Renewable Energy

R-ENERGY

Photovoltaic Inverters

Photovoltaik Wechselrichter

nach BDEW Richtlinie

Astrid
ENERGY ENTERPRISES

MISSION

Unser Antrieb our Driving Force Nasa Pokretacna snaga

"Unser Ziel ist es, markt- und bedarfsgerechte Produkte sowie Dienstleistungen anzubieten, die eine nachhaltige Energieversorgung sicherstellen. Grundlage unseres Erfolges ist neben der Innovationskraft und der langjaehrigen Erfahrung das Alles aus einer Hand Prinzip, bei dem technisch und wirtschaftlich alles aufeinander abgestimmt ist."

"Our objektive is to supply products and servicestailored to market requirements and wich can ensure a sustainable energy supply. Alongside our creative innovation and longstanding industry experience, our sucess is based on the "single source" pricinple, where everything is technically and economically coordinated."

"Nas cilj da se opskrbe proizvode i usluge prialagodene zahtjevima trzista i koja moze osigurati odrzivo opskrbu energijom. Uz nase kreativne inovacije i dugogodisnjie iskustvo, nas uspjeh temelji se na "jedan izvor" sve iz jedne ruke nacelu, gdje je sve tehnicki i gospodarski koordinirana."

Dragana & Bodo Bolsenkoetter
CEO´s energ ykonzept by Hallertauer Leasing GmbH

COPERNICO

The three-phase inverters Copernico have been designed using the experience of Astrid Energy Enterprises SpA in the field of power conversion. That is why they are especially suitable for medium and high power installations. The use of two latest-generation 32-bit microcontrollers, one dedicated to the DC section and one to the AC section, has allowed them to achieve high performance in terms of:

- PWM switching technology at high frequency for the IGBT bridge
- Low THDi harmonic distortion, well below the values imposed by the law
- Unit power factor
- High efficiency in the different working points of the PV field voltage and under various load conditions
- Innovative MPPT (Maximum Power Point Tracker) algorithm to optimize the power taken from the PV field.

Copernico TT
With Integrated Transformer

Astrid EE operates in the market providing total solutions. Our customers may rely on our advice during the design stage of the plant, on our experience during the installation and on our service available all over Italy. Astrid also manufactures string combiners prearranged for field monitoring as well as for the anti-theft system.
Inverters Copernico implement the RS485 Mod-BUS RTU communication protocol to be perfectly integrated into the power generation system, composed of Array monitor, inverters and energy meters.
The entire production plant, via the optional Green Power Guardian, can be locally and remotely monitored in real time, allowing the operator to manage the whole plant as one unit and to examine every single component.

POWER - KW		20	30	50	100
INPUT DATA					
Maximum voltage	V	950			
MPPT voltage range	V	450 ÷ 820			
Maximum current	A	46	69	115	230
Input Protection		Isolator + Fuses			Isolator (*)
OUTPUT DATA					
Nominal power	kW	20	30	50	100
Max. PV power recommended	kWp	24	35	60	120
Nominal voltage	V	400 three-phase with integrated transformer			
Nominal frequency	Hz	50 ÷ 60			
Power factor	Cos ∅	0,99			
Current harmonics	THD	< 2 % @ nominal power and sinusoidal voltage			
Output protection		Electronic short-circuit protection Fuses - Contactor			
SYSTEM DATA					
Maximum efficiency	%	>94,12	> 95,51	>95,79	>96,28
Maximum European efficiency	%	>93,20	>94,08	>95,04	>95,79
Loss under normal operation Nominal power	Wh	1150	1350	2100	3720
	BTU	3900	4600	7200	12700
Weight	kg	475	486	540	905
Dim. (WxDxH) mm - Cabinet IP20 (IEC529)		690x895x1345			800x800x1900
Accessibility		From the Front			
USER INTERFACE					
Front panel		LCD display with keyboard, mimic panel and LED's			
Standard communication ports		RS232, USB, RS485 with MODBUS protocol			
Optional interfaces		Relay card for alarms and statuses			
ENVIRONMENT					
Working temperature	°C	-10..+45			
Storage temperature	°C	-10..+70			
Relative humidity (non-condensing)	%	<95			
Altitude	m	< 1000 above sea level			
STANDARDS					
Mark		CE			
Safety		IEC 62103 – EN 50178			
EMC		EN 61000-6-2, IEC EN 61000-6-4			
Quality		ISO9001:2000			
Environmental quality		ISO14000 - EMAS			

Applications

- LV photovoltaic power plants
- MV photovoltaic power plants
- Stand alone power plants with energy storage system
- Hybrid power generation plants
- Battery discharge systems delivering constant power or current to mains

The following accessories for PV plants are also available:

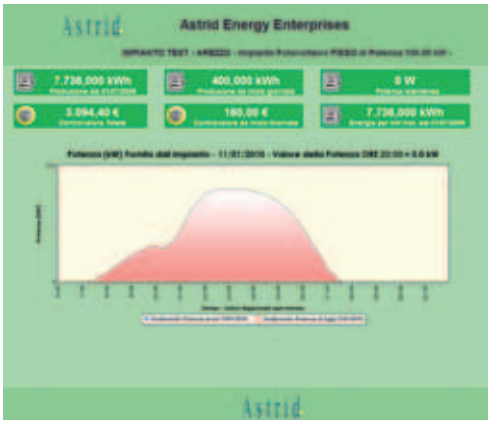
- Diode boxes for string protection
- Array monitor
- Green Power Guardian (supervision system)
- Knx accessories
- Sensors: radiation, ambient temperature, module temperature, anemometers, etc.

Copernico TL Transformerless

POTENZA - KW		20	30	50	100	150	200	250	350	500
INPUT DATA										
Maximum Voltage	V	950								
MPPT Voltage Range	V	450 ÷ 820								
Maximum Current	A	46	69	115	230	345	460	570	795	1140
Input Protection		Isolator + Fuses			Isolator (*)					
OUTPUT DATA										
Nominal Power	kW	20	30	50	100	150	200	250	350	500
Max. PV Power Recommended	kWp	24	35	60	120	180	240	295	410	580
Nominal Voltage	V	300 three-phase								
Nominal Frequency	Hv	50 ÷ 60								
Power factor	Cos ∅	0,99								
Current harmonics	THD	< 2 % @ nominal power and sinusoidal voltage								
Output protection		Electronic short-circuit protection - Fuses - Contactor								
SYSTEM DATA										
Maximum efficiency	%	>96,76	>97,21	>96,97	>97,37	>97,67	>97,73	>97,79	>97,95	>98,08
Maximum European efficiency	%	>94,77	>95,86	>96,01	>96,60	>97,03	>97,18	>97,17	>97,45	>97,69
Loss under normal operation Nominal power	Wh	650	850	1500	2600	3500	4500	5500	8200	12000
	BTU	2200	2900	5100	8800	12000	15300	18700	27900	40900
Weight	kg	260	271	320	415	500	635	686	1150	1372
Dim. (WxDxH) mm - Cabinet IP20 (IEC529)		690x895x1345			800x800x1900		1000x800x2100		1600x1000x2100	
Accessibility		From the Front								
USER INTERFACE										
Front panel		LCD display with keyboard, mimic panel and LED's								
Standard communication ports		RS232, USB, RS485 with MODBUS protocol								
Optional interfaces		Relay card for alarms and statuses								
ENVIRONMENT										
Working temperature	°C	-10..+45								
Storage temperature	°C	-10..+70								
Working temperature	°C	-10..+40								
Relative humidity (non-condensing)	%	<95								
Altitude	m	< 1000 above sea level								
Audible noise level (acc. EN 62040)	dBA	<65								
STANDARDS										
Mark		CE								
Sicurezza		IEC 62103 - EN 50178								
EMC		EN 61000-6-2, IEC EN 61000-6-4								
Quality		ISO9001:2000								
Environmental quality		ISO14000 - EMAS								

String Combiner
Array Monitor

Array Monitor is designed to connect the strings of a PV field in parallel, supervising them efficiently. In very large plants, without efficient monitoring and exact diagnosis, it may become very expensive, or even impossible, to determine if there is a possible malfunction on any single panel.
Array Monitor has been designed entirely by Astrid Energy Enterprises S.p.A. and is an integral and irreplaceable component for the proper supervision of the whole photovoltaic power generation system. The device is able to communicate with Green Power Guardian via ModBus protocol on RS485 serial interface. Due to its measurement of a set of string currents and voltages, solar radiation, PV panel temperature, etc., it is able to detect the presence of failures in the plant, and highlight deviations in the expected operation under various environmental conditions.

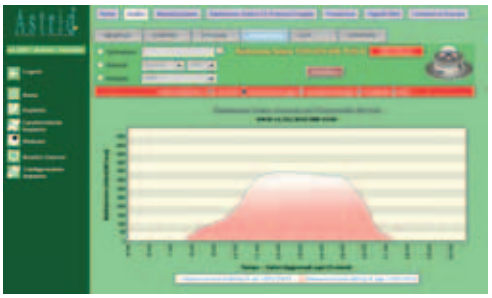


PC remote control
Software monitoring
- PC connection with Array Monitor via RS232/RS485
- Indications about the operation of the connected strings: measurements and alarms
- Basic diagnostics

Free inputs
For additional measurements and alarms
- 3 analogue inputs (sensors)
- 1 analogue input (PT100)
- 4 digital inputs (alarms)

Remote control
Connection via RS-485
- Measurements of string currents and voltages
- Alarms
- POF anti-theft system
- Solar radiation sensor
- PV panel temperature sensor
- Ambient temperature sensor
- Anemometer
- Tripping coil for isolator

Options
- Direct current isolator
- Solar radiation sensor
- PV panel temperature sensor
- Ambient temperature sensor
- Anemometer
- Tripping coil for DC isolator controlled via external push-button
- Tripping coil for DC isolator controlled via protocol
- Modbus RTU



Technical Data

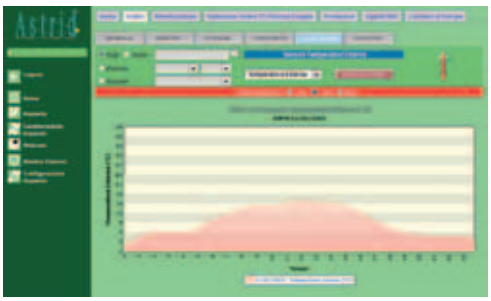
INPUT PARAMETERS	
Maximum input voltage - V	900
Input voltage range - V	200 ÷ 900
Auxiliary continuous supply – Vac/dc	24 ÷ 4816
Max. string current - A	16
Max. number of measuring channels	10
Nominal consumption - W	6
Max. consumption - W	10
Number of DC fuses	20
Possible fuse sizes - A	10 - 20
Max. string current for 10A fuse - A	8
Max. string current for 20A fuse - A	16
Max. number of strings per fuse	2
Max. number of connectable strings	20
Section of each string cable	up to 6 mm2
Types of string cable connection	• Cable gland • Tyco Solarlock • Lumberg LC3• Others on request
Input surge protection present (with removable varistor)	Presente (Con varistore rimuovibile)
OUTPUT PARAMETERS	
Max. output current - A	160
DC connection type	M8
Ground connection	M8
DC isolator rating (optional)	125A/1200Vcc
MECHANICAL DATA	
Dimensions (WxHxD) - mm	760 x 560 x 250
ENVIRONMENTAL DATA	
Environmental protection degree	IP65
Ambient operating temperature – C°	-25 ÷ +55
Relative humidity (non-condensing) - %	15 ÷ 95
Max. altitude - m	1000
COMMUNICATION DATA	
Transmission medium	RS485
Baud rate	9600 (configurable)
Available information	String supervision parameters: current and voltage, fuse status, suppressor status, monitoring of (optional) external sensors
ANTI-THEFT SYSTEM	
Standard anti-theft system with coded wave optical fiber	2 lines
Plastic Optical Fiber (not included)	Section 2.2 mm

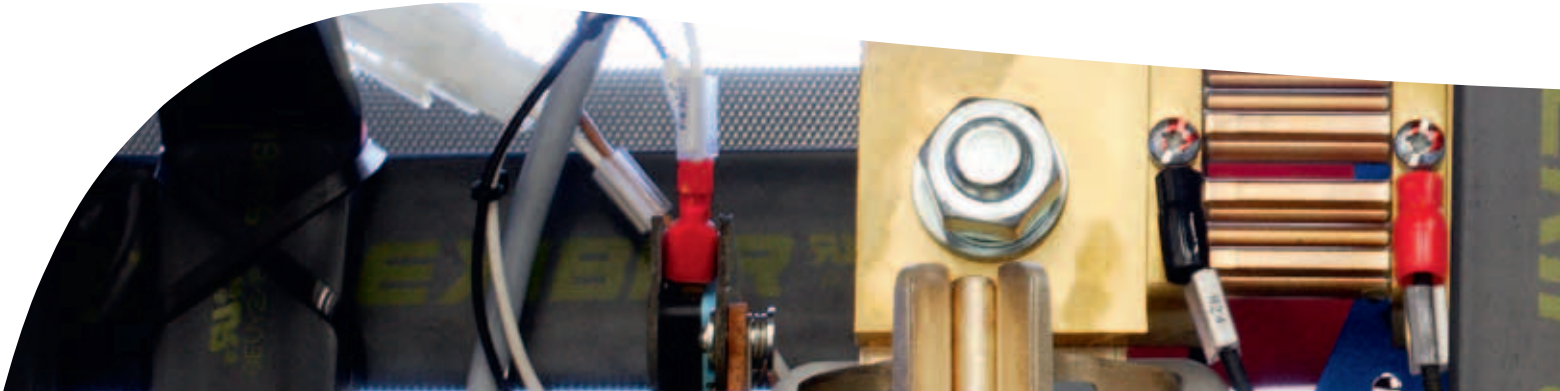
Green Power Guardian Supervision System

Green Power Guardian can be entirely handled via a web interface designed to provide supervision and maintenance functionality of the equipment, as well as monitoring of your financial investment.
As everyone is aware, in renewable power generation plants of medium and high power, without efficient monitoring and exact diagnosis, it may become very expensive, or even impossible, to determine if there is a possible malfunction or if the system performance can be improved. In addition to its basic function of monitoring the power plant parameters, Green Power Guardian can provide information about the status of renewable energy generation as it measures:

- The instantaneous power of the system, the daily energy produced and the total energy delivered since the start-up
- The avoided CO2 emissions, equivalent trees, equivalent litres of oil
- The incentives accrued since the beginning of the day, the incentives accrued and the savings in energy bills since the day of installation of the power generation plant

Due to its multiple access options, the system allows access to a considerable amount of technical data concerning the plant. The Service function allows the user to monitor, also remotely, every single device comprising the plant, including Array Monitor, inverters and sensors and to examine their operation at any time of the day. This allows the system to operate using those configurable installation parameters that maximize the efficiency of the entire system.





Green Power Guardian has been specifically designed for photovoltaic and wind applications. The following values can be acquired via RS485 and/or RS232 interface:

- Energy meter
- Instantaneous AC and DC power
- (DC) voltage and current coming from the strings
- (AC) voltage and current supplied by the inverters
- Operating status of the inverters and of Array Monitor

The KNX bus provides the analogue measurements coming from the sensors and the digital measurements coming from the circuit breakers, etc., and control contact outputs.

It is also possible to:

- Handle several webcams installed in the plant with mosaic or full page visualization
- Send e-mails regarding possible malfunctions, such as total or partial shutdown of the plant, as well as inverter and Array Monitor faults, or performance drops related to solar radiation
- Schedule module cleaning
- Connect remotely via ADSL or via router with 3G/EDGE/GPRS modem

Our system is able to store for at least 10 years intraday, daily, monthly and yearly values regarding:

- The power and the energy produced by the whole plant and by a single inverter
- Values acquired by each sensor installed
- Profits from incentives, savings and sales of electric energy
- Performance of the power plant and of the PV modules
- Anomalies that occurred in the power plant.

Astrid's Solution for ENEL Power Station in Montalto di Castro

- The photovoltaic power station in Montalto di Castro, with its 6 MWp, is one of the largest in Italy
- Astrid supplied 22x inverters COPERNICO to ensure the conversion of the photovoltaic energy produced of about 5 MWp

Photovoltaic Panels

- The photovoltaic field is made up of both monocrystalline and polycrystalline silicon panels to obtain the best configuration for each sub-field

Sub-fields

- Each sub-field consists of several photovoltaic generators, each one connected to its own converter. All the converters in the same sub-field are housed in one unit.

Photovoltaic Generators

- To achieve a voltage suitable for the converter, the photovoltaic panels are connected in series, creating strings.
- The parallel connection of the strings determines the correct power range of the photovoltaic generator.

The Heart of the Power Plant

- The power conversion system is the main component of the plant.
- ASTRID's inverters COPERNICO guarantee best performance combined with extremely high reliability
- The wide range of available power makes them suitable for small industrial applications, as well as for large power generation plants

Model	100kW	180kW	200kW	250kW
MPPT input voltage range	450			
Maximum output power	120kWp	215kWp	250kWp	300kWp
Nominal output voltage	300 Vac three-phase			
Output power factor (cosϕ) at Pac nominal	0,99			
Current distortion (THD) to mains	< 2%			
Output protection	Short-circuit protection, fuses, contactor			
Working temperature	-10 ÷ +45°C			

Monitoring System

- The unit contains a built-in monitoring system which allows the display of environmental and operational parameters in real time.
- Monitoring is performed via a web interface accessible through ADSL or UMTS/EDGE modem.
- Green Power Guardian can be equipped with environmental sensors to allow the monitoring of all the sensitive parameters of the plant.

Astrid
ENERGY ENTERPRISES

distributed and serviced in Germany - Austria - Switzerland - Balkan by:

ENERGY konzept

Kontakt:

energykonzept.de *
by Hallertauer Leasing GmbH
Hohenwarter Str. 68
D - 85276 Pfaffenhofen a.d. Ilm

Tel. ++49-8441-7972730
Fax ++49-8441-7972732

www.energykonzept.de
www.energykonzept.com

Mail: energykonzept@gmx.de

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CE conforms to all appropriate IEC standards

SYSTEM CERTIFICATION ISO 14001 SGS

SYSTEM CERTIFICATION ISO 9001 SGS

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