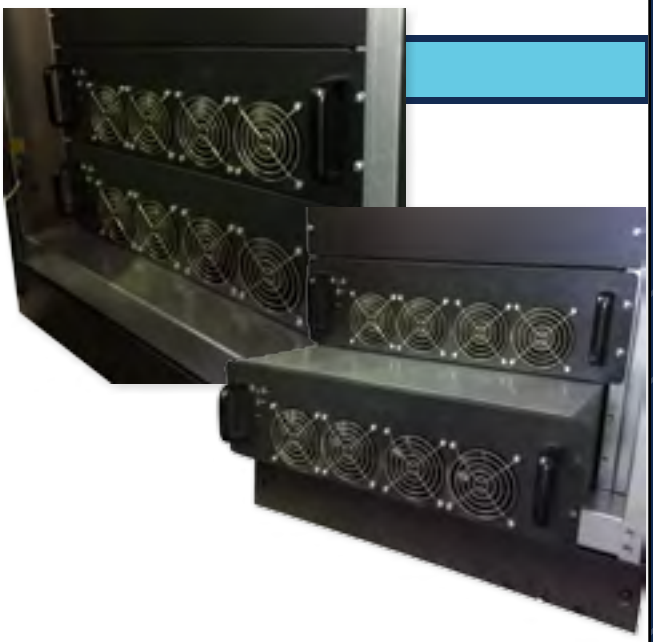
ST6I series parallel UPS features a powerful parallel capacity. There is no need to set the parallel units. The user can extend the parallel capacity as needed for N+1 parallel redundancy. This increases the reliability of the power system.

UPS - ONLINE (TRANSFORMERLESS)
3 PHASE INPUT, 3 PHASE OUTPUT

Model	ST6-010I	ST6-015I	ST6-020I	ST6-030I	ST6-040I	ST6-060I	ST6-090I	ST6-100I	ST6-120I	ST6-150I	ST6-200I	ST6-250I	ST6-300I	ST6-400I	ST6-500I
Input															
Voltage	380/400/415VAC (Line to Line), 50/60Hz														
Input Connection	3Ph+N+PE														
Power Factor	>0.99														
Input Voltage Window	304 ~ 478VAC (Line-Line), Full Load														
	228 ~ 304VAC (Line-Line), load decreases linearly according to the min phase voltage														
Frequency Window	40-70Hz														
Battery															
Battery Voltage	±240Vdc														
Charge Power	20%*Power														
Max. Internal Batteries	40 x 9Ah		40 x 12Ah		80 x 9Ah	External Only									
Output (kVA)	10	15	20	30	40	60	90	100	120	150	200	250	300	400	500
Voltage Precision	1.5% (0-100% linear load)														
Output Voltage Transient	< 5% (20% - 80% - 20% load step)														
Voltage THD	THD < 1% (linear load), THD < 6% (non-linear load)														
Power Factor	0.9														
Frequency Regulation	50/60Hz ± 0.1%														
Crest Factor	3:1														
Overload Capability	102% continuous, 110% for 1 hour, 125% for 10mins, 150% for 1 min, > 150% for 200ms														
Bypass Overload	125% continuous, 130% for 10mins, 150% for 1 min														
System															
Efficiency	Normal Mode: 95%, ECO Mode: 99%, Battery Mode: 95%														
Battery Configuration	12V, 40 PCS (36-44PCS acceptable)														
Display	LCD, LED + Keyboard					LCD, LED, Touch Screen and Keyboard									
EMI	IEC62040-2														
EMS	IEC61000-4-2 (ESD), IEC61000-4-3 (RS), IEC61000-4-4 (EFT), IEC61000-4-5 (Surge)														
IP Class	IP 20														
Communication	RS232, RS485, Dry Contacts, SNMP, EPO, Generator Interface														
Operating Temperature	0-40^{0}C														
Relative Humidity	0-90% (non-condensing)														
Noise @100% load (1 metre)	58dB		65dB			68dB					72dB				
Weight (w/o battery)	51.5		89		140	170	231	210	266	305	350	445	490	810	900
Dimensions (W x D x H, mm)	250 x 840 x 715		350 x 738 x 1335		500 x 840 x 1400	600 x 980 x 950	600 x 980 x 1400	600 x 980 x 1150	600 x 980 x 1400	650 x 960 x 1600		650 x 960 x 2000		1300 x 1100 x 2000	

All information contained in this brochure is purely indicative and can not be used to form any contractual obligations.
Specification or design can be changed at anytime without prior notice.

UPS - ONLINE (TRANSFORMERLESS)
3 PHASE INPUT, 3 PHASE OUTPUT



T7 MODULAR SERIES (10kVA-500KVA)

FEATURES:

- Hot swappable for each module, easy maintenance
- Redundant and High Reliability
- Strong load adaptability for linear and nonlinear load
- Intelligent module and system protection design
- Double DSP controller for individual power module
- IGBT modules rather than discrete components are applied in the power module.
- Friendly generator interface
- SNMP communication card
- Battery temperature compensation module
- Alarm and message module for mobile phone.
- Parallel up to 3 units

UPS - ONLINE (TRANSFORMERLESS)
PHASE INPUT, PHASE OUTPUT

Size Range	20-200kVA	30-300kVA	50-500kVA
Module Capacity	20kVA	30kVA	50kVA
Main Input			
Input voltage	380V/400V/415V, 304~478VAC (Line-Line), Full Load		
Input frequency	50/60Hz, 40-70HZ		
Power factor	>0.99		
Battery			
Battery voltage	±240VDC		
Charger power	20%*Power		
Charger voltage precision	1%		
Bypass			
Bypass voltage	380V/400V/415V, three phase		
Bypass voltage window	-20%-+15%, full load		
Output			
Output voltage	380V/400V/415V, three phase		
Voltage precision	±1.5%(0-100% linear load)		±2%(0-100% linear load)
Voltage THD	THD<1.5%(linear load),THD<5%(nonlinear load)	THD<1%(linear load),THD<6%(nonlinear load)	THD<1.5%(linear load),THD<5.5%(nonlinear load)
Power factor	0.8	0.9	
Crest factor	3:1		
Overload capabiltiy	105%,long time operation		
	110%, transfer to bypass after 1hour		
	125%, transfer to bypass after 10 minutes		
	150%, transfer to bypass after 1 minute		
	>150%, transfer to bypass after 200ms		
System			
System efficiency	Normal mode: 96%, ECO mode: 99%, Bat. Mode: 96%		
Display	LCD+LED, Touch screen and keyboard		
Interface (Communication Ports)	RS232,RS485,Dry contacts,SNMP card,EPO,Generator interface		
Operation temperature	0-40°C		
Storage temperature	-25°C ~70°C		
Relative humidity	0-95% (non-condensing)		
Noise @ 100% Load (1 metre)	<55dB	<65dB	
Weight (kg) of each module	22	34	45
Dimensions (W x D x H) (mm) of each module	440 x 600 x 134	460 x 790 x 134	510 x 700 x 170
Cabinets Available	3, 6 and 10 module cabinets	6, 10 and 20 module cabinets	10 module cabinet
Cabinet Weight (kg)	3-Module: 100kg	6-Module: 165kg	10-Module: 400kg
	6-Module: 150	10-Module: 220kg	
	10-Module: 180kg	20-Module: 660kg	
Cabinet Dimensions (W x D x H) (mm)	3-Module: 600 x 900 x 1000	6-Module: 600 x 1100 x 1600	10-Module: 600 x 1100 x 2000
	6-Module: 600 x 900 x 1600	10-Module: 600 x 1100 x 2000	
	10-Module: 600 x 900 x 2000	20-Module: 2000 x 1050 x 2000	

SWITCH MODE RECTIFIERS
1 PHASE & 3 PHASE

ES1948 SERIES - SWITCHING MODE RECTIFIER

The PHD ES1948-48V/39.6A is a switched mode rectifier (SMR) module designed to provide up to 39.6A of output current into a 48V nominal system. This rectifier has been designed especially to be used in conjunction with a battery to provide an uninterruptable DC power system. The low noise and high reliability make it ideally suited to telecommunications applications. The rectifiers are designed to slide and plug into a single magazine-SR1948-9, designed for a 19" rack, which can accommodate up to 9 rectifiers and up to 32 rectifiers can be configured as a system using one control and supervisory unit (MCSU2048).

The ES1948 Switching Mode Rectifiers are highly compact, highly efficient, fully featured switch mode rectifiers which can operate in a modular rack environment with overall control from the control and supervisory unit MCSU2048. With overall control, such features as active current sharing, accurate battery voltage regulation, battery recharging current limit control, automatic battery equalization and battery temperature compensation are achieved.

The ES1948 rectifier modules incorporate a microcontroller-based control card which incorporates the control and supervisory facilities of the SMR. The microcontroller enables digital communications to the MCSU2048 as well as to the outside world (via the MCSU2048), so that it is possible to examine the operating parameters and, if necessary change them to suit a particular situation, from a remote location, even a distant one if a modem is used. This method of monitoring and control opens up entirely new methods of routine and emergency maintenance procedures.

INTERFACE BOARD AND OPTIONAL ACCESSORIES

MUIB: PHD's MUIB board combined with MCSU, external transducers and digital or analog I/O contacts to control and monitor a 24V or 48V or 110V DC power system. It provides a basic interface between the MCSU and the system environment.

MMIB (optional): PHD's MMIB board is an add-on module for the MCSU. It is used to monitor external AC power sources in either single phase or three phase configurations during operation.

BCM (optional): PHD's BCM board is an add-on module for the MCSU. It is used to monitor individual cells of a batteries during either float, equalize operation, or discharge. Each BCM board is capable of monitoring up to 24 cells(BCM) or 96 cells(BCM2).

SMM (optional): PHD's SMM board is an expansion of the MCSU. It allows the user to monitor the status of equipment that is external to PHD's DC power system. It can also be used to monitor a 3rd party DC power system. Using the same communication link and winCSU2000 software, the SMM can supervise numerous off-site systems from a central monitoring station.

WinCSU2000: PHD's WinCSU2000 software is an intuitive program designed for the Windows 95,98 and NT environments. Working through MCSU and interface boards, you can monitor and control PHD's DC power system either locally or remotely through a modem.

MCSU NetAgent Ⅱ: PHD has integrated various communication protocols over networking to enable the equipment's real-time remote monitoring and management via MCSU NetAgent Ⅱ. It is equipped with a UTP RJ45 plug for 10Base-T or 100M fast Ethernet connecting through TCP/IP, UDP, HTTP, Telnet, SNTP, PPP or SMTP protocol to LAN and WAN. It also has a RS232 port to connect with an external modem to dial in via the PPP protocol to access an internet connection.

FEATURES:

- Innovative single phase and three phase input stage with wide input range (90-275VAC, 310-480VAC)
- Power factor > 0.99
- High efficiency
- Microprocessor based
- Active or passive load sharing
- Rear "push in to plug in" connection for AC, DC and communications link
- Weight less than 1.9kg
- Exceptional power density (>18W/in3).

APPLICATIONS:

- Telephone Exchanges
- Cellular Phone/ Radio Base Stations
- Satellite Base Stations
- Microwave Links Remote Multiplexes
- Rural Telecomunications
- PABX's
- Railway Switching Controls
- Transmission and ISDN
- Equipment
- Power Plants
- Airport, Hospital, Banks.

SWITCH MODE RECTIFIERS
1 PHASE & 3 PHASE

Model	ES1948
Input	
Voltage	Wide Input Range: 90-275Vac or 310-480Vac
Frequency	44~66 Hz
Input Protection	13A HRC fuses at input of SMR(line and neutral); power circuit is turned off if the AC voltage exceeds 275Vac or falls to less than 90Vac
Current	<12A rms
Power Factor	>0.99 at full load; sinusoidal wave shape
THD	<5% at full load; satisfies requirements of EN61000-3-2
Efficiency	>91% at nominal mains voltage
Output	
Voltage	Float: -Adjustable 48~59V; Equalise: -Adjustable 50~61V
Current Limit	Adjustable 5~40A
Power (Max)	1900W at 48~60Vdc(input>185Vac); 900W at 48~60Vdc(input 90~185Vac)
Load Sharing	Better than ±5% of full scale with active current sharing from MCSU2048
Protection	Overvoltage - only faulty unit shuts down Overcurrent - can sustain short circuit at output terminals indefinitely Over-temperature - gradual reduction of current limit if heat-sink temperature exceeds pre-set limit
Static Regulation	Line- +0.1%; Load- +1.0%
Dynamic Regulation	+3% for 10~90% or 90~10% load variation; +1% for +25% step change in AC input voltage
Output Noise	< 2mVrms Psophometric weighting; < 10mVrms 10kHz - 100MHz; < 100mV peak to peak 0~30MHz bandwidth
Other	
Surge Protection	EN 61000-4-5
EMC	Emission: EN 61000-6-3,Immunity: EN61000-6-1
Inrush Current	<12 Arms peak at nominal mains voltage
Voltage Withstand Test	3.0 kVac – input and output (4.25 kVdc primary-secondary); 1.5 kVac – input earth (2.12 kVdc primary-ground); 0.75 kVdc – output earth
Environmental	
Audible Noise @ 1m	< 65dBA
Operating Temperature	Operating range -40°C ~ 70°C; derated power at 50°C ~ 70°C
Cooling	Two fan cooled, speed controlled and alarmed
Humidity	0~95% non-condensing
Mechanical	
Dimension (W x H x D)	41mm x 144mm x 287mm
Weight	<1.9kgs(4.19lbs)
Alarms	
Alarm & Status LED indication on SMR	On (Green) - SMR functioning normally Alarm (Yellow) - Blinking when any SMR alarm is present. Shutdown (Red) - Stays on when SMR has turned off due to a signal from the MCSU2048 or an internal fault
Rectifier Alarms	Low/High output voltage alarm; Over voltage shutdown alarm; Current limit alarm; Fan Alarm; Temperature alarm; Rectifier failure alarm

INVERTER/CHARGERS
PURE SINEWAVE (LONG STANDBY)

T2X SERIES (800W-8kW)

The Star T2X UPS is an All-In-One user friendly UPS, easy to handle, suitable and compatible for almost all Home/Office applications (Linear and non-linear loads including Air Conditioners!).

Being a line interactive UPS, it can produce clean and perfect PURE SINEWAVES, by providing the best power quality for all your electric equipment.

The traditional UPS supplies power only for a limited few minutes, the T2X can function as an efficient GENERATOR! With an Auto Transfer Switch, it can easily handle any critical power failure situations.

Also, the T2X Series has a powerful charger that can supply a capacity over 500 Ah, it can adapt itself and charge without any damage to any type of battery. Its Solar Power Server allows the UPS to work with solar panels to supplement the built in battery charger of the UPS.

The Star T2X Series: an ecologic solution for homes and offices!

Features:	
✓	Multiple microprocessor design base
✓	Compatible with linear and non-linear load
✓	Stronger charger to support batteries 500AH and up
✓	24 hours operation on the inverter
✓	Parameter presentable
✓	DC start and automatic self-diagnostic function
✓	THD less than 3%
✓	High efficiency design to save electricity
✓	Low heat dissipation in long time operation
✓	Designed to operate under harsh environment
✓	LCD Panel Control
✓	Controllable & Removable panel with LCD
✓	Wall Mounted Design or 19" Rack


Powerful charger

Auto transfer switch


Pure sinewave

Sinewave inverter


Solar power server

INVERTER/CHARGERS
PURE SINEWAVE (LONG STANDBY)

Model			ST2008X	ST2010X	ST2020X	ST2040X	ST2060X	ST2080X
Capacity	Watt/Amps		800W/3.6A	1600W/7.2A	2400W/10.9A	4000W/18.1A	6000W/27.2A	8000W/36.3A
Input	Normal Voltage		220Vac / 110Vac					220Vac
		Acceptable Voltage	120-275Vac / 60-135Vac					120Vac-275Vac
		Frequency	50Hz / 60Hz (45Hz- 70Hz)					
	Voltage Range	Line Low Transfer	120Vac +-2% /60VAC +- 2%					120Vac+-2%
		Line Low Return	130Vac +-2% /65Vac +-2%					130Vac+-2%
		Line High Transfer	275Vac +-2% / 135Vac +-2%					275Vac+-2%
		Line High Return	260Vac+-2% / 130Vac +-2%					260Vac+-2%
Output	Voltage		220Vac (230V or 240 Vac re-settable via LCD panel); 110Vac (115V or 120Vac re-settable via LCD panel)					230Vac (220V or 240Vac re-settable via LCD panel)
	Voltage Regulation (Batt Mode)		<3% RMS for entire battery voltage range					
	Frequency		50Hz or 60 Hz					
	Frequency Regulation (Batt Mode)		+-0.1 Hz					
	Power Factor		0.67			0.6		0.62
	Waveform		Pure Sinewave					
Transfer Time	Typical		< 8ms					
Battery	Battery Voltage		12Vdc	24Vdc			48Vdc	
	Backup Time (at full load)		Long time available					
	Max Charging Current (3 steps selectable)		>40A	>50A		>60A		
Solar Power	Solar Power Server 50A (Option)		Optional*			Standard		
Display LCD	LCD Extended LCD Remote Control (optional)		UPS status,I/P &O/P Voltage Frequency, Load%, Battery Voltage & %, Temperature, Model					
	LED		Normal (Green), Warning (Yellow), Fault (Red)					
Audible Alarm	Battery Mode		Beeping every 4 seconds					
	Low Battery		Beeping every second					
	UPS Fault		Beeping Continuously					
	Overload		Beeping twice per second. UPS will shutdown automatically in 30 seconds if overload is over 105~ 150% and up to 150 % will shutdown immediately.					
	Operation Temperature		0-40 degree C; 32-104 degree F					
Environ-ment	Relative Humidity		0-95% non-condensing					
	Audible Noise		Less than 55dBA (at 1M)					
Physical	Net Weight (Kgs)		14	21	23	49.2	51.4	53.6
	Dimension (WxHxD)mm Rack Mount		440*132*290	440*132*360	440*132*360	N/A	N/A	N/A
	Wall Mounted(W*H*D)mm		298*400*150	298*450*190	298*450*190	415*600*260	415*600*260	415*600*260

* Add "S" to the part number for the solar server option

Different specifications required are available
All specifications mentioned above are subject to change without prior notice.

INVERTER/CHARGERS
MODIFIED SINEWAVE

IG SERIES - INVERTER/CHARGER (600VA-2kVA)

- Simulated sinewave inverter
- Selectable input voltage range for home appliances and personal computers
- Auto restart with AC recovery
- Overload, and short circuit protection
- Cold start function
- Generator and Computer-related products compatible
- Reverse polarity protection.

Model	IG600	IG1000	IG2000
Capacity	600VA/300W	850VA/600W	2000VA/1200W
Input			
Voltage	220/230/240VAC		
Selectable Voltage Range	140-300VAC	90-280VAC (wide range), 170-280VAC (narrow range)	
Frequency Range	50Hz/60Hz (auto-sensing)		
Output			
AC Voltage Regulation (Batt. Mode)	±10% (battery mode)		
Frequency Range (Batt. Mode)	50Hz/60Hz ±1Hz		
Transfer Time	10ms Typical		
Battery			
Battery Voltage	12Vdc		24Vdc
Floating Charge Voltage	13.7Vdc ±2%		26.8Vdc ±2%
Low Battery Alarm Voltage	10.2Vdc ±2%		21.6Vdc ±2%
Shutdown Voltage	9.9Vdc ±2%		20.0Vdc ±2%
Overcharge Protection	15Vdc ±2%		30Vdc ±2%
Maximum Charge Current	13A	10A or 20A optional	
Alarm			
Low Battery	Sounding every second		
Overload	Sounding evry 0.5 seconds		
Fault	Continuously sounding		
Physical			
Dimensions, L x W x H (mm)	358.5 x 96.8 x 146.5	290 x 290 x 115	336 x 300 x 90
Net Weight (kg)	5.8	7	8
Operating Environment			
Humidity	0-90% Relative Humidity (Non-Condensing)		
Operating Temperature	0^0C-50^0C		
Storage Temperature	-15^0C-70^0C		

BATTERY CHARGER
FOR 192VDC & 240VDC SYSTEMS

EXTERNAL BATTERY SUPER CHARGER

DESCRIPTION:

The PHD external battery charger is suitable for any 192Vdc and 240Vdc system (16 and 20 batteries in series). It is designed for 192Vdc and 240Vdc UPS systems to enable longer standby times for them. The 240Vdc version can be used with PHD's T3 Series (6-10kVA models) and T4 Series (10-20kVA models) and the 192Vdc version can be used with PHD's T3T Series (5-15kVA) and T4T Series (10-15kVA). It is easy to install as it is connected in parallel to the UPS's existing battery charger.

FEATURES:

- Compact and light
- Easy to install
- Battery overcharge protection
- Input surge protection.

Model	ST-CHARGER-10A	ST-CHARGER-12A
Input		
Voltage	(176 -276)VAC @ Full Load	
Frequency	(46 - 75)Hz for 50Hz system	
Power Factor	≥0.96@ full load	
THD	<20%@ full load	
Output		
Current	10A Nom. / 10A Max.	12A Nom. / 21A Max.
Voltage	160V Minimum, 218V Nominal, 224V Maximum	200V Minimum, 273V Nominal, 280V Maximum
Voltage Ripple	1%@ full load	
Current Ripple	10% of Ah CAP @ full load	
Efficiency	90%	
Fault Protection		
Output Reverse Polarity Protection	Fuse will open when reversing	
Short-circuit Protection	Yes	
Input Protection	276Vac(+/- 2%) Over Voltage, 176 Vac(+/- 2%) Under Voltage, 110%,1s Open Circuit	
Fault Protection		
Working and Storage Temperature	0^0C - 40^0C	
Humidity	<95% (No condensing)	
Altitude	< 1000m	
Fault Protection		
ESD	IEC 61000-4-2 Level 4	
RS	IEC 61000-4-3 Level 3	
EFT	IEC 61000-4-4 Level 4	
Surge	IEC 61000-4-5 Level 4	
Conduction	IEC/EN 62040-2 Category C3	
Radiation	IEC 61000-3-2	
Safety	IEC 60950-1/EN 60950-1	
Drop, Variation	ISTA Procedure 2A	
Mechanical Characteristics		
Inlet, Outlet	Terminal Block	
Dimensions (W x D x H) (mm)	200 x 352 x 450	340 x 250 x 110
Net Weight (kg)	15	6

BATTERY CHARGERS
MISCELLANEOUS

AC-DC BATTERY CHARGERS

FEATURES:

- Multi step charger setup and auto shutdown (tri step)
- Fast charge, normal charge and average charge
- Voltage with auto sensor battery
- Full charge with auto shutdown
- Output short circuit protection
- Universal input voltage suitable for worldwide operation
- Anti-reverse voltage protect device
- Fast charge transferred into slow charge
- Overload protection
- LED status display
- Suitable for lead acid battery.

Model	Input Voltage	Input Frequency	Output Current	Output Equaliser DC Voltage	Output Floating DC Voltage	Dimensions (L x W x H) mm	Net Weight
AC0212A	100-240VAC	50/60Hz	2A	14.6Vdc	13.7Vdc	120 x 61.6 x 37.4	0.5kg
AC0224A	100-240VAC	50/60Hz	2A	29.2Vdc	27.4Vdc	120 x 61.6 x 37.4	0.5kg
AC0312A	110/220Vdc ±10% AUTO SW	50/60Hz	3A	14.6Vdc	13.7Vdc	186 x 88 x 47.5	0.8Kg
AC0324A	110/220Vdc ±10% AUTO SW	50/60Hz	3A	29.2Vdc	27.4Vdc	186 x 88 x 47.5	0.8Kg
AC0412A	110/220Vdc ±10% AUTO SW	50/60Hz	4A	14.6Vdc	13.7Vdc	186 x 88 x 47.5	0.8Kg
AC0424A	110/220Vdc ±10% AUTO SW	50/60Hz	4A	29.2Vdc	27.4Vdc	186 x 88 x 47.5	0.8Kg
AC0512A	110/220Vdc ±10% AUTO SW	50/60Hz	5A	14.6Vdc	13.7Vdc	186 x 88 x 47.5	0.8Kg
AC0524A	110/220Vdc ±10% AUTO SW	50/60Hz	5A	29.2Vdc	27.4Vdc	186 x 88 x 47.5	0.8Kg
AC0612A	110/220Vdc ±10% AUTO SW	50/60Hz	6A	14.6Vdc	13.7Vdc	186 x 88 x 47.5	0.8Kg
AC0624A	110/220Vdc ±10% AUTO SW	50/60Hz	6A	29.2Vdc	27.4Vdc	186 x 88 x 47.5	0.8Kg
AC0712A	110/220Vdc ±10% AUTO SW	50/60Hz	7A	14.6Vdc	13.7Vdc	186 x 88 x 47.5	0.8Kg
AC0724A	110/220Vdc ±10% AUTO SW	50/60Hz	7A	29.2Vdc	27.4Vdc	186 x 88 x 47.5	0.8Kg
AC0812A	110/220Vdc ±10% AUTO SW	50/60Hz	8A	14.6Vdc	13.7Vdc	186 x 88 x 47.5	0.8Kg
AC1012A	110/220Vdc ±10% AUTO SW	50/60Hz	10A	14.6Vdc	13.7Vdc	186 x 88 x 47.5	0.8Kg
AC1212A	110/220Vdc ±10% AUTO SW	50/60Hz	12A	14.6Vdc	13.7Vdc	186 x 88 x 47.5	0.8Kg
AM0236A	100-240VAC	50/60Hz	2A	44.5Vdc	41.3Vdc	164 x 90 x 50	0.5kg
AM0424A	100-240VAC	50/60Hz	4A	29.6Vdc	27.4Vdc	164 x 90 x 50	0.5kg
AM0612A	100-240VAC	50/60Hz	6A	14.8Vdc	13.6Vdc	164 x 90 x 50	0.5kg
Other currents and voltages available on request							

GENERATORS
1 PHASE & 3 PHASE

STANDBY DIESEL GENERATOR SETS (10kVA-2000kVA)

FEATURES:

All units complete with exhaust systems, 12 hour fuel tanks (larger tanks available), batteries, automatic mains failure control panels and prime power base load control panels.
The panels include standard metering switchgear, control gear and engine protection. Both single and three phase versions available.

APPLICATIONS:

- Agriculture
- Cold Rooms
- Banking
- Airports
- Building Services
- Hospitals
- Hotels and Entertainment
- Engineering.

SPECIFICATIONS:

Engine Types:	Caterpillar, Cummins, Daimler Chrysler MTU, Detroit Diesel VM Sun, Deutz, Hatz, John Deere, Kirloskar, Lister, Lombardini, Perkins, Scania, Volvo and Yanmar
Alternator Types:	Leroy Somer, Marelli and Mecc Alte
Sizes:	Petrol powered up to 10KVA Single Phase; Diesel Powered from 10KVA to 2000KVA Three Phase
Voltage Ranges:	110V-525V
Frequencies:	50/60Hz
Engine Speeds:	3000 or 1500 RPM
Generator Sets:	Available with Base Load and Automatic Mains Failure Control Panels mounted on open steel frame. Weatherproof Silent Canopy. Mobile Trailer mounted.

All engines and alternators used in the manufacture of Power Generation Equipment conform to the following specifications:
ENGINES: B.S. 5514 1982; ISO 30461; 1DIN6271.
ALTERNATORS: B.S. 5000; VDE 30; IEC 23; UTE 5100; NEC 51-111; NEMA – IEEE CSA.
Where applicable alternators specified for Marine Applications will conform to: BUREAU VERITAS; LLOYDS REGISTER; AMERICAN BUREAU OF SHIPPING; DNV; RINA; GERMANISHER LLOYDS; KOREAN REGISTER OF SHIPPING; NKK.

300KVA Automatic mains failure

100KVA, 25KVA, 13KVA remote start/stop and AMF

1000KVA Automatic mains failure Generator Set. MTU 16V 2000 G62 / Leroy Somer (Installed at the Capital Alliance Building, Johannesburg)

30KVA Automatic mains failure soundproof Generator Set. Standard soundproof canopy with sound levels of 65dB(A) at 7 metres in an open field.

TRANSFORMERS
ISOLATION TRANSFORMERS
1 PHASE & 3 PHASE

ISOLATION TRANSFORMER (10kVA-40kVA)

DESCRIPTION:

This interface transformer has been specifically designed for use in Africa, where conditions vary from country to country and site to site. The input of the transformer has an easily adjustable tap changer, allowing for voltage variation of 380VAC ~ 415VAC nominal. The output is designed to offer 400VAC as this is the European standard, three phase voltage, of which 95% of equipment manufactured in Europe and Southern Africa require.

The input winding has been designed to withstand high input voltages, often found in African conditions, without experiencing permanent damage. The overall transformer has been designed to tolerate the type of harmonic distortion often associated with non linear loads, like x-ray and telecommunications equipment. The inter-winding screens offer high attenuation of interwinding voltages and good common-mode and differential-mode protection (0V between neutral and earth). Due to the delta primary, phase shifting is eliminated.

The overall, oil-cooled packaging allows for outdoor installation. This feature becomes handy when space and cooling in existing installations are limited. Finally, because of the double wound design and the electro-static screen, you have complete isolation between primary and secondary, providing additional safety between the installation and the uitility.

FEATURES:

- Interface Isolation Transformer designed for Harsh African conditions
- Easily adjustable tap changer 380V-415V
- Withstands high input voltages
- For non-linear loads
- High attenuation of inter-winding voltages.
- Outdoor installation
- Complete Isolation between primary and secondary.

SPECIFICATIONS:

• Input Voltages:	Single Phase 230V; Three phase 380, 400, 415V Delta
• Frequency:	48-63Hz; 0.95%
• Output Voltage:	Single Phase 230VAC; Three Phase 400VAC Star
• Cooling:	Oil Cooled
• Application:	Outdoor
• Nominal Power Range:	From 10kVA 1P; From 20kVA to 40kVA 3P
• Enclosing:	Weatherproof powder-coated mild steel
• Vector Group:	Dyn 11
• Temperature Class:	H
• Environment:	- Ambient 0-45°C; - Humidity 0-95%; - Altitude Max 3000m, no die-rating

Model	Input/Output	Rating	Connection	Dimensions (W x H x D mm)	Weight
10kVA/IS	230/230	10kW	Stud	450 x 535 x 425	120kg
20kVA/IS	400/400	20kW	Stud	515 x 840 x 696	250kg
25kVA/IS	400/400	25kW	Stud	515 x 840 x 696	250kg
30kVA/IS	400/400	30kW	Stud	515 x 840 x 696	250kg
40kVA/IS	400/400	40kW	Stud	515 x 840 x 696	265kg
Note: Other ratings available on request					

TRANSFORMERS
CONSTANT VOLTAGE TRANSFORMERS
1 PHASE

CONSTANT VOLTAGE TRANSFORMERS (150VA-20kVA)

FEATURES:

- Input Voltage: Single Phase, 230V (184-276). Other voltage on request
- Supply Frequency: 50Hz
- Output Voltage: 230V. Other voltages on request
- Output Accuracy: Btter than 3% (1% option available)
- Harmonic Distortion: Typically less than 2%
- Effect of Frequency Change: 1% change in frequency produces approximately 2.5% change in output voltage
- Response: Typically 1-2 cycles (20-40ms)
- Overload: Short circuit limited
- Efficiency: Approximately 85% at full load.

Model*	Input/Output	Rating	Current	Dimensions (W x H x D) mm	Mass
SC150S	230V/230V	120W	0.52A	290 x 231 x 400	17kg
SC250S	230V/230V	200W	0.87A	290 x 231 x 400	18kg
SC500S	230V/230V	400W	1.74A	290 x 231 x 400	21kg
SC750S	230V/230V	600W	2.61A	290 x 231 x 400	24kg
SC1000S	230V/230V	800W	3.48A	290 x 231 x 400	26kg
SC1500S	230V/230V	1200W	5.22A	290 x 231 x 400	36kg
SC2000S	230V/230V	1600W	7.27A	400 x 263 x 550	55kg
SC2500S	230V/230V	2000W	9.09A	400 x 263 x 555	59kg
SC3000S	230V/230V	2400W	10.91A	400 x 263 x 565	65kg
SC4000S	230V/230V	3200W	14.55A	400 x 263 x 600	83kg
SC5000S	230V/230V	4000W	18.18A	400 x 263 x 600	90kg
SC6000S	230V/230V	4800W	21.82A	540 x 365 x 908	154kg
SC7500S	230V/230V	6000W	27.27A	540 x 365 x 925	172kg
SC10000S	230V/230V	8000W	36.36A	540 x 365 x 970	212kg
SC12000S	230V/230V	9600W	43.64A	450 x 890 x 1100	290kg
SC15000S	230V/230V	12000W	54.55A	450 x 890 x 1100	340kg
SC18000S	230V/230V	14400W	65.45A	450 x 890 x 1100	435kg
SC20000S	230V/230V	16000W	72.73A	450 x 890 x 1100	450kg

AUTOMATIC VOLTAGE REGULATORS
SERVO TYPE
1 PHASE

SERVO TYPE FULLY AUTOMATIC VOLTAGE STABILISER (SINGLE PHASE)

DESCRIPTION:

The SVC fully automatic voltage regulator consists of a contact voltage regulator, samplingcontrol circuit and service motor as well. It features small waveform distortion, high efficiency and high power factor. It is also not affected by input frequency variations. It can be widely used in most situations where voltage stabilisation is required.

Model	500VA	1kVA	1.5kVA	2kVA	3kVA	5kVA	7.5kVA	10kVA	15kVA	20kVA	30kVA
Input Voltage	150V-250V					160V-250V			150V-250V		
Output Voltage	220V ± 3%										
Frequency	50Hz/60Hz										
Response Time	< 1s (against 10% input voltage deviation)										
Efficiency	> 90%										
Ambient Temperature	-10°C ~ +40°C										
Relative Humidity	< 90%										
Power Factor	0.8										
Insulation Resistance	> 5MΩ										
Length (cm)	18.5	21	21	27.5	29	45	47	47	42	42	42
Width (cm)	15	18	18	23.5	23	24	26	26	38	38	38
Height (cm)	12.5	14.5	14.5	18.5	22	18.5	22	22	73	73	83
Weight (kg)	4.6	6.5	7	10.5	13.6	22.4	40	43	75.5	80	87
Append “SVC-” to the model above for the full part number											

AUTOMATIC VOLTAGE REGULATORS
SERVO/ELECTRONIC TYPE
3 PHASE

SERVO/ELECTRONIC TYPE FULLY AUTOMATIC VOLTAGE STABILISER (THREE PHASE)

DESCRIPTION:

- Microprocessor DSP control
- Automatic Voltage Regulation
- Protection against Brownouts and Overvoltages
- Short Circuit & Overload Protection
- Digital meter indicates line voltage and regulated voltage
- LED indicators to show status of working input and output
- Selectable Delay Time
- Built-in transformer, Square transformer or Servo motor
- Surge, Spike & Lightning Protection.

Model*	10kVA	15kVA	20kVA	30kVA	50kVA	80kVA	100kVA	150kVA	200kVA
Input Voltage	260-430VAC				260-450VAC				
Power Factor	0.8 PF				0.65 PF				
Input Frequency	50/60Hz								
Output Voltage	380/400/415VAC								
Output Precision	± 3%								
Technology	Servo, Independent Phase Control				Silicon Controlled, Non-Contact, Independent Phase Control				
Efficiency	98%								
Response Time	1s/step				4ms/step				
LED Display	Input Voltage / Output Voltage								
LED Input Status	Blue; indicating phase voltage normal/abnormal								
LED Power Status	Red; indicating Power ON/OFF								
LED Delay Status	Yellow; during delay the LED flashes								
LED Output Status	Blue; indicating output voltage ON/OFF								
Protection	High Voltage, Low Voltage, Overload, High Temp.								
Safety Standards	CE, EN60950, EN55024								
Operating/Storage Temp.	0^0C-40^0C / -15^0C-45^0C								
Operating Humidity	10% RH - 102% RH, non-condensing								
Dimensions, L x W x H (mm)	443 x 483 x 858		503 x 553 x 888	503 x 553 x 938	1000 x 640 x 1250	1000 x 640 x 1380		1285 x 750 x 1600	
Weight (kg)	57.8	62.3	88.4	108.4	238	300	318	450	506
* Append “PDR-“ to the model above for the full part number									

All information contained in this brochure is purely indicative and can not be used to form any contractual obligations.
Specification or design can be changed at any time without prior notice.

SOLAR PV
Off-grid
PV Controller & Inverter

Off-grid
PV Controller & Inverter

SPO-M Series (20~120kVA)

» 3 in 1 Integrated Off-grid System
» Innovative hybrid system
» Intelligent Energy Management System
» Efficient and Flexible

Efficient and Flexible

- Wide MPPT range 420~850V
- MPPT efficiency up to 99.8%
- Three phase output isolation transformer support 300% unbalanced load
- Hot-swap MPPT modules, flexible configurationand expansion
- Front access, easy for installation and maintenance
- Integrated design, less initial investment and footprint, lower maintenance cost

Excellent Performance

- PV controller+AC charger+inverter, 3 in 1 integrated system
- Intelligent EMS achieves smart energy control among Solar, Battery, Grid and Gen-Set
- Multi- MPPT tracking function, up to 3 strings, fulfillvariousapplication conditions
- Comprehensive centralized monitoring on MPPT module/utility/ inverter parameters

High Reliability

- Full alarm and protectiondesign
- Advanced no-master-slave parallel technology (optional)
- Unique air tunnel design, increase cooling efficiency and operation lifetime
- High quality components maximize service life

Smart Management

- RS485 Modbus communication, easy monitoring
- Intelligent BMS enable longer battery lifespan
- User-friendly touch screen provides extensive monitor and control
- 8+6 dry contact communication signal

Reliable Power Network

SOLAR PV
Off-grid
PV Controller & Inverter

Off-grid PV Controller & Inverter

SPO-M Series (20~120kVA)

Technical Specification:

Items	SPO3320~3360-M075~150					SPO3380~33120-M150~225		
Input Features - PV								
MPPT Voltage (Vdc)	420~850							
MPPT Tracking Precision (Max.) (%)	≥99%							
MPPT String	1 / 2					2 / 3		
MPPT Current (A)	75 / 150					150 / 225		
Input Features - Battery								
Rated Voltage (Vdc)	360							
Battery Type	Lead-acid or Li-battery							
Input Features - AC (Charger Option)								
Rated Input Voltage (Vac)	380/400/415 (L-L)							
Input Voltage Range (Vac)	±25%							
Phase	Three phase four line (3φ4W + PE)							
Input Frequency (Hz)	40~70							
AC Charge Current (A)	10~20 (adjustable)					10~80 (adjustable)		
Output Features								
Rated Power (kVA)	20	30	40	50	60	80	100	120
Power Factor	0.8							
Voltage (Vac)	380/400/415±1%							
Frequency (Hz)	Synchronize bypass input (Bypass Normal); 50/60 ±0.1% (Bypass abnormal)							
Wave Form	Sine wave, THD<2%(Linear load)							
Transfer Time (ms)	<0 ms (switch from inverting mode to bypass mode); 0 ms (switch from bypass mode to inverting mode)							
Environment								
Operating Temperature	-5℃~40℃							
Storage Temperature	-20℃~+55℃							
Relative Humidity	0%~95% (no condensation)							
Noise (dB)	<65							
Standard								
EMC	IEC 62040-2 CLASS C3							
Safety Standard	IEC 60068-1, IEC 62040-1-1, UL1778							
Design and Test	IEC62040-3							
Mechanical Feature								
Dimension (W×D×H) (mm)	850×800×1800					1350×800×1800		
Weight (kg)	360	380	520	540	580	740	760	780
Other Features								
Warning & Protection	BW fault, Battery low voltage, Overload, Short circuit, Over-temp, Bypass abnormal etc.							
Communication	Support 485(RS485), Dry Contact Communication							

• Specifications are subject to change without prior notice.

SOLAR PV
SELF-CONSUMPTION (HYBRID) INVERTER

SELF-CONSUMPTION SERIES (3.3kW-5kW)

- Grid-tie with battery backup fo power failure situations
- Battery discharge level settings for energy saving with solar charging
- LCD display allowing easy monitoring of energy flow
- Supplied with smart meter with split-core CT for smart load control and easy installation
- Selectable scenarios for sophisticated energy applications
- Special external capacitor modular design for long life span
- High battery discharge power (5.3kW) with charge/discharge efficiency of greather than 95%
- Optimise charge/discharge control for long life span of Li-ion batteries (optional)
- IP65 fan-less natural cooling design / up to 50^{0}C without derating
- NRS 097 Certified.

Model	SELFENERGY-3300	SELFENERGY-4000	SELFENERGY-5000
Input (DC)			
Max. DC Input Power (W)	3600	4300	5300
Max. DC Input Current	18A	21.5A	26.5A
Max. Number of MPPT's	1		
Max. DC Voltage	650V		
MPPT Voltage Range	150-500V		
Peak Power Tracking Voltage Range	200-460V		
Output (AC)			
Rated Output Power (W) / Curremt (A)	3300 / 16.5	4000 / 20	5000 / 24.5
Nominal AC Voltage	220-240VAC		
Grid AC Frequency	50/60HZ Auto-Selection		
Power Factor	> 0.99 @ 20% load		
Reactive Power Factor	1 or adjustable from -0.9 to 0.9		
THD	< 3%		
AC Connction / Grid Forms	Single-phase / TN-C, TN-S, TN-C-S		
Efficiency			
MPPT Efficiency	> 99.9%		
Max. Efficiency	96.5%	96.7%	96.9%
Self-Consumtpion (at night) (W)	< 0.5		
Other			
Dimensions (W x H x D, mm) / Weight (kg)	405 x 442 x 165 / 25.8		
Acoustic Noise Level	< 35dB (A)		
Max. Operating Temp. Range w/o Derating	-20^{0}C-60^{0}C		-20^{0}C-55^{0}C
Humidity	0-95% (no condensation)		
Protection Degree / Topology	IP65 / Transformerless		
DC Connection	PV4, MC4, Tyco		
DC Disconnect	Yes		
Communication Interface	RS485, Bluetooth (Optional)		
Factory Warranty	5 years		
Battery Input Data			
Max. Discharge Power (W) / Current (A)	3600 / 18	4300 / 20	5300 / 24.5
Max. AC Charge Curremt	20A		
Configurable Battery Voltage Ramge	198-400Vdc		
Battery Types / Battery Range	FLA, VRLA, Li-ion / 14Ah-1000Ah		
Charge Control	Constant Current (CC) or Constant Voltage (CV)		

SOLAR PV
GRID-TIE INVERTER 1 PHASE

TOUCH-ECO SERIES GRID-TIE INVERTER (2kW-5kW)

- Single MPPT with wide input voltage range
- IP65 water and dust proof enclosure
- Operating temperature up to 60^{0}C without derating
- Maintenance-free fan-less natural cooling design
- Low acoustic noise level while in operation
- Monitoring software via RS232, RS485, Bluetooth, WiFi and other optional devices.
- Conformity with multiple international standards

Model	TOUGH-ECO 2kW	TOUGH-ECO 3kW	TOUGH-ECO 4kW	TOUGH-ECO 5kW
Input (DC)				
Max. DC Input Power (W)	2200	3300	4800	6000
Max. DC Input Voltage (V)	450	550	600	
Starting Voltage/Min. Operation Voltage	80/60		120/100	
MPPT Range (V)	100-410	120-450	120-550	
Number of MPPT/String per MPPT	1/1		1/2	
Max. DC Current (A) per MPPT/No. of MPPT	12/1	15/1	19/1	23/1
Output (AC)				
Rated Output Power (W)	2000	3000	4000	5000
Max. AC Output Current (A)	9	13	20	24
Grid Voltage Range	230/180-277V			
Grid Frequency Range	50Hz(44-55Hz) / 60Hz(54-65Hz)			
Power Factor	≥0.99 (at rated power)			
THDi	< 3% (at rated power)			
AC Output	Single-phase (L,N,PE)			
System				
Max. Efficiency	97.2%	97.3%	97.7%	97.8%
MPPT Efficiency	99.9%			
Protection Rating	IP65			
Self-Consumtpion (at night) (W)	< 1			
Topology	Transformerless			
Operating Temperature Range	-25^{0}C-60^{0}C (derate after 45^{0}C)			
Relative Humidity	0-95% (no condensation)			
Protection	PV array insulation, PV array leakage current, Ground fault monitoring, Grid monitoring, Island Protection, DC monitoring, Short circuit			
Other				
Display	LED (standard) / LCD (optional)			
Communication Interface	RS485 (standard); WiFi, Ethernet (optional)			
Dimensions (H x W x D, mm)/Weight (kg)	280 x 300 x 138 / 9.5		405 x 360 x 150 / 15	
DC Terminal	MC4			
Grid Standard	DIN VDE 0126-1-1:2013, VDE-AR-N 4105:2011, DIN VDE V 0124-100:2012, EN 50438:2013, G83-2:2012, IEC 61727 (IEC62116), AS/NZS 4777.2:2015, NB/T32004-2013, IEC60068-2-1:2007, IEC 60068-2-2:2007, IEC 60068-2-14:2009, IEC 60068-2-30:2005, IEC 61683:1999			
Safety Certificate/EMC Category	IEC 62109-1:2010, IEC 62109-2:2011, EN61000-6-2:2005, EN 61000-6-3:2007/A1:2011			
Factory Warranty	5 years			

SOLAR PV
GRID-TIE INVERTER 1 PHASE

TOUCH SERIES GRID-TIE INVERTER (3.3kW-5kW)

- Single/Dual MPPT with wide input voltage range
- IP65 water and dust proof enclosure
- Operating temperature up to 60^{0}C without derating
- Maintenance-free fan-less natural cooling design
- Low acoustic noise level while in operation
- Monitoring software via RS232, RS485, Bluetooth, WiFi and other optional devices.
- Conformity with multiple international standards

Model	TOUGH-3300	TOUGH-4000	TOUGH-5000
Input (DC)			
Max. DC Input Power (W)	3600	4300	5300
Max. DC Input Current	2 x 10A	2 x 13A	2 x 15A
Max. Number of MPPT's	2		
Max. DC Voltage	650V		
MPPT Voltage Range	150-500V		
Peak Power Tracking Voltage Range	200-460V		
Output (AC)			
Rated Output Power (W) / Curremt (A)	3300 / 16.5	4000 / 20	5000 / 22
Nominal AC Voltage	220-240VAC		
Grid AC Frequency	50/60HZ Auto-Selection		
Power Factor	> 0.99 @ 20% load		
Reactive Power Factor	1 or adjustable from -0.9 to 0.9		
THD	< 3%		
AC Connction / Grid Forms	Single-phase / TN-C, TN-S, TN-C-S		
Efficiency			
MPPT Efficiency	> 99.9%		
Max. Efficiency	96.5%	96.7%	96.9%
Self-Consumtpion (at night) (W)	< 0.2		
Other			
Dimensions (W x H x D, mm)	405 x 442 x 165		
Weight	25.8kg		
Acoustic Noise Level	< 35dB (A)		
Max. Operating Temp. Range w/o Derating	-20^{0}C-60^{0}C		-20^{0}C-55^{0}C
Humidity	0-95% (no condensation)		
Protection Degree	IP65		
Topology	Transformerless		
DC Connection	MC4, Tyco		
DC Disconnect	Yes		
Display	LCD 16 x 2 screen		
Communication Interface	RS232, RS485, Bluetooth (Optional)		
Factory Warranty	5 years		

SOLAR PV
GRID-TIE INVERTER 3 PHASE

TRIENERGY SERIES 3 PHASE GRID-TIE INVERTER (10kW-30kW)

TRINERGY SEREIS three-phase grid-tie solar inverters adopt the latest technologies combination of T type three level topology and SVPWM, providing flexible system configuration and monitoring solutions for household, commerical and power plant systems.

- Dual MPPTs work independently and allow unbalanced input power. One string maximum input is up to 60% of Max. DC power
- High efficiency and stable performance at entire input voltage and output power range
- Max. efficiency is up to 98.6%
- Wide input voltage range allowing for different types of PV modules
- Bus capacitor adopts advanced film capacitor, designed with the latest thermal simulation technology for longer lifespan
- Integrated intelligent DC combiner and surge protection improves the system' s flexibility and helps reduce cost
- 12V 100mA auxiliary DC power interface is optional for system expansion
- Reactive power control and power factor adjustable : 0.8 leading ~ 0.8 lagging
- RS485, Ethernet, WIFI communication modes are optional for multiple monitoring solutions via PC, mobile phones etc.
- NRS 097 Certified.

Model	TRIENERGY-10	TRIENERGY-15	TRIENERGY-20	TRIENERGY-25	TRIENERGY-30
Input (DC)					
Max. DC Power (W)	10400	15600	20800	26000	31200
Max. DC Current per MPPT / No. of MPPT	19 / 2	21 / 2	25 / 2	30 / 2	33 / 2
Strings per MPPT	3 or 2 (Integrated Combiner Box)				
Max. DC Voltage / Starting Voltage	1000V / 200V		1000V / 300V		
MPPT Voltage Range (V)	180-800 / 610		280-800 / 610		
Rated Power Voltage Range (V)	320-800	400-800	450-800	480-800	
Output (AC)					
Rated Output Power (W) / Curremt (A)	10000 / 16	15000 / 24	20000 / 32	25000 / 40	30000 / 48
Rated AC Voltage Range	3 / N / PE. 230 / 400V, (320-460V); 3 / N / PE. 220 / 380V. (320-460V)				
Grid AC Frequency	50Hz (47-51.5Hz) / 60HZ (57-61.5Hz)				
Power Factor	-0.8 - +0.8 (Adjustable)				
THD	< 3% (at rated power)				
Efficiency					
MPPT Efficiency	99.9%				
Max. Efficiency	98.2%	98.3%	98.4%	98.4%	98.5%
Self-Consumtpion (at night) (W)	< 0.5				
Other					
Dimensions (W x H x D, mm)	480 x 610 x 204		660 x 525 x 220		
Weight	38kg		48kg	50kg	52kg
Acoustic Noise Level	< 50dB (A)				
Max. Operating Temp. Range	-25°C-60°C, derate after 45°C				
Humidity	0-95% (no condensation)				
Protection Degree	IP65				
Topology	Transformerless				
DC Connection	MC4 water-proof terminal				
DC Disconnect	Optional		Yes		

SOLAR PV
PHOTOVOLTAIC PANELS

SOLAR PANELS AND GREEN ENERGY SYSTEMS

Powerhouse Distributions has launched a reliable, high performance and high quality range of:

- Solar panels
- Solar charge controllers (MPPT)
- Pure and modified sinewave inverters
- Solar water pumps
- Wind turbines
- Deep cycle (solar) batteries.

SOLAR IN SOUTHERN AFRICA

In the past few years, the number of solar system installations in Africa has grown at a tremendous rate. We at Powerhouse Distribution strive to always come up with new ideas and be at the forefront of the renewable energy sector. We stock a very comprehensive range of solar products and equipment.

SOLAR PANELS

We have a high grade range of solar panels in the poly and mono-crystalline range designed for high efficiency solar systems. Our panels are available in 12V or 24V from 10W up to and including 310W.

Model	Wattage (W)	Voltage (V)	Weight (kg)	Dimensions (L x W x H, mm)
Sol 10	10	18	1.5	280 x 350 x 17
Sol 15	15	18	1.7	370 x 360 x 17
Sol 20	20	18	2.5	550 x 340 x 25
Sol 30	30	18	3.4	540 x 520 x 25
Sol 40	40	18	4.4	530 x 670 x 25
Sol 50	50	18	5.2	530 x 670 x 35
Sol 80	80	18	7.4	905 x 670 x 35
Sol 95	95	18	8.0	1000 x 670 x 35
Sol 100	100	18	10.0	1000 x 670 x 35
Sol 120	120	18	11.6	1250 x 670 x 35
Sol 140	140	18	11.6	1480 x 670 x 35
Sol 145	145	18	11.6	1480 x 670 x 35
Sol 150	150	18	11.6	1480 x 670 x 35
Sol 255	255	30	17.5	1640 x 990 x 40
Sol 260	260	30	17.5	1640 x 990 x 40
Sol 300	300	36	21.0	1956 x 992 x 40
Sol 305	305	36	21.0	1956 x 992 x 40
Sol 310	310	36	21.0	1956 x 992 x 40
Sol 330	330	43	22.5	195 x 992 x 40

BATTERIES
SEALED & SEMI-SEALED

BATTERIES - SEALED MAINTENANCE FREE

Model	Design Life	Volts	Capacity at 20Hr Rate (Ah)	Dimensions (L x W x H) mm	Mass (kg)
12V7-5	3-5 years	12V	7.2Ah	151 x 65 x 100	2.0
12V17-5	3-5 years	12V	17Ah	181 x 77 x 167	5.3
12V24-5	3-5 years	12V	24Ah	166 x 175 x 125	7.6
12V33-10	10 years	12V	33Ah	195 x 130 x 168	9.7
12V45-10	10 years	12V	45Ah	197 x 166 x 170	14.6
12V65-10	10 years	12V	65Ah	350 x 167 x 179	22.4
12V100-10	10 years	12V	100Ah	330 x 171 x 222	29.0

BATTERIES - SEMI SEALED MAINTENANCE FREE

Model	Volts	Capacity (Ah)	Dimensions (L x W x H) mm	Mass (kg)
12V45-5	12V	45Ah	207x 175 x 175	12.1
12V65-5	12V	66Ah	277 x 175 x 175	16.4
12V100-5	12V	102Ah	330 x 175 x 240	26

* Other battery capacities and technologies available.

Phoenix Inverters

180VA – 1200VA 230V/50Hz and 110V/60Hz

Phoenix Inverter
12/180

Phoenix Inverter
12/800 with Schuko socket

SinusMax – Superior engineering

Developed for professional duty, the Phoenix range of inverters is suitable for the widest range of applications. The design criteria have been to produce a true sine wave inverter with optimized efficiency but without compromise in performance. Employing hybrid HF technology, the result is a top quality product with compact dimensions, light in weight and capable of supplying power, problem-free, to any load.

Extra start-up power

A unique feature of the SinusMax technology is very high start-up power. Conventional high frequency technology does not offer such extreme performance. Phoenix Inverters, however, are well suited to power up difficult loads such as computers and low power electric tools.

To transfer the load to another AC source: the automatic transfer switch

For our lower power models we recommend the use of our Filax Automatic Transfer Switch. The Filax features a very short switchover time (less than 20 milliseconds) so that computers and other electronic equipment will continue to operate without disruption.

LED diagnosis

Please see manual for a description.

Remote on/off switch

Connector for remote on/off switch available on all models.

DIP switch for 50/60Hz selection (48/350 model only)

Available with different output sockets

Please see pictures below.

Phoenix Inverter 12/350
with IEC-320 sockets

Phoenix Inverter 12/180
with Schuko socket

Phoenix Inverter 12/180
with Nema 5-15R sockets

Phoenix Inverter 12/800
with IEC-320 socket

Phoenix Inverter 12/800
with Schuko socket

Phoenix Inverter 12/800
with BS 1363 socket

Phoenix Inverter 12/800
with AN/NZS 3112 socket

Phoenix Inverter 12/800
with Nema 5-15R socket

Phoenix Inverter 12 Volt / 24 Volt / 48 Volt	12/180 24/180	12/350 24/350 48/350	12/800 24/800 48/800	12/1200 24/1200 48/1200
Cont. AC power at 25°C (VA) (3)	180	350	800	1200
Cont. power at 25°C / 40°C (W)	175 / 150	300 / 250	700 / 650	1000 / 900
Peak power (W)	350	700	1600	2400
Output AC voltage / frequency (4)	110 VAC or 230 VAC +/- 3% 50 Hz or 60 Hz +/- 0,1%			
Input voltage range (V DC)	10,5 - 15,5 / 21,0 - 31,0 / 42,0 - 62,0		9,2 - 17,3 / 18,4 - 34,0 / 36,8 - 68,0	
Low battery alarm (V DC)	11,0 / 22 / 44		10,9 / 21,8 / 43,6	
Low battery shut down (V DC)	10,5 / 21 / 42		9,2 / 18,4 / 36,8	
Low battery auto recovery (V DC)	12,5 / 25 / 50		12,5 / 25 / 50	
Max. efficiency (%)	87 / 88	89 / 89/ 90	91 / 93 / 94	92 / 94 / 94
Zero load power (W)	2,6 / 3,8	3,1 / 5,0 / 6,0	6 / 5 / 4	6 / 5 / 6
Zero load power in search mode	n. a.	n. a.	2	2
Protection (2)	a - e			
Operating temperature range	-40 to +50°C (fan assisted cooling)			
Humidity (non-condensing)	max 95%			
ENCLOSURE				
Material & Colour	aluminium (blue Ral 5012)			
Battery-connection	1)	1)	1)	1)
Standard AC outlets	230V: IEC-320 (IEC-320 plug included), CEE 7/4 (Schuko) 120V: Nema 5-15R			
Other outlets (at request)	BS 1363 (United Kingdom) AN/NZS 3112 (Australia, New Zealand)			
Protection category	IP 20			
Weight (kg / lbs)	2,7 / 5,4	3,5 / 7,7	6,5 / 14.3	8,5 / 18.7
Dimensions (hxwxd in mm) (hxwxd in inches)	72x132x200 2.8x5.2x7.9	72x155x237 2.8x6.1x9.3	104 x 194 x 305 4.1 x 7.6 x 12.0	104 x 194 x 305 4.1 x 7.6 x 12.0
ACCESSORIES				
Remote on-off switch	Two pole connector			
Automatic transfer switch	Filax			
STANDARDS				
Safety	EN 60335-1			
Emission Immunity	EN 55014-1 / EN 55014-2/ EN 61000-6-2 / EN 61000-6-3			

1) Battery cables of 1.5 meter (12/180 with cigarette plug)
2) Protection key:
   a) output short circuit
   b) overload
   c) battery voltage too high
   d) battery voltage too low
   e) temperature too high
3) Non-linear load, crest factor 3:1
4) Frequency can be set by DIP switch (48/350 model only)

Battery Alarm
An excessively high or low battery voltage is indicated by an audible and visual alarm, and a relay for remote signalling.

BMV-700 Battery Monitor
The BMV-700 Battery Monitor features an advanced microprocessor control system combined with high resolution measuring systems for battery voltage and charge/discharge current. Besides this, the software includes complex calculation algorithms to exactly determine the state of charge of the battery. The BMV-700 selectively displays battery voltage, current, consumed Ah or time to go. The monitor also stores a host of data regarding performance and use of the battery.

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Phoenix Inverters

1200VA – 5000VA (per module)

Phoenix Inverter 24/5000

SinusMax - Superior engineering

Developed for professional duty, the Phoenix range of inverters is suitable for the widest range of applications. The design criteria have been to produce a true sine wave inverter optimized efficiency but without compromise in performance. Employing hybrid HF technology, the result is a top quality product with compact dimensions, light in weight and capable of supplying power, problem-free, to any load.

Extra start-up power

A unique feature of the SinusMax technology is very high start up power. Conventional high frequency technology does not offer such extreme performance. Phoenix Inverters, however, are well suited to power up difficult loads such as refrigeration compressors, electric motors and similar appliances.

Virtually unlimited power thanks to parallel and 3-phase operation capability

Up to 6 units inverters can operate in parallel to achieve higher power output. Six 24/5000 units, for example, will provide 24kW / 30kVA output power. Operation in 3-phase configuration is also possible.

To transfer the load to another AC source: the automatic transfer switch

If an automatic transfer switch is required we recommend using the MultiPlus inverter/charger instead. The switch is included in these products and the charger function of the MultiPlus can be disabled. Computers and other electronic equipment will continue to operate without disruption because the MultiPlus features a very short switchover time (less than 20 milliseconds).

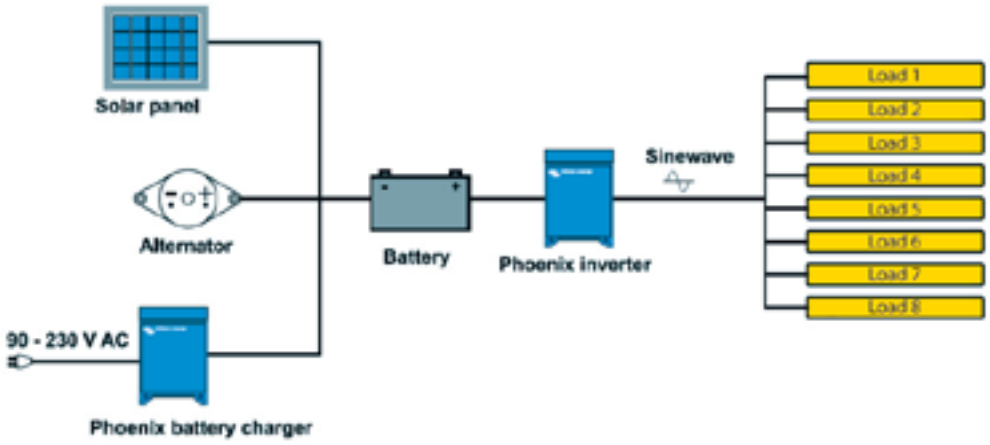
Computer interface

All models have a RS-485 port. All you need to connect to your PC is our MK3-USB VE.Bus to USB interface (see under accessories). Together with our VEConfigure software, which can be downloaded free of charge from our website, all parameters of the inverters can be customized. This includes output voltage and frequency, over and under voltage settings and programming the relay. This relay can for example be used to signal several alarm conditions, or to start a generator. The inverters can also be connected to VENet, the new power control network of Victron Energy, or to other computerized monitoring and control systems.

New applications of high power inverters

The possibilities of paralleled high power inverters are truly amazing. For ideas, examples and battery capacity calculations please refer to our book 'Energy Unlimited' (available free of charge from Victron Energy and downloadable from www.victronenergy.com).

Phoenix Inverter Compa 24/1600



Phoenix Inverter	C12/1200 C24/1200	C12/1600 C24/1600	C12/2000 C24/2000	12/3000 24/3000 48/3000	24/5000 48/5000
Parallel and 3-phase operation	Yes				
INVERTER					
Input voltage range (V DC)	9,5 – 17V 19 – 33V 38 – 66V				
Output	Output voltage: 230 VAC ±2% Frequency: 50 Hz ± 0,1% (1)				
Cont. output power at 25°C (VA) (2)	1200	1600	2000	3000	5000
Cont. output power at 25°C (W)	1000	1300	1600	2400	4000
Cont. output power at 40°C (W)	900	1200	1450	2200	3700
Cont. output power at 65°C (W)	600	800	1000	1700	3000
Peak power (W)	2400	3000	4000	6000	10000
Max. efficiency 12/ 24 /48 V (%)	92 / 94 / 94	92 / 94 / 94	92 / 92	93 / 94 / 95	94 / 95
Zero load power 12 / 24 / 48 V (W)	8 / 10 / 12	8 / 10 / 12	9 / 11	20 / 20 / 25	30 / 35
Zero load power in AES mode (W)	5 / 8 / 10	5 / 8 / 10	7 / 9	15 / 15 / 20	25 / 30
Zero load power in Search mode (W)	2 / 3 / 4	2 / 3 / 4	3 / 4	8 / 10 / 12	10 / 15
GENERAL					
Programmable relay (3)	Yes				
Protection (4)	a - g				
VE.Bus communication port	For parallel and three phase operation, remote monitoring and system integration				
Remote on-off	Yes				
Common Characteristics	Operating temperature range: -40 to +65°C (fan assisted cooling) Humidity (non-condensing): max 95%				
ENCLOSURE					
Common Characteristics	Material & Colour: aluminium (blue RAL 5012) Protection category: IP 21				
Battery-connection	battery cables of 1.5 meter included		M8 bolts	2+2 M8 bolts	
230 V AC-connection	G-ST18i plug		Spring-clamp	Screw terminals	
Weight (kg)	10		12	18	30
Dimensions (hxwhd in mm)	375x214x110		520x255x125	362x258x218	444x328x240
STANDARDS					
Safety	EN 60335-1				
Emission Immunity	EN 55014-1 / EN 55014-2				

1) Can be adjusted to 60 Hz and to 240 V
2) Non-linear load, crest factor 3:1
3) Programmable relay that can a.o. be set for general alarm, DC under voltage or genset start/stop function.
AC rating: 230 V / 4 A
DC rating: 4 A up to 35 VDC, 1A up to 60VDC

4) Protection key:
a) output short circuit
b) overload
c) battery voltage too high
d) battery voltage too low
e) temperature too high
f) 230 V AC on inverter output
g) input voltage ripple too high

Phoenix Inverter Control

This panel can also be used on a MultiPlus Inverter/Charger when an automatic transfer switch but no charger function is desired.
The brightness of the LEDs is automatically reduced during night time.

Computer controlled operation and monitoring

Several interfaces are available:

Color Control GX

Provides monitor and control. Locally, and also remotely on the VRM Portal.

MK3-USB VE.Bus to USB interface

Connects to a USB port (see 'A guide to VEConfigure')

VE.Bus to NMEA 2000 interface

Connects the device to a NMEA 2000 marine electronics network. See the NMEA 2000 & MFD integration guide

BMV-700 Battery Monitor

The BMV-700 Battery Monitor features an advanced microprocessor control system combined with high resolution measuring systems for battery voltage and charge/discharge current. Besides this, the software includes complex calculation algorithms, like Peukert's formula, to exactly determine the state of charge of the battery. The BMV-700 selectively displays battery voltage, current, consumed Ah or time to go. The monitor also stores a host of data regarding performance and use of the battery.

Several models available (see battery monitor documentation).

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Phoenix Inverters

250VA – 1200VA 230V and 120V, 50Hz or 60Hz

Phoenix 12/375 VE.Direct

Phoenix 12/375 VE.Direct

VE.Direct communication port

The VE.Direct port can be connected to:

- A computer (VE.Direct to USB interface cable needed)
- Apple and Android smartphones, tablets, MacBook's and other devices (VE.Direct Bluetooth Smart dongle needed)

Fully configurable:

- Low battery voltage alarm trip and reset levels
- Low battery voltage cut-off and restart levels
- Dynamic cut-off: load dependent cut-off level
- Output voltage 210 - 245V
- Frequency 50 Hz or 60 Hz
- ECO mode on/off and ECO mode sense level

Monitoring:

- In- and output voltage, % load and alarms

Proven reliability

The full bridge plus toroidal transformer topology has proven its reliability over many years.
The inverters are short circuit proof and protected against overheating, whether due to overload or high ambient temperature.

High start-up power

Needed to start loads such as power converters for LED lamps, halogen lamps or electric tools.

ECO mode

When in ECO mode, the inverter will switch to standby when the load decreases below a preset value (min load: 15W). Once in standby the inverter will switch on for a short period (adjustable, default: every 2,5 seconds). If the load exceeds a preset level, the inverter will remain on.

Remote on/off

A remote on/off switch can be connected to a two pole connector, or between battery plus and the left hand contact of the two pole connector.

LED diagnosis

Please see manual for a description.

To transfer the load to another AC source: the automatic transfer switch

For our low power inverters we recommend our Filax Automatic Transfer Switch. The Filax features a very short switchover time (less than 20 milliseconds) so that computers and other electronic equipment will continue to operate without disruption.

Available with different output sockets

Schuko	UK	AU/NZ	IEC-320 (male plug included)	Nema 5-15R
				

DC connection with screw terminals

No special tools needed for installation

Phoenix Inverter 12 Volt / 24 Volt / 48 Volt	12/250 24/250 48/250	12/375 24/375 48/375	12/500 24/500 48/500	12/800 24/800 48/800	12/1200 24/1200 48/1200
Cont. power at 25°C (1)	250VA	375VA	500VA	800VA	1200VA
Cont. power at 25°C / 40°C	200 / 175W	300 / 260W	400 / 350W	650 / 560W	1000 / 850W
Peak power	400W	700W	900W	1500W	2200W
Output AC voltage / frequency (adjustable)	230VAC or 120VAC +/- 3% 50Hz or 60Hz +/- 0,1%				
Input voltage range	9,2 - 17 / 18,4 - 34,0 / 36,8 - 62,0V				
DC low shut down (adjustable)	9,3 / 18,6 / 37,2V				
Dynamic (load dependent) DC low shut down (fully configurable)	Dynamic cut-off, see https://www.victronenergy.com/live/ve.direct:phoenix-inverters-dynamic-cutoff				
DC low restart and alarm (adjustable)	10,9 / 21,8 / 43,6V				
Battery charged detect (adjustable)	14,0 / 28,0 / 56,0V				
Max. efficiency	87 / 88 / 88%	89 / 89 / 90%	90 / 90 / 91%	90 / 90 / 91%	91 / 91 / 92%
Zero-load power	4,2 / 5,2 / 7,9W	5,6 / 6,1 / 8,5W	6 / 6,5 / 9W	6,5 / 7 / 9,5W	7 / 8 / 10W
Default zero-load power in ECO mode (default retry interval: 2,5 s, adjustable)	0,8 / 1,3 / 2,5W	0,9 / 1,4 / 2,6W	1 / 1,5 / 3,0	1 / 1,5 / 3,0	1 / 1,5 / 3,0
ECO mode stop and start power setting	Adjustable				
Protection (2)	a - f				
Operating temperature range	-40 to +65°C (fan assisted cooling) Derate 1,25% per °C above 40°C				
Humidity (non-condensing)	max 95%				
ENCLOSURE					
Material & Colour	Steel chassis and plastic cover (blue Ral 5012)				
Battery-connection	Screw terminals				
Maximum cable cross-section	10 mm² / AWG8	10 mm² / AWG8	10 mm² / AWG8	25/10/10mm² / AWG4/8/8	35/25/25 mm² / AWG 2/4/4
Standard AC outlets	230V: Schuko (CEE 7/4), IEC-320 (male plug included) UK (BS 1363), AU/NZ (AS/NZS 3112) 120V: Nema 5-15R				
Protection category	IP 21				
Weight	2,4kg / 5,3lbs	3,0kg / 6,6lbs	3,9kg / 8.5lbs	5,5kg / 12lbs	7,4kg / 16,3lbs
Dimensions (hxwxd, mm) (hxwxd, inch)	86 x 165 x 260 3.4 x 6.5 x 10.2	86 x 165 x 260 3.4 x 6.5 x 10.2	86 x 172 x 275 3,4 x 6,8 x 10,8	105 x 216 x 305 4.1 x 8.5 x 12.1 (12V model: 105 x 230 x 325)	117 x 232 x 327 4.6 x 9.1 x 12.9 (12V model: 117 x 232 x 362)
ACCESSORIES					
Remote on-off	Yes				
Automatic transfer switch	Filax				
STANDARDS					
Safety	EN-IEC 60335-1 / EN-IEC 62109-1				
EMC	EN 55014-1 / EN 55014-2 / IEC 61000-6-1 / IEC 61000-6-2 / IEC 61000-6-3				
Automotive Directive	ECE R10-4				

1) Nonlinear load, crest factor 3:1
2) Protection key:
   a) output short circuit
   b) overload
   c) battery voltage too high
   d) battery voltage too low
   e) temperature too high
   f) DC ripple too high

Battery Alarm
An excessively high or low battery voltage is indicated by an audible and visual alarm, and a relay for remote signalling.

BMV Battery Monitor
The BMV Battery Monitor features an advanced microprocessor control system combined with high resolution measuring systems for battery voltage and charge/discharge current. Besides this, the software includes complex calculation algorithms to exactly determine the state of charge of the battery. The BMV selectively displays battery voltage, current, consumed Ah or time to go. The monitor also stores a host of data regarding performance and use of the battery.

VE.Direct Bluetooth Smart dongle
(must be ordered separately)

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PROJECT REFERENCES

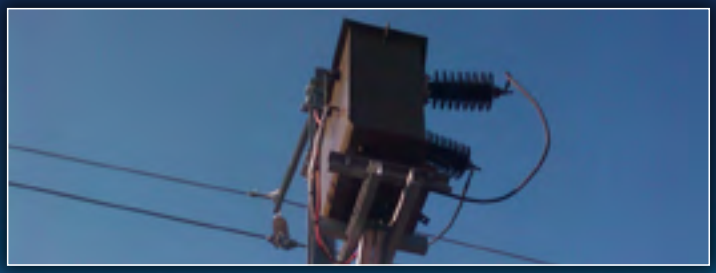
Solar Access Control Katu

120KWp Grid Tie - Claremont

5KW Self Consumption - Vereeniging

5KW Solar Ebotse

solar ATM - Vorna Valley



Stepdown Transformer - Gautrain

300KVA Generator - Durban

4 x 10KVA Long Runtime - Eastern Cape

Dialysis Clinic - Home UPS - Howick

T5-40KVA x 2 - Glass Factory Nigel

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ALSO AVAILABLE

PHD POWERHOUSE

Reliable Power Solutions

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