

The blueplanet™ XP100U



K A C O



new energy.

Headquartered in Neckarsulm, Germany, the **KACO new energy Group** has specialized in the design and production of power conditioning devices for over 60 years.

The largest part of our business is photovoltaic inverters. Our second largest product lines are power supply systems for automotive and aerospace applications. KACO's clients in these fields include global players like Volkswagen and Airbus. KACO new energy's product portfolio also includes custom inverter designs and inverters for CHPs (Combined Heat and Power plants), and battery based power supply systems. KACO inverters are in operation all over the world.

With more than 3 GW of grid-tied PV inverters sold world wide, KACO new energy is one of the leading global manufacturers in this field. Our international sales will surpass \$1 billion in 2011 through strong sales growth at branches in the USA, Canada, Greece, Italy, Spain, Israel, China, and Korea as well as in our sales agents in other important markets like India, the Czech Republic and Australia. KACO manufactures in Neckarsulm, Germany; Seoul, South Korea; San Jose, London, Canada; and **USA**. KACO will continue to secure jobs and employ a highly skilled workforce who create high-quality products. More than 800 employees contribute to the success of KACO new energy and its customers.

As early as 1999, KACO launched one of the first serial production PV inverters without a transformer. This made our company a pioneer in the field of transformerless inverter technology. In recent years KACO's US based engineers have increased our product portfolio with industry leading, isolated PV inverters specifically for the Americas.

Investments in research and development are the most vital components of KACO's business. We have established designated research teams in Kassel and Neckarsulm, Germany for the further development of inverters with a power class of 1 kW up to 35 kW, as well as a new engineering team in Seoul, South Korea for the development and production of solar inverters of power classes from 50 kW up to 2 MW. KACO's world wide network of engineers collaborate with California based engineers to ensure the product range of KACO for the Americas is state of the art and configured for compliance to tough North American electric code standards.

We have established a rigorous Quality Management Program to ensure sustained reliability of KACO devices. KACO customers expect PV inverters which have successfully passed extensive thermal and electronic testing processes under extreme conditions. These and other stringent corporate directives are inherent to the KACO corporate philosophy. We believe that even a high degree of efficiency cannot compensate for the damage caused by a failed inverter on a sunny day!

Special Features

The blueplanet XP Series



XP100U-H2



XP100U-H4

Networking Interfaces



Powerful Monitoring System



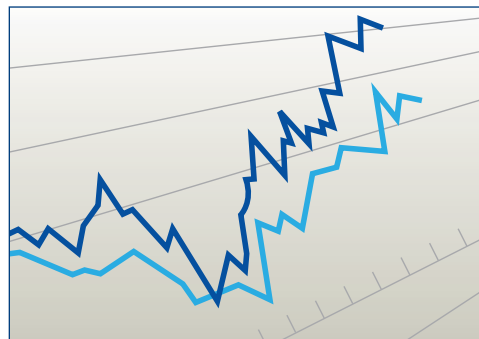
Graphic User Interface GUI



Full Digital Control System



Maximum Efficiency > 96%



High Reliability and Availability



High Performance



Performance

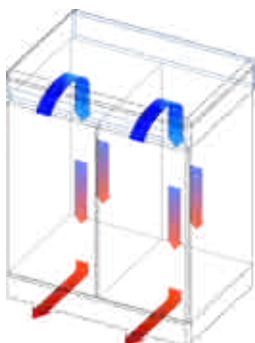
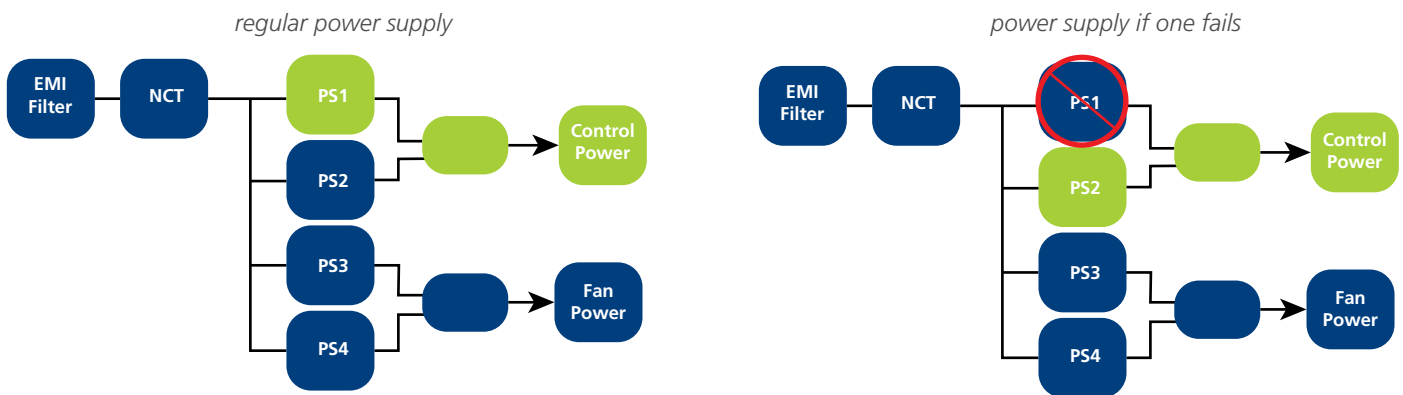
Floating point digital signal processors reduce total AC harmonic distortion providing more reliable clean grid power to enhance kWh performance.

- 96.5% max efficiency - generate fast return on investment
- Complex MPPT provides MPP accuracy during weather fluctuations
- Remotely monitored surge protection devices on all AC & DC inputs
- Film capacitors are designed for the 20 years life of the inverter

Redundant Power Supplies

The blueplanet XP Series inverter is delivered with two control power supplies and two fan power supplies.

- Redundant power supplies provide continuous and reliable output
- Quality power circuits ensure minimum faults



Effective Cooling System

Variable speed fans ensure maximum reliability with top quality fan components for longest life.

- Easy to clean filter system
- Digital signal processor tracks fan performance
- Additional fans dedicated to cool the Power Electronic Building Block (PEBB)

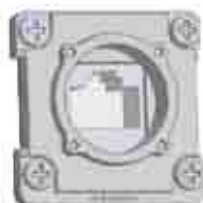
Easy Data Access



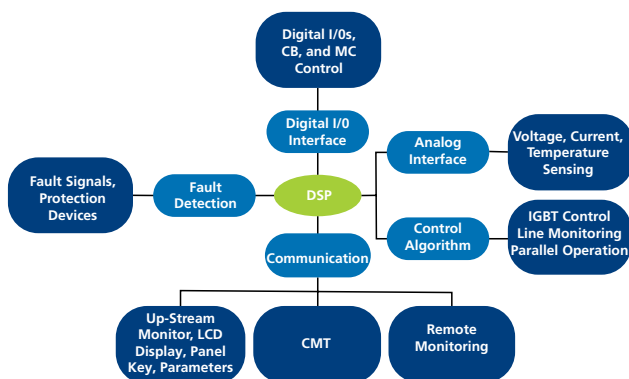
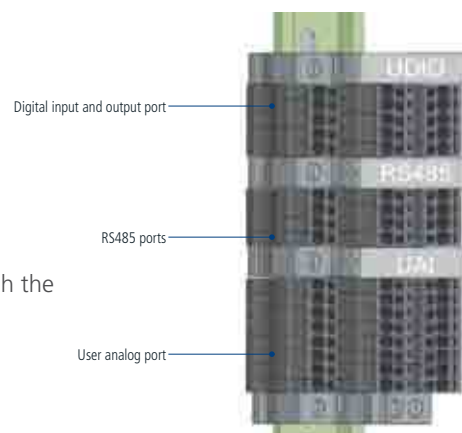
Communication Access

Various interfaces increase the number of user options compared to competitors products.

- One S0 input, One S0 output
- One digital input, one digital output
- Two RS485 ports
- Four analog inputs
- One Ethernet port
- Internal 24V power supply



Ethernet Port
Remote monitoring capability using a simple cable through the Ethernet port.



Full Digital Control

The blueplanet XP Series' key control logic functions are controlled through the following features that guarantee maximum performance and flexibility.

- Two Digital Signal Processors (DSP)
- Application Specific Integrated Circuits (ASICs)
- Real-time Operating System (OS)

Commissioning and Monitoring Technology (CMT)

The CMT is a powerful remote diagnostic tool. The information and capabilities available allow for maximum efficiency in monitoring and troubleshooting.

- Remote Control (On/Off function)
- Remote software upgrades
- Historical trace functions (built-in oscilloscope)
- Reset inverter after fault events
- Real time access to all installed inverters



Robust Monitoring



Graphic User Interface (GUI)

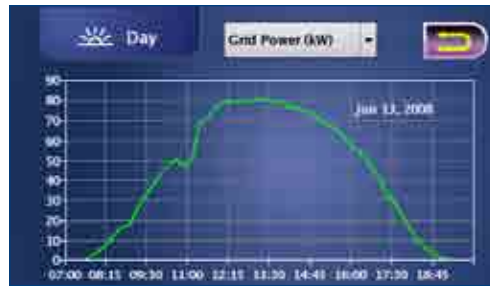
The blueplanet XP Series includes a GUI control panel located on the front of the unit. It features a menu driven TFT LCD color touch screen. This enables users to quickly identify the operational status of the inverter.

- Access to basic inverter controls
- Easy to use menu hierarchy
- Quickly commission inverter
- Detailed data reporting



Main Display

Displays array status, inverter's current operation status and grid status.



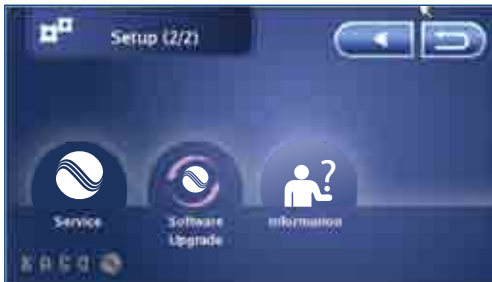
Statistics

Up to 20 years of daily, monthly & annual performance data can be displayed.



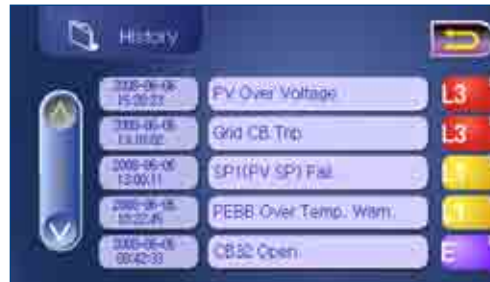
Operation Modes

Various operation modes, national grid codes and languages can be configured.



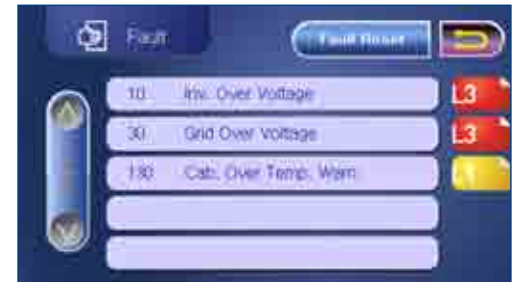
Setup

Service mode allows onsite parameter changes and easy software upgrades available through the SD card.



History

Over 40 operation events can be recorded in three different color codes.



Fault Display

All fault states can be displayed.

Robust Monitoring



Java Enabled Web Monitoring

The Java Enabled Web Monitoring provides remote monitoring and control of certain functions of the blueplanet XP Series inverter at no additional cost. No other inverter in the industry offers comparable functionality for FREE.

- Accessible via internet
- Access accurate real time performance data
- Check up on all events including faults and error messages
- Graphic display of performance data
- Choose your own login and password
- Built in web server in each unit
- Access data via unique IP address
- Output data may be downloaded in .csv format
- Extended monitoring solution option with KACO **proLOG**



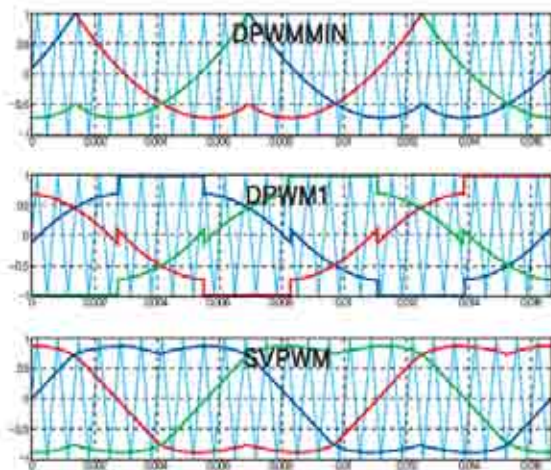
High Efficiency



Variable Structure Pulse Width Modulation

KACO new energy developed a patent pending IGBT switching technology called "Variable Structure Pulse Width Modulation (VSPWM)" for use in the blueplanet XP Series inverters.

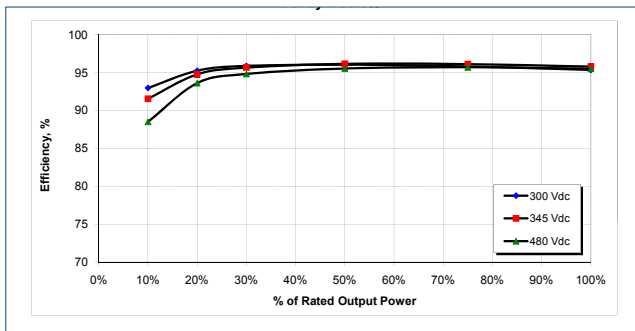
- PWM controller selects optimum operating state based on current conditions
- Control strategy increases inverter's overall efficiency
- Lower harmonic ripple currents



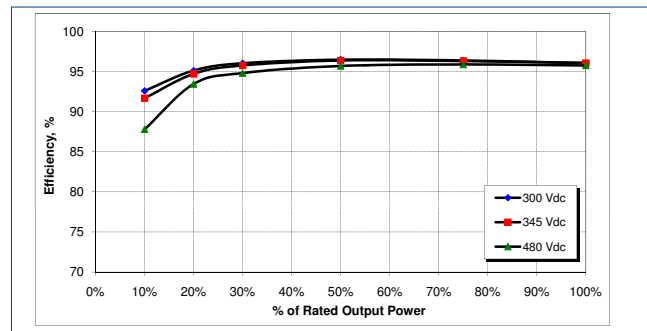
Input Power	Input Voltage					
	300V			480V		
	DPWM	DPWMMIN	SVPWM	DPWM	DPWMMIN	SVPWM
5kW	$\eta = 88.0\%$ THDi = 50.0% p.f. = 0.82	$\eta = 89.5\%$ THDi = 40.0% p.f. = 0.84	$\eta = 90.4\%$ THDi = 35.0% p.f. = 0.89	$\eta = 79.0\%$ THDi = 150.0% p.f. = 0.52	$\eta = 81.5\%$ THDi = 65.0% p.f. = 0.77	$\eta = 84.7\%$ THDi = 31.3% p.f. = 0.92
20kW	$\eta = 96.3\%$ THDi = 32.0% p.f. = 0.98	$\eta = 96.5\%$ THDi = 11.0% p.f. = 0.99	$\eta = 96.3\%$ THDi = 11.0% p.f. = 0.99	$\eta = 93.3\%$ THDi = 35.0% p.f. = 0.94	$\eta = 93.3\%$ THDi = 17.0% p.f. = 0.97	$\eta = 94.2\%$ THDi = 9.0% p.f. = 0.99
40kW	$\eta = 97.1\%$ THDi = 5.5% p.f. = 1.00	$\eta = 97.1\%$ THDi = 6.0% p.f. = 1.00	$\eta = 97.0\%$ THDi = 5.5% p.f. = 1.00	$\eta = 95.8\%$ THDi = 18.0% p.f. = .98	$\eta = 95.5\%$ THDi = 17.0% p.f. = 0.99	$\eta = 95.8\%$ THDi = 5.0% p.f. = 1.00
70kW	$\eta = 97.0\%$ THDi = 3.3% p.f. = 1.00	$\eta = 97.0\%$ THDi = 3.7% p.f. = 1.00	$\eta = 96.9\%$ THDi = 3.0% p.f. = 1.00	$\eta = 96.0\%$ THDi = 10.0% p.f. = 0.99	$\eta = 96.0\%$ THDi = 5.8% p.f. = 1.00	$\eta = 96.0\%$ THDi = 3.0% p.f. = 1.00
100kW	$\eta = 96.7\%$ THDi = 2.2% p.f. = 1.00	$\eta = 96.6\%$ THDi = 2.2% p.f. = 1.00	$\eta = 96.4\%$ THDi = 2.3% p.f. = 1.00	$\eta = 95.9\%$ THDi = 7.5% p.f. = 1.00	$\eta = 95.9\%$ THDi = 4.0% p.f. = 1.00	$\eta = 95.7\%$ THDi = 1.9% p.f. = 1.00

PWM hardware and software instantaneously chooses the maximum production state from all power input levels

Efficiency of the blueplanet XP Series



blueplanet XP100U-H2
CEC efficiency 96%
Maximum efficiency 96.5%



blueplanet XP100U-H4
CEC efficiency 95.5%
Maximum efficiency 96.5%

Modular Design



Low impact profile

The blueplanet XP Series inverters have been designed to be easy to transport and install. The inverter has a physical profile that is ideal for installation in indoor and outdoor situations.

Crane lift or fork lift into place*

Light weight: 2,425 lbs - 2,646 lbs (1,102 kg - 1,202 kg)

Low profile outer dimensions fits through most standard double doors

NEMA 3R enclosure for indoor or outdoor installation

Only 4 in (10.2 cm) minimum clearance required on sides and rear of unit allowing mounting in corners, narrow spaces or back-to-back and side-by-side

All components serviceable from front of unit

*Lift kit available for rent from KACO

Cleanest Internal Design

The blueplanet XP Series inverter's clean internal design makes it easy to install and maintain. This user friendly design makes servicing the inverter's Power Electronic Building Block (PEBB) easy and convenient.

Interchangeable **easySwap** PEBB

DC/AC terminals located directly at conduit entry point

Practical placement of sensor interfaces

Safe and easy to access internal design

Redundant variable speed fan cooling



World Wide Project



Davis, CA - USA, 100kW: blueplanet XP100U, 2009



Carlstadt, NJ - USA, 300kW: KACO XP100U, 2011



Waco, TX - USA, 100kW: blueplanet XP100U, 2010



Phoenix, AZ - USA, 99.5 kW: KACO XP100U, 2010



Alconera, Spain, 10MW: KACO XP100-HV, 2008



Ganwondo, Korea, 120kW: KACO XP100-HV, 2009

The blueplanet XP Series

Performance

High efficiency:	96.5% maximum efficiency - generate fast return on investment
Variable speed fans:	No unnecessary cooling - decrease internal power consumption & increase uptime
Floating Point DSP:	Reduce total harmonic distortion and provide more accurate AC power control
Variable structure PWM:	Reduce IGBT switching losses by up to 20% when compared to other PV inverters
Complex MPPT algorithm:	Dynamic MPPT accuracy during severe weather fluctuations
Full digital control:	Total transparency of inverter functions - faster reaction time and increased uptime

Ease of installation

Easy handling:	Use a fork lift or crane - XP 100U fits through most standard double doors
Integrated DC recombiner:	4x 100A, 4x 125A, 2x 200A, 2x 250A and 1x400A fused DC inputs
Pre-set parameters:	Save time and labor cost - one step configuration with TFT LCD color touch screen
Internal 24V power supply:	An option for external power supplies for monitoring & accessories at additional cost
Polycarbonate safety shields:	Protect installation crews from high current / high voltage bus bars & connectors
Reverse polarity protection:	Avoid potential damage to inverter caused by mis-wiring during installation

Reliability

History:	KACO has been manufacturing power electronics for more than 60 years
Experience:	More than 3 GW of PV inverters worth about \$1 billion installed world wide
Redundant power supplies:	Increase reliability and uptime - no single point of failure for fans and control boards
Power capacitors:	Film capacitors are designed for the 20 years life of the inverter
Split architecture design:	Power electronics are protected in a separate chamber
NEMA 3R enclosure:	Stainless steel option for coastal installations
Surge protection (SPD):	Remotely monitored SPDs on all AC & DC inputs for better preventative maintenance
Modular IGBT stack:	Power devices, gate drives, and other critical components are integrated into the easySwap PEBB (Power Electronic Building Block) for fast maintenance and increased reliability

Model number	blueplanet XP100-U-H2	blueplanet XP100-U-H4
Input data (DC)		
DC operating range (MPP)	300 – 600 V _{DC}	
Max. DC input voltage	600 V _{DC}	
Nominal DC input current	350 A _{DC}	
Max. DC input I _{sc} current	410 A _{DC}	
Output data (AC)		
Max. continuous output power (CEC)	100 kW	
Max. over-current protection	400 A	150 A
Max. continuous current	278 A _{AC}	120 A _{AC}
Max. output fault current	278 A _{AC}	121 A _{AC}
AC operating voltage	208 V _{AC} 3-Phase Wye	480 V _{AC} 3-Phase Wye
Frequency	60 Hz (59.3 – 60.5 Hz)	
CEC rated efficiency	95.5 %	96 %
Additional data		
AC/DC disconnect	Yes	
Cooling	Variable speed cooling fans	
DC reverse polarity protection	Yes	
Ground fault protection	Integrated ground fault detector/interrupter (GFDI)	
Grounding	Negative Ground (Optional Positive Ground configuration) ed from factory)	
Visual displays	TFT - Graphical LCD with touch screen interface	
Included accessory interfaces	easy Link S0 / RS232 / RS485 / Ethernet	
Ambient temp @ max AC power	-5°F – +122°F (-20°C – + 50°C)	
Thermal protection	Yes	
Noise emissions	< 65 dB	
Relative humidity range	0-95% (non condensing)	
Max. altitude	6600' (2000 m)	
Power Consumption	< 60.4 W (during standby and at night)	
User programmable inputs	1 digital input / 4 analog inputs	
Warranty	Standard 5 years (10, 15, 20 years extensions available)	
Certifications		
Safety compliance	UL1741 Rev 2005, IEEE1547, IEEE1547.1 CAN/CSA C22.2 No. 107.1	
Communications compliance	FCC Part 15 Class A	
Specifications		
Enclosure type	NEMA 3R	
Dimensions (H, W, D)	73 x 68 x 37 in. (1840 x 1724 x 930 mm)	
Weight	2,646 lbs (1200kg)	2,425 lbs (1100kg)