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AROS PARTNER

AROS
THE SCIENCE OF CONTINUITY

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SIRI
Solar Inverters

2010

Sirio

General Catalogue

AROS
THE SCIENCE OF CONTINUITY

Aros, a history of research and continuity.

Continuous operation is the key word for Aros. It is its field of activity, a sophisticated technology upon which the efficiency of every electrical system depends.
Aros has over 70 years of experience in this highly specialized sector and is currently a leading brand name in the field.
But continuity is also Aros "trademark" as acknowledged by design and installation engineers: the will to strive constantly to achieve the highest production standards and to anticipate market demands. Thinking in this way brought Aros to set up the Research and Development team of about forty persons to better respond to the market requirements.
Research and Development that, spurned by company policy of energy conservation and environmental protection, have permitted Aros to apply its experience in electronic management of energy to conversion systems for photovoltaic plants.

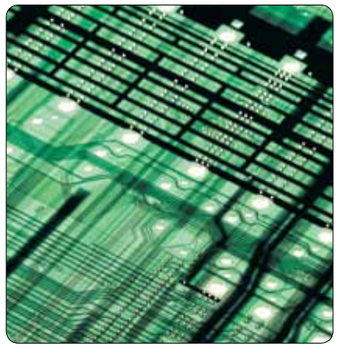
Aros was set up in 1935 and after just a few years established itself as the leading Italian manufacturer of voltage regulators, transformers and power supplies. In the fifties Aros was the first company manufacturer in Italy of ballasts for fluorescent neon lamps and became the Italian leader in the field of components for lighting. In the eighties it designed, developed and produced switching power supplies for IBM computers. Aros thus acquired know-how in PWM (Pulse-Width- Modulation) technology that enabled it to enter the UPS sector. This is now the most important field of activity for Aros, which has maintained its leadership in voltage regulators and components.

Steps to success

1935	Manufacture of radio loudspeakers
1940	Production of transformers for radios and electrical power supplies
1945	Entry on the market of the first power supplies (ballasts) for fluorescent neon lamps
1950-1959	Manufacture of magnetic reactors for fluorescent and discharge lamps
1960-1969	First suppliers of components for IBM Manufacture of ferro-resonant regulators
1970-1979	Production of electronic components for regulators
1980-1989	Manufacture of uninterruptible power supplies (UPS), switching power supplies and electronic reactors
1990-1999	Expansion of the range of UPS for various applications (IT, industrial)
2000-2010	Growth and consolidation in the Worldwide UPS market and expansion of its production with the solar inverters.

Highly trained personnel and state of the art technologies lie behind every project.

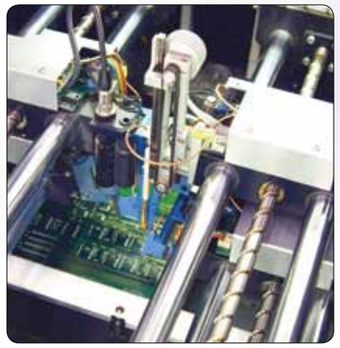
Entering the Research and Development department means entering the heart of Aros. Here users' real problems are "filtered" by means of the latest technologies and transformed into successful products. Environmental simulators, sophisticated analysis tools, CAD systems: super specialized devices for super specialized design engineers to predict tomorrow's needs today, needs arising from developments in electronics and market trends. Aros dedicates its greatest resources to this team and has recently boosted the power area. This both consolidates the strength of its core business of Uninterruptible Power Supplies (UPS), components and voltage regulators, while mapping out its future course.



To understand the work carried out by the research team, just think of the technological "nodes" that are hidden behind the apparent functional linearity of a UPS system. To provide a high level of efficiency, withstand strong line interference, interact with surrounding systems that may not be homogeneous, comply with complex international safety standards, minimize the level of interference emitted towards the mains and towards the environment and finally, offer a degree of reliability that is increasingly demanded by new electronic systems.

Millions of users believe in Aros because Aros believes in excellence.

Quality not only as an objective but also as an indispensable condition for every product: this is the creed that Aros abides by and which is centered around the certification of its quality system. Aros is certified UNI EN ISO 9001:2000 for the design and development, manufacture, sales and after-sales service of its products. This certification guarantees stringent and constant control of its corporate processes. The result is not just higher product quality and reliability but also a philosophy focused on understanding customers' present and future requirements, complying with their requests and aiming to exceed their expectations.



The quality certificate is valid for UPS, stabilisers, inverters for photovoltaic plants and accessories.

With so much trade taking place across borders, conformity assessment has become an important component of the world economy. Before they are put on the market, all Aros products are subjected to testing for conformance with specifications complying with ISO 9001:2000 standards.

The service rendered to customers every day makes Aros a partner.

For Aros, a product is not technologically complete unless it "incorporates" a level of support that resolves users' problems. High resolution capacity, low intervention times: this formula has been one of the keys to its success on the domestic and worldwide markets.
A formula that finds concrete application in services such as the remote support service that remotely manages and controls the devices 24 hours a day. Choosing Aros means being able to connect online with the Control Centre, being informed in real time on the status of the devices and obtaining immediate action in emergencies. Aros combines this advanced service for its users with training activities for technical and commercial operators, on its own premises or at the customer's site.

With a highly trained team, UPService provides a reliable and technical support and after-sales service. Through ATI service (Aros Technical Information) Aros provides pre-sales assistance to the client or to the client's engineers, analyzing the system and configuring the best solution that takes into account all the technological and economic variables.

Safeguard the environment. For everyone's peace of mind.

Aros has always been extremely careful of the impact its business has on the environment and for this has planned to obtain ISO 14001 certification by the end of 2010 and activated all the procedures to reduce pollution and to control the resources. This means disposing waste in compliance with the laws, avoiding wastage of material and energy and insisting that its suppliers use the same procedures. Moreover, Aros manages and recycles electronic equipment waste according to the European Union guidelines (RAEE) and does not use dangerous substances (RoHS) in the products it launches on the market.
An obvious example of this philosophy is Aros's entry into the photovoltaic market, a market of the future, one of quality and environmental protection.

All Aros employees are given special training and apply very strict standards that often go beyond the existing regulations. All this is quite natural for Aros, because it is a company that looks to the future. As well as the future of the world we live in.

Introduction

Range preview with a technical overview

Transformerless solar inverters

Central Inverters

MT Central Inverters

Sirio Central Station (SCS)

Software and Communication accessories

Aros Solar Management

Sirio Inverter, communication and monitoring systems

Appendix

Solar energy: an intelligent solution for the environment

The sun can satisfy all our needs if we learn to rationally take advantage of the energy that constantly irradiates toward the Earth. It shines in the sky from less than 5 billion years and however, it has been calculated that it has reached only half of its life expectancy. Just think that during this year the sun will irradiate towards the earth four thousand times more energy than that which the entire world population could consume. Thanks to available technology it would be a crime not to take advantage of it, considering that such energy source is free, clean and never ending and that this could finally free us from oil dependence and from other not safe and contaminating alternatives. This energy can be directly used or transformed into electricity. Opportunely treated and controlled it is possible to sell the energy produced to the electricity administrator following national norms and laws. The choice of a PV solution represents an investment of sure returns and easily calculable thanks to financing schemes estimated by different national laws.

The price of oil is always increasing and the pollution is less sustainable making renewable alternate sources of energy an irremissible necessity. Economic incentives and giant steps forward in electronic technology consent the use of photovoltaic plants in an easy and economically convenient way; the use of machinery permits the direct connection to the power grid that allows selling efficiently and in a practical manner to the distributor the energy produced and not used. The use of an inverter without transformer, for the direct connection the photovoltaic plants to the grid is creating more and more interest due to the reduction of costs and high efficiency of the solution. Aros, the Italian company that is the leader in the production of UPS, using it own experience in power supplies, has put together an innovative series of inverters for photovoltaic plants connected to the grid made with highly durable quality components.

Solar radiation

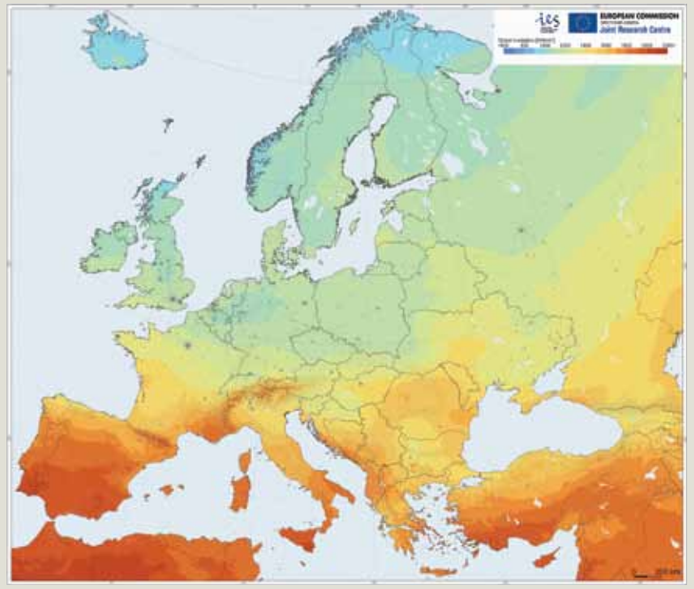
Solar radiation is electromagnetic energy emitted by the fusion of hydrogen in the sun; such energy does not reach the Earth's surface in a constant manner and its amount varies during the day, between seasons and depends on the cloudiness, from the angle of incidence and the reflectivity of the surfaces. The radiation that a square meter on a horizontal surface receives is called global radiation and is the result of the sum of the direct and diffuse radiation. The direct radiation is that which reaches the Earth directly from the sun while the diffuse radiation is that which is reflected by the sky, clouds and other surfaces. Direct radiation is present only when the sun is well visible. During the winter diffuse radiation is higher in percentage and on an annual basis and is equal to 55% of the global total. In the calculation of dimensions of the photovoltaic solar systems it is often opportune to take into consideration the amount of solar radiation that is reflected by the surfaces near the photovoltaic modules (Albedo's coefficient).

The intensity of the solar radiation on the ground depends on the inclination angle of the radiation itself: the smaller the angle that the sun rays form with the horizontal surface and greater the amount of atmosphere they have to travel means consequent lower radiation that reaches the surface. As we have seen, a surface received the maximum amount when the solar rays hit perpendicularly on it. The sun's position varies during the day and during the seasons and thus also the angle with which the sun's rays hit a surface varies.

The amounts thus depend on the position and inclination of the surfaces. A horizontal surface receives the maximum amount of energy during the summer when the sun's position is high and the days are long while a vertical surface set toward the south receives higher amount during the winter than during the summer – about 1.5 times more than the horizontal surface. The best orientation of a vertical or inclined surface that must capture the most sun rays is thus that one set towards a southern direction.

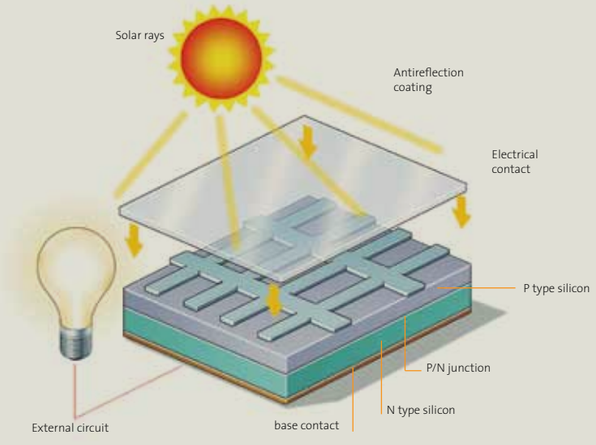
Albedo's coefficient

Gravel roads:	0,04
Forest in winter:	0,07
Bitumen and gravel surfaces:	0,13
Clayey soils:	0,14
Dry grass:	0,20
Cement:	0,22
Green grass:	0,26
Dark walls of buildings:	0,27
Dry leaves:	0,30
Clear walls of buildings:	0,60
Water surfaces:	0,75
Fresh snow:	0,75

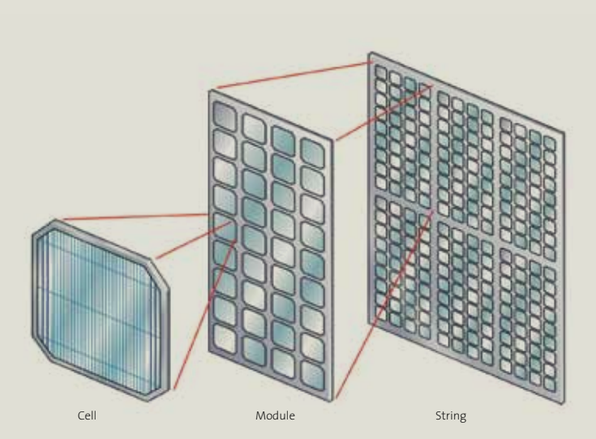


Technology used in photovoltaic plants

The working of photovoltaic systems is based upon the capacity of some semiconductor materials opportunely treated to convert solar radiation energy into electric current in DC with the need of moving mechanical parts. The semiconductor material almost universally used today is silicon. The basic element of a photovoltaic plant is the so-called photovoltaic cell, a type of thin silicon round, rectangular or octagonal sheet. For example, a 150x150mm2 cell can produce a current of more that 7A with a tension of 0.5V, therefore a strength of 3.5 Watts under standard conditions. This means that when it is in 25 C it has the power of solar radiation equal to 1000W/m2. More cells assembled and connected together in a series/parallel they create a single structure called a "Photovoltaic Module".The module made up of 48 of these cells has a surface of about 1.3m2 and produces, under standard conditions, about 170Wp. A group of panels connected serially create a "String" that if they are parallel connected they constitute a photovoltaic generator (or Array).



PV cell



PV generator components

Classification of PV plants

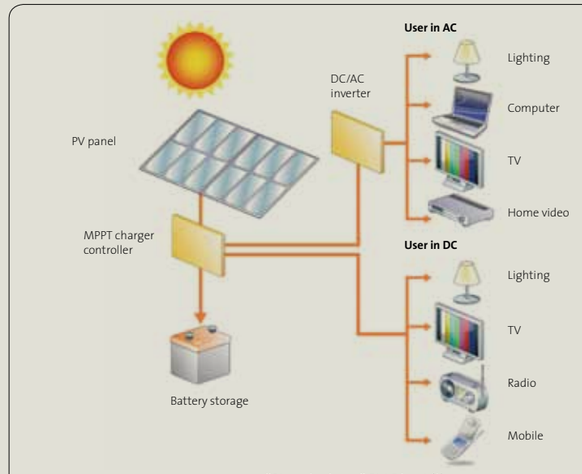
PV plants are generally divided into two big families: stand-alone plants and grid-connected. The **stand-alone** plants are used to give electricity to isolated users, distant from the electricity grid and that are hard to feed because they are in poorly accessible areas or ones characterized by low electricity usage that do not make the connection to the public grid convenient. It is necessary at these plants to store the energy produced by the photovoltaic modules with batteries to guarantee energy continuity at night or when there is no sun. The small plants for only illumination can be made completely in DC at 12V or for greater use at 24V or 48DC. To always have electricity in alternate form (AC) or the same as that of ones own power supplier, it is necessary to install in the plant an inverter that transforms energy from the batteries in DC to AC with 220V. The heart of the isolated photovoltaic system is the power regulator that preserves battery efficiency and prolongs their life expectancy via several methods:

- Recharge the batteries by DC and controlled tension;
- Location of the MMPT (Maximum Power Point Tracker);
- Disconnect the battery from the photovoltaic if the voltage is below the useful level for example at sunset;
- Disconnect the battery from the photovoltaic should the battery be completely recharged;
- Disconnect the battery from the electric load if it is completely discharged.

The **grid-connected** systems are those parallel connected to the public electric grid and are designed to input the energy produced into the same thus becoming little "power plants" able to nullify or reduce the energetic needs of any building for public or industrial use, private home, etc.

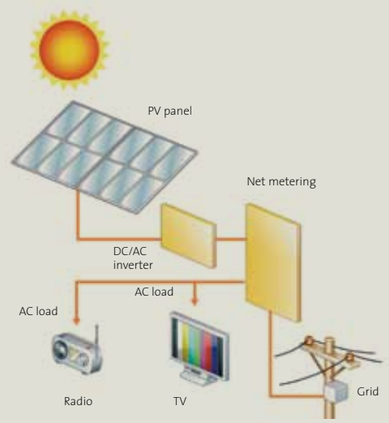
The plant parallel connected with the grid is composed of a determined surface of photovoltaic modules connected together in an opportune way which feed with the appropriate device, the inverter, which adapts the energy produced to the standards of the mono-phase or tri-phase grid and inputs it into the same.

The net metering then takes care of quantifying the amount of energy input into the grid so such amount can be deducted from that which the users consumed.



"Stand-alone" PV Plant(*)

* The scheme is only explanatory. Sirio inverters are only compatible with "grid-connected" plants

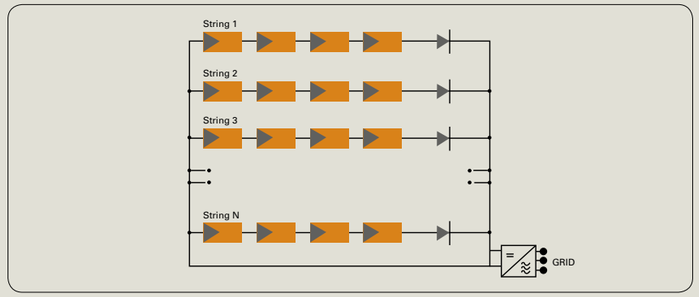


"Grid-connected" PV Plant

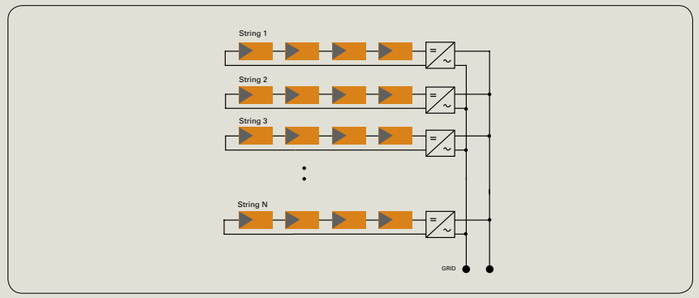
Inverter technology for Grid-Connected plants

A photovoltaic generator produces direct electric current and can therefore only supply loads which work with this form of current, mainly with voltages of 12, 24 and 48V. Usually loads work with alternating current and if the plant is connected to the electricity transmission grid the output current must be of this type; European standards envisage 230V / 50Hz for single-phase and 400V / 50Hz for three-phase networks. Thus the need to transform direct current output from the PV generator to alternating current. This is done by the inverter, which apart from the DC/AC conversion also increases the output voltage up to the electricity network voltage level for inclusion in the network. The current introduced must in fact have a sinusoidal waveform and be synchronized with the network frequency and, in case of power failure, even for short periods, the inverter must be capable of disconnecting immediately. Another fundamental feature for inverters is the optimization of the effective energy production of the plant with respect to the incident solar radiation, by regulating the Maximum Power Point (MPP).

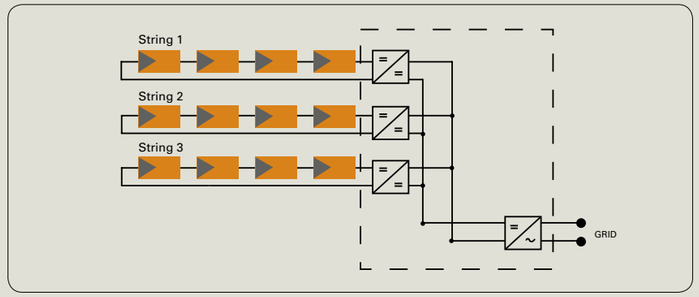
Optimum technical solutions according to local conditions have resulted in the classification of three different types of inverter and configurations:



Centralized inverter
A single inverter handles the whole plant, which can supply power even in the MW range. All the strings, made up of modules connected in series, are joined together in a parallel connection. Advantages of this solution are limited economic investments, plant simplification and reduced maintenance costs. One disadvantage is the sensitivity to partial shading thus limiting the optimum exploitation of every string. It is ideal for solar fields with uniform orientation, inclination and conditions of shade.



String inverter
Every string, made up of various modules in series, has its own inverter representing an independent mini-plant.
Efficiency is improved with this configuration compared to centralized inverters using single MPPT devices, reducing losses due to shading. It has a higher cost per power batch compared to a plant with a centralized inverter. It is suitable for joined solar fields with various conditions of radiation. It can also be used for plants made up of several geographically distributed solar fields.

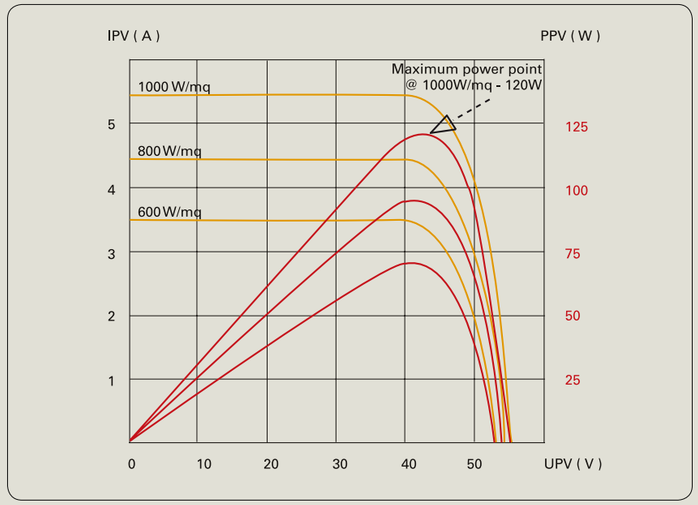


Multi-string inverter
This topology is a trade-off between centralized inverters and string inverters, allowing the connection of two or three strings for each unit with different orientations, inclinations and power. From the DC generator aspect the strings are connected to dedicated inputs handled by independent MPPTs and from the aspect of inclusion in the network they operate like a centralized inverter optimizing the efficiency.

The importance of MPPT (Maximum Power Point Tracker)

Solar irradiation that hits the photovoltaic modules has a strongly variable character depending on the latitude, orientation of the solar field, the season and hour of the day. During the course of a day, a shadow may be cast on the cell that may be foreseen, as in the case of a building near the solar field or unforeseeable as those created by clouds.

Also the energy produced by each photovoltaic cell depends on the irradiation and temperature. From these considerations, the necessity to identify instant by instant that particular point on the Vxl characteristic of the PV generator in which there is the maximum amount of power transfer to the grid occurs.



Graphically, the point of maximum power corresponds to the tangent point between the characteristics of the photovoltaic generator for a certain value of the irradiation and the hyperbole of the equation Vxl=corresponding constant.

As we have seen, the tangent point varies instantly in function of the solar irradiation conditions and with the variations in temperature. The MPPT's duty is to identify instant by instant such a maximum power point.

Rating

The inverter
During the plant design phase and when selecting the PV system components, the compatibility between the PV generator's electrical characteristics and those of the DC/AC converter i.e. the inverter, must be verified.
The main photovoltaic generator parameters to consider are power, voltage and current generated by the generator itself under the various operation conditions. For the inverter it is necessary to know:

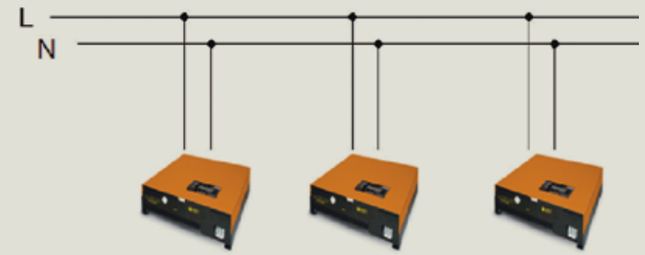
- the MPPT interval, which is the voltage range in which the inverter is capable of tracking the maximum power point;
- the maximum d.c. voltage in open circuit;
- the maximum input current.

The photovoltaic field
The ideal photovoltaic generator power is generally 10÷25% more than the maximum power supplied by the inverter in order to compensate for the loss of power of the PV modules due to dirt accumulated over time, the operating temperature, cable and inverter losses apart from performance degradation of the PV module due to ageing. The conditions of installation of the field itself (latitude, orientation, slope, etc.) must also be taken into account.

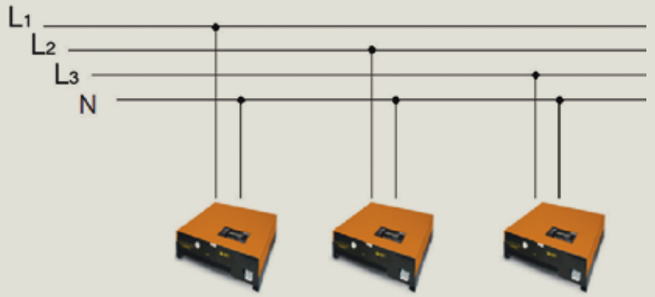
In particular exceptional conditions when the supplied power in the network is greater than the maximum acceptable for the inverter, the inverter protects itself by lowering said power to the ratedvalue (or the overloading value for a limited period). Some inverter manufacturers use the power value of the photovoltaic field to identify its model. This value should not to be confused with the real power supplied to the network which can be much less; in fact our Sirio 2800 is capable of supplying a maximum AC power of 3000W, while some inverters labelled as "3000" have rated AC power values of 2500W. Clearly the two models are not equivalent and the correct choice of product must be carefully considered to guarantee the best performance for your plant. As far as the open circuit maximum voltage of the modules is concerned, it must be remembered that the values supplied by the manufacturers are normally specified at a temperature of 25C. The PV modules supply a voltage to their ends which varies as a function of the operating temperature; more precisely, their voltage increases as the temperature decreases. All this implies that the verification of the maximum open circuit voltage must be carried out according to the assumed minimum operating temperature and at that temperature the voltage must be less than the maximum applied at the inverter input.

Connecting to the electrical grid
To obtain the desired power it is possible to connect more inverters in parallel to the grid. When the total power exceeds 6kW the three-phase connection (Italy: CEI 11-20; V1) becomes mandatory, obtainable also by connecting several single-phase inverters between a phase and neutral. If the latter solution is used, the power should be distributed equally on the three phases maintaining the imbalance under 6kW.

Utilizing more inverters means placing more MPPTs with the result of being able to run each unit separately, optimizing the configuration and consequently the performance of the entire plant.
Furthermore in the event of inverter malfunction, only the part involved in the malfunction is affected and not the entire production as in the case of the single inverter. NOTE: It must be remembered that if the total production power exceeds 20kW the galvanic separation between the direct current part and the alternating current part by means of an isolating transformer becomes necessary. It is furthermore mandatory to insert a single interface system surpassing the three units installed in the plant.



Single-phase



Three-phase

Sirio Inverters

An example of dimensioning
For a better understanding of the mechanisms that influence choices in the PV field, the following example is based on the hypothesis of creating a plant to produce peak power of 3KWp. The correct dimensioning, considering the principal electrical characteristics of Sirio 3100, will be as follows:

sirio inverter 3100 technical data

Nominal AC power	3100W
Peak AC power	3400W
Maximum operating voltage	500V
MPPT voltage range	150V÷450V
Maximum input current	20A

Below, the characteristics of the PV panel

PV module STC

Peak power (Wp)	185W
Peak power voltage (Vpm)	36,8V
Open circuit voltage (Voc)	43,6V
Current at maximum power (Ipm)	5,03A
Voltage temperature coefficient (ΔV%/°C)	-0,34%

(1) Datasheets may include the voltage temperature coefficient expressed in mV/°C; in this case, to determine the temperature increase of the PV field with respect to standard conditions, multiply this value by the temperature difference and by the number of modules in the string.

First, calculate the number of modules needed to obtain the desired power:

3000Wp / 185Wp = 16,2 modules

Rounding off to the lower whole number, it is evident that a single string of 16 modules or 2 strings of 8 modules will meet the requirement. In the first case the total open circuit voltage (VocT) will be:

VocT = no. of modules in the string →
VocT = 16 x 43,6V = 697,6V

The resulting value is greater than the maximum operating voltage input value of the inverter, equal to 500V. In alternative, the use of two strings of 8 modules will reduce the voltage value by half (349V) and be within the limits of the inverter, but will double the power input, which must therefore be verified:

ImpT = no. of strings x Imp →
ImpT = 2 x 5A = 10A

This value is compatible with the maximum input of the inverter, which is equal to 13A. The maximum and minimum voltage of the PV generator must be verified for the various operating conditions. Given the known voltage temperature coefficient of (-0.34%/°C), the calculations are as follows.

PV generator maximum voltage at the minimum temperature

The variation of VocT per centigrade degree is:

ΔV/°C = VocT x ΔV%/°C →
ΔV/°C = 349V x 0.35% = 1.2V for each °C

Multiplying this value by 35, which is the estimated shift from the minimum temperature (-10°C) with respect to the operating temperature of reference (25°C):

ΔV = 1.2V x 35 = 42V

Summing the increment and the original value gives the following result:

VocT (-10°C) = 349V + 42V = 391V (Vmax)

This value represents the maximum open circuit voltage of the PV field with power input of 1000 W/m2 at -10°C.

PV generator minimum voltage at the maximum temperature

Starting from the operating tension of the PV field for maximum power at 25°C (given by the sum of Vpm):

VpmT = no. modules in series x Vpm →
VpmT = 8 x 36,8V = 294,4V

The variation of Vpm per centigrade degree is:

ΔV/°C = VpmT x ΔV%/°C →
ΔV/°C = 294,4V x (-0,35%) = -1,04V

Multiplying this value by 45, which is the estimated shift from the maximum temperature (70°C) with respect to the operating temperature of reference (25°C), will result in the variation of voltage within the PV field:

ΔV = -1,04V x 45 = -46,8V

Summing this with the original value gives the following result:

VpmT (70°C) = 294,4V + (-46,8V) =
247,6V (Vmin)

This value is within the range of the inverter and therefore compatibility is confirmed.

To verify the configuration of your PV plant you are advised to make use of the PV configurator, a programme available for download free of charge from www.aros.it/sirio.

Standards and certifications

Electromagnetic compatibility EMC
- **Directives:** 2004/108/ EEC
- **Standards:** EN61000

Safety
- **Directives:** 2006/95/EC
- **Standards:** IEC 62103; EN50178

Certification
- **Italy:** DK5940 ed. 2.2
- **Germany:** VDE 0126-1-1; 2006-02
- **Spain:** Real Decreto 1663-2000

Transformerless solar inverters

Model	Sirio 1500	Sirio 2000	Sirio 2800
Recommended power of the photovoltaic field	max 1900 Wp min 1000 Wp	max 2500 Wp min 1400 Wp	max 3500 Wp min 1960 Wp
Rated AC power	1500 W	2000 W	2800 W
Maximum AC power	1650 W	2200 W	3000 W
INPUT	**Sirio 1500**	**Sirio 2000**	**Sirio 2800**
Maximum DC voltage in an open circuit	450 Vdc	500 Vdc	500 Vdc
MPPT operating range	100 ÷ 450 Vdc	100 ÷ 500 Vdc	100 ÷ 500 Vdc
MPPT full rating range	200 ÷ 405 Vdc	250 ÷ 450 Vdc	250 ÷ 450 Vdc
Maximum input current	8,9 Adc	10 Adc	13 Adc
Voltage during system startup	120 Vdc	120 Vdc	120 Vdc
Initial feeding voltage	150 Vdc	150 Vdc	150 Vdc
Ripple voltage	<10%	<10%	<10%
Number of inputs	1	1	1
MPPT number	1	1	1
OUTPUT	**Sirio 1500**	**Sirio 2000**	**Sirio 2800**
Operating voltage	230 Vac	230 Vac	230 Vac
Operating interval	190 ÷ 260 Vac	190 ÷ 260 Vac	190 ÷ 260 Vac
Maximum power range	210 ÷ 260 Vac	210 ÷ 260 Vac	210 ÷ 260 Vac
Frequency range	49,7 ÷ 50,3 Hz	49,7 ÷ 50,3 Hz	49,7 ÷ 50,3 Hz
Settable frequency range	49 ÷ 51 Hz	49 ÷ 51 Hz	49 ÷ 51 Hz
Nominal current	6,6 Aac	8,7 Aac	12,2 Aac
Maximum current	7,9 Aac	10,5 Aac	14,3 Aac
DC current injection (max.)	<30 mA	<40 mA	<60 mA
Current Harmonic Distorsion (THDi)	<3%	<3%	<3%
Power factor	>0,99	>0,99	>0,99
Galvanic separation	NO	NO	NO
SYSTEM	**Sirio 1500**	**Sirio 2000**	**Sirio 2800**
Maximum efficiency	>96,3%	>96,5%	>97,1%
European efficiency	>95%	>95,1%	>96%
Off-Grid protection	YES	YES	YES
Detecting earth leakage	YES	YES	YES
Heat dissipation	convection	convection	convection
FEATURES	**Sirio 1500**	**Sirio 2000**	**Sirio 2800**
Dimensions (WxDxH)	315x120x270	350x120x303	350x135x301
Weight	8,5 Kg	11,4 Kg	12,5 Kg
Protection level	IP43	IP43	IP43

Sirio 3100	Sirio 4000	Sirio 4000P	Sirio 4600P	Sirio 6000P	Sirio 10000P
max 3900 Wp min 2400 Wp	max 5000 Wp min 2800 Wp	max 5000 Wp min 2800 Wp	max 5700 Wp min 3200 Wp	max 7500 Wp min 4200 Wp	max 12500 Wp min 7000 Wp
3100 W	4000 W	4000 W	4600 W	6000 W	10000 W
3400 W	4400 W	4400 W	5100 W	6000 W	11000 W
Sirio 3100	**Sirio 4000**	**Sirio 4000P**	**Sirio 4600P**	**Sirio 6000P**	**Sirio 10000P**
500 Vdc	500 Vdc	500 Vdc	750 Vdc	550 Vdc	800 Vdc
100 ÷ 500 Vdc	100 ÷ 500 Vdc	100 ÷ 500 Vdc	100 ÷ 750 Vdc	130 ÷ 550 Vdc	200 ÷ 800 Vdc
190 ÷ 450 Vdc	250 ÷ 450 Vdc	250 ÷ 450 Vdc	190 ÷ 700 Vdc	230 ÷ 500 Vdc	270 ÷ 720 Vdc
20 Adc	20 Adc	20 Adc	8,5 Adc MTTP	27,5 Adc	13 Adc MTTP
120 Vdc	120 Vdc	120 Vdc	120 Vdc	150 Vdc	260 Vdc
150 Vdc	150 Vdc	150 Vdc	150 Vdc	180 Vdc	350 Vdc
<10%	<10%	<10%	<10%	<10%	<10%
2	2	3	3	3	3
1	1	1	3	1	3
Sirio 3100	**Sirio 4000**	**Sirio 4000P**	**Sirio 4600P**	**Sirio 6000P**	**Sirio 10000P**
230 Vca	230 Vac	230 Vac	230 Vac	230 Vac	400 Vac
190 ÷ 260 Vac	190 ÷ 260 Vac	190 ÷ 260 Vac	190 ÷ 260 Vac	190 ÷ 260 Vac	320 ÷ 480 Vac
210 ÷ 260 Vac	210 ÷ 260 Vac	210 ÷ 260 Vac	210 ÷ 260 Vac	210 ÷ 260 Vac	330 ÷ 480 Vac
49,7 ÷ 50,3 Hz	49,7 ÷ 50,3 Hz	49,7 ÷ 50,3 Hz	49,7 ÷ 50,3 Hz	49,7 ÷ 50,3 Hz	49,7 ÷ 50,3 Hz
49 ÷ 51 Hz	49 ÷ 51 Hz	49 ÷ 51 Hz	49 ÷ 51 Hz	49 ÷ 51 Hz	49 ÷ 51 Hz
13,5 Aac	17,4 Aac	17,4 Aac	20 Aac	26 Aac	14,5 Aac each phase
16,2 Aac	20 Aac	20 Aac	26 Aac	28,6 Aac	17,5 Aac each phase
<80 mA	<80 mA	<80 mA	<100 mA	<130 mA	<100 mA
<3,5%	<3%	<3%	<3%	<3%	<3%
>0,99	>0,99	>0,99	>0,99	>0,99	>0,99
NO	NO	NO	NO	NO	NO
Sirio 3100	**Sirio 4000**	**Sirio 4000P**	**Sirio 4600P**	**Sirio 6000P**	**Sirio 10000P**
>96,1%	>96,2%	>96,2%	>96,2%	>97,6%	>96,2%
>95,3%	>95,7%	>95.7%	>95,2%	>96,6%	>94,6%
YES	YES	YES	YES	YES	YES
YES	YES	YES	YES	YES	YES
convection	convection	convection	convection	convection	forced air
Sirio 3100	**Sirio 4000**	**Sirio 4000P**	**Sirio 4600P**	**Sirio 6000P**	**Sirio 10000P**
424x120x367	424x120x367	434x135x387	430x130x530	430x155x531	444x151x584
16,4 Kg	16,4 Kg	19,5 Kg	27 Kg	30 Kg	37 Kg
IP43	IP43	IP65	IP65	IP65	IP65

Central inverters

Model	Sirio 12K	Sirio 16K	Sirio 20K	Sirio 30K
Recommended power of the photovoltaic field	max 14 kWp min 9 kWp	max 18 KWp min 12 KWp	max 21 KWp min 16 KWp	max 30 kWp min 20 kWp
Rated AC power	12 KW	15 KW	18 KW	25 kW
Maximum AC power	13,2 KW	17 KW	20 KW	28 kW
INPUT	**Sirio 12K**	**Sirio 16K**	**Sirio 20K**	**Sirio 30K**
Maximum DC voltage in an open circuit	800 Vdc	800 Vdc	800 Vdc	800 Vdc
Recommended Vo@STC voltage	540 ÷ 640 Vdc	540 ÷ 640 Vdc	540 ÷ 640 Vdc	540 ÷ 640 Vdc
MPPT operating range	330 ÷ 700 Vdc	330 ÷ 700 Vdc	330 ÷ 700 Vdc	330 ÷ 700 Vdc
Maximum input current	36 Adc	54 Adc	63 Adc	80 Adc
Initial feeding voltage	390 Vdc	390 Vdc	390 Vdc	390 Vdc
Ripple voltage	<1%	<1%	<1%	<1%
Number of inputs	1	1	1	1
MPPT number	1	1	1	1
OUTPUT	**Sirio 12K**	**Sirio 16K**	**Sirio 20K**	**Sirio 30K**
Operating voltage	400 Vac	400 Vac	400 Vac	400 Vac
Operating interval	360 ÷ 440 Vac	360 ÷ 440 Vac	360 ÷ 440 Vac	360 ÷ 440 Vac
Maximum power range	360 ÷ 440 Vac	360 ÷ 440 Vac	360 ÷ 440 Vac	360 ÷ 440 Vac
Frequency range	49,7 ÷ 50,3 Hz	49,7 ÷ 50,3 Hz	49,7 ÷ 50,3 Hz	49,7 ÷ 50,3 Hz
Settable frequency range	47 ÷ 52 Hz	47 ÷ 52 Hz	47 ÷ 52 Hz	47 ÷ 52 Hz
Nominal current	14,5 Aac	21,7 Aac	26,0 Aac	36 Aac
Maximum current	19,8 Aac	28,1 Aac	33,0 Aac	46 Aac
Current Harmonic Distorsion (THDi)	<3%	<3%	<3%	<3%
Power factor	>0,99	>0,99	>0,99	>0,99
Galvanic separation	LF transformer	LF transformer	LF transformer	LF transformer
SYSTEM	**Sirio 12K**	**Sirio 16K**	**Sirio 20K**	**Sirio 30K**
Maximum efficiency	95,8% (*)	95,8% (*)	95,8% (*)	95,8%
European efficiency	94,8% (*)	94,8% (*)	94,8% (*)	94,9%
Off-Grid protection	YES	YES	YES	YES
Detecting earth leakage	NO	NO	NO	NO
Heat dissipation	fans	fans	fans	fans
FEATURES	**Sirio 12K**	**Sirio 16K**	**Sirio 20K**	**Sirio 30K**
Dimensions (WxDxH)	555x720x1200	555x720x1200	555x720x1200	555x720x1200
Weight	260 Kg	280 Kg	300 Kg	300 Kg
Protection level	IP20	IP20	IP20	IP20

(*) *Data prior to printing*

Sirio 40K	Sirio 50K	Sirio 80K	Sirio 100K	Sirio 125K	Sirio 250K
max 40 kWp min 30 kWp	max 50 kWp min 40 kWp	max 80 kWp min 55 kWp	max 100 kWp min 70 kWp	max 125 kWp min 80 kWp	max 250 kWp min 180 kWp
33 kW	36 kW	64 kW	80 kW	100 kW	200 kW
36 kW	44 kW	71 kW	88 kW	110 kW	220 kW
Sirio 40K	**Sirio 50K**	**Sirio 80K**	**Sirio 100K**	**Sirio 125K**	**Sirio 250K**
800 Vcc	800 Vcc	800 Vcc	800 Vcc	800 Vcc	800 Vcc
540 ÷ 640 Vcc	540 ÷ 640 Vcc	540 ÷ 640 Vcc	540 ÷ 640 Vcc	540 ÷ 640 Vcc	540 ÷ 640 Vcc
330 ÷ 700 Vcc	330 ÷ 700 Vcc	330 ÷ 700 Vcc	330 ÷ 700 Vcc	330 ÷ 700 Vcc	330 ÷ 700 Vcc
105 Acc	130 Acc	205 Acc	260 Acc	320 Acc	650 Acc
390 Vcc	390 Vcc	390 Vcc	390 Vcc	390 Vcc	390 Vcc
<1%	<1%	<1%	<1%	<1%	<1%
1	1	1	1	1	1
1	1	1	1	1	1
Sirio 40K	**Sirio 50K**	**Sirio 80K**	**Sirio 100K**	**Sirio 125K**	**Sirio 250K**
400 Vca	400 Vca	400 Vca	400 Vca	400 Vca	400 Vca
360 ÷ 440 Vca	360 ÷ 440 Vca	360 ÷ 440 Vca	360 ÷ 440 Vca	360 ÷ 440 Vca	360 ÷ 440 Vca
360 ÷ 440 Vca	360 ÷ 440 Vca	360 ÷ 440 Vca	360 ÷ 440 Vca	360 ÷ 440 Vca	360 ÷ 440 Vca
49,7 ÷ 50,3 Hz	49,7 ÷ 50,3 Hz	49,7 ÷ 50,3 Hz	49,7 ÷ 50,3 Hz	49,7 ÷ 50,3 Hz	49,7 ÷ 50,3 Hz
47 ÷ 52 Hz	47 ÷ 52 Hz	47 ÷ 52 Hz	47 ÷ 52 Hz	47 ÷ 52 Hz	47 ÷ 52 Hz
48 Aca	58 Aca	92 Aca	115 Aca	145 Aca	289 Aca
60 Aca	73 Aca	117 Aca	146 Aca	182 Aca	364 Aca
<3%	<3%	<3%	<3%	<3%	<3%
>0,99	>0,99	>0,99	>0,99	>0,99	>0,99
LF transformer	LF transformer	LF transformer	LF transformer	LF transformer	LF transformer
Sirio 40K	**Sirio 50K**	**Sirio 80K**	**Sirio 100K**	**Sirio 125K**	**Sirio 250K**
95,8%	95,8%	96,1%	96,1%	96,1%	96,2%
94,9%	95%	95%	95%	95,1%	95,2%
YES	YES	YES	YES	YES	YES
NO	NO	NO	NO	NO	NO
fans	fans	fans	fans	fans	fans
Sirio 40K	**Sirio 50K**	**Sirio 80K**	**Sirio 100K**	**Sirio 125K**	**Sirio 250K**
555x720x1200	555x720x1200	800x800x1900	800x800x1900	800x800x1900	1630x1000x1900
330 Kg	420 Kg	600 Kg	650 Kg	720 Kg	1580 Kg
IP20	IP20	IP20	IP20	IP20	IP20

HV Central inverters

Model	Sirio 30K HV	Sirio 40K HV	Sirio 50K HV
Recommended power of the photovoltaic field	max 30 kWp min 20 kWp	max 40 kWp min 30 kWp	max 50 kWp min 36 kWp
Rated AC power	25 kW	33 kW	40 kW
Maximum AC power	28 kW	36 kW	44 kW
INPUT	**Sirio 30K HV**	**Sirio 40K HV**	**Sirio 50K HV**
Maximum DC voltage in an open circuit	880 Vdc	880 Vdc	880 Vdc
Recommended Vo@STC voltage	710 ÷ 760 Vdc	710 ÷ 760 Vdc	710 ÷ 760 Vdc
MPPT range	450 ÷ 760 Vdc	450 ÷ 760 Vdc	450 ÷ 760 Vdc
Maximum input current	59 Adc	79 Adc	98 Adc
Initial feeding voltage	540 Vdc	540 Vdc	540 Vdc
Ripple voltage	<1%	<1%	<1%
Number of inputs	1	1	1
MPPT number	1	1	1
OUTPUT	**Sirio 30K HV**	**Sirio 40K HV**	**Sirio 50K HV**
Operating voltage	400 Vac	400 Vac	400 Vac
Operating interval	360 ÷ 440 Vac	360 ÷ 440 Vac	360 ÷ 440 Vac
Maximum power range	360 ÷ 440 Vac	360 ÷ 440 Vac	360 ÷ 440 Vac
Frequency range	49,7 ÷ 50,3 Hz	49,7 ÷ 50,3 Hz	49,7 ÷ 50,3 Hz
Settable frequency range	47 ÷ 52 Hz	47 ÷ 52 Hz	47 ÷ 52 Hz
Nominal current	36 Aac	48 Aac	58 Aac
Maximum current	46 Aac	60 Aac	73 Aac
Current Harmonic Distorsion (THDi)	<3%	<3%	<3%
Power factor	>0,99	>0,99	>0,99
Galvanic separation	LF transformer	LF transformer	LF transformer
SYSTEM	**Sirio 30K HV**	**Sirio 40K HV**	**Sirio 50K HV**
Maximum efficiency	96,4%	96,3%	96,2%
European efficiency	95,3%	95,3%	95,3%
Off-Grid protection	YES	YES	YES
Detecting earth leakage	NO	NO	NO
Heat dissipation	fans	fans	fans
FEATURES	**Sirio 30K HV**	**Sirio 40K HV**	**Sirio 50K HV**
Dimensions (WxDxH)	555x720x1200	555x720x1200	555x720x1200
Weight	300 Kg	330 Kg	420 Kg
Protection level	IP20	IP20	IP20

Sirio 80K HV	Sirio 100K HV	Sirio 125K HV	Sirio 250K HV	Sirio 320K HV
max 80 kWp min 55 kWp	max 100 kWp min 70 kWp	max 125 kWp min 80 kWp	max 250 kWp min 180 kWp	max 320 kWp min 220 kWp
64 kW	80 kW	100 kW	200 KW	250 kW
71 kW	88 kW	110 kW	220 KW	250 kW
Sirio 80K HV	**Sirio 100K HV**	**Sirio 125K HV**	**Sirio 250K HV**	**Sirio 320K HV**
880 Vcc	880 Vcc	880 Vcc	880 Vcc	880 Vcc
710 ÷ 760 Vcc	710 ÷ 760 Vcc	710 ÷ 760 Vcc	710 ÷ 760 Vcc	710 ÷ 760 Vcc
450 ÷ 760 Vcc	450 ÷ 760 Vcc	450 ÷ 760 Vcc	450 ÷ 760 Vcc	450 ÷ 760 Vcc
157 Acc	196 Acc	245 Acc	500 Acc	590 Acc
540 Vcc	540 Vcc	540 Vcc	540 Vcc	540 Vcc
<1%	<1%	<1%	<1%	<1%
1	1	1	1	1
1	1	1	1	1
Sirio 80K HV	**Sirio 100K HV**	**Sirio 125K HV**	**Sirio 250K HV**	**Sirio 320K HV**
400 Vca	400 Vca	400 Vca	400 Vca	400 Vca
360 ÷ 440 Vca	360 ÷ 440 Vca	360 ÷ 440 Vca	360 ÷ 440 Vca	360 ÷ 440 Vca
360 ÷ 440 Vca	360 ÷ 440 Vca	360 ÷ 440 Vca	360 ÷ 440 Vca	360 ÷ 440 Vca
49,7 ÷ 50,3 Hz	49,7 ÷ 50,3 Hz	49,7 ÷ 50,3 Hz	49,7 ÷ 50,3 Hz	49,7 ÷ 50,3 Hz
47 ÷ 52 Hz	47 ÷ 52 Hz	47 ÷ 52 Hz	47 ÷ 52 Hz	47 ÷ 52 Hz
92 Aca	115 Aca	145 Aca	289 Aca	361 Aca
117 Aca	146 Aca	182 Aca	364 Aca	420 Aca
<3%	<3%	<3%	<3%	<3%
>0,99	>0,99	>0,99	>0,99	>0,99
LF transformer	LF transformer	LF transformer	LF transformer	LF transformer
Sirio 80K HV	**Sirio 100K HV**	**Sirio 125K HV**	**Sirio 250K HV**	**Sirio 320K HV**
96,1%	96,1%	96,1%	96,3%	96,3%
94,9%	95%	95,1%	95,2%	95,3%
YES	YES	YES	YES	YES
NO	NO	NO	NO	NO
fans	fans	fans	fans	fans
Sirio 80K HV	**Sirio 100K HV**	**Sirio 125K HV**	**Sirio 250K HV**	**Sirio 320K HV**
800x800x1900	800x800x1900	800x800x1900	1630x1000x1900	1630x1000x1900
600 Kg	650 Kg	720 Kg	1580 Kg	1630 Kg
IP20	IP20	IP20	IP20	IP20

MT Central inverters

Model	SIRIO 250K HV-MT	Sirio 320K HV-MT	Sirio 640K HV-MT
Recommended power of the photovoltaic field	max 250 kWp min 180 kWp	max 320 kWp min 220 kWp	max 640 kWp min 440 kWp
Rated AC power	200 KW	250 KW	500 KW
Maximum AC power	220 KW	250 KW	500 KW
INPUT	**SIRIO 250K HV-MT**	**Sirio 320K HV-MT**	**Sirio 640K HV-MT**
Maximum DC voltage in an open circuit	880 Vdc	880 Vdc	880 Vdc
Recommended Vo@STC voltage	710 ÷ 760 Vdc	710 ÷ 760 Vdc	710 ÷ 760 Vdc
MPPT range	450 ÷ 760 Vdc	450 ÷ 760 Vdc	450 ÷ 760 Vdc
Maximum input current	500 Adc	590 Adc	1180 Adc
Initial feeding voltage	540 Vdc	540 Vdc	540 Vdc
Ripple voltage	<1%	<1%	<1%
Number of inputs	1	1	2
MPPT number	1	1	1
OUTPUT	**SIRIO 250K HV-MT**	**Sirio 320K HV-MT**	**Sirio 640K HV-MT**
Operating voltage	270 Vac	270 Vac	270 Vac
Operating interval	245 ÷ 300 Vac	245 ÷ 300 Vac	245 ÷ 300 Vac
Maximum power range	245 ÷ 300 Vac	245 ÷ 300 Vac	245 ÷ 300 Vac
Frequency range	49,7 ÷ 50,3 Hz	49,7 ÷ 50,3 Hz	49,7 ÷ 50,3 Hz
Settable frequency range	47 ÷ 52 Hz	47 ÷ 52 Hz	47 ÷ 52 Hz
Nominal current	428 Aac	535 Aac	1070 Aac
Maximum current	554 Aac	630 Aac	1260 Aac
Current Harmonic Distorsion (THDi)	<3%	<3%	<3%
Power factor	>0,99	>0,99	>0,99
Galvanic separation	NO	NO	NO
SYSTEM	**SIRIO 250K HV-MT**	**Sirio 320K HV-MT**	**Sirio 640K HV-MT**
Maximum efficiency	98,1%	98,1%	98,1% (*)
European efficiency	97,5%	97,5%	97,5% (*)
Off-Grid protection	YES	YES	YES
Detecting earth leakage	NO	NO	NO
Heat dissipation	fans	fans	fans
FEATURES	**SIRIO 250K HV-MT**	**Sirio 320K HV-MT**	**Sirio 640K HV-MT**
Dimensions (WxDxH)	1630x1000x1900	1630x1000x1900	1630x1000x1900
Weight	1100 Kg	1150 Kg	1150 Kg
Protection level	IP20	IP20	IP20

(*) Data prior to printing

Transformerless solar inverters

Quality power distribution
The range of inverters for Sirio photovoltaic plants uses high quality innovative technologies and components, having a large margin compared with normal operating conditions, and reaching a high level of reliability (Mean Time Between Failure > 100.000 hours). These technologies and components mean that the periodic maintenance of the equipment can be avoided without compromising the operating flexibility of any photovoltaic system and any electrical grid. Sirio inverters integrate protection against input and output overvoltage and are equipped with redundant control and protection devices, especially in the output phase (double relay with double control microprocessor), giving further guarantee of operability and continuity of operation.

High conversion efficiency
In small photovoltaic plants reduction of energy loss during the conversion process is essential. In the search for maximum efficiency to reduce losses, inverters of the Sirio series up to 10kWp are made without transformers and moving parts (except for the model 10.000P which is provided with fans). This construction philosophy allows for the reduction in the footprint and weight of the inverters and increases reliability over time by eliminating the parts subjected to mechanical wear. Thanks to this "transformerless" technology, Sirio photovoltaic inverters guarantee a conversion efficiency up to 97% which is amongst the highest levels in this category.

Easy installation and use
Light, compact and with an attractive design, the Sirio series inverters are easy to use and simple to install. An LCD display on the front panel provides a simple and intuitive display of all the main data: power, energy produced and any failures. The display can also show other parameters such as grid voltage, photovoltaic module voltage and grid frequency.

Reduced noise
The Sirio series of photovoltaic inverters have been designed with static electronic devices without the use of rotating components and cooling ventilators, thus reducing noise considerably.

Simple communication
All models in the series have a standard RS232 serial connection (RS485 optional) enabling all information accessible locally on the display to be available from remote locations. The optional remote device SOLAR VIEW allows the acquisition and display of the main electrical parameters (voltage, frequency, current, instantaneous power and total energy transferred on the network) besides information on operation and on any inverter alarms (up to 5 units).

MPPT device
The MPPT (Maximum Power Point Tracker) device ensures the inverter works in such a way as to make the most of the maximum power of the photovoltaic generator as a function of the solar radiation and the temperature of the cells. The MPPT system response times are so fast (100ms) that it always ensures the maximum power generated by the solar field.

GFCI (Ground Fault Circuit Interrupter)
Sirio series inverters are equipped with an advanced fault-protection circuit that constantly monitors the dispersion of current towards earth. In the event of an earth fault, the inverter is deactivated and the fault is shown by a red LED on the front control panel.

Electromagnetic compatibility EMC
Directives: 2004/108/EEC
Standards: EN61000

Safety
Directives: 2006/95/EC
Standards: IEC 62103 ; EN50178

Certifications
Italy
DK5940 ed. 2.2

Germany
VDE 0126-1-1; 2006-02

Spain
Real decreto 1663/2000

Sirio 1500

Model	Sirio 1500
Recommended power of the photovoltaic field	max 1900 Wp min 1000 Wp
Rated AC power	1500 W
Maximum AC power	1650 W

Input	
Maximum DC voltage in an open circuit	450 Vdc
MPPT operating range	100 ÷ 450 Vdc
MPPT at full rating range	200 ÷ 405 Vdc
Working range	100 ÷ 450 Vdc
Maximum input current	8,9 Adc
Voltage during system startup	120 Vdc
Initial feeding voltage	150 Vdc
Shutdown voltage	70 Vdc
Ripple voltage	<10%
Number of inputs	1
MPPT number	1
D.C. connectors	Multi-Contact type MC3 (type PV-KST3II E PV-KBT3II)

Output	
Operating voltage	230 Vac
Operating interval	190 ÷ 260 Vac
Maximum power range	210 ÷ 260 Vac
Frequency range	49,7 ÷ 50,3 Hz
Settable frequency range	49 ÷ 51 Hz
Nominal current	6,6 Aac
Maximum current	7,9 Aac
DC current injection (max.)	<30 mA
Current Harmonic Distorsion (THDi)	<3%
Power factor	>0,99
Galvanic separation	NO
A.C. connectors	Terminal block

System	
Maximum efficiency	>96,3%
European efficiency	>95%
Stand-by consumption	~7 W
Night consumption	~0 W
Internal protections	protection DC/AC side (RCD type B in accordance with IEC 60755). Overvoltage protection (OVR type 3)
Off-Grid protection	YES
Detecting earth leakage	YES
Heat dissipation	Convection
Operating temperature	-20°C ÷ 55°C
Storage temperature	-20°C ÷ 70°C
Humidity	0 ÷ 95% non-condensing

CERTIFICATION

The complete range complies with ENEL DK5940, v.2.2.

RCD TYPE B

Each device comes with internal RCD protection type B, in accordance with IEC 60755.

PROTECTIONS

Each device is equipped with an interface system which complies with ENEL DK5940, v.2.2.

FEATURES

Colour: RAL 1033

Dimensions (WxDxH): 315x120x270

Weight: 8,5 kg

Protection level: IP43

Acoustic noise: <35dBA

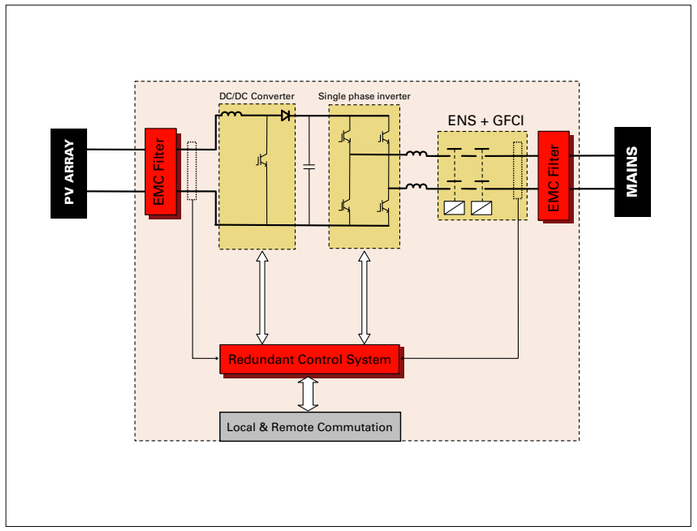
COMMUNICATION

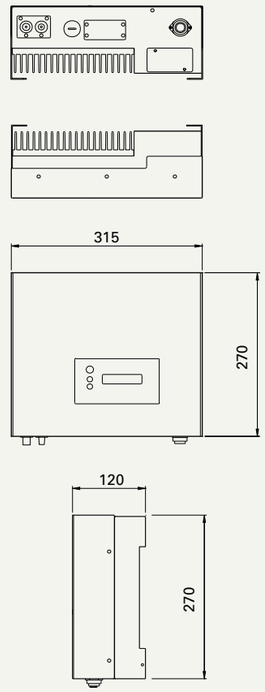
Display: 1 row LCD, 16 characters

Communication interface: RS232 supplied as standard, optional RS485, ModBUS and Ethernet (slot version)

STANDARDS

EMC: Directive 89/336/EEC EN 50081, part 1(emission of EMV interferences) (EN 55014, EN 60555 part 2, EN 55011 group 1, class B) EN 50082, part 1 (EMV interferences immunity).
Grid interference: EN 61000-3-2.
Grid monitoring: Independent disconnection device (MSD, Main Switching Device) in conformity with VDEW; VDE 0126 (1999.04) ENEL DK5940 Ed. 2.2 and subsequent "Guide for connections to the ENEL Distribuzione power grid".
Low voltage regulation: Directive 73/23/EEC EN 50178 (4.98) (VDE 0160) (which shall become IEC62103) EN 60146 part 1-1 (3.94) (VDE 0558 part 11).





Model	Sirio 2000
Recommended power of the photovoltaic field	max 2500 Wp min 1400 Wp
Rated AC power	2000 W
Maximum AC power	2200 W

Input	
Maximum DC voltage in an open circuit	500 Vdc
MPPT range	100 ÷ 500 Vdc
MPPT at full rating range	250 ÷ 450 Vdc
Working range	100 ÷ 500 Vdc
Maximum input current	10 Adc
Voltage during system startup	120 Vdc
Initial feeding voltage	150 Vdc
Shutdown voltage	70 Vdc
Ripple voltage	<10%
Number of inputs	1
MPPT number	1
D.C. connectors	Multi-Contact type MC3 (type PV-KST3II E PV-KBT3II)

Output	
Operating voltage	230 Vac
Operating interval	190 ÷ 260 Vac
Maximum power range	210 ÷ 260 Vac
Frequency range	49,7 ÷ 50,3 Hz
Settable frequency range	49 ÷ 51 Hz
Nominal current	8,7 Aac
Maximum current	10,5 Aac
DC current injection (max.)	<40 mA
Current Harmonic Distorsion (THDi)	<3%
Power factor	>0,99
Galvanic separation	NO
A.C. connectors	Terminal block

System	
Maximum efficiency	>96,5%
European efficiency	>95,1%
Stand-by consumption	~7 W
Night consumption	~0 W
Internal protections	protection DC/AC side (RCD type B in accordance with IEC 60755) Overvoltage protection (OVR type 3)
Off-Grid protection	YES
Detecting earth leakage	YES
Heat dissipation	Convection
Operating temperature	-20°C ÷ 55°C
Storage temperature	-20°C ÷ 70°C
Humidity	0 ÷ 95% non-condensing

CERTIFICATION

The complete range complies with ENEL DK5940, v.2.2.

RCD TYPE B

Each device comes with internal RCD protection type B, in accordance with IEC 60755.

PROTECTIONS

Each device is equipped with an interface system which complies with ENEL DK5940, v.2.2.

FEATURES

Colour: RAL 1033

Dimensions (WxDxH): 350x120x303

Weight: 11,4 kg

Protection level: IP43

Acoustic noise: <35dBA

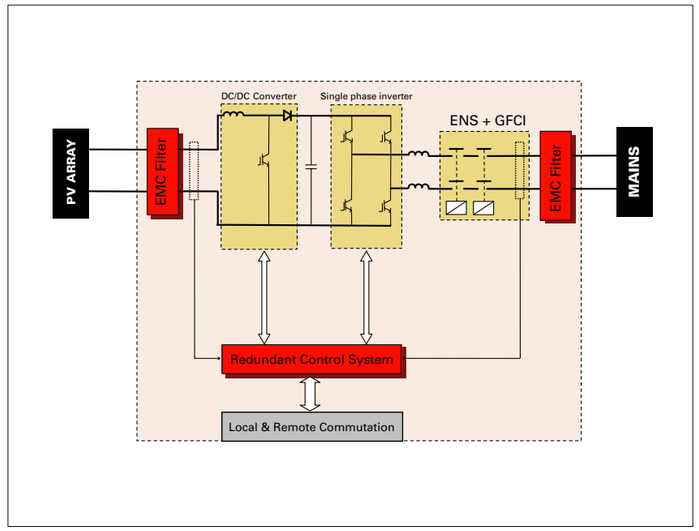
COMMUNICATION

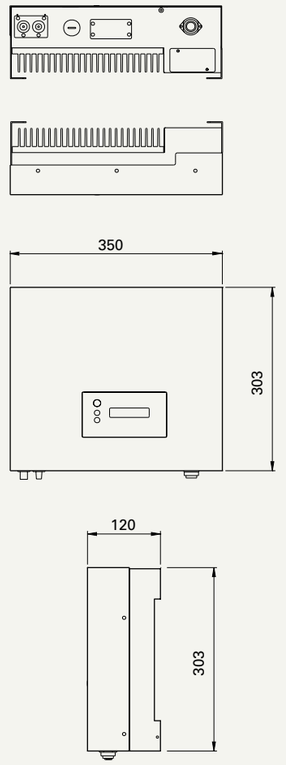
Display: 1 row LCD, 16 characters

Communication interface: RS232 supplied as standard, optional RS485, ModBUS and Ethernet (slot version)

STANDARDS

EMC: Directive 89/336/EEC EN 50081, part 1(emission of EMV interferences) (EN 55014, EN 60555 part 2, EN 55011 group 1, class B) EN 50082, part 1 (EMV interferences immunity).
Grid interference: EN 61000-3-2.
Grid monitoring: Independent disconnection device (MSD, Main Switching Device) in conformity with VDEW; VDE 0126 (1999.04) ENEL DK5940 Ed. 2.2 and subsequent "Guide for connections to the ENEL Distribuzione power grid".
Low voltage regulation: Directive 73/23/EEC EN 50178 (4.98) (VDE 0160) (which shall become IEC62103) EN 60146 part 1-1 (3.94) (VDE 0558 part 11).





Model	Sirio 2800
Recommended power of the photovoltaic field	max 3500 Wp min 1960 Wp
Rated AC power	2800 W
Maximum AC power	3000 W

Innput	
Maximum DC voltage in an open circuit	500 Vdc
MPPT range	100 ÷ 500 Vdc
MPPT at full rating range	250 ÷ 450 Vdc
Working range	100 ÷ 500 Vdc
Maximum input current	13 Adc
Voltage during system startup	120 Vdc
Initial feeding voltage	150 Vdc
Shutdown voltage	70 Vdc
Ripple voltage	<10%
Number of inputs	1
MPPT number	1
D.C. connectors	Multi-Contact type MC3 (type PV-KST3II E PV-KBT3II)

Output	
Operating voltage	230 Vac
Operating interval	190 ÷ 260 Vac
Maximum power range	210 ÷ 260 Vac
Frequency range	49,7 ÷ 50,3 Hz
Settable frequency range	49 ÷ 51 Hz
Nominal current	12,2 Aac
Maximum current	14,3 Aac
DC current injection (max.)	<60 mA
Current Harmonic Distorsion (THDi)	<3%
Power factor	>0,99
Galvanic separationa	NO
A.C. connectors	Terminal block

System	
Maximum efficiency	>97,1%
European efficiency	>96%
Stand-by consumption	~7 W
Night consumption	~0 W
Internal protections	protection DC/AC side (RCD type B in accordance with IEC 60755). Overvoltage protection (OVR type 3)
Off-Grid protection	YES
Detecting earth leakage	YES
Heat dissipation	Convection
Operating temperature	-20°C ÷ 55°C
Storage temperature	-20°C ÷ 70°C
Humidity	0 ÷ 95% non-condensing

CERTIFICATION

The complete range complies with ENEL DK5940, v.2.2.

RCD TYPE B

Each device comes with internal RCD protection type B, in accordance with IEC 60755.

PROTECTIONS

Each device is equipped with an interface system which complies with ENEL DK5940, v.2.2.

FEATURES

Colour: RAL 1033

Dimensions (WxDxH): 350x135x301

Weight: 12,5 kg

Protection level: IP43

Acoustic noise: <35dBA

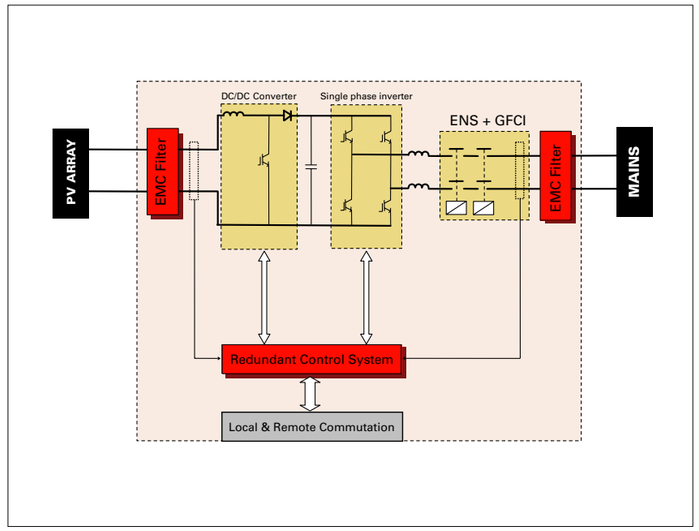
COMMUNICATION

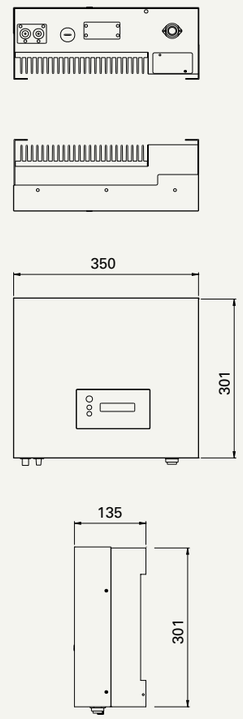
Display: 1 row LCD, 16 characters

Communication interface: RS232 supplied as standard, optional RS485, ModBUS and Ethernet (slot version)

STANDARDS

EMC: Directive 89/336/EEC EN 50081, part 1(emission of EMV interferences) (EN 55014, EN 60555 part 2, EN 55011 group 1, class B) EN 50082, part 1 (EMV interferences immunity).
Grid interference: EN 61000-3-2.
Grid monitoring: Independent disconnection device (MSD, Main Switching Device) in conformity with VDEW; VDE 0126 (1999.04) ENEL DK5940 Ed. 2.2 and subsequent "Guide for connections to the ENEL Distribuzione power grid".
Low voltage regulation: Directive 73/23/EEC EN 50178 (4.98) (VDE 0160) (which shall become IEC62103) EN 60146 part 1-1 (3.94) (VDE 0558 part 11).





Sirio 3100

Model	Sirio 3100
Recommended power of the photovoltaic field	max 3900 Wp min 2400 Wp
Rated AC power	3100 W
Maximum AC power	3400 W

Input	
Maximum DC voltage in an open circuit	500 Vdc
MPPT range	100 ÷ 500 Vdc
MPPT at full rating range	190 ÷ 450 Vdc
Working range	100 ÷ 500 Vdc
Maximum input current	20 Adc
Voltage during system startup	120 Vdc
Initial feeding voltage	150 Vdc
Shutdown voltage	70 Vdc
Ripple voltage	<10%
Number of inputs	2
MPPT number	1
D.C. connectors	Multi-Contact type MC3 (type PV-KST3II E PV-KBT3II)

Output	
Operating voltage	230 Vac
Operating interval	190 ÷ 260 Vac
Maximum power range	210 ÷ 260 Vac
Frequency range	49,7 ÷ 50,3 Hz
Settable frequency range	49 ÷ 51 Hz
Nominal current	13,5 Aac
Maximum current	16,2 Aac
DC current injection (max.)	<80 mA
Current Harmonic Distorsion (THDi)	<3,5%
Power factor	>0,99
Galvanic separation	NO
A.C. connectors	Terminal block

System	
Maximum efficiency	>96,1%
European efficiency	>95,3%
Stand-by consumption	~7 W
Night consumption	~0 W
Internal protections	protection DC/AC side (RCD type B in accordance with IEC 60755). Overvoltage protection (OVR type 3)
Off-Grid protection	YES
Detecting earth leakage	YES
Heat dissipation	Convection
Operating temperature	-20°C ÷ 55°C
Storage temperature	-20°C ÷ 70°C
Humidity	0 ÷ 95% non-condensing

CERTIFICATION

The complete range complies with ENEL DK5940, v.2.2.

RCD TYPE B

Each device comes with internal RCD protection type B, in accordance with IEC 60755.

PROTECTIONS

Each device is equipped with an interface system which complies with ENEL DK5940, v.2.2.

FEATURES

Colour: RAL 1033

Dimensions (WxDxH): 424x120x367

Weight: 16,4 kg

Protection level: IP43

Acoustic noise: <35dBA

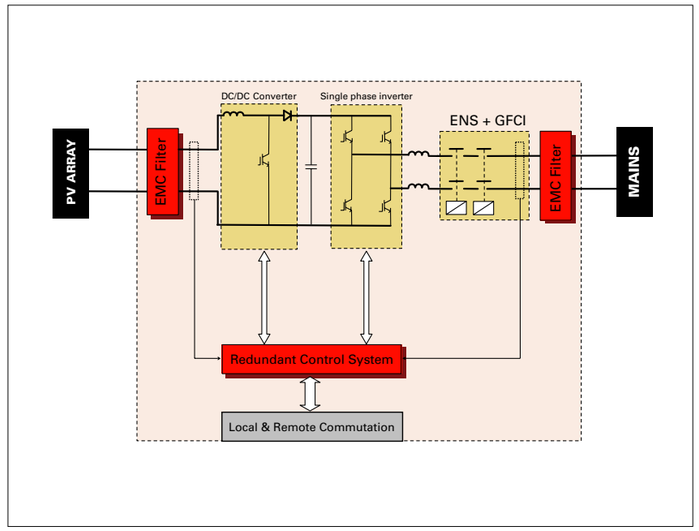
COMMUNICATION

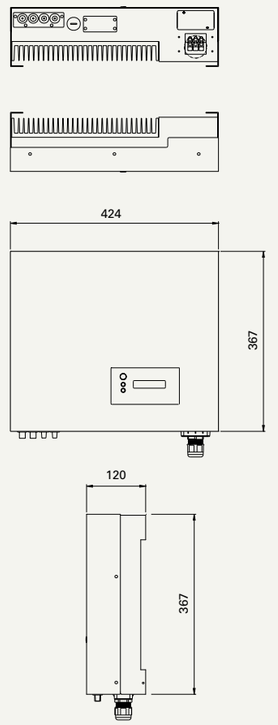
Display: 1 row LCD, 16 characters

Communication interface: RS232 supplied as standard, optional RS485, ModBUS and Ethernet (slot version)

STANDARDS

EMC: Directive 89/336/EEC EN 50081, part 1(emission of EMV interferences) (EN 55014, EN 60555 part 2, EN 55011 group 1, class B) EN 50082, part 1 (EMV interferences immunity).
Grid interference: EN 61000-3-2.
Grid monitoring: Independent disconnection device (MSD, Main Switching Device) in conformity with VDEW; VDE 0126 (1999.04) ENEL DK5940 Ed. 2.2 and subsequent "Guide for connections to the ENEL Distribuzione power grid".
Low voltage regulation: Directive 73/23/EEC EN 50178 (4.98) (VDE 0160) (which shall become IEC62103) EN 60146 part 1-1 (3.94) (VDE 0558 part 11).





Model	Sirio 4000
Recommended power of the photovoltaic field	max 5000 Wp min 2800 Wp
Rated AC power	4000 W
Maximum AC power	4400 W

Input	
Maximum DC voltage in an open circuit	500 Vdc
MPPT range	100 ÷ 500 Vdc
MPPT at full rating range	250 ÷ 450 Vdc
Working range	100 ÷ 500 Vdc
Maximum input current	20 Adc
Voltage during system startup	120 Vdc
Initial feeding voltage	150 Vdc
Shutdown voltage	70 Vdc
Ripple voltage	<10%
Number of inputs	2
MPPT number	1
D.C. connectors	Multi-Contact type MC3 (type PV-KST3II E PV-KBT3II)

Output	
Operating voltage	230 Vac
Operating interval	190 ÷ 260 Vac
Maximum power range	210 ÷ 260 Vac
Frequency range	49,7 ÷ 50,3 Hz
Settable frequency range	49 ÷ 51 Hz
Nominal current	17,4 Aac
Maximum current	20 Aac
DC current injection (max.)	<80 mA
Current Harmonic Distorsion (THDi)	<3%
Power factor	>0,99
Galvanic separation	NO
A.C. connectors	Terminal block

System	
Maximum efficiency	>96,2%
European efficiency	>95,7%
Stand-by consumptiony	7 W
Night consumption	0 W
Internal protections	protection DC/AC side (RCD type B in accordance with IEC 60755). Overvoltage protection (OVR type 3)
Off-Grid protection	YES
Detecting earth leakage	YES
Heat dissipation	Convection
Operating temperature	-20°C ÷ 55°C
Storage temperature	-20°C ÷ 70°C
Humidity	0 ÷ 95% non-condensing

CERTIFICATION

The complete range complies with ENEL DK5940, v.2.2.

RCD TYPE B

Each device comes with internal RCD protection type B, in accordance with IEC 60755.

PROTECTIONS

Each device is equipped with an interface system which complies with ENEL DK5940, v.2.2.

FEATURES

Colour: RAL 1033

Dimensions (WxDxH): 424x120x367

Weight: 16,4 kg

Protection level : IP43

Acoustic noise: <35dBA

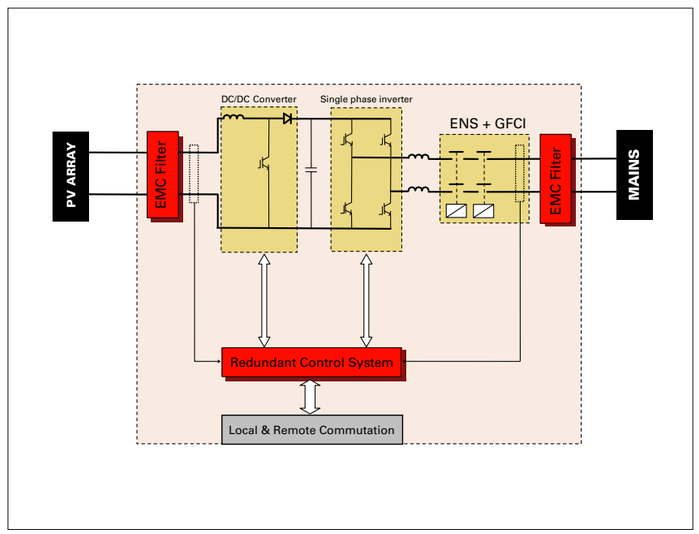
COMMUNICATION

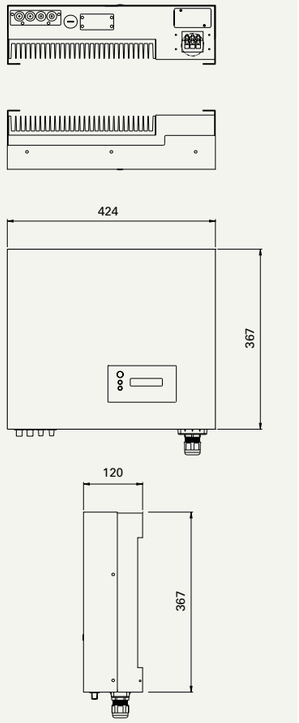
Display: 1 row LCD, 16 characters

Communication interface: RS232 supplied as standard, optional RS485, ModBUS and Ethernet (slot version)

STANDARDS

EMC: Directive 89/336/EEC EN 50081, part 1(emission of EMV interferences) (EN 55014, EN 60555 part 2, EN 55011 group 1, class B) EN 50082, part 1 (EMV interferences immunity).
Grid interference: EN 61000-3-2.
Grid monitoring: Independent disconnection device (MSD, Main Switching Device) in conformity with VDEW; VDE 0126 (1999.04) ENEL DK5940 Ed. 2.2 and subsequent "Guide for connections to the ENEL Distribuzione power grid".
Low voltage regulation: Directive 73/23/EEC EN 50178 (4.98) (VDE 0160) (which shall become IEC62103) EN 60146 part 1-1 (3.94) (VDE 0558 part 11).





Sirio 4000P

Model	Sirio 4000P
Recommended power of the photovoltaic field	max 5000 Wp min 2800 Wp
Rated AC power	4000 W
Maximum AC power	4400 W

Input	
Maximum DC voltage in an open circuit	500 Vdc
MPPT range	100 ÷ 500 Vdc
MPPT at full rating range	250 ÷ 450 Vdc
Working range	100 ÷ 500 Vdc
Maximum input current	20 Adc
Voltage during system startup	120 Vdc
Initial feeding voltage	150 Vdc
Shutdown voltage	70 Vdc
Ripple voltage	<10%
Number of inputs	3
MPPT number	1
D.C. connectors	Multi-Contact type MC3 (type PV-KST3II E PV-KBT3II)

Output	
Operating voltage	230 Vac
Operating interval	190 ÷ 260 Vac
Maximum power range	210 ÷ 260 Vac
Frequency range	49,7 ÷ 50,3 Hz
Settable frequency range	49 ÷ 51 Hz
Nominal current	17,4 Aac
Maximum current	20 Aac
DC current injection (max.)	<80 mA
Current Harmonic Distorsion (THDi)	<3%
Power factor	>0,99
Galvanic separation	NO
A.C. connectors	Terminal block

System	
Maximum efficiency	>96,2%
European efficiency	>95.7%
Stand-by consumption	~7 W
Night consumption	~0 W
Internal protections	protection DC/AC side (RCD type B in accordance with IEC 60755). Overvoltage protection (OVR type 3)
Off-Grid protection	YES
Detecting earth leakage	YES
Heat dissipation	Convection
Operating temperature	-20°C ÷ 55°C
Storage temperature	-20°C ÷ 70°C
Humidity	0 ÷ 95% non-condensing

CERTIFICATION

The complete range complies with ENEL DK5940, v.2.2.

RCD TYPE B

Each device comes with internal RCD protection type B, in accordance with IEC 60755.

PROTECTIONS

Each device is equipped with an interface system which complies with ENEL DK5940, v.2.2.

FEATURES

Colour: RAL 1033

Dimensions (WxDxH): 434x135x387

Weight: 19,5 kg

Protection level: IP65

Acoustic noise: <35dBA

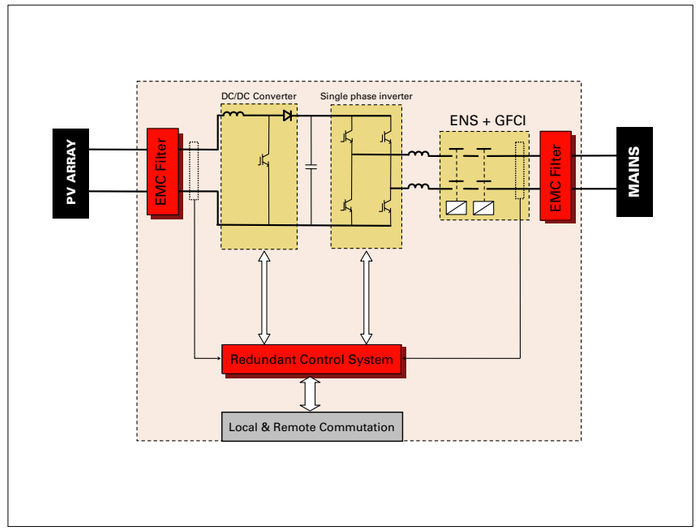
COMMUNICATION

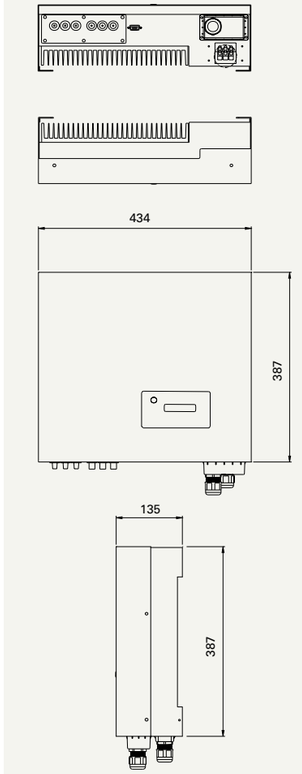
Display: 1 row LCD, 16 characters

Communication interface: RS232 supplied as standard, optional RS485, ModBUS and Ethernet (slot version)

STANDARDS

EMC: Directive 89/336/EEC EN 50081, part 1(emission of EMV interferences) (EN 55014, EN 60555 part 2, EN 55011 group 1, class B) EN 50082, part 1 (EMV interferences immunity).
Grid interference: EN 61000-3-2.
Grid monitoring: Independent disconnection device (MSD, Main Switching Device) in conformity with VDEW; VDE 0126 (1999.04) ENEL DK5940 Ed. 2.2 and subsequent "Guide for connections to the ENEL Distribuzione power grid".
Low voltage regulation: Directive 73/23/EEC EN 50178 (4.98) (VDE 0160) (which shall become IEC62103) EN 60146 part 1-1 (3.94) (VDE 0558 part 11).





Sirio 4600P

Model	Sirio 4600P
Recommended power of the photovoltaic field	max 5700 Wp min 3200 Wp
Rated AC power	4600 W
Maximum AC power	5100 W
Input	
Maximum DC voltage in an open circuit	750 Vdc
MPPT range	100 ÷ 750 Vdc
MPPT at full rating range	190 ÷ 700 Vdc
Working range	100 ÷ 750 Vdc
Maximum input current	8,5 Acc per tracker
Voltage during system startup	120 Vdc
Initial feeding voltage	150 Vdc
Shutdown voltage	80 Vdc
Ripple voltage	<10%
Number of inputs	3
MPPT number	3
D.C. connectors	Multi-Contact type MC3 (type PV-KST3II E PV-KBT3II)
Output	
Operating voltage	230 Vac
Operating interval	190 ÷ 260 Vac
Maximum power range	210 ÷ 260 Vac
Frequency range	49,7 ÷ 50,3 Hz
Settable frequency range	49 ÷ 51 Hz
Nominal current	20 Aac
Maximum current	26 Aac
DC current injection (max.)	<100 mA
Current Harmonic Distorsion (THDi)	<3%
Power factor	>0,99
Galvanic separation	NO
A.C. connectors	Terminal block
System	
Maximum efficiency	>96,2%
European efficiency	>95,2%
Stand-by consumption	~8 W
Night consumption	~0 W
Internal protections	protection DC/AC side (RCD type B in accordance with IEC 60755). Overvoltage protection (OVR type 3)
Off-Grid protection	YES
Detecting earth leakage	YES
Heat dissipation	Convection
Operating temperature	-20°C ÷ 55°C
Storage temperature	-20°C ÷ 70°C
Humidity	0 ÷ 95% non-condensing

CERTIFICATION

The complete range complies with ENEL DK5940, v.2.2.

RCD TYPE B

Each device comes with internal RCD protection type B, in accordance with IEC 60755.

PROTECTIONS

Each device is equipped with an interface system which complies with ENEL DK5940, v.2.2.

FEATURES

Colour: RAL 1033

Dimensions (WxDxH): 430x130x530

Weight: 27 kg

Protection level: IP65

Acoustic noise: <35dBA

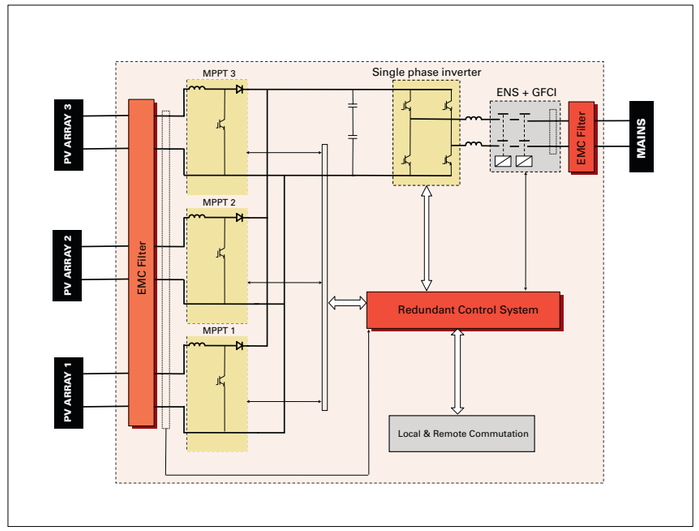
COMMUNICATION

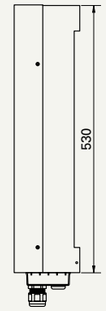
Display: 2 row LCD, 16 characters

Communication interface: RS232 supplied as standard, optional RS485, ModBUS and Ethernet (slot version)

STANDARDS

EMC: Directive 89/336/EEC EN 50081, part 1(emission of EMV interferences) (EN 55014, EN 60555 part 2, EN 55011 group 1, class B) EN 50082, part 1 (EMV interferences immunity).
Grid interference: EN 61000-3-2.
Grid monitoring: Independent disconnection device (MSD, Main Switching Device) in conformity with VDEW; VDE 0126 (1999.04) ENEL DK5940 Ed. 2.2 and subsequent "Guide for connections to the ENEL Distribuzione power grid".
Low voltage regulation: Directive 73/23/EEC EN 50178 (4.98) (VDE 0160) (which shall become IEC62103) EN 60146 part 1-1 (3.94) (VDE 0558 part 11).





Sirio 6000P

Model	Sirio 6000P
Recommended power of the photovoltaic field	max 7500 Wp min 4200 Wp
Rated AC power	6000 W
Maximum AC power	6000 W

Input	
Maximum DC voltage in an open circuit	550 Vdc
MPPT range	130 ÷ 550 Vdc
MPPT at full rating range	230 ÷ 500 Vdc
Working range	130 ÷ 550 Vdc
Maximum input current	27,5 Adc
Voltage during system startup	150 Vdc
Initial feeding voltage	180 Vdc
Shutdown voltage	100 Vdc
Ripple voltage	<10%
Number of inputs	3
MPPT number	1
D.C. connectors	Multi-Contact type MC3 (type PV-KST3II E PV-KBT3II)

Output	
Operating voltage	230 Vac
Operating interval	190 ÷ 260 Vac
Maximum power range	210 ÷ 260 Vac
Frequency range	49,7 ÷ 50,3 Hz
Settable frequency range	49 ÷ 51 Hz
Nominal current	26 Aac
Maximum current	28,6 Aac
DC current injection (max.)	<130 mA
Current Harmonic Distorsion (THDi)	<3%
Power factor	>0,99
Galvanic separation	NO
A.C. connectors	Terminal block

System	
Maximum efficiency	>97,6%
European efficiency	>96,6%
Stand-by consumption	~8 W
Night consumption	~0 W
Internal protections	protection DC/AC side (RCD type B in accordance with IEC 60755). Overvoltage protection (OVR type 3)
Off-Grid protection	YES
Detecting earth leakage	YES
Heat dissipation	Convection
Operating temperature	-20°C ÷ 55°C
Storage temperature	-20°C ÷ 70°C
Humidity	0 ÷ 95% non-condensing

CERTIFICATION

The complete range complies with ENEL DK5940, v.2.2.

RCD TYPE B

Each device comes with internal RCD protection type B, in accordance with IEC 60755.

PROTECTIONS

Each device is equipped with an interface system which complies with ENEL DK5940, v.2.2.

FEATURES

Colour: RAL 1033

Dimensions (WxDxH): 430x155x531

Weight: 30 kg

Protection level: IP65

Acoustic noise: <35dBA

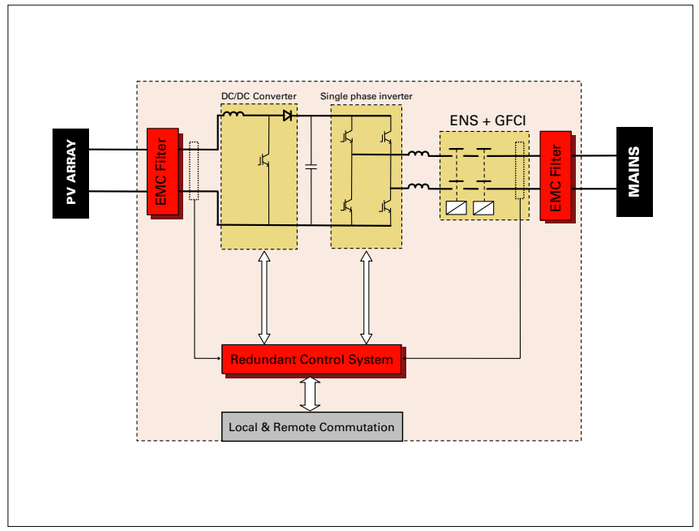
COMMUNICATION

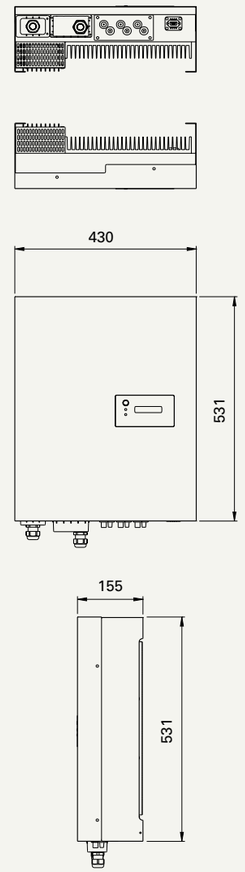
Display: 1 row LCD, 16 characters

Communication interface: RS232 supplied as standard, optional RS485, ModBUS and Ethernet (slot version)

STANDARDS

EMC: Directive 89/336/EEC EN 50081, part 1(emission of EMV interferences) (EN 55014, EN 60555 part 2, EN 55011 group 1, class B) EN 50082, part 1 (EMV interferences immunity).
Grid interference: EN 61000-3-2.
Grid monitoring: Independent disconnection device (MSD, Main Switching Device) in conformity with VDEW; VDE 0126 (1999.04) ENEL DK5940 Ed. 2.2 and subsequent "Guide for connections to the ENEL Distribuzione power grid".
Low voltage regulation: Directive 73/23/EEC EN 50178 (4.98) (VDE 0160) (which shall become IEC62103) EN 60146 part 1-1 (3.94) (VDE 0558 part 11).





Sirio 10000P

Model	Sirio 10000P
Recommended power of the photovoltaic field	max 12500 Wp min 7000 Wp
Rated AC power	10000 W
Maximum AC power	11000 W
Input	
Maximum DC voltage in an open circuit	800 Vdc
MPPT range	200 ÷ 800 Vdc
MPPT at full rating range	270 ÷ 720 Vdc
Working range	200 ÷ 800 Vdc
Maximum input current	13 Acc per MPPT
Voltage during system startup	260 Vdc
Initial feeding voltage	350 Vdc
Shutdown voltage	200 Vdc
Ripple voltage	<10%
Number of inputs	3
MPPT number	3
D.C. connectors	Multi-Contact type MC3 (type PV-KST3II E PV-KBT3II)
Output	
Operating voltage	400 Vac
Operating interval	320 ÷ 480 Vac
Maximum power range	330 ÷ 480 Vac
Frequency range	49,7 ÷ 50,3 Hz
Settable frequency range	49 ÷ 51 Hz
Nominal current	14,5 Aca per phase
Maximum current	17,5 Aca per phase
DC current injection (max.)	<100 mA
Current Harmonic Distorsion (THDi)	<3%
Power factor	>0,99
Galvanic separation	NO
A.C. connectors	Terminal blocks
System	
Maximum efficiency	>96,2%
European efficiency	>94,6%
Stand-by consumption	<30 W
Night consumption	<5 W
Internal protections	protection DC/AC side (RCD type B in accordance with IEC 60755). Overvoltage protection (OVR type 3)
Off-Grid protection	YES
Detecting earth leakage	YES
Heat dissipation	forced air
Operating temperature	-20°C ÷ 55°C
Storage temperature	-20°C ÷ 70°C
Humidity	0 ÷ 95% non-condensing

CERTIFICATION

The complete range complies with ENEL DK5940, v.2.2.

RCD TYPE B

Each device comes with internal RCD protection type B, in accordance with IEC 60755.

PROTECTIONS

Each device is equipped with an interface system which complies with ENEL DK5940, v.2.2.

FEATURES

Colour: RAL 1033

Dimensions (WxDxH): 444x151x584

Weight: 37 kg

Protection level: IP65

Acoustic noise: <45dBA

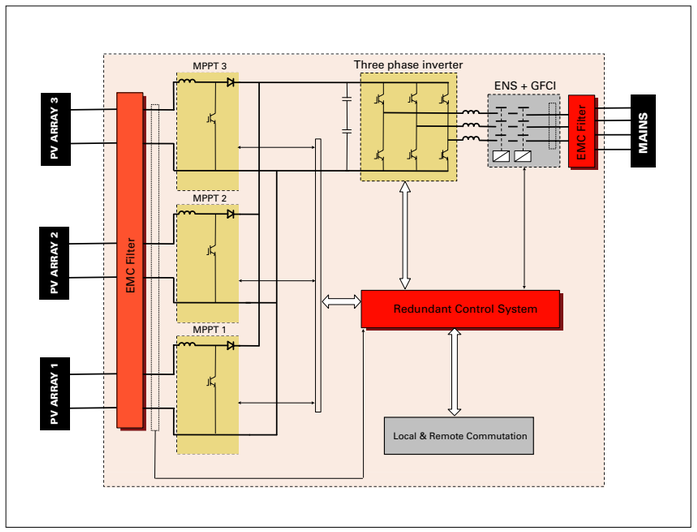
COMMUNICATION

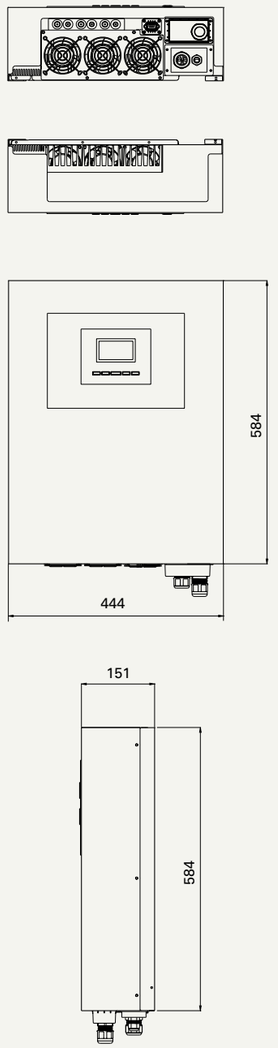
Display: Graphic 3 colors

Communication interface: RS232 supplied as standard, optional RS485, ModBUS and Ethernet (slot version)

STANDARDS

EMC: Directive 89/336/EEC EN 50081, part 1(emission of EMV interferences) (EN 55014, EN 60555 part 2, EN 55011 group 1, class B) EN 50082, part 1 (EMV interferences immunity).
Grid interference: EN 61000-3-2.
Grid monitoring: Independent disconnection device (MSD, Main Switching Device) in conformity with VDEW; VDE 0126 (1999.04) ENEL DK5940 Ed. 2.2 and subsequent "Guide for connections to the ENEL Distribuzione power grid".
Low voltage regulation: Directive 73/23/EEC EN 50178 (4.98) (VDE 0160) (which shall become IEC62103) EN 60146 part 1-1 (3.94) (VDE 0558 part 11).





Central inverters

Sirio Central inverters allow direct connection to the low voltage distribution network ensuring the galvanic separation compared to direct current installations. The generous rating of the transformer and the other inverter components provides a return of the highest among the machines of the same category.

Maximum energy and safety
The Maximum Power Point Tracking (MPPT) research algorithm implemented in the control system of Sirio inverters allows full use of the photovoltaic generator in any radiation and temperature conditions, making the plant work constantly at maximum efficiency. In the absence of solar radiation the converter goes on standby and resumes normal operation when there is radiation again. This feature reduces self-consumption to a minimum and maximizes energy efficiency. The use of speed-controlled fans helps to optimize the overall efficiency of the inverter. Fan operation that is linked to the temperature also increases the expected lifespan and reduces costs incurred for extraordinary maintenance.
All these design features, the careful choice of components and guaranteed quality of production according to ISO 9001 standards make the three-phase inverters with transformer of Sirio series extremely efficient and reliable and guarantee maximum energy production.

Advanced communications
The Sirio Central series inverters have an intuitive man-machine interface, made up of an integrated display and keyboard with which it is possible to control the photovoltaic system's main parameters and interact with it to control its operation. The display and keyboard facilitate diagnosis and solutions to any operating problems at local level while interaction with the remote inverter is possible through the most common of media (local serial link, Local Area Network, GSM, etc.) by means of RS232/RS485 communication ports. Communication interfaces and related software are common to the family of transformerless inverters, which can be referred to for more detailed information.

Easy installation and maintenance
The footprint of these devices has been considerably reduced and there is no need to leave space at the side or back of the equipment since the electronics and power components are fully accessible from the front. Fully automatic operation ensures ease of use and facilitates installation and startup, thus avoiding installation and configuration errors which could lead to failures or reduced plant productivity.

Conformance
Sirio Central inverters with low frequency isolation transformers conform fully with European safety standards LVD and EMC and with Italian and international regulations regarding parallel connection to the public distribution network.
- Electromagnetic Compatibility Directive (89/336/EEC and subsequent amendments 92/31/EEC, 93/68/EEC and 93/97/EEC);
- CEI EN 61000 Electromagnetic Compatibility (EMC);
- CEI 11-20 Electrical energy production systems and uninterruptible power supplies connected to I and II class networks;
- CEI 11-20, V1 Electrical energy production systems and uninterruptible power supplies connected to I and II class networks - V1;
- Guide for connections to the ENEL DISTRIBUZIONE power grid.

Special solutions
AROS is able on request to supply Sirio inverters specific to the installation needs. Available options include the integrated isolation control and the pole/earth connection kit (positive or negative) that is required for **some kinds of photovoltaic modules**.

Certifications
Italy
DK5940 ed. 2.2

Germany
VDE 0126-1-1; 2006-02*

Spain
Real decreto 1663/2000

* dedicated version

Model	Sirio 12K
Recommended power of the photovoltaic field	max 14 kWp min 9 kWp
Rated AC power	12 kW
Maximum AC power	13,2 kW
Input	
Maximum DC voltage in an open circuit	800 Vdc
Recommended Vo@STC voltage	540÷640 Vdc
MPPT range	330÷700 Vdc
Working range	330÷700 Vdc
Maximum input current	36 Adc
Initial feeding voltage	390 Vdc
Ripple voltage	<1%
Number of inputs	1
MPPT number	1
D.C. connectors	Terminal blocks
Output	
Operating voltage	400 Vac
Operating interval	360 ÷ 440 Vac
Maximum power range	360 ÷ 440 Vac
Frequency range	49,7 ÷ 50,3 Hz
Settable frequency range	47 ÷ 52 Hz
Nominal current	14,5 Aac
Maximum current	19,8 Aac
Current Harmonic Distorsion (THDi)	<3%
Power factor	>0,99
Galvanic separation	LF transformer
A.C. connectors	Terminal blocks
System	
Maximum efficiency	95,8% (*)
European efficiency	94,8% (*)
Stand-by consumption	<32 W
Night consumption	<32 W
Internal protection	MCCB AC side and switch DC side, DC isolation detector (optional)
Off-Grid protection	YES
Detecting earth leakage	NO
Heat dissipation	Fans
Operating temperature	0°C ÷ 45°C
Storage temperature	-20°C ÷ 70°C
Humidity	0 ÷ 95% non-condensing

(*) Data prior to printing

CERTIFICATION

The complete range complies with ENEL DK5940, v.2.2.

PROTECTIONS

Each device is equipped with protections against overvoltages and lightning.

OPTIONS ON REQUEST

- Integrated insulation control
- Pole-earth connection kit

FEATURES

Colour: RAL 7035 / RAL 1033

Dimensions (WxDxH): 555x720x1200

Weight: 260 Kg

Protection level: IP20

Acoustic noise: <66dBA

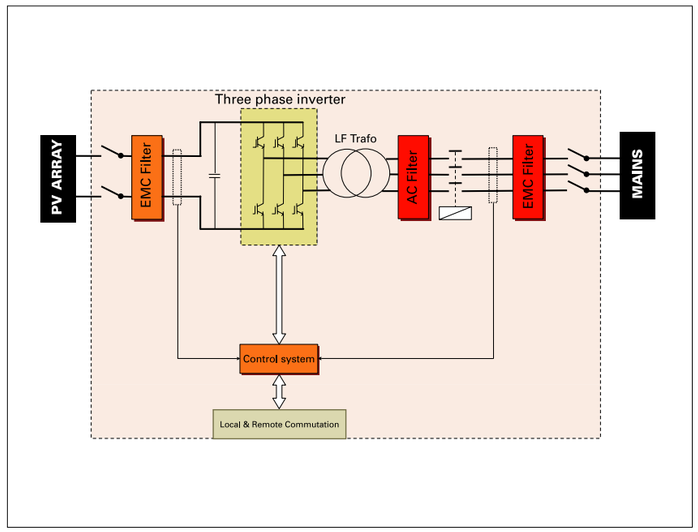
COMMUNICATION

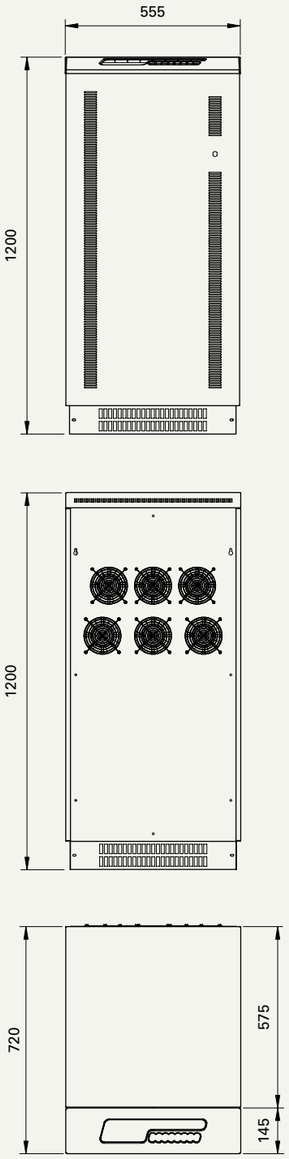
Display: 2 row LCD, 40 characters

Communication interface: 2xRS232 supplied as standard, optional RS485, ModBUS and Ethernet (slot version)

STANDARDS

EMC: Directive 89/336/EEC EN 50081, part 1(emission of EMV interferences) (EN 55014, EN 60555 part 2, EN 55011 group 1, class B) EN 50082, part 1 (EMV interferences immunity).
Grid interference: EN 61000-3-2.
Grid monitoring: ENEL DK5940 Ed. 2.2 and subsequent "Guide for connection to ENEL Distribuzione power grid".
Low voltage regulation: Directive 73/23/EEC EN 50178 (4.98) (VDE 0160) (which shall become IEC62103) EN 60146 part 1-1 (3.94) (VDE 0558 part 11).





Model	Sirio 16K
Recommended power of the photovoltaic field	max 18 kWp min 12 kWp
Rated AC power	15 kW
Maximum AC power	17 kW
Input	
Maximum DC voltage in an open circuit	800 Vdc
Recommended Vo@STC voltage	540÷640 Vdc
MPPT range	330÷700 Vdc
Working range	330÷700 Vdc
Maximum input current	54 Adc
Initial feeding voltage	390 Vdc
Ripple voltage	<1%
Number of inputs	1
MPPT number	1
D.C. connectors	Terminal blocks
Output	
Operating voltage	400 Vac
Operating interval	360 ÷ 440 Vac
Maximum power range	360 ÷ 440 Vac
Frequency range	49,7 ÷ 50,3 Hz
Settable frequency range	47 ÷ 52 Hz
Nominal current	21,7 Aac
Maximum current	28,1 Aac
Current Harmonic Distorsion (THDi)	<3%
Power factor	>0,99
Galvanic separation	LF transformer
A.C. connectors	Terminal blocks
System	
Maximum efficiency	95,8% (*)
European efficiency	94,8% (*)
Stand-by consumption	<32 W
Night consumption	<32 W
Internal protection	MCCB AC side and switch DC side, DC isolation detector (optional)
Off-Grid protection	YES
Detecting earth leakage	NO
Heat dissipation	Fans
Operating temperature	0°C ÷ 45°C
Storage temperature	-20°C ÷ 70°C
Humidity	0 ÷ 95% non-condensing

(*) Data prior to printing

CERTIFICATION

The complete range complies with ENEL DK5940, v.2.2.

PROTECTIONS

Each device is equipped with protections against overvoltages and lightning.

OPTIONS ON REQUEST

- Integrated insulation control
- Pole-earth connection kit

FEATURES

Colour: RAL 7035 / RAL 1033

Dimensions (WxDxH): 555x720x1200

Weight: 280 Kg

Protection level: IP20

Acoustic noise: <66dBA

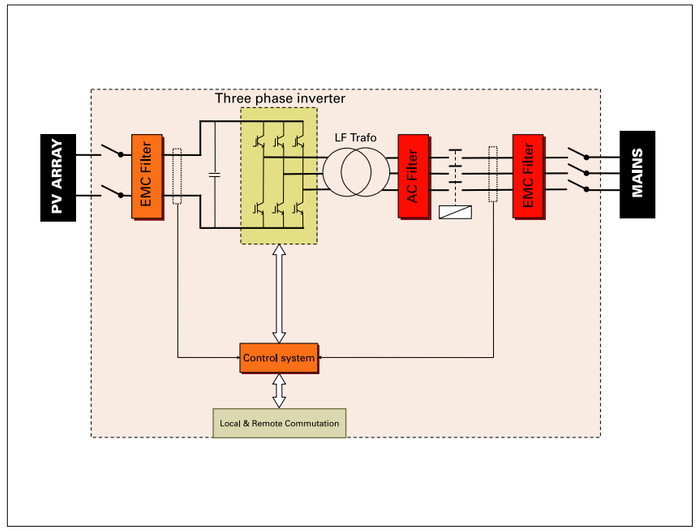
COMMUNICATION

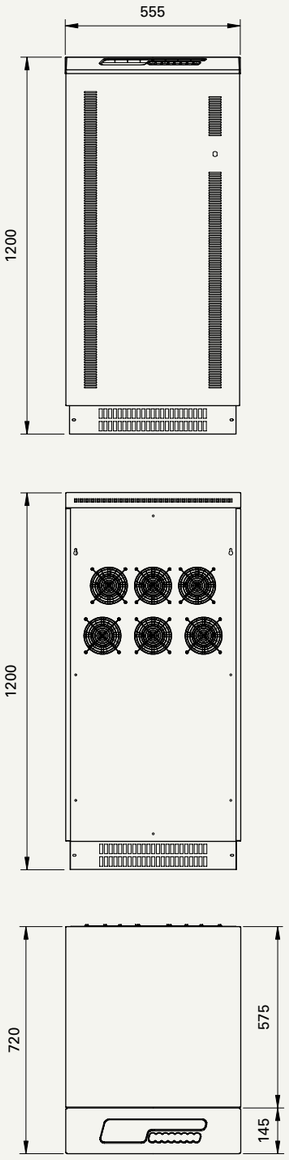
Display: 2 row LCD, 40 characters

Communication interface: 2xRS232 supplied as standard, optional RS485, ModBUS and Ethernet (slot version)

STANDARDS

EMC: Directive 89/336/EEC EN 50081, part 1(emission of EMV interferences) (EN 55014, EN 60555 part 2, EN 55011 group 1, class B) EN 50082, part 1 (EMV interferences immunity).
Grid interference: EN 61000-3-2.
Grid monitoring: ENEL DK5940 Ed. 2.2 and subsequent "Guide for connection to ENEL Distribuzione power grid".
Low voltage regulation: Directive 73/23/EEC EN 50178 (4.98) (VDE 0160) (which shall become IEC62103) EN 60146 part 1-1 (3.94) (VDE 0558 part 11).





Model	Sirio 20K
Recommended power of the photovoltaic field	max 21 kWp min 16 kWp
Rated AC power	18 kW
Maximum AC power	20 kW
Input	
Maximum DC voltage in an open circuit	800 Vdc
Recommended Vo@STC voltage	540÷640 Vdc
MPPT range	330÷700 Vdc
Working range	330÷700 Vdc
Maximum input current	63 Adc
Initial feeding voltage	390 Vdc
Ripple voltage	<1%
Number of inputs	1
MPPT number	1
D.C. connectors	Terminal blocks
Output	
Operating voltage	400 Vac
Operating interval	360 ÷ 440 Vac
Maximum power range	360 ÷ 440 Vac
Frequency range	49,7 ÷ 50,3 Hz
Settable frequency range	47 ÷ 52 Hz
Nominal current	26 Aac
Maximum current	33 Aac
Current Harmonic Distorsion (THDi)	<3%
Power factor	>0,99
Galvanic separation	LF transformer
A.C. connectors	Terminal blocks
System	
Maximum efficiency	95,8% (*)
European efficiency	94,8% (*)
Stand-by consumption	<32 W
Night consumption	<32 W
Internal protection	MCCB AC side and switch DC side, DC isolation detector (optional)
Off-Grid protection	YES
Detecting earth leakage	NO
Heat dissipation	Fans
Operating temperature	0°C ÷ 45°C
Storage temperature	-20°C ÷ 70°C
Humidity	0 ÷ 95% non-condensing

(*) Data prior to printing

CERTIFICATION

The complete range complies with ENEL DK5940, v.2.2.

PROTECTIONS

Each device is equipped with protections against overvoltages and lightning.

OPTIONS ON REQUEST

- Integrated insulation control
- Pole-earth connection kit

FEATURES

Colour: RAL 7035 / RAL 1033

Dimensions (WxDxH): 555x720x1200

Weight: 300 Kg

Protection level: IP20

Acoustic noise: <66dBA

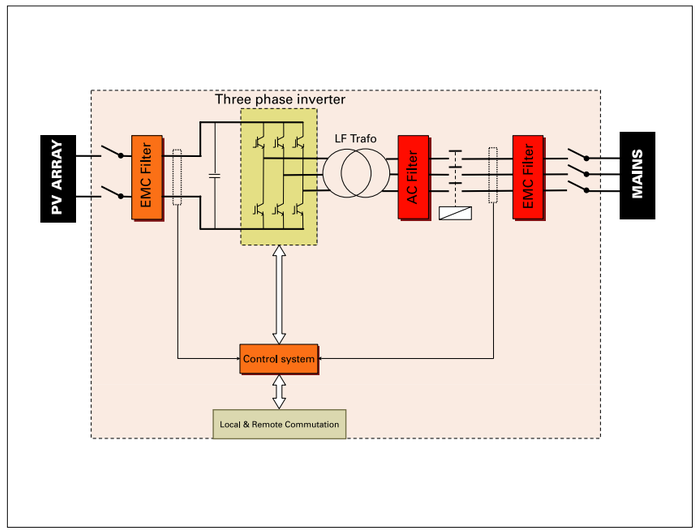
COMMUNICATION

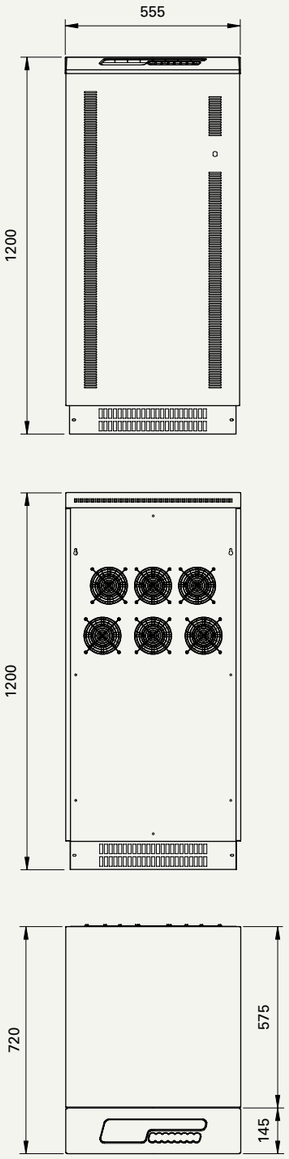
Display: 2 row LCD, 40 characters

Communication interface: 2xRS232 supplied as standard, optional RS485, ModBUS and Ethernet (slot version)

STANDARDS

EMC: Directive 89/336/EEC EN 50081, part 1(emission of EMV interferences) (EN 55014, EN 60555 part 2, EN 55011 group 1, class B) EN 50082, part 1 (EMV interferences immunity).
Grid interference: EN 61000-3-2.
Grid monitoring: ENEL DK5940 Ed. 2.2 and subsequent "Guide for connection to ENEL Distribuzione power grid".
Low voltage regulation: Directive 73/23/EEC EN 50178 (4.98) (VDE 0160) (which shall become IEC62103) EN 60146 part 1-1 (3.94) (VDE 0558 part 11).





Sirio 30K and 30K HV

Model	Sirio 30K	Sirio 30K HV
Recommended power of the photovoltaic field	max 30 kWp min 20 kWp	
Rated AC power	25 kW	
Maximum AC power	28 kW	
Input		
Maximum DC voltage in an open circuit	800 Vdc	880 Vdc
Recommended Vo@STC voltage	540÷640 Vdc	710÷760 Vdc
MPPT range	330÷700 Vdc	450÷760 Vdc
Working range	330÷700 Vdc	450÷760 Vdc
Maximum input current	80 Adc	59 Adc
Initial feeding voltage	390 Vdc	540 Vdc
Ripple voltage	<1%	
Number of inputs	1	
MPPT number	1	
D.C. connectors.	Terminal blocks	
Output		
Operating voltage	400 Vac	
Operating interval	360 ÷ 440 Vac	
Maximum power range	360 ÷ 440 Vac	
Frequency range	49,7 ÷ 50,3 Hz	
Settable frequency range	47 ÷ 52 Hz	
Nominal current	36 Aac	
Maximum current	46 Aac	
Current Harmonic Distorsion (THDi)	<3%	
Power factor	>0,99	
Galvanic separation	LF transformer	
A.C. connectors	Terminal blocks	
System		
Maximum efficiency	95,8%	96,4%
European efficiency	94,9%	95,3%
Stand-by consumption	<32 W	
Night consumption	<32 W	
Internal protection	MCCB AC side and switch DC side, DC isolation detector (optional)	
Off-Grid protection	YES	
Detecting earth leakage	NO	
Heat dissipation	Fans	
Operating temperature	0°C ÷ 45°C	
Storage temperature	-20°C ÷ 70°C	
Humidity	0 ÷ 95% non-condensing	

CERTIFICATION

The complete range complies with ENEL DK5940, v.2.2.

PROTECTIONS

Each device is equipped with protections against overvoltages and lightning.

OPTIONS ON REQUEST

- Integrated insulation control
- Pole-earth connection kit

FEATURES

Colour: RAL 7035 / RAL 1033

Dimensions (WxDxH): 555x720x1200

Weight 300 kg

Protection level: IP20

Acoustic noise: <66dBA

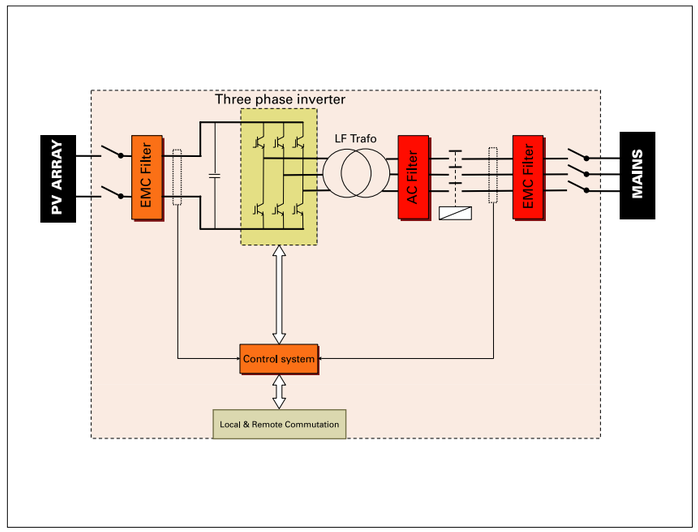
COMMUNICATION

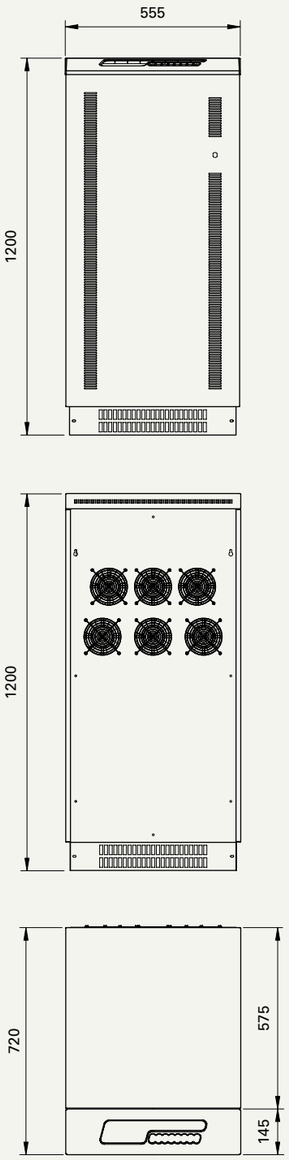
Display: 2 row LCD, 40 characters

Communication interface: 2xRS232 supplied as standard, optional RS485, ModBUS and Ethernet (slot version)

STANDARDS

EMC: Directive 89/336/EEC EN 50081, part 1(emission of EMV interferences) (EN 55014, EN 60555 part 2, EN 55011 group 1, class B) EN 50082, part 1 (EMV interferences immunity).
Grid interference: EN 61000-3-2.
Grid monitoring: ENEL DK5940 Ed. 2.2 and subsequent "Guide for connection to ENEL Distribuzione power grid".
Low voltage regulation: Directive 73/23/EEC EN 50178 (4.98) (VDE 0160) (which shall become IEC62103) EN 60146 part 1-1 (3.94) (VDE 0558 part 11).





Sirio 40K and 40K HV

Model	Sirio 40K	Sirio 40K HV
Recommended power of the photovoltaic field	max 40 kWp min 30 kWp	
Rated AC power	33 kW	
Maximum AC power	36 kW	
Input		
Maximum DC voltage in an open circuit	800 Vdc	880 Vdc
Recommended Vo@STC voltage	540÷640 Vdc	710÷760 Vdc
MPPT range	330÷700 Vdc	450÷760 Vdc
Working range	330÷700 Vdc	450÷760 Vdc
Maximum input current	105 Adc	79 Adc
Initial feeding voltage	390 Vdc	540 Vdc
Ripple voltage	<1%	
Number of inputs	1	
MPPT number	1	
D.C. connectors	Terminal blocks	
Output		
Operating voltage	400 Vac	
Operating interval	360 ÷ 440 Vac	
Maximum power range	360 ÷ 440 Vac	
Frequency range	49,7 ÷ 50,3 Hz	
Settable frequency range	47 ÷ 52 Hz	
Nominal current	48 Aac	
Maximum current	60 Aac	
Current Harmonic Distorsion (THDi)	<3%	
Power factor	>0,99	
Galvanic separation	LF transformer	
A.C. connectors	Terminal blocks	
System		
Maximum efficiency	95,8%	96,3%
European efficiency	94,9%	95,3%
Stand-by consumption	<32 W	
Night consumption	<32 W	
Internal protection	MCCB AC side and switch DC side, DC isolation detector (optional)	
Off-Grid protection	YES	
Detecting earth leakage	NO	
Heat dissipation	Fans	
Operating temperature	0°C ÷ 45°C	
Storage temperature	-20°C ÷ 70°C	
Humidity	0 ÷ 95% non-condensing	

CERTIFICATION

The complete range complies with ENEL DK5940, v.2.2.

PROTECTIONS

Each device is equipped with protections against overvoltages and lightning.

OPTIONS ON REQUEST

- Integrated insulation control
- Pole-earth connection kit

FEATURES

Colour: RAL 7035 / RAL 1033

Dimensions (WxDxH): 555x720x1200

Weight: 330 kg

Protection level: IP20

Acoustic noise: <66dBA

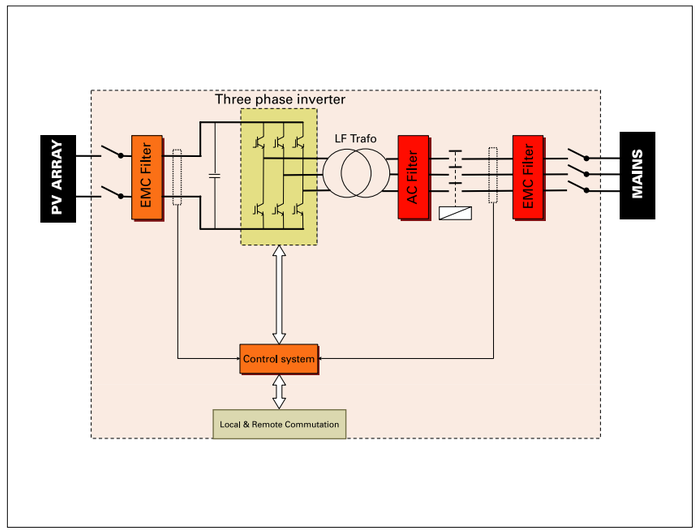
COMMUNICATION

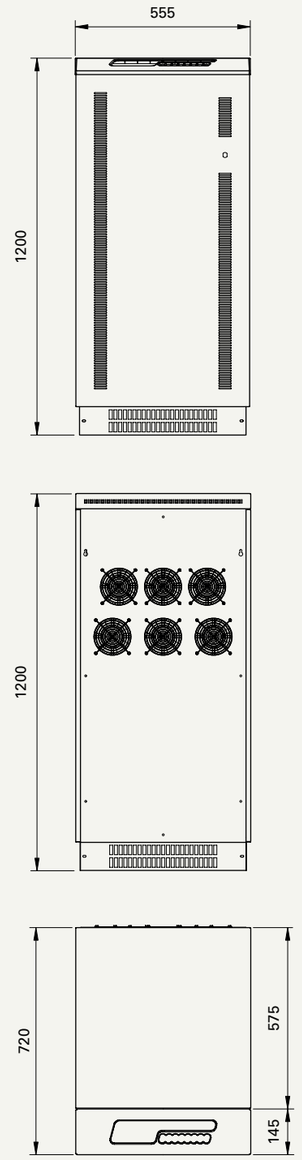
Display: 2 row LCD, 40 characters

Communication interface: 2xRS232 supplied as standard, optional RS485, ModBUS and Ethernet (slot version)

STANDARDS

EMC: Directive 89/336/EEC EN 50081, part 1(emission of EMV interferences) (EN 55014, EN 60555 part 2, EN 55011 group 1, class B) EN 50082, part 1 (EMV interferences immunity).
Grid interference: EN 61000-3-2.
Grid monitoring: ENEL DK5940 Ed. 2.2 and subsequent "Guide for connection to ENEL Distribuzione power grid".
Low voltage regulation: Directive 73/23/EEC EN 50178 (4.98) (VDE 0160) (which shall become IEC62103) EN 60146 part 1-1 (3.94) (VDE 0558 part 11).





Sirio 50K and 50K HV

Model	Sirio 50K	Sirio 50K HV
Recommended power of the photovoltaic field	max 50 kWp min 36 kWp	
Rated AC power	40 kW	
Maximum AC power	44 kW	
Input		
Maximum DC voltage in an open circuit	800 Vcc	880 Vcc
Recommended Vo@STC voltage	540÷640 Vcc	710÷760 Vcc
MPPT operating range	330÷700 Vcc	450÷760 Vcc
Working range	330÷700 Vcc	450÷760 Vcc
Maximum input current	130 Acc	98 Acc
Initial feeding voltage	390 Vcc	540 Vcc
Ripple voltage	<1%	
Number of inputs	1	
MPPT number	1	
D.C. connectors	Terminal blocks	
Output		
Operating voltage	400 Vca	
Operating interval	360 ÷ 440 Vca	
Maximum power range	360 ÷ 440 Vca	
Frequency range	49,7 ÷ 50,3 Hz	
Settable frequency range	47 ÷ 52 Hz	
Nominal current	58 Aca	
Maximum current	73 Aca	
Current Harmonic Distorsion (THDi)	<3%	
Power factor	>0,99	
Galvanic separation	LF transformer	
A.C. connectors	Terminal blocks	
System		
Maximum efficiency	95,8%	96,2%
European efficiency	95%	95,3%
Stand-by consumption	<32 W	
Night consumption	<32 W	
Internal protection	MCCB AC side and switch DC side, DC isolation detector (optional)	
Off-Grid protection	YES	
Detecting earth leakage	NO	
Heat dissipation	Fans	
Operating temperature	0°C ÷ 45°C	
Storage temperature	-20°C ÷ 70°C	
Humidity	0 ÷ 95% non-condensing	

CERTIFICATION

The complete range complies with ENEL DK5940, v.2.2.

PROTECTIONS

Each device is equipped with protections against overvoltages and lightning.

OPTIONS ON REQUEST

- Integrated insulation control
- Pole-earth connection kit

FEATURES

Colour: RAL 7035 / RAL 1033

Dimensions (WxDxH): 555x720x1200

Weight: 420 kg

Protection level: IP20

Acoustic noise: <66dBA

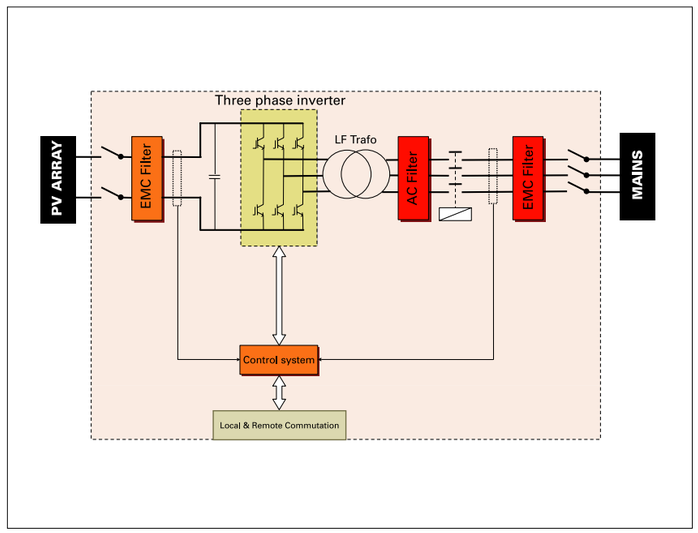
COMMUNICATION

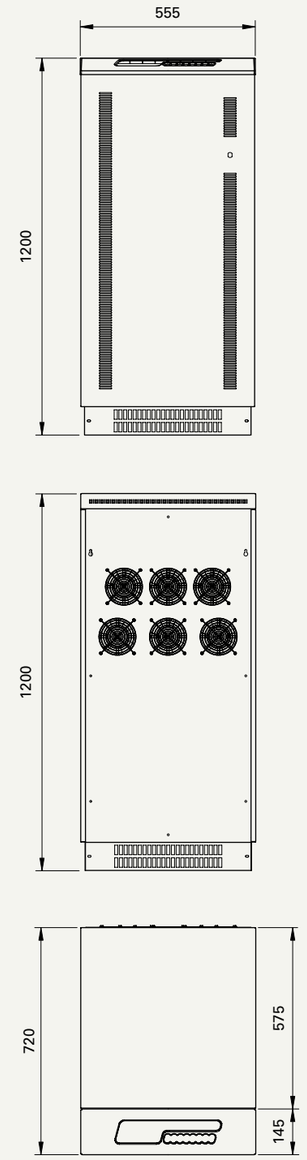
Display: 2 row LCD, 40 characters

Communication interface: 2xRS232 supplied as standard, optional RS485, ModBUS and Ethernet (slot version)

STANDARDS

EMC: Directive 89/336/EEC EN 50081, part 1(emission of EMV interferences) (EN 55014, EN 60555 part 2, EN 55011 group 1, class B) EN 50082, part 1 (EMV interferences immunity).
Grid interference: EN 61000-3-2.
Grid monitoring: ENEL DK5940 Ed. 2.2 and subsequent "Guide for connection to ENEL Distribuzione power grid".
Low voltage regulation: Directive 73/23/EEC EN 50178 (4.98) (VDE 0160) (which shall become IEC62103) EN 60146 part 1-1 (3.94) (VDE 0558 part 11).





Sirio 80K and 80K HV

Model	Sirio 80K	Sirio 80K HV
Recommended power of the photovoltaic field	max 80 kWp min 55 kWp	
Rated AC power	64 kW	
Maximum AC power	71 kW	
Input		
Maximum DC voltage in an open circuit	800 Vdc	880 Vdc
Recommended Vo@STC voltage	540÷640 Vdc	710÷760 Vdc
MPPT range	330÷700 Vdc	450÷760 Vdc
Working range	330÷700 Vdc	450÷760 Vdc
Maximum input current	205 Adc	157 Adc
Initial feeding voltage	390 Vdc	540 Vdc
Ripple voltage	<1%	
Number of inputs	1	
MPPT number	1	
D.C. connectors	Bus bar	
Output		
Operating voltage	400 Vac	
Operating interval	360 ÷ 440 Vac	
Maximum power range	360 ÷ 440 Vac	
Frequency range	49,7 ÷ 50,3 Hz	
Settable frequency range	47 ÷ 52 Hz	
Nominal current	92 Aac	
Maximum current	117 Aac	
Current Harmonic Distorsion (THDi)	<3%	
Power factor	>0,99	
Galvanic separation	LF transformer	
A.C. connectors	Bus bar	
System		
Maximum efficiency	96,1%	
European efficiency	95%	94,9%
Stand-by consumption	<32 W	
Night consumption	<32 W	
Internal protection	MCCB AC side and switch DC side, DC isolation detector (optional)	
Off-Grid protection	YES	
Detecting earth leakage	NO	
Heat dissipation	Fans	
Operating temperature	0°C ÷ 45°C	
Storage temperature	-20°C ÷ 70°C	
Humidity	0 ÷ 95% non-condensing	

CERTIFICATION

The complete range complies with ENEL DK5940, v.2.2.

PROTECTIONS

Each device is equipped with protections against overvoltages and lightning.

OPTIONS ON REQUEST

- Integrated insulation control
- Pole-earth connection kit

FEATURES

Colour: RAL 7035 / RAL 1033

Dimensions (WxDxH): 800x800x1900

Weight: 600 kg

Protection level: IP20

Acoustic noise: <68dBA

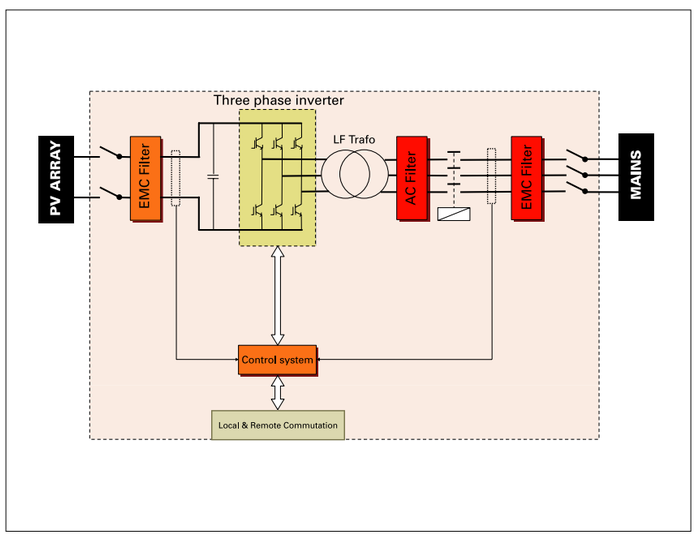
COMMUNICATION

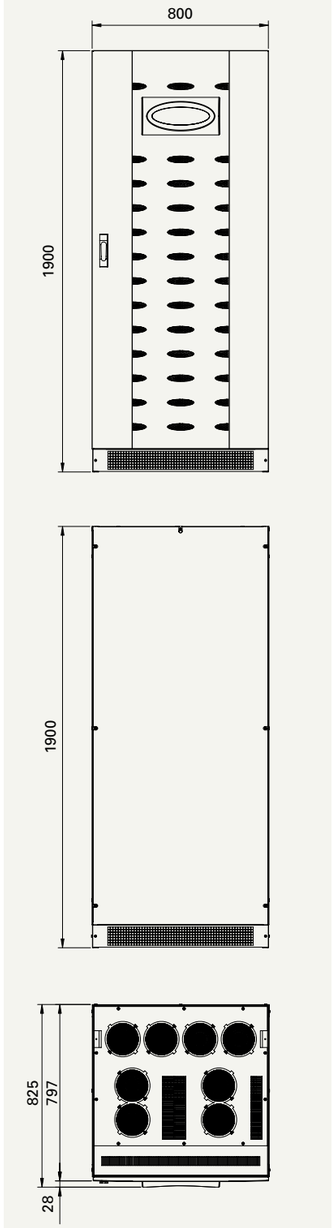
Display: 2 row LCD, 40 characters

Communication interface: 2xRS232 supplied as standard, optional RS485, ModBUS and Ethernet (slot version)

STANDARDS

EMC: Directive 89/336/EEC EN 50081, part 1(emission of EMV interferences) (EN 55014, EN 60555 part 2, EN 55011 group 1, class B) EN 50082, part 1 (EMV interferences immunity).
Grid interference: EN 61000-3-2.
Grid monitoring: ENEL DK5940 Ed. 2.2 and subsequent "Guide for connection to ENEL Distribuzione power grid".
Low voltage regulation: Directive 73/23/EEC EN 50178 (4.98) (VDE 0160) (which shall become IEC62103) EN 60146 part 1-1 (3.94) (VDE 0558 part 11).





Sirio 100K and 100K HV

Model	Sirio 100K	Sirio 100K HV
Recommended power of the photovoltaic field	max 100 kWp min 70 kWp	
Rated AC power	80 kW	
Maximum AC power	88 kW	
Input		
Maximum DC voltage in an open circuit	800 Vdc	880 Vdc
Recommended Vo@STC voltage	540÷640 Vdc	710÷760 Vdc
MPPT range	330÷700 Vdc	450÷760 Vdc
Working range	330÷700 Vdc	450÷760 Vdc
Maximum input current	260 Adc	196 Adc
Initial feeding voltage	390 Vdc	540 Vdc
Ripple voltage	<1%	
Number of inputs	1	
MPPT number	1	
D.C. connectors	Bus bar	
Output		
Operating voltage	400 Vac	
Operating interval	360 ÷ 440 Vac	
Maximum power range	360 ÷ 440 Vac	
Frequency range	49,7 ÷ 50,3 Hz	
Settable frequency range	47 ÷ 52 Hz	
Nominal current	115 Aac	
Maximum current	146 Aac	
Current Harmonic Distorsion (THDi)	<3%	
Power factor	>0,99	
Galvanic separation	LF transformer	
A.C. connectors	Bus bar	
System		
Maximum efficiency	96,1%	
European efficiency	95%	
Stand-by consumption	<32 W	
Night consumption	<32 W	
Internal protection	MCCB AC side and switch DC side, DC isolation detector (optional)	
Off-Grid protection	YES	
Detecting earth leakage	NO	
Heat dissipation	Fans	
Operating temperature	0°C ÷ 45°C	
Storage temperature	-20°C ÷ 70°C	
Humidity	0 ÷ 95% non-condensing	

CERTIFICATION

The complete range complies with ENEL DK5940, v.2.2.

PROTECTIONS

Each device is equipped with protections against overvoltages and lightning.

OPTIONS ON REQUEST

- Integrated insulation control
- Pole-earth connection kit

FEATURES

Colour: RAL 7035 / RAL 1033

Dimensions (WxDxH): 800x800x1900

Weight: 650 kg

Protection level: IP20

Acoustic noise: <68dBA

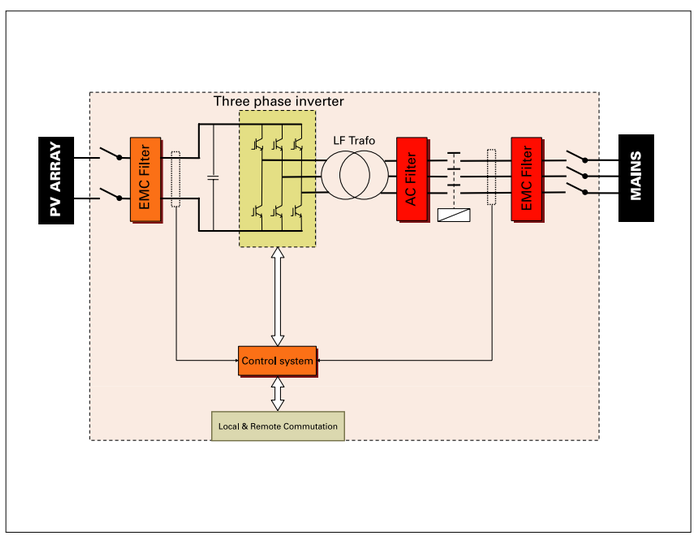
COMMUNICATION

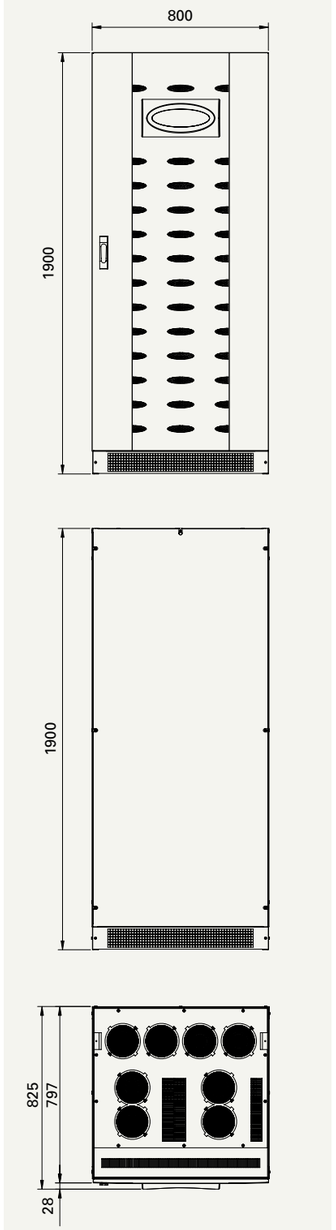
Display: 2 row LCD, 40 characters

Communication interface: 2xRS232 supplied as standard, optional RS485, ModBUS and Ethernet (slot version)

STANDARDS

EMC: Directive 89/336/EEC EN 50081, part 1(emission of EMV interferences) (EN 55014, EN 60555 part 2, EN 55011 group 1, class B) EN 50082, part 1 (EMV interferences immunity).
Grid interference: EN 61000-3-2.
Grid monitoring: ENEL DK5940 Ed. 2.2 and subsequent "Guide for connection to ENEL Distribuzione power grid".
Low voltage regulation: Directive 73/23/EEC EN 50178 (4.98) (VDE 0160) (which shall become IEC62103) EN 60146 part 1-1 (3.94) (VDE 0558 part 11).





Sirio 125K and 125K HV

Model	Sirio 125K	Sirio 125K HV
Recommended power of the photovoltaic field	max 125 kWp min 80 kWp	
Rated AC power	100 kW	
Maximum AC power	110 kW	
Input		
Maximum DC voltage in an open circuit	800 Vdc	880 Vdc
Recommended Vo@STC voltage	540÷640 Vdc	710÷760 Vdc
MPPT operating range	330÷700 Vdc	450÷760 Vdc
Working range	330÷700 Vdc	450÷760 Vdc
Maximum input current	320 Adc	245 Adc
Initial feeding voltage	390 Vdc	540 Vdc
Ripple voltage	<1%	
Number of inputs	1	
MPPT number	1	
D.C. connectors	Bus bar	
Output		
Operating voltage	400 Vac	
Operating interval	360 ÷ 440 Vac	
Maximum power range	360 ÷ 440 Vac	
Frequency range	49,7 ÷ 50,3 Hz	
Settable frequency range	47 ÷ 52 Hz	
Nominal current	145 Aac	
Maximum current	182 Aac	
Current Harmonic Distorsion (THDi)	<3%	
Power factor	>0,99	
Galvanic separation	LF transformer	
A.C. connectors	Bus bar	
System		
Maximum efficiency	96,1%	
European efficiency	95,1%	
Stand-by consumption	<32 W	
Night consumption	<32 W	
Internal protection	MCCB AC side and switch DC side, DC isolation detector (optional)	
Off-Grid protection	YES	
Detecting earth leakage	NO	
Heat dissipation	Fans	
Operating temperature	0°C ÷ 45°C	
Storage temperature	-20°C ÷ 70°C	
Humidity	0 ÷ 95% non-condensing	

CERTIFICATION

The complete range complies with ENEL DK5940, v.2.2.

PROTECTIONS

Each device is equipped with protections against overvoltages and lightning.

OPTIONS ON REQUEST

- Integrated insulation control
- Pole-earth connection kit

FEATURES

Colour: RAL 7035 / RAL 1033

Dimensions (WxDxH): 800x800x1900

Weight: 720 kg

Protection level: IP20

Acoustic noise: <68dBA

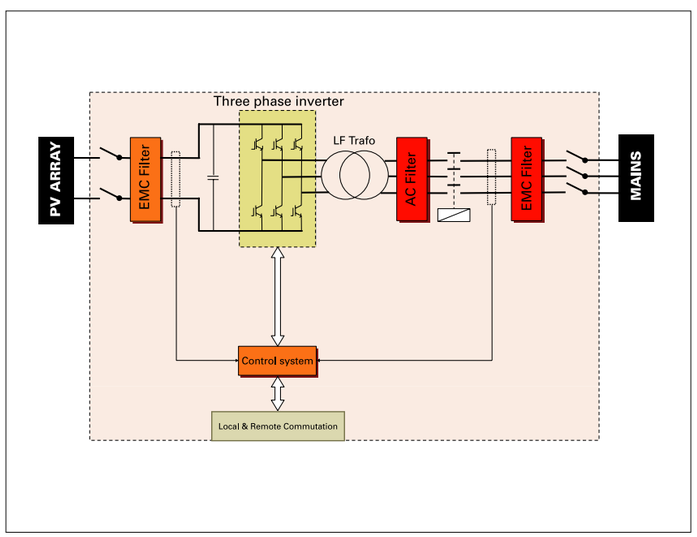
COMMUNICATION

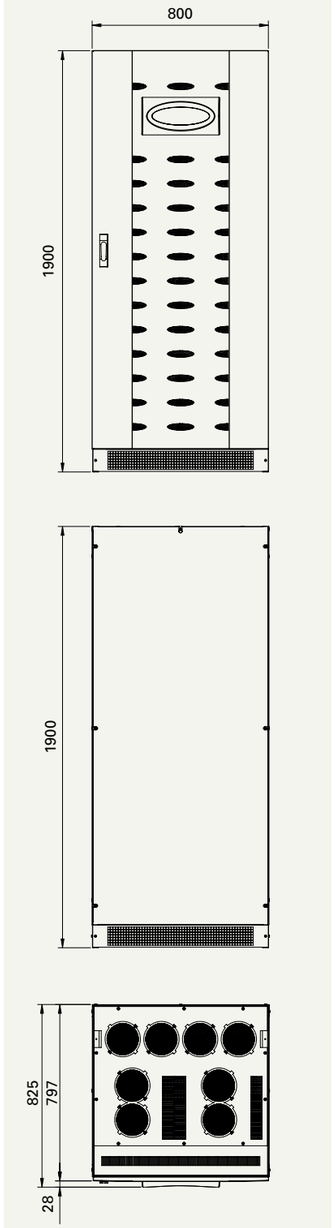
Display: 2 row LCD, 40 characters

Communication interface: 2xRS232 supplied as standard, optional RS485, ModBUS and Ethernet (slot version)

STANDARDS

EMC: Directive 89/336/EEC EN 50081, part 1(emission of EMV interferences) (EN 55014, EN 60555 part 2, EN 55011 group 1, class B) EN 50082, part 1 (EMV interferences immunity).
Grid interference: EN 61000-3-2.
Grid monitoring: ENEL DK5940 Ed. 2.2 and subsequent "Guide for connection to ENEL Distribuzione power grid".
Low voltage regulation: Directive 73/23/EEC EN 50178 (4.98) (VDE 0160) (which shall become IEC62103) EN 60146 part 1-1 (3.94) (VDE 0558 part 11).





Sirio 250K and 250K HV

Model	Sirio 250K	Sirio 250K HV
Recommended power of the photovoltaic field	max 250 kWp min 180 kWp	
Rated AC power	200 kW	
Maximum AC power	220 kW	
Input		
Maximum DC voltage in an open circuit	800 Vcc	880 Vcc
Recommended Vo@STC voltage	540÷640 Vcc	710÷760 Vcc
MPPT range	330÷700 Vcc	450÷760 Vcc
Working range	330÷700 Vcc	450÷760 Vcc
Maximum input current	650 Acc	500 Acc
Initial feeding voltage	390 Vcc	540 Vcc
Ripple voltage	<1%	
Number of inputs	1	
MPPT number	1	
D.C. connectors	Bus bar	
Output		
Operating voltage	400 Vca	
Operating interval	360 ÷ 440 Vca	
Maximum power range	360 ÷ 440 Vca	
Frequency range	49,7 ÷ 50,3 Hz	
Settable frequency range	47 ÷ 52 Hz	
Nominal current	289 Aca	
Maximum current	364 Aca	
Current Harmonic Distorsion (THDi)	<3%	
Power factor	>0,99	
Galvanic separation	LF transformer	
A.C. connectors	Bus bar	
System		
Maximum efficiency	96,2%	96,3%
European efficiency	95,2%	
Stand-by consumption	<32 W	
Night consumption	<32 W	
Internal protection	MCCB AC side and switch DC side, DC isolation detector (optional)	
Off-Grid protection	YES	
Detecting earth leakage	NO	
Heat dissipation	Fans	
Operating temperature	0°C ÷ 45°C	
Storage temperature	-20°C ÷ 70°C	
Humidity	0 ÷ 95% non-condensing	

CERTIFICATION

The complete range complies with ENEL DK5940, v.2.2.

PROTECTIONS

Each device is equipped with protections against overvoltages and lightning.

OPTIONS ON REQUEST

- Integrated insulation control
- Pole-earth connection kit

FEATURES

Colour: RAL 7035 / RAL 1033

Dimensions (WxDxH): 1630x1000x1900

Weight: 1580 kg

Protection level: IP20

Acoustic noise: <72dBA

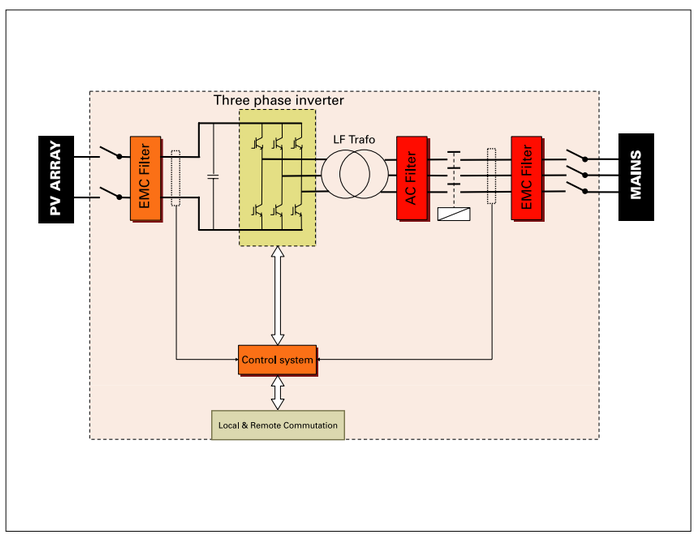
COMMUNICATION

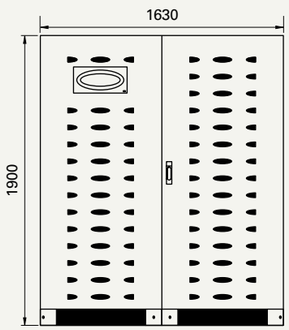
Display: 2 row LCD, 40 characters

Communication interface: 2xRS232 supplied as standard, optional RS485, ModBUS and Ethernet (slot version)

STANDARDS

EMC: Directive 89/336/EEC EN 50081, part 1(emission of EMV interferences) (EN 55014, EN 60555 part 2, EN 55011 group 1, class B) EN 50082, part 1 (EMV interferences immunity).
Grid interference: EN 61000-3-2.
Grid monitoring: ENEL DK5940 Ed. 2.2 and subsequent "Guide for connection to ENEL Distribuzione power grid".
Low voltage regulation: Directive 73/23/EEC EN 50178 (4.98) (VDE 0160) (which shall become IEC62103) EN 60146 part 1-1 (3.94) (VDE 0558 part 11).





Sirio 320K HV

Model	Sirio 320K HV
Recommended power of the photovoltaic field	max 320 kWp min 220 kWp
Rated AC power	250 kW
Maximum AC power	250 kW
Input	
Maximum DC voltage in an open circuit	880 Vcc
Recommended Vo@STC voltage	710÷760 Vcc
MPPT range	450÷760 Vcc
Working range	450÷760 Vcc
Maximum input current	590 Acc
Initial feeding voltage	540 Vcc
Ripple voltage	<1%
Number of inputs	1
MPPT number	1
D.C. connectors	Bus bar
Output	
Operating voltage	400 Vca
Operating interval	360 ÷ 440 Vca
Maximum power range	360 ÷ 440 Vca
Frequency range	49,7 ÷ 50,3 Hz
Settable frequency range	47 ÷ 52 Hz
Nominal current	361 Aca
Maximum current	420 Aca
Current Harmonic Distorsion (THDi)	<3%
Power factor	>0,99
Galvanic separation	LF transformer
A.C. connectors	Bus bar
System	
Maximum efficiency	96,3%
European efficiency	95,3%
Stand-by consumption	<32 W
Night consumption	<32 W
Internal protection	MCCB AC side and switch DC side, DC isolation detector (optional)
Off-Grid protection	YES
Detecting earth leakage	NO
Heat dissipation	Fans
Operating temperature	0°C ÷ 45°C
Storage temperature	-20°C ÷ 70°C
Humidity	0 ÷ 95% non-condensing

CERTIFICATION

The complete range complies with ENEL DK5940, v.2.2.

PROTECTIONS

Each device is equipped with protections against overvoltages and lightning.

OPTIONS ON REQUEST

- Integrated insulation control
- Pole-earth connection kit

FEATURES

Colour: RAL 7035 / RAL 1033

Dimensions (WxDxH): 1630x1000x1900

Weight: 1630 kg

Protection level: IP20

Acoustic noise: <72dBA

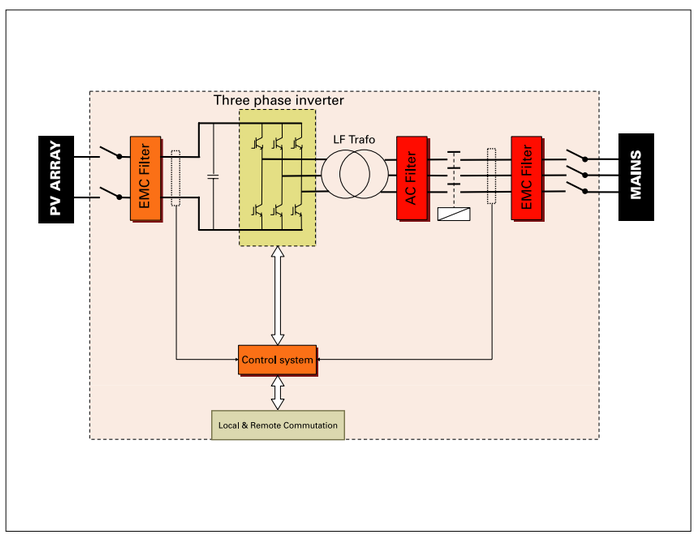
COMMUNICATION

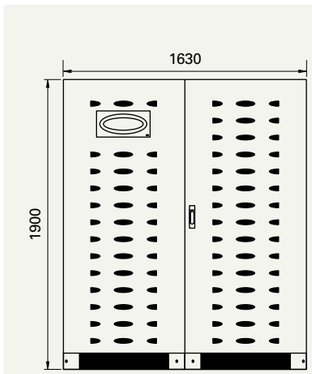
Display: 2 row LCD, 40 characters

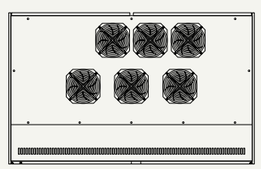
Communication interface: 2xRS232 supplied as standard, optional RS485, ModBUS and Ethernet (slot version)

STANDARDS

EMC: Directive 89/336/EEC EN 50081, part 1(emission of EMV interferences) (EN 55014, EN 60555 part 2, EN 55011 group 1, class B) EN 50082, part 1 (EMV interferences immunity).
Grid interference: EN 61000-3-2.
Grid monitoring: ENEL DK5940 Ed. 2.2 and subsequent "Guide for connection to ENEL Distribuzione power grid".
Low voltage regulation: Directive 73/23/EEC EN 50178 (4.98) (VDE 0160) (which shall become IEC62103) EN 60146 part 1-1 (3.94) (VDE 0558 part 11).







Connection of Central Medium Voltage Inverters

In order to increase overall plant efficiency, the Sirio Central MT inverters do not have an integrated transformer. This feature and the meticulous design make them ideal for use in medium-high power plants connected to a medium voltage distribution network.

Maximum energy and safety
The Maximum Power Point Tracking (MPPT) research algorithm implemented in the control system of Sirio inverters allows full use of the photovoltaic generator under any radiation and temperature conditions, making the plant work constantly at maximum efficiency. In the absence of solar radiation the converter goes on standby and resumes normal operation when there is radiation again. This feature reduces self-consumption to a minimum and maximizes energy efficiency. The use of speed-controlled fans helps to optimize the overall efficiency of the inverter. Fan operation that is linked to the temperature also increases the expected lifespan and reduces costs incurred for extraordinary maintenance. All these design features, the careful choice of components and guaranteed quality of production according to ISO 9001 standards make the Sirio series of three phase inverters with transformer extremely efficient and reliable and guarantee maximum energy production.

Advanced communications
The Sirio Central series inverters have an intuitive man-machine interface, made up of an integrated display and keyboard with which to control the photovoltaic system's main parameters and interact with it to control its operation. The display and keyboard facilitate diagnosis and solutions to any operating problems at local level while interaction with the inverter to know the plant's status and to assess statistics about its operation is possible remotely through most common media (local series link, Local Area Network, GSM, etc.) by means of RS232/RS485 communication ports. The communication interfaces and related software are common to the family of transformerless inverters, which can be referred to for more detailed information.

Easy installation and maintenance
The footprint of these devices has been considerably reduced and there is no need to leave space at the side or back of the equipment since the electronics and power components are fully accessible from the front. Fully automatic operation ensures ease of use and facilitates installation and startup, thus avoiding installation and configuration errors which could lead to failures or reduced plant productivity.

Conformance
Sirio Central MT inverters conform fully with European safety standards LVD and EMC and with Italian and international regulations regarding parallel connection to the public distribution network.

- Electromagnetic Compatibility Directive (89/336/EEC and subsequent amendments 92/31/EEC, 93/68/EEC and 93/97/EEC);
- CEI EN 61000 Electromagnetic Compatibility (EMC);
- CEI 11-20 Electrical energy production systems and uninterruptible power supplies connected to I and II class networks;
- CEI 11-20, V1 Electrical energy production systems and uninterruptible power supplies connected to I and II class networks, V1;
- Guide for connections to the ENEL DISTRIBUZIONE power grid.

Special solutions
AROS is able to supply on request Sirio inverters specific to the installation needs. Available options include the integrated isolation control and the pole/earth connection kit that is required for back-contact modules.

Certifications
Italy
DK5940 ed. 2.2

Spain
Real decreto 1663/2000

Sirio 250K HV-MT

Model	Sirio 250K HV-MT
Recommended power of the photovoltaic field	max 250 kWp min 180 kWp
Rated AC power	200 kW
Maximum AC power	220 kW
Input	
Maximum DC voltage in an open circuit	880 Vdc
Recommended Vo@STC voltage	710÷760 Vdc
MPPT range	450÷760 Vdc
Working range	450÷760 Vdc
Maximum input current	500 Adc
Initial feeding voltage	540 Vdc
Ripple voltage	<1%
Number of inputs	1
MPPT number	1
D.C. connectors	Bus bar
Output	
Operating voltage	270 Vac
Operating interval	245÷300 Vac
Maximum power range	245÷300 Vac
Frequency range	49,7 ÷ 50,3 Hz
Settable frequency range	47 ÷ 52 Hz
Nominal current	428 Aac
Maximum current	554 Aac
Current Harmonic Distorsion (THDi)	<3%
Power factor	>0,99
Galvanic separation	NO
A.C. connectors	Bus bar
System	
Maximum efficiency	98,1%
European efficiency	97,5%
Stand-by consumption	<32 W
Night consumption	<32 W
Internal protection	MCCB AC side and switch DC side, DC isolation detector (optional)
Off-Grid protection	YES
Detecting earth leakage	NO
Heat dissipation	Fans
Operating temperature	0°C ÷ 45°C
Storage temperature	-20°C ÷ 70°C
Humidity	0 ÷ 95% non-condensing

CERTIFICATION

The complete range complies with ENEL DK5940, v.2.2.

PROTECTIONS

Each device is equipped with protections against overvoltages and lightning.

OPTIONS ON REQUEST

- Integrated insulation control
- Pole-earth connection kit

FEATURES

Colour: RAL 7035 / RAL 1033

Dimensions (WxDxH): 1630x1000x1900

Weight: 1100 kg

Protection level: IP20

Acoustic noise: <72dBA

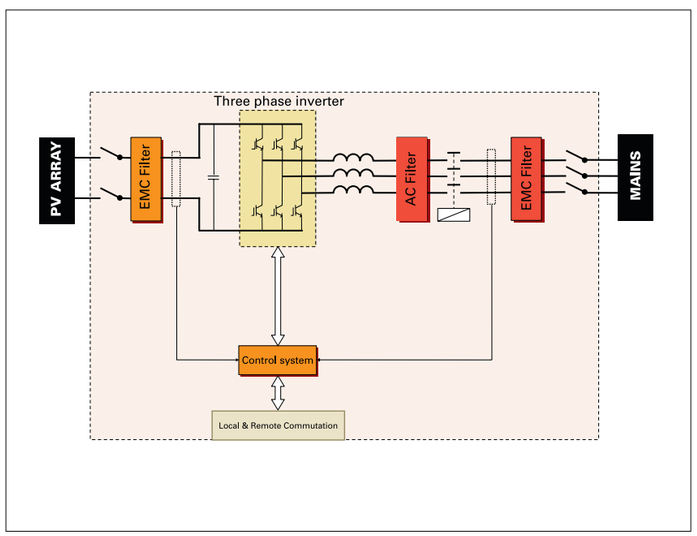
COMMUNICATION

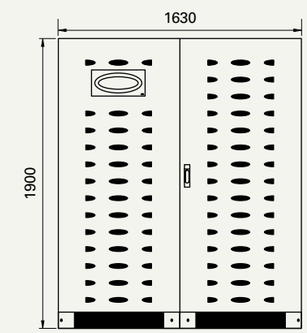
Display: 2 row LCD, 40 characters

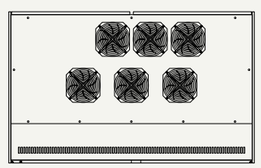
Communication interface: 2xRS232 supplied as standard, optional RS485, ModBUS and Ethernet (slot version)

STANDARDS

EMC: Directive 89/336/EEC EN 50081, part 1(emission of EMV interferences) (EN 55014, EN 60555 part 2, EN 55011 group 1, class B) EN 50082, part 1 (EMV interferences immunity).
Grid interference: EN 61000-3-2.
Grid monitoring: ENEL DK5940 Ed. 2.2 and subsequent "Guide for connection to ENEL Distribuzione power grid".
Low voltage regulation: Directive 73/23/EEC EN 50178 (4.98) (VDE 0160) (which shall become IEC62103) EN 60146 part 1-1 (3.94) (VDE 0558 part 11).







Sirio 320K HV-MT

Model	Sirio 320K HV-MT
Recommended power of the photovoltaic field	max 320 kWp min 220 kWp
Rated AC power	250 kW
Maximum AC power	250 kW
Input	
Maximum DC voltage in an open circuit	880 Vdc
Recommended Vo@STC voltage	710÷760 Vdc
MPPT range	450÷760 Vdc
Working range	450÷760 Vdc
Maximum input current	590 Adc
Initial feeding voltage	540 Vdc
Ripple voltage	<1%
Number of inputs	1
MPPT number	1
D.C. connectors	Bus bar
Output	
Operating voltage	270 Vac
Operating interval	245÷300 Vac
Maximum power range	245÷300 Vac
Frequency range	49,7 ÷ 50,3 Hz
Settable frequency range	47 ÷ 52 Hz
Nominal current	535 Aac
Maximum current	630 Aac
Current Harmonic Distorsion (THDi)	<3%
Power factor	>0,99
Galvanic separation	NO
A.C. connectors	Bus bar
System	
Maximum efficiency	98,1%
European efficiency	97,5%
Stand-by consumption	<32 W
Night consumption	<32 W
Internal protection	MCCB AC side and switch DC side, DC isolation detector (optional)
Off-Grid protection	YES
Detecting earth leakage	NO
Heat dissipation	Fans
Operating temperature	0°C ÷ 45°C
Storage temperature	-20°C ÷ 70°C
Humidity	0 ÷ 95% non-condensing

CERTIFICATION

The complete range complies with ENEL DK5940, v.2.2.

PROTECTIONS

Each device is equipped with protections against overvoltages and lightning.

OPTIONS ON REQUEST

- Integrated insulation control
- Pole-earth connection kit

FEATURES

Colour: RAL 7035 / RAL 1033

Dimensions (WxDxH): 1630x1000x1900

Weight: 1150 kg

Protection level: IP20

Acoustic noise: <72dBA

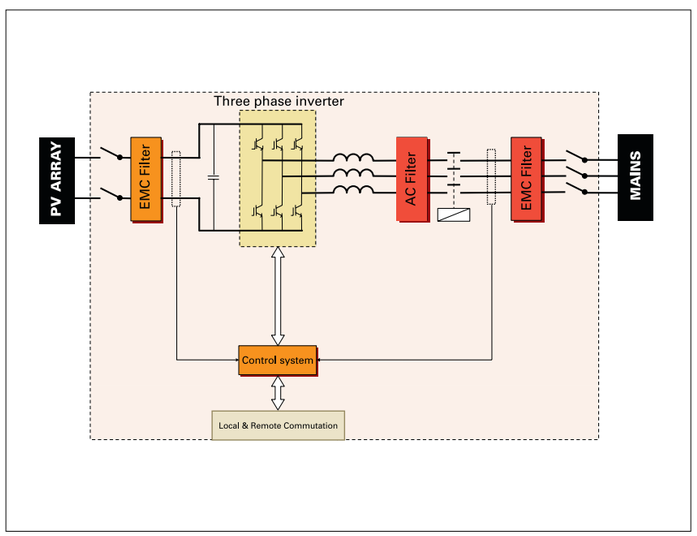
COMMUNICATION

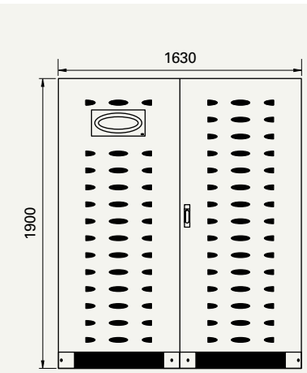
Display: 2 row LCD, 40 characters

Communication interface: 2xRS232 supplied as standard, optional RS485, ModBUS and Ethernet (slot version)

STANDARDS

EMC: Directive 89/336/EEC EN 50081, part 1(emission of EMV interferences) (EN 55014, EN 60555 part 2, EN 55011 group 1, class B) EN 50082, part 1 (EMV interferences immunity).
Grid interference: EN 61000-3-2.
Grid monitoring: ENEL DK5940 Ed. 2.2 and subsequent "Guide for connection to ENEL Distribuzione power grid".
Low voltage regulation: Directive 73/23/EEC EN 50178 (4.98) (VDE 0160) (which shall become IEC62103) EN 60146 part 1-1 (3.94) (VDE 0558 part 11).





Sirio 640K HV-MT

Model	Sirio 640K HV-MT
Recommended power of the photovoltaic field	max 640 kWp min 440 kWp
Rated AC power	500 kW
Maximum AC power	500 kW
Input	
Maximum DC voltage in an open circuit	880 Vdc
Recommended Vo@STC voltage	710÷760 Vdc
MPPT range	450÷760 Vdc
Working range	450÷760 Vdc
Maximum input current	1180 Adc
Initial feeding voltage	540 Vdc
Ripple voltage	<1%
Number of inputs	2
MPPT number	1
D.C. connectors	Bus bar
Output	
Operating voltage	270 Vac
Operating interval	245÷300 Vac
Maximum power range	245÷300 Vac
Frequency range	49,7 ÷ 50,3 Hz
Settable frequency range	47 ÷ 52 Hz
Nominal current	1070 Aac
Maximum current	1260 Aac
Current Harmonic Distorsion (THDi)	<3%
Power factor	>0,99
Galvanic separation	NO
A.C. connectors	Bus bar
System	
Maximum efficiency	98,1% (*)
European efficiency	97,5% (*)
Stand-by consumption	<32 W
Night consumption	<32 W
Internal protection	MCCB AC side and switch DC side, DC isolation detector (optional)
Off-Grid protection	YES
Detecting earth leakage	NO
Heat dissipation	Fans
Operating temperature	0°C ÷ 45°C
Storage temperature	-20°C ÷ 70°C
Humidity	0 ÷ 95% non-condensing

(*) Data prior to printing

CERTIFICATION

The complete range complies with ENEL DK5940, v.2.2.

PROTECTIONS

Each device is equipped with protections against overvoltages and lightning.

OPTIONS ON REQUEST

- Integrated insulation control
- Pole-earth connection kit

FEATURES

Colour: RAL 7035 / RAL 1033

Dimensions (WxDxH): 1630x1000x1900

Weight: 1150 kg

Protection level: IP20

Acoustic noise: <72dBA

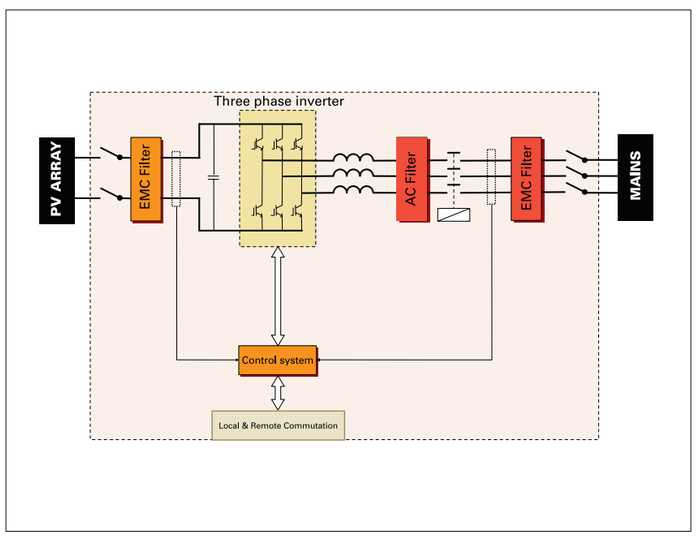
COMMUNICATION

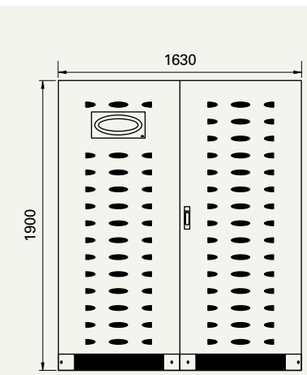
Display: 2 row LCD, 40 characters

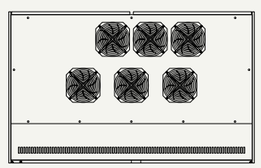
Communication interface: 2xRS232 supplied as standard, optional RS485, ModBUS and Ethernet (slot version)

STANDARDS

EMC: Directive 89/336/EEC EN 50081, part 1(emission of EMV interferences) (EN 55014, EN 60555 part 2, EN 55011 group 1, class B) EN 50082, part 1 (EMV interferences immunity).
Grid interference: EN 61000-3-2.
Grid monitoring: ENEL DK5940 Ed. 2.2 and subsequent "Guide for connection to ENEL Distribuzione power grid".
Low voltage regulation: Directive 73/23/EEC EN 50178 (4.98) (VDE 0160) (which shall become IEC62103) EN 60146 part 1-1 (3.94) (VDE 0558 part 11).







Sirio Central Station (SCS)

How to increase the overall efficiency of a conversion system and cut installation costs. This objective can be achieved by using a Sirio Central Station (SCS) system with Sirio Central MV inverters connected to a common medium voltage transformer. The devices are installed in concrete stations to prolong their useful life, improve thermal insulation and to provide resistance to atmospheric agents and the most unfavourable environmental conditions.

An integral system for large plants

Sirio Central Station is available in 500kW, 750kW and 1MW versions and is a complete, safe and high-performing "Plug&Play" solution. The modular system, which uses inverters housed in separate stations, each with it own MV/LV transformer, enables the inverters to have a barycentric position within the photovoltaic field to optimize installation.

The logic of having separate stations cuts production losses caused by failures and during ordinary and extraordinary maintenance operations. The stations are built in vibrated reinforced concrete, in accordance with the CEI.0-16 standards currently in force, with the Guide for Connections to the Enel Distribuzione Power Grid Ed. 1 December 2008 and with the Enel DG 2092 Construction Specifications Ed. 1 December 2008. The structures are particularly resistant to atmospheric agents since they are treated with special plastic and waterproofing coatings which protect against the formation of cracks and seepages. The external walls are coated with a quartz/rubber paint with a textured finish to provide optimal resistance to atmospheric agents, even in marine, mountain, industrial or very polluted environments. The normal operating conditions of the installed equipment are guaranteed by a natural ventilation system using air vents thus avoiding recourse to air conditioning systems.

The whole structure is assembled entirely with electromechanical equipment in the factory in accordance with the CEI EN 61330 standard, and electrical equipment where applicable, ready to be placed on site for subsequent start-up.

Optional solutions

Aros can also offer pre-assembled solutions for:

- stations for utility providers and general protection with ENEL-approved medium voltage switchboard panels housing the incoming MV line devices and the measurement unit where the electricity distribution utility takes its readings;
- protection and interfacing stations housing all the MV, protection, measurement, interface and control panels.

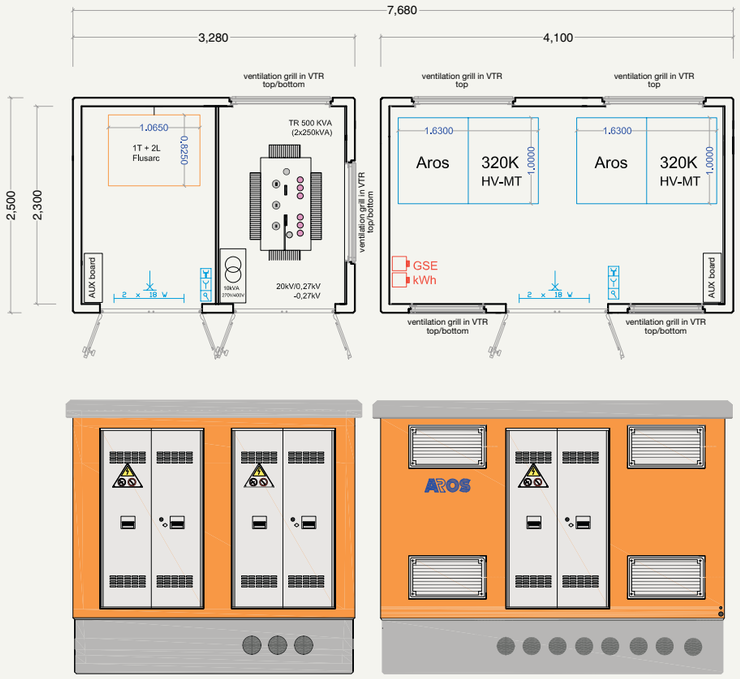
Practical and complete

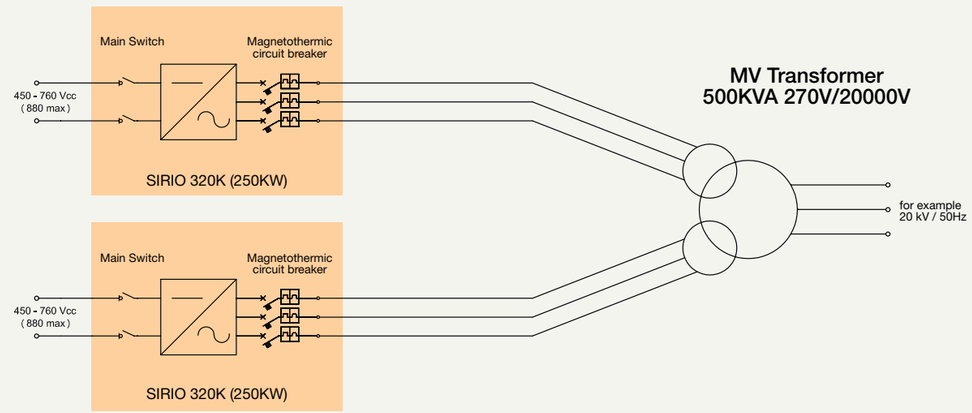
The SCS provides solutions that can be defined as "All in One" since they reduce the normal design phases, cut transport and installation times and come already equipped with all that is needed for system start-up.

The significantly lower costs, the excellent efficiency of the whole system (due to the inverters and transformers used) and the time saving in the start-up phases make the Sirio Central Station an attractive choice for optimizing return on investment.

Model	SCS 500-2
Recommended power of the photovoltaic field	max 600 kWp min 450 kWp
Rated AC power	500 kW
Input	
Maximum DC voltage in an open circuit	880 Vdc
Mppt range	450÷760 Vdc
Maximum input current	2x 590 Adc
Ripple voltage	<1%
Numbers of inputs	2
Mppt number	2
DC connectors	Bus bar
Output	
Operating voltage	20kV
Frequency range	49,7 ÷ 50,3 Hz
Settable frequency range	47 ÷ 52 Hz
Nominal current (at 20kV)	14,45 Aac
Current Harmonic Distortion (THDi)	<3%
Power factor	>0,99
System	
Maximum efficiency (*)	97,3%
European efficiency (*)	96,7%
Operating temperature	-20°C ÷ 40°C
Humidity	0 ÷ 95% non-condensing
Station features	
Materials	Block construction with reinforced concrete, class Rck 250 Kg/sq. cm with superfluidifying and waterproofing additives
Structure	Comprising electro-soldered metal mesh reinforcement and corrugated iron, with improved adherence, both in Feb44k
Walls	Waterproof plastic coating painted with quartz/rubber paint with a textured finish
Cooling	Natural ventilation through metal ducting
Cover	flat cover
Dimensions (WxDxH)	7680x2500x2550 mm
Lighting	2x18W fluorescent lamps, of which 1x18W is for emergency lighting, for each prefabricated structure
Standard features	2 ENEL-approved meters, GSM remote reading system, extinguisher
Conformance to specifications	CEI 0-16 ed. 2 July 2008; ENEL Guide for grid connections ed. 1 December 2008 and Construction Specifications DG 2092 ed. 1 December 2008
Transformer	
Construction	Oil bath seal
Primary nominal power	500kVA
Secondary nominal power	2x250kVA
In/Out voltage	2x(270V)/20000V
Cooling	ONAN (Oil Natural Air Natural, without pumps or fans)
Short circuit voltage	6%

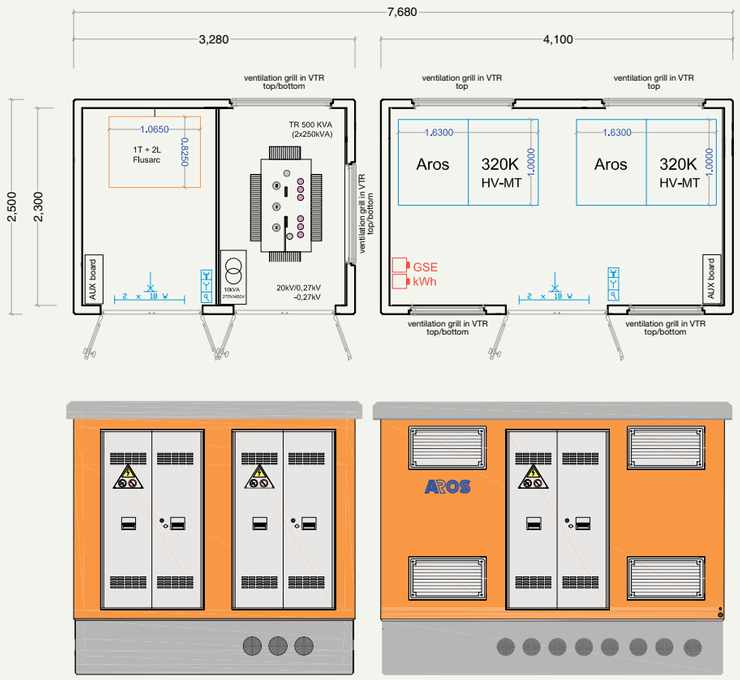
(*) Data include the auxiliary inverters





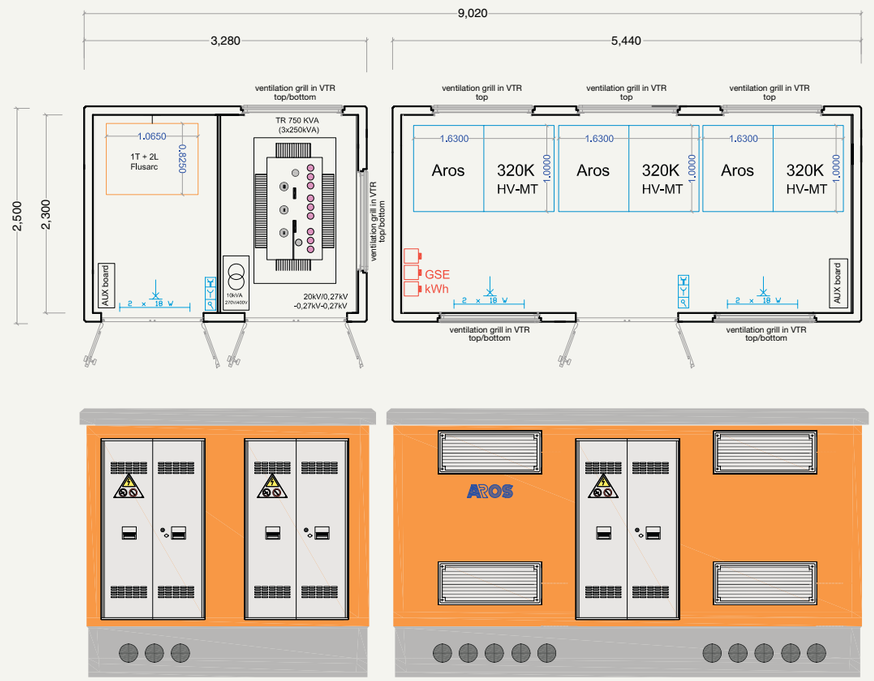
Model	SCS 500-1
Recommended power of the photovoltaic field	max 600 kWp min 450 kWp
Rated AC power	500 kW
Input	
Maximum DC voltage in an open circuit	880 Vdc
Mppt range	450÷760 Vdc
Maximum input current	1180 Adc
Ripple voltage	<1%
Numbers of inputs	2
Mppt number	2
DC connectors	Bus bar
Output	
Operating voltage	20kV
Frequency range	49,7 ÷ 50,3 Hz
Settable frequency range	47 ÷ 52 Hz
Nominal current (at 20kV)	14,45 Aac
Current Harmonic Distortion (THDi)	<3%
Power factor	>0,99
System	
Maximum efficiency (*)	97,3%
European efficiency (*)	96,7%
Operating temperature	-20°C ÷ 40°C
Humidity	0 ÷ 95% non-condensing
Station features	
Materials	Block construction with reinforced concrete, class Rck 250 Kg/sq. cm with superfluidifying and waterproofing additives
Structure	Comprising electro-soldered metal mesh reinforcement and corrugated iron, with improved adherence, both in Feb44k
Walls	Waterproof plastic coating painted with quartz/rubber paint with a textured finish
Cooling	Natural ventilation through metal ducting
Cover	flat cover
Dimensions (WxDxH)	5440x2500x2550 mm
Lighting	2x18W fluorescent lamps, of which 1x18W is for emergency lighting, for each prefabricated structure
Standard features	2 ENEL-approved meters, GSM remote reading system, extinguisher
Conformance to specifications	CEI 0-16 ed. 2 July 2008; ENEL Guide for grid connections ed. 1 December 2008 and Construction Specifications DG 2092 ed. 1 December 2008
Transformer	
Construction	Oil bath seal
Primary nominal power	500kVA
Secondary nominal power	500kVA
In/Out voltage	270V/20000V
Cooling	ONAN (Oil Natural Air Natural, without pumps or fans)
Short circuit voltage	6%

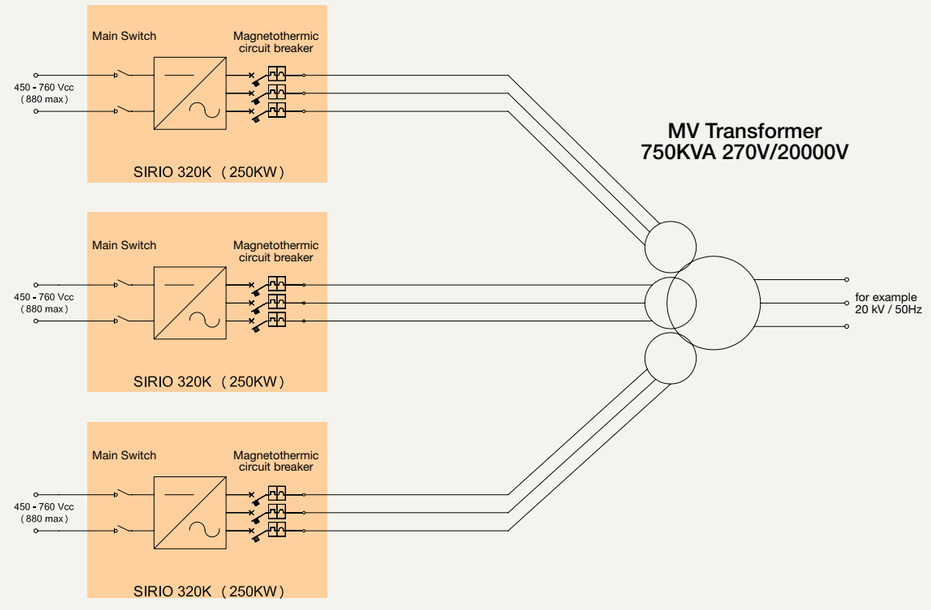
(*) Data include the auxiliary inverters



Model	SCS 750
Recommended power of the photovoltaic field	max 880 kWp min 600 kWp
Rated AC power	750 kW
Input	
Maximum DC voltage in an open circuit	880 Vdc
Mppt range	450÷760 Vdc
Maximum input current	3x 590 Adc
Ripple voltage	<1%
Numbers of inputs	3
Mppt number	3
DC connectors	Bus bar
Output	
Operating voltage	20kV
Frequency range	49,7 ÷ 50,3 Hz
Settable frequency range	47 ÷ 52 Hz
Nominal current (at 20kV)	21,68 Aac
Current Harmonic Distortion (THDi)	<3%
Power factor	>0,99
System	
Maximum efficiency (*)	97,3%
European efficiency (*)	96,7%
Operating temperature	-20°C ÷ 40°C
Humidity	0 ÷ 95% non-condensing
Station features	
Materials	Block construction with reinforced concrete, class Rck 250 Kg/sq. cm with superfluidifying and waterproofing additives
Structure	Comprising electro-soldered metal mesh reinforcement and corrugated iron, with improved adherence, both in Feb44k
Walls	Waterproof plastic coating painted with quartz/rubber paint with a textured finish
Cooling	Natural ventilation through metal ducting
Cover	flat cover
Dimensions (WxDxH)	9840x2500x2550 mm
Lighting	2x18W fluorescent lamps, of which 1x18W is for emergency lighting, for each prefabricated structure
Standard features	2 ENEL-approved meters, GSM remote reading system, extinguisher
Conformance to specifications	CEI 0-16 ed. 2 July 2008; ENEL Guide for grid connections ed. 1 December 2008 and Construction Specifications DG 2092 ed. 1 December 2008
Transformer	
Construction	Oil bath seal
Primary nominal power	750kVA
Secondary nominal power	3x250kVA
In/Out voltage	3x(270V)/20000V
Cooling	ONAN (Oil Natural Air Natural, without pumps or fans)
Short circuit voltage	6%

(*) Data include the auxiliary inverters





Model	SCS 1000
Recommended power of the photovoltaic field	max 1150 kWp min 880 kWp
Rated AC power	1000 kW

Input	
Maximum DC voltage in an open circuit	880 Vdc
Mppt range	450÷760 Vdc
Maximum input current	2x 1180 Adc
Ripple voltage	<1%
Numbers of inputs	4
Mppt number	2
DC connectors	Bus bar

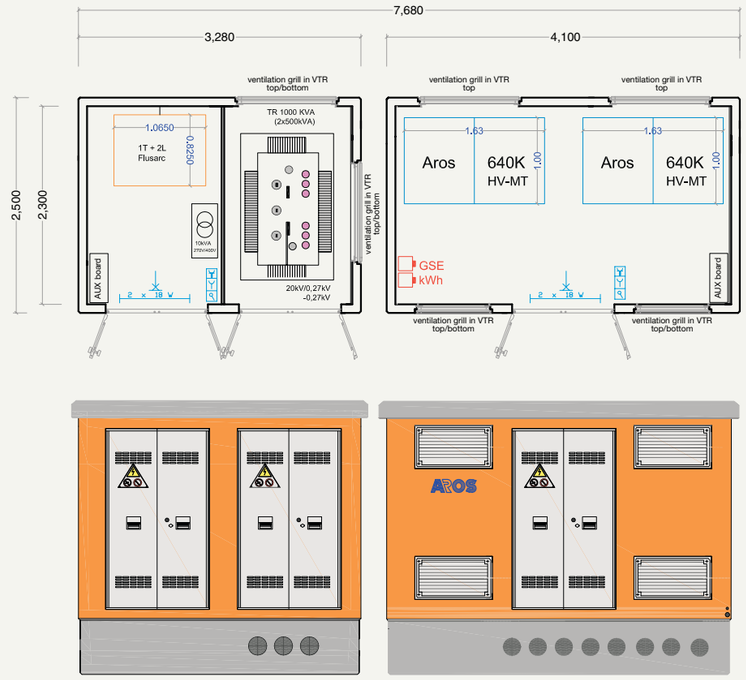
Output	
Operating voltage	20kV
Frequency range	49,7 ÷ 50,3 Hz
Settable frequency range	47 ÷ 52 Hz
Nominal current (at 20kV)	28,90 Aac
Current Harmonic Distortion (THDi)	<3%
Power factor	>0,99

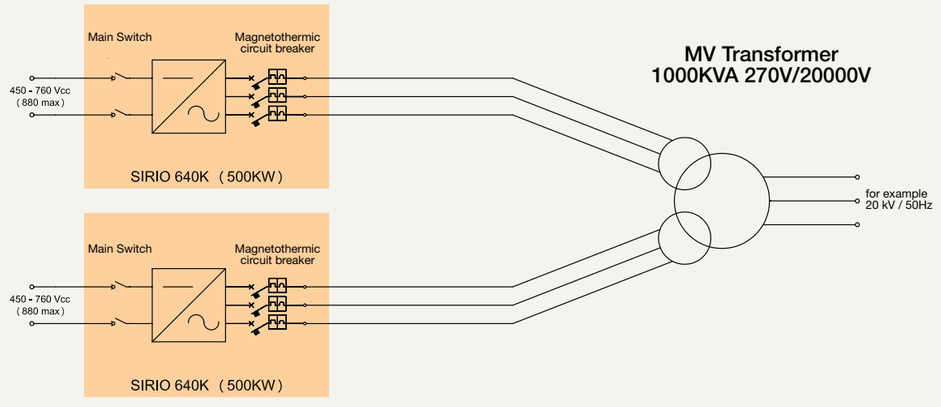
System	
Maximum efficiency (*)	97,4%
European efficiency (*)	96,8%
Operating temperature	-20°C ÷ 40°C
Humidity	0 ÷ 95% non-condensing

Station features	
Materials	Block construction with reinforced concrete, class Rck 250 Kg/sq. cm with superfluidifying and waterproofing additives
Structure	Comprising electro-soldered metal mesh reinforcement and corrugated iron, with improved adherence, both in Feb44k
Walls	Waterproof plastic coating painted with quartz/rubber paint with a textured finish
Cooling	Natural ventilation through metal ducting
Cover	flat cover
Dimensions (WxDxH)	7680x2500x2550 mm
Lighting	2x18W fluorescent lamps, of which 1x18W is for emergency lighting, for each prefabricated structure
Standard features	2 ENEL-approved meters, GSM remote reading system, extinguisher
Conformance to specifications	CEI 0-16 ed. 2 July 2008; ENEL Guide for grid connections ed. 1 December 2008 and Construction Specifications DG 2092 ed. 1 December 2008

Transformer	
Construction	Oil bath seal
Primary nominal power	1MVA
Secondary nominal power	2x500kVA
In/Out voltage	2x(270V)/20000V
Cooling	ONAN (Oil Natural Air Natural, without pumps or fans)
Short circuit voltage	6%

(*) Data include the auxiliary inverters





Software and communication accessories

Aros offers the ideal solution to guarantee a protected, efficient and global system combining SIRIO inverters with software designed to ensure the complete control of your plant.

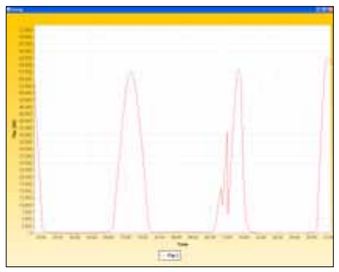
SunVision – Monitoring program

SunVision guarantees efficient and intuitive management of your photovoltaic plant (up to 127 inverters), displaying such essential information as voltage (AC/DC), current (AC/DC), power and temperature. The values of energy produced and the economic returns generated are always available via the indicators, which also calculate the reduction of CO_2 emissions. Timely graphic reports allow you to monitor your plant's energy production on a daily, weekly, monthly, and annual basis. The new export routine in text format makes it possible to use data in various software applications. Thanks to the "discovering/ browsing" function, any inverters connected to the RS485 bus or to the Ethernet network are automatically displayed in a directory list, without the need for manual configuration interventions.

MAIN FEATURES
- Real time graphic monitoring of inverter status
- Detailed display including all values
- Centralized control of PV inverters connected via serial port (RS232 or RS485) or network
- Internal graphic data-log with two levels of detail
- Alarm notification via email and SMS
- HTTP functionality for remote control
- Multilingual support
- Compatible with String Box

SUPPORTED OPERATING SYSTEMS
Windows 7
Windows Server 2008
Windows Vista
Windows 2003
Windows XP
Windows 2000
Linux
Sun Solaris 8,9 e 10

Download the software free of charge from our website: www.aros.it/sirio

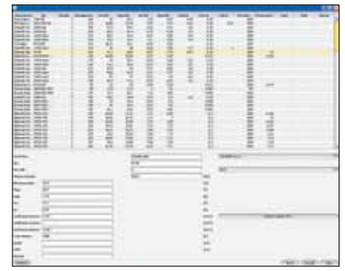


PV Configurator

PV Configurator gives you a complete overview so that you can correctly rate your grid-connected photovoltaic plant. With the optimization of the calculation process, the software is now capable of operating with the entire range of Sirio inverters, with or without transformers.

MAIN FEATURES
- Updated database of photovoltaic modules
- Complete range of SIRIO inverters
- Rapid search for optimal configuration function (according to power or number of panels)
- Creation of reports with the configuration adopted
- Multilingual support

Download the software free of charge from our website: www.aros.it/sirio



Software and communication accessories

NetMan Plus PV Agent Network

PRODUCT CODE	
Version for Sirio transformerless	**XPV2RSA2A**
Version for Sirio with transformer	**XPV2RSA1A**

The NetMan Plus PV network card enables management of an inverter directly connected to a 10/100Mbps LAN using the main network communication protocols (TCP/IP and HTTP).

NetMan Plus

MAIN FEATURES
- 10/100Mbps Ethernet and IPv4 network compatible
- SunVision compatible
- HTTP for control via web browser
- SMTP for sending alarm emails
- Serial port for communication with inverter
- Event history log management
- Other standards: DHCP, DNS, RARP, FTP, NTP, ICMP, IGMP
- Configurable via multisession Telnet and serial terminal with data import/export
- Firmware upgradable via serial port and server TFTP

RS485 – Communication adapter

PRODUCT CODE	
Version for Sirio transformerless	**XPV2RBC1A**
Version for Sirio with transformer	**XPV2RBC2A**

The RS485 card enables the creation of a bus to connect additional inverters, displaying all parameters via connection to a PC equipped with SunVision software.

RS485

MAIN FEATURES
- Plug&Play installation
- Data transfer up to 9.6 KBaud

ModCOM PV – Modbus Protocol Converter

PRODUCT CODE	
Version for Sirio transformerless	**XPV2RMC1A**
Version for Sirio with transformer	**XPV2RMC2A**

MODBUS is an open-source and royalty-free serial communication protocol, which has become an industry standard in recent years thanks its ease of use and implementation.
The ModCOM PV device makes it possible to monitor Aros photovoltaic inverters via the MODBUS RTU protocol over half-duplex RS-485 serial cable.

ModCOM PV

MAIN FEATURES
- MODBUS/JBUS port can be configured as RS232 or RS485
- RJ-45 connector for connecting to the MODBUS network
- can be integrated with the main BMS management programs
- LED signals for communication activity
- Firmware upgradeable through serial port

AROS Solar Management

Solar View

PRODUCT CODE	
	XPV1RD13A

This remote data acquisition device is capable of providing the main electric parameter information for a photovoltaic generator via an RS485 connection. By simple touch on the touch screen display , you can recall such values as panel voltage, power generated by the plant, line voltage and line current, energy produced and the amount of CO_2 unemitted. In addition, an intuitive horizontal bar indicates the percentage of instant power. Touch screen technology makes it possible to scroll through and zoom in on
graphics created by the device directly on the display. Compatible with installations of up to 5 inverters, it does not require special configurations since it is capable of automatically detecting the model and related characteristics of the inverters.

Solar View

MAIN FEATURES
System:
- B/W 240x128 pixel LCD touch screen with LED backlight
- RS485 and USB communication ports
- Multimedia graphic interface
- 12Vdc power supply

Graphics:
- 5 display settings: 6-hour, 12-hour, 24-hour, weekly, and monthly
- The ability to display averages or individual readings

Modem RTG 100

PRODUCT CODE	
	XGSMR002A

RTG 100 is a GSM/GPRS modem designed for the purpose of controlling solar inverters. It sends out text messages (SMS) if the devices it is connected to fail and/or change status. The RTG 100 may also be used for remote supervision, as it has the ability to acquire, store and transmit the inverter production data to a customer monitoring station.
This function is managed by TeleNETGuard, software installed on a PC provided with a static IP address which is necessary for the inverter to send the data it has stored via GPRS. This software can also send out a call via the GPRS modem to force a transmission of the monitored device's data.

Note: The client is responsible for fitting a Data SIM of the telephone operator of his choice in the device – this is required for its correct operation.

RTG 100

MAIN FEATURES
- dual band GSM 850/900/1800/1900 MHz
- multi-slot class 12,CS-1, CS-2, CS-3, CS-4
- transmission higher than 56.3Kb/s

AROS Solar Management

Through solar management solutions, Aros guarantees its clients the most complete and advanced monitoring system available today.

At the heart of the system is the WEB'log device enabling the centralization of information produced by:

- the photovoltaic generator
- the inverter
- the temperature and irradiance sensors, the anemometer
- the i'Checker sensors.

WEB'log sends stored data via an internal modem that is either analog or ISDN, GPRS, ADSL modem or ethernet to the control server interfaced with a meteorological satellite system that analyzes the production data and highlights any problems at plant level. Sending data to the server can be programmed by the user in an automatic manner or can be remotely "forced" at any time of the day. In the event of faults the WEB'log picks up alarm signals connected to clean contacts and immediately sends alarm signals via fax, mail or SMS.

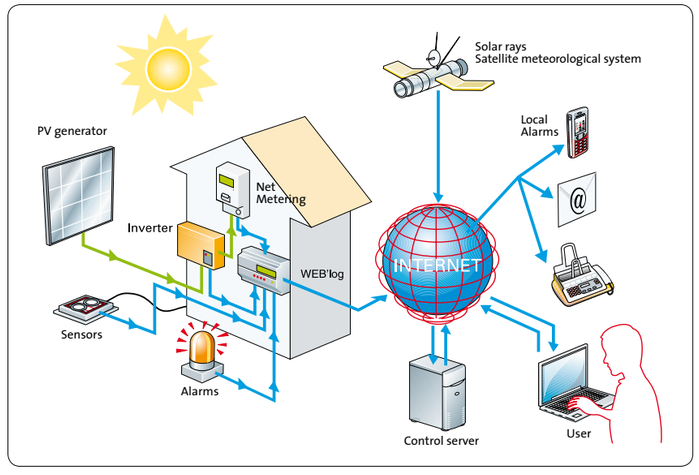
Solar Management enables you to monitor the production data of several systems simply and quickly from a remote location, comparing the production values with those of the local satellite weather forecasting system and revealing any system engineering problems. In addition, complete management of statistics, with large volumes of energy production data and graphs, electrical parameters, system efficiency and income, is guaranteed for 20 years.

MAIN SYSTEM FEATURES:

- complete alarm criteria management;
- in-depth analysis of system performance and energy production;
- graphs on all parameters of the PV field and inverters;
- possibility of making reports on all the information stored;
- history file of over 20 years.

The portal is accessed directly from the www.aros.it/sirio site, by entering your username and password.

The screens that follow are just a taste of the potential of this tool, which is capable of handling several systems under a single access profile, drawing up in-depth reports on each parameter concerned and setting all fault and/or alarm conditions to suit your needs.



AROS Solar Management

WEB'log LIGHT + Solar management control center

PRODUCT CODE

WEB'log LIGHT + Analogic	**XPV1RD01A**
WEB'log LIGHT + Ethernet	**XPV1RD02A**
WEB'log LIGHT + DSL	**XPV1RD03A**

MAIN FEATURES

- "Ready to Go" – simply plug in and it will automatically dial-in and start operation
- Automatic transfer of recorded data to the portal
- Integrated telephone, DSL or Ethernet modem
- Two measurement inputs (for example, the energy meter, status information, analog or temperature sensors)
- Data management per single device for up to a maximum of 20kWp
- Communication via RS485 for up to 5 inverters
- Signal LEDs

WEB'log PRO Solar management control center

PRODUCT CODE

WEB'log PRO Analogic	**XPV1RD08A**
WEB'log PRO Ethernet	**XPV1RD11A**
WEB'log PRO DSL	**XPV1RD12A**
WEB'log PRO GSM	**XPV1RD10A**
WEB'log PRO ISDN	**XPV1RD09A**

MAIN FEATURES

- Integrated power supply
- Integrated modem (see available versions)
- 4 analog inputs (10V, 20mA)
- 4 digital inputs (counters, measurements, etc.)
- RS485 bus interface for up to 30 inverters and Ethernet interface internal 32Mb memory
- LCD display
- Output for large display or local alarm

RS485 Repeater

PRODUCT CODE **XPV3R004A**

The signal repeater for RS485 is indispensable for plants containing more than 20 inverters.

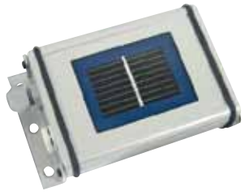
i'Checker Current monitor

PRODUCT CODE	
i'Checker 14A	**XPV3R001A**
i'Checker 35A	**XPV3R002A**
i'Checker 70A	**XPV3R003A**

MAIN FEATURES
- Ideal for measuring direct and alternating currents
- Non-contact current measurement
- Up to 100 i'Checkers can be installed per WEB'log
- Data is transferred by protocol
- Integrated audible and visual indicators
- Standard cable connections
- Output for local alarms
- DIN rail mounting

Irradiance and temperature sensor

PRODUCT CODE		
Si-12TC	**Irradiance sensor**	**XPV3RS01A**
Si12TC-T	**Irradiance and temperature sensor**	**XPV3RS02A**



MAIN FEATURES
- Temperature-compensated solar irradiance measurement
- Measurement range up to 1200W/ m2
- Module temperature measurement
- Ease of installation
- Supplied with 3 meter-cable (UV resistant)

Anemometer

PRODUCT CODE **XPV3RS05A**

The anemometer connected to the WEB'log control center enables detection of wind velocity for a complete analysis of environmental data.

MAIN FEATURES
- Power supply: 13 – 30 VDC
- Heating supply: 24 V AC/DC
- Heating: 20 W
- Output: 0 –10V
- Range of detection: 0.5 – 50 m/s
- Tolerance: +/- 3%
- Length of supplied cable: 12 meters

PT100 temperature sensor

PRODUCT CODE **XPV3RS03A**

Suitable for detecting the temperature of PV modules. Can be directly connected to the WEB'log control center through the PT100 signal convertor.

MAIN FEATURES
- Range of use: -50.. +50 0 C
- Output: PT 100
- Length of supplied cable: 2 meters

PT100 signal convertor

PRODUCT CODE **XPV3R006A**

Indispensable device for transmitting signals of the XPV3RS06A sensor.

MAIN FEATURES
- Power supply: 230VAC
- Input signal: PT 100 (3 wire)
- Output: 0-10 V

PT1000 temperature sensor

PRODUCT CODE **XPV3RS04A**

Suitable for measuring the ambient temperature. Can be directly connected to the WEB'log control center. Version equipped with integrated signal convertor and with IP65 protection.

MAIN FEATURES
- Power supply: 15—24 VDC
- Power consumption: 12 mA @ 24 V
- Tolerance: ± 1%
- Output: 0 –10V
- Temperature range: -50°C...+ 50°C

Sirio Inverters, Communication and Monitoring Systems

In the current global economic situation, where energy costs have risen significantly due to the ever-increasing price of fossil fuels, renewable energy offers an obvious alternative for those countries whose dependence on energy is vital for the development of the economy.
Photovoltaic power stations play an essential role in this scenario: however, these installations, whether they are large photovoltaic farms or individual private plants, must work constantly at their maximum efficiency if they are to guarantee the profitability estimated in their investment plans. It is no mere coincidence that the CEI 82-25 Guide recommends the "constant monitoring" of the system in order to identify and immediately eliminate any faults or failures that may affect the efficiency of the plant.

AROS offers a number of solutions for photovoltaic plant monitoring which can be implemented at various levels in order to have an efficient control system according to customer requirements.

LOCAL MONITORING (POINT – POINT)

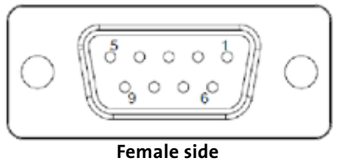
LOCAL MONITORING SYSTEM

- **Interface: RS232**
  Data acquisition: PC
  Software: Sun Vision
- **Interface: RS485**
  Data acquisition: PC
  Software: Sun Vision
- **Interface: NetMan Plus FV**
  Data acquisition: NetMan Plus FV
  Data visualisation: PC
  Software: Sun Vision
- **Interface: RS485**
  Data acquisition: PC
  Software: Sun Vision

INVERTER - PC Connection with SUN VISION monitoring and management software installed

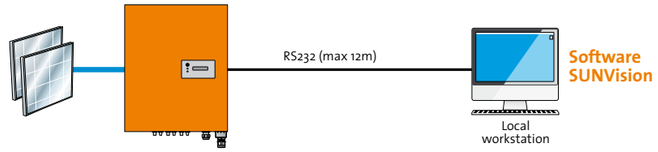
Single connection < 12m from the PC

For a single connection, with just one inverter located at a distance of less than 12 metres from the PC, connection must be made via the RS232 interface supplied as a standard accessory with the whole range of inverters. In this way users can connect a PC and use SUN VISION software to monitor the inverter.
Data storage and event history logs are performed directly by the Personal Computer connected to the system.



Female side

Diagram of point-point connection with RS232



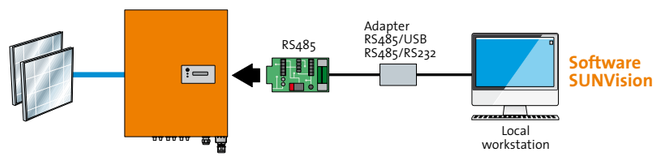
THE FOLLOWING ACCESSORIES ARE NEEDED FOR THIS SOLUTION:

- RS232 serial cable;
- Personal Computer with SUN VISION software installed (downloadable from the "download" section of the website www.aros.it/sirio).

Single connection > 12m from the PC

For a single connection, with just one inverter located at a distance of more than 12 metres from the PC, a 485 BUS must be constructed by installing the RS485 card in the appropriate inverter slot; this will create a BUS connecting one or more inverters, and all the parameters can be displayed via connection to a PC equipped with SUN VISION software.
Data storage and event history logs are performed directly by the Personal Computer connected to the system.

Diagram of point-point connection with RS485



An RS485/USB or RS485/RS232 converter, NOT provided by AROS, (such as the "Distrelec" model, item 688257, see *www.distrelec.it*) is required to complete the connection to the relevant PC.

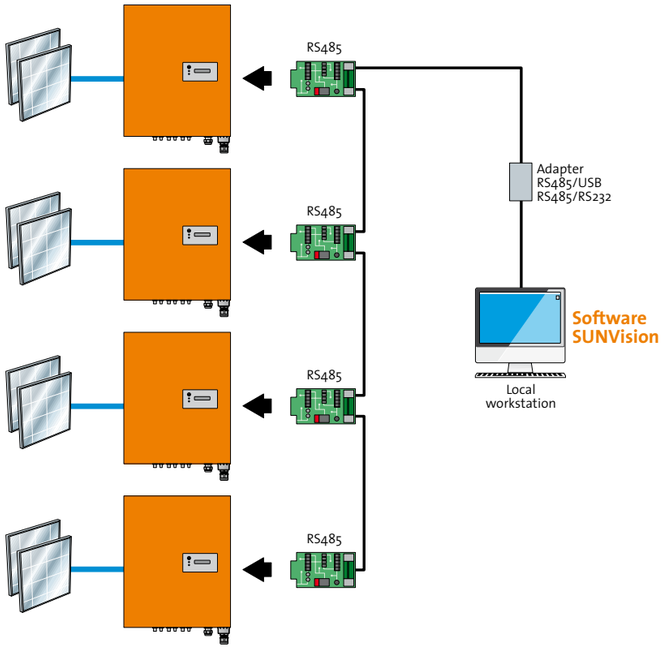
THE FOLLOWING ACCESSORIES ARE NEEDED FOR THIS SOLUTION:

- RS485 card (codes: for transformerless inverters, XPV2RBC1A; for inverters with transformer, XPV2RBC2A);
- 485 BUS serial cable;
- Personal Computer with SUN VISION software installed (downloadable from the "download" section of the website www.aros.it/sirio).

Multi inverter connection up to 127 inverters

For a multi inverter connection (up to 127 inverters) using an RS485 interface, a 485 BUS must be constructed, regardless of the distance from the PC; installing the RS485 card in the appropriate inverter slot will create a BUS connecting one or more inverters, and all the parameters can be displayed via connection to a PC equipped with SUN VISION software.
Data storage and event history logs are performed directly by the Personal Computer connected to the system.

Diagram of MULTINVERTER point-point connection with RS485



THE FOLLOWING ACCESSORIES ARE NEEDED FOR THIS SOLUTION:

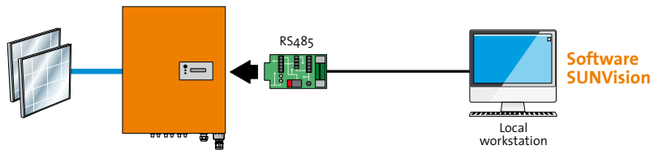
- RS485 card for each inverter (codes: for transformerless inverters, XPV2RBC1A; for inverters with transformers, XPV2RBC2A);
- 485 BUS serial cable;
- Personal Computer with SUN VISION software installed (downloadable from the "download" section of the website www.aros.it/sirio).

An RS485/USB or RS485/RS232 converter, NOT provided by AROS, (such as the "Distrelec" model, item 688257, see *www.distrelec.it*) is required to complete the connection to the relevant PC.

Single or multi inverter connection

For a single or multi inverter connection, a NetMan Plus PV interface can also be used, regardless of the distance from the PC; this expansion card is inserted in the inverter slot as shown in the figure below and will record the inverter measurements and events in the log file.
This uses the capability of the NetMan Plus PV device to store the data relating to events and make them available in a "log" file, which can be downloaded directly from the SUN VISION software (version 1.7) and with which the information can be processed in the form of graphs.
An UPDATE of the data files can be carried out via the Log & Tools menu (password required = password).
At this point the parameters can be displayed in the form of graphs, or exported for reading in a text file or Excel spreadsheet (for more information please refer to the SUN VISION manual).
The interval of time between one log and the next (Log frequency) can be configured by the user in the NetMan Plus PV card. The data are saved in a circular list procedure whereby the most recent data are saved by overwriting the older data; data relating to up to 1,024 different instants can be logged.
With this local monitoring solution, it is no longer necessary for the display computer to be kept in constant operation in order to have the data log file.

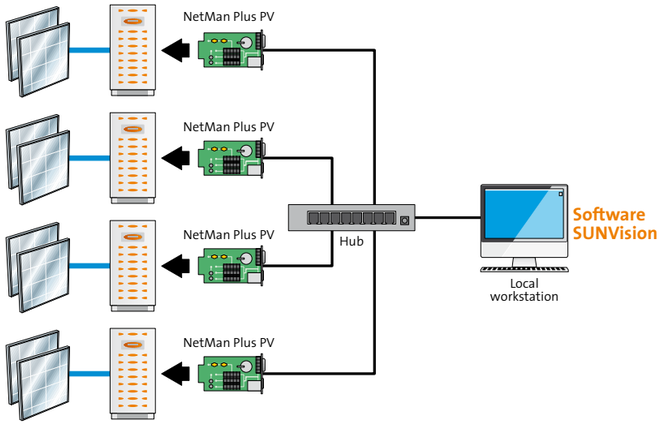
Diagram of SINGLE INVERTER point-point connection with NetMan Plus PV



THE FOLLOWING ACCESSORIES ARE NEEDED FOR THIS SOLUTION:

- NetMan card (codes: for transformerless inverters, XPV2RSA2A; for inverters with transformers, XPV2RSA1A);
- Ethernet or crossover cable: this is a kind of network cable used for the direct connection of the PC and other devices equipped with a network card without the aid of a network switch, hub or router;
- Personal Computer with SUN VISION software installed (downloadable from the "download" section of the website www.aros.it/sirio).

Diagram of MULTINVERTER point-point connection with NetMan Plus PV



THE FOLLOWING ACCESSORIES ARE NEEDED FOR THIS SOLUTION:

- NetMan card (codes: for transformerless inverters, XPV2RSA2A; for inverters with transformers, XPV2RSA1A);
- network cable to connect each inverter to a hub or network switch;
- Personal Computer with SUN VISION software installed (downloadable from the "download" section of the website www.aros.it/sirio).

SUN VISION LOCAL MONITORING SOFTWARE

SUN VISION, a utility program for the configuration and monitoring of solar inverters, is the monitoring interface software for all connections. SUN VISION can provide a wealth of information, such as inverter status and the power fed into the grid, as well as allowing some machine parameters to be configured.
The software ensures the efficient and intuitive management of the photovoltaic plant (up to 127 inverters), displaying all the electrical parameters subdivided into different access menus, the most important being:
- graphic monitoring of inverter status in instantaneous operating conditions;
- detailed display with all values;
- centralized control of the PV inverters connected via serial port (RS232 or RS485), or via network;
- internal graphic data log, with two levels of detail;
- alarm notification via e-mail and SMS;
- http functionality for remote control.

View of the main SUN VISION window

System capacity subdivided into the various menus

"General" tab

Each square, except for the last square in the bottom right-hand corner, represents a photovoltaic inverter connected to the BUS and contains information on the associated inverter. This information includes the MAT code, the nominal power and the fraction of nominal power, expressed as a percentage, that the inverter is feeding into the grid, as shown in Figure 1.

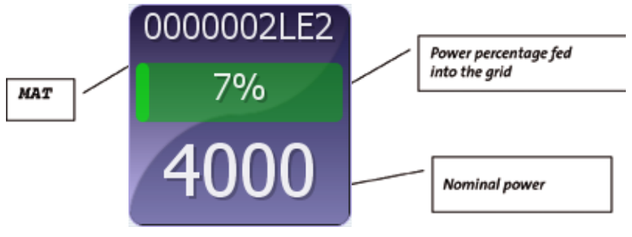


Figure 1: Detail of general tab

The sum of the nominal powers of all inverters detected is displayed in the last square in the bottom right-hand corner, as shown in Figure 2.

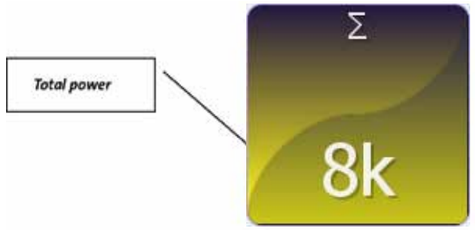


Figure 2: General tab - sum

"Details" tab

The Details tab (Figure 3) has the same structure as the "General" tab, except that each square shows the instantaneous output parameters and the internal temperature of each PV inverter.

Figure 3: Details tab

The following information is provided:
- Vac = phase-neutral voltage (L1-N for a three-phase inverter) of the AC electricity grid;
- Iac = inverter AC output current (from L1 for a three-phase inverter);
- Temp = inverter temperature;
- Fac = frequency of the grid voltage;
- Pac = power fed into the grid by the inverter;
- Zac = grid impedance (only for versions that support this feature).

Figure 4: Detail of the "Details" tab

The bottom right-hand square shown in Figure 3 displays the sum of the nominal powers and the powers fed into the grid shown in the squares of Figure 4 for the inverters connected to the BUS at that time, as shown in Figure 5.

Figure 5: Details sum square

"Sun" tab

The "Sun" tab (Figure 6) provides an immediate view of all the parameters of the photovoltaic power plant.

Figure 6: Sun tab

The "Sun" tab is divided into two parts, as can be seen in Figure 6. The instantaneous electrical input parameters for each tracker (PV generator voltage, input current for the models that support this feature) and output parameters for each phase (grid voltage, current and power fed into the grid) are shown on the left-hand side, while the right-hand side displays the information identifying the inverter, some instantaneous parameters and the cumulative parameters, such as the counters measuring the amount of energy produced and the total hours of operation, in graphic/digital format. These cumulative parameters are used to calculate the gain and the equivalent mass of CO_2, expressed in kg, that has not been emitted into the atmosphere by using solar energy rather than fossil fuels.

The "Sun" tab displays the following parameters, shown in Figure 7:

1) MAT code;
2) inverter model;
3) nominal power;
4) FW version;
5) input voltage of the first inverter MPPT tracker;
6) inverter temperature;
7) power supplied by the inverter;
8) presence of solar radiation;
9) inverter status;
10) grid status;
11) kgCO_2 saved;
12) kWh produced;
13) hours of operation;
14) gain;
15) percentage of instantaneous power fed into the grid.

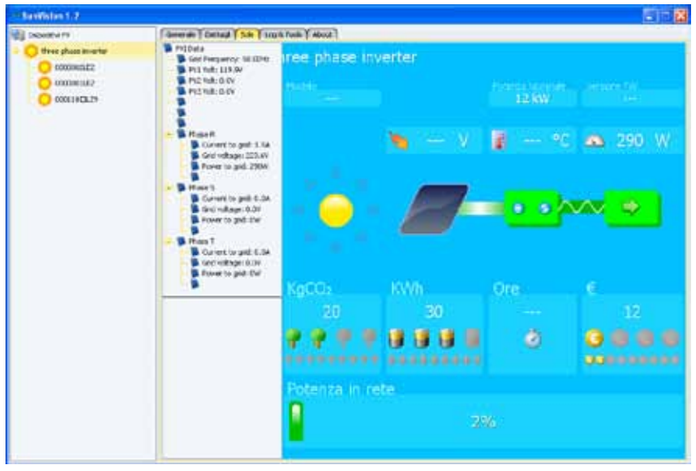


Figure 7: "Sun" tab in detail

"Log & Tools" tab

The "Log & Tools" tab, shown in Figure 8, displays, in the form of graphs, the data read by the inverter selected on the left and stored in the internal program data log; configuration operations can also be carried out for the reception and processing of the data.
The "Log & Tools" tab is divided into four submenus:
- Log;
- Load files;
- Load parameters;
- Tools.

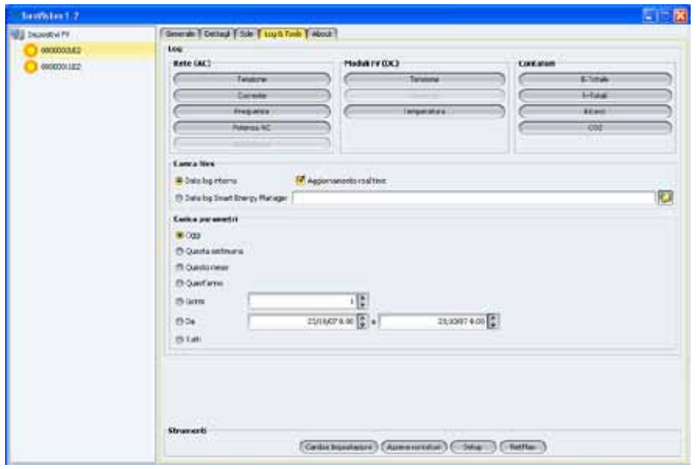


Figure 8: "Log & Tools" tab

"Log" menu

The "Log" menu (Figure 9) provides a graphic display of the parameters for a specific photovoltaic inverter, divided into three subgroups:

1) Grid (AC): corresponds to the inverter output and therefore provides the parameters associated with the alternating current grid. Press the relevant button shown in Figure 9 to display the following graphs:
- voltage;
- current;
- frequency;
- AC power;
- impedance (only for versions that support this feature).

The graphs show the state of the above parameters in relation to the time expressed in hours.

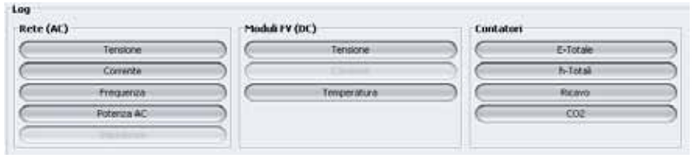
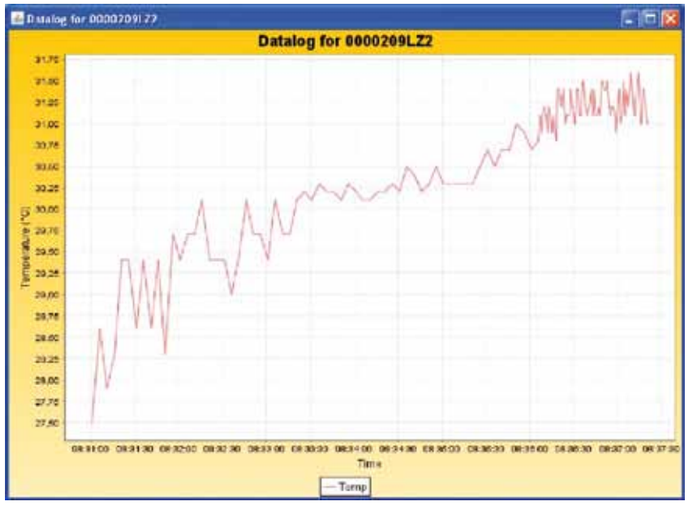


Figure 9: "Log" menu

Example: Press the "AC Power" button to display the graph of the power fed into the grid over time

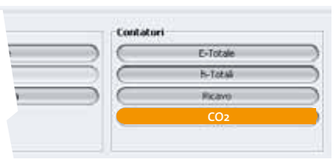
2) PV modules (DC): corresponds to the output of the photovoltaic panels and, therefore, to the inverter input. The following graphs can be displayed by pressing the relevant button shown in Figure 9:
- input voltage;
- input current (for the PV inverter models that provide this measurement).

3) Inverter: corresponds to internal inverter readings. The following graph can be displayed by pressing the relevant button shown in Figure 9:
- inverter temperature.



Example: Press the "Temperatura" button to display the graph of the inverter temperature over time.

4) Counters: SunVision counters can provide a graphic display of the following values:
- Total E;
- Total h;
- Revenew;
- CO_2.



Example: Press the "CO_2", button to display the graph of the kg of CO_2 saved up to that time.

The daily/monthly energy graph provides a graphic representation of the energy produced in the previous days or months.

For more information and specific details, reference should be made to the SUN VISION manual, which can be downloaded from the site: www.aros.it/sirio

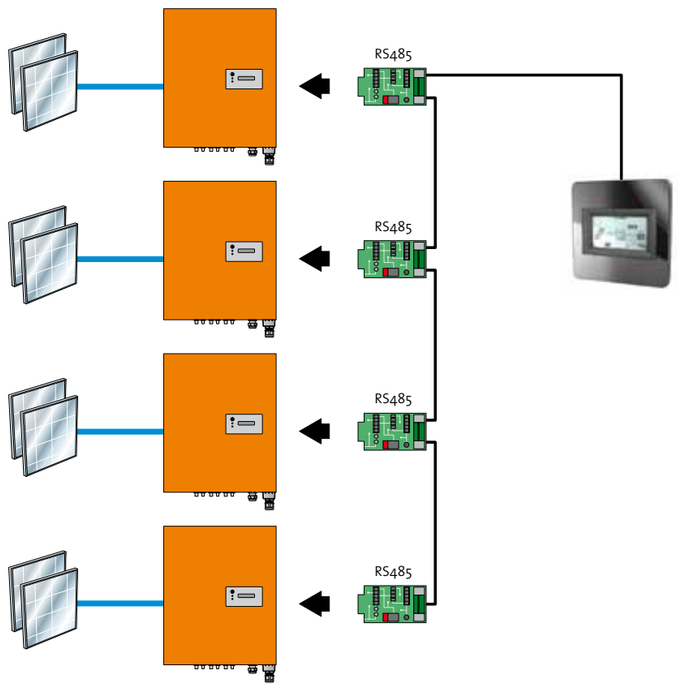
Connection with SOLAR VIEW data logger (up to a maximum of 5 inverters)

This data acquisition device can provide all the information on the main electrical parameters of the photovoltaic generator, by means of the RS485 connection. A 485 BUS must be constructed between the inverters by installing an RS485 card in the relevant slot of each device (up to a maximum of 5 inverters).
A simple touch of the touch screen display is sufficient to show the following values:
- DC side voltage;
- power generated by the plant;
- AC side voltage;
- AC side current;
- energy produced;
- CO_2 value avoided;
- remuneration in euros for each kWh produced.

All the parameters are also displayed in the form of graphs.

The data logger also logs a series of events relating to the status of the devices and of the plant in general, as well as operating faults (grid power outage, exceeding the overvoltage thresholds, electric grid parameters that do not comply with regulations).

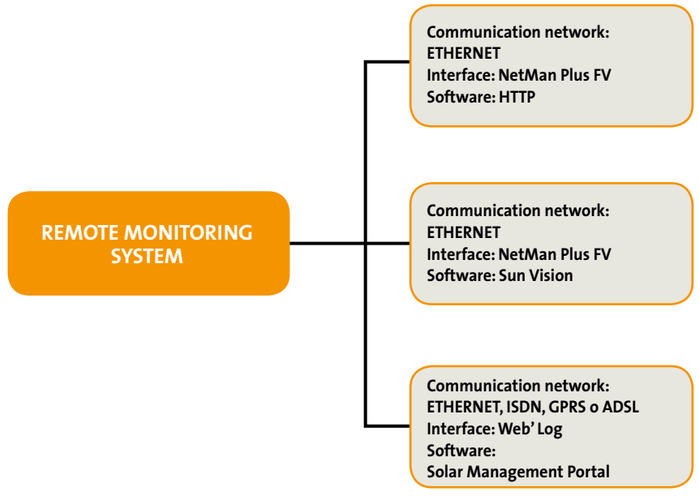
Lastly, the data logger stores the history log of the last 30 days.



THE FOLLOWING ACCESSORIES ARE NEEDED FOR THIS SOLUTION:

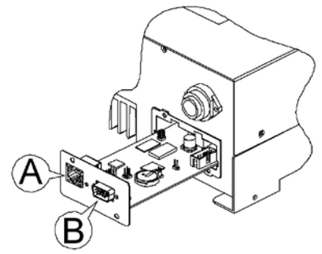
- RS485 card (codes: for transformerless inverters, XPV2RBC1A; for inverters with transformers, XPV2RBC2A);
- 485 BUS serial cable;
- data logger, Solar View model.

REMOTE MONITORING



Connection from INVERTER to PC installed on a LAN network with NetMan Plus PV

Connection via the NetMan Plus PV network card, a device which can be used to manage the inverter via the LAN (Local Area Network); this accessory supports all the main network protocols (TCP/IP, HTTP, etc.) and is compatible with Ethernet 10/100Mbps IPv4/6 networks, so all inverters can be easily integrated into medium and large sized networks.
The device also records the inverter measurements and events in log files.
NetMan Plus PV is an expansion card which should be inserted in the inverter slot as shown in Figures 10 and 11.



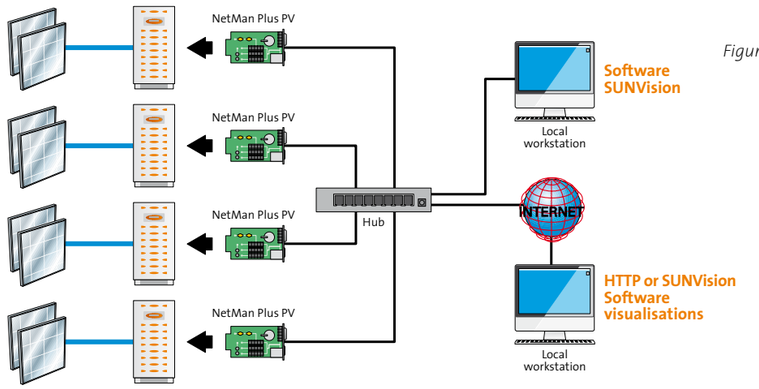


Figure 10: Monitoring LAN networks

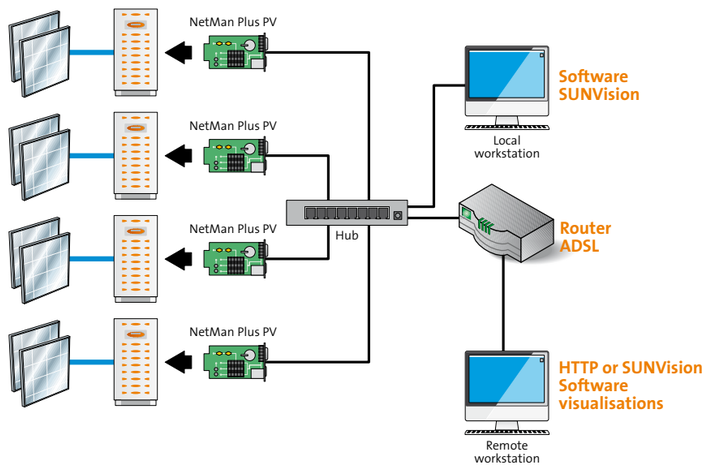


Figure 11: Monitoring ADSL networks

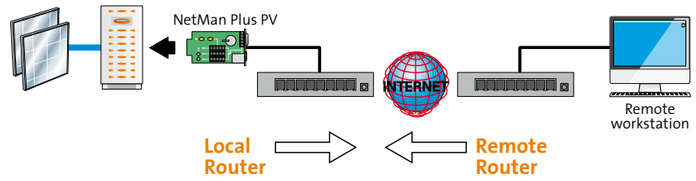
THE FOLLOWING ACCESSORIES ARE NEEDED FOR THIS SOLUTION:

- NetMan card for each inverter (codes: for transformerless inverters, XPV2RSA2A; for inverters with transformers, XPV2RSA1A);
- LAN line;
- Ethernet cable;
- HUB (see description above):
- Personal Computer with SUN VISION software installed (downloadable from the "download" section of the website www.aros.it/sirio).

N.B.
The HUB is a concentrator, a network device that acts as a switching node in a data communication network.
In the case of the widespread Ethernet networks, a hub is a device that forwards data coming from any of its ports onto all the other ports. For this reason it can also be defined as a "multiport repeater".
This device is NOT supplied by AROS; it can be purchased from any retailer dealing in data processing equipment.

Remote access
A VPN connection with the network where the photovoltaic plant is connected is required in order to display data from a remote location.
There are two possible ways to do this:
- by acquiring a STATIC IP address associated with the relevant router from the telephone network operator (at a cost of around 20 euros a year);
- by using DNS services to obtain a DYNAMIC IP domain. This service is used to create a dynamic DNS that associates the IP, which changes at each new connection, with the domain name.
As far as Italy is concerned, the only free dynamic DNS service is provided by Dyndns.it.
It should be noted that the services are independent of the operating system used.
For example: *www.impianto1.noip.com*

Monitoring with SUN VISION with PC in a remote location



THE FOLLOWING ACCESSORIES ARE NEEDED FOR THIS SOLUTION:

- NetMan card for each inverter (codes: for transformerless inverters, XPV2RSA2A; for inverters with transformers, XPV2RSA1A);
- network cable and router with enough inputs to connect all the inverters, or an additional hub or network switch;
- Personal Computer with SUN VISION software installed (downloadable from the "download" section of the website www.aros.it/sirio).

Remote monitoring software: HTTP display; NetMan Plus PV network agent capabilities

The capabilities of the NetMan Plus PV network card can be used for the remote control of the system; besides interfacing with the system, NetMan Plus PV also allows data logging, in particular:

HTTP
The inverter status can be monitored via a WEB browser without having to install any additional software, by means of the HTTP protocol (Hyper Text Transfer Protocol). All the most popular WEB browsers (Internet Explorer, Safari, Firefox, Netscape Navigator, Konqueror, Opera) are supported.
Enter the hostname or the NetMan Plus PV IP address on your WEB browser to display a screen similar to the one shown in Figure 12, containing the main operating data of the inverter.

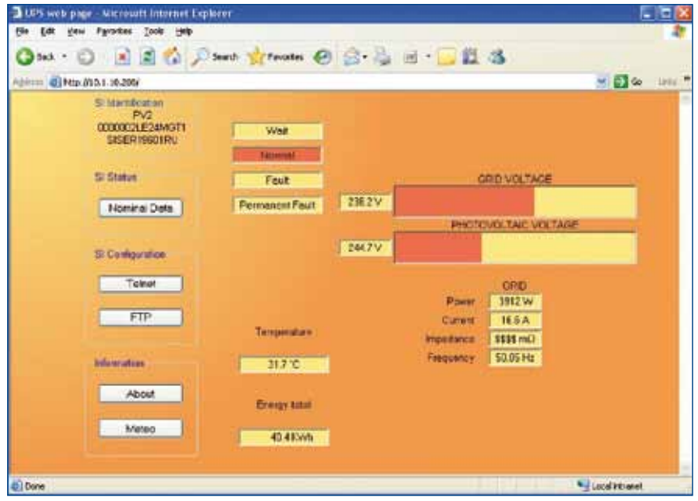


Figure 12: Example of a display via HTTP

The following buttons are shown on the left-hand side of the page:
- Nominal Data: opens a page that displays the nominal values of the inverter, the list of active alarms and the counters (see Figure 13);
- Telnet: opens a Telnet session (see section on "**Telnet**");
- FTP: opens an FTP session (see section on "**FTP**");
- About: opens a page with information on copyright;
- Weather: opens a weather forecast web page (see section on "**Feeding config**").

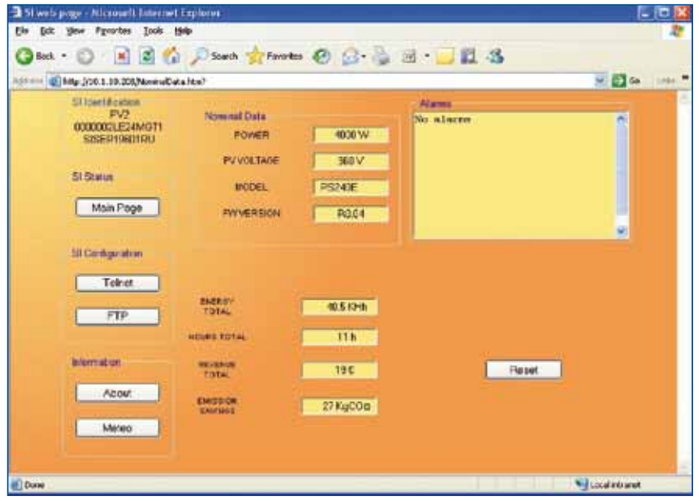


Figure 13:
Example of the "Nominal Data" window

UDP
UDP (User Datagram Protocol) is a low-level network protocol that guarantees speed in data exchanges and low network congestion. It is the protocol used by SUN VISION software for the monitoring and control of the inverter.
The UDP connection uses the UDP 33000 port by default, but can be configured on other ports if necessary.

FTP
FTP (File Transfer Protocol) is a network protocol used to exchange files. NetMan plus uses this protocol for two purposes:

- to download files from the inverter measurements and events log file (Datalog and Eventlog);
- to download and upload configuration files.

Both cases require an FTP client configured with the following parameters:

- Host: hostname or NetMan Plus PV IP address;
- User: "root";
- Password: current password (default configuration: "password").

The connection can also be established by using a WEB browser (all the most popular WEB browsers are supported), by entering the following address: ftp://root@<indirizzo.NetMan plus>, where <indirizzo.NetMan plus> is replaced with the actual address of the device. In this case a screen similar to the one shown in Figure 14 will be displayed.

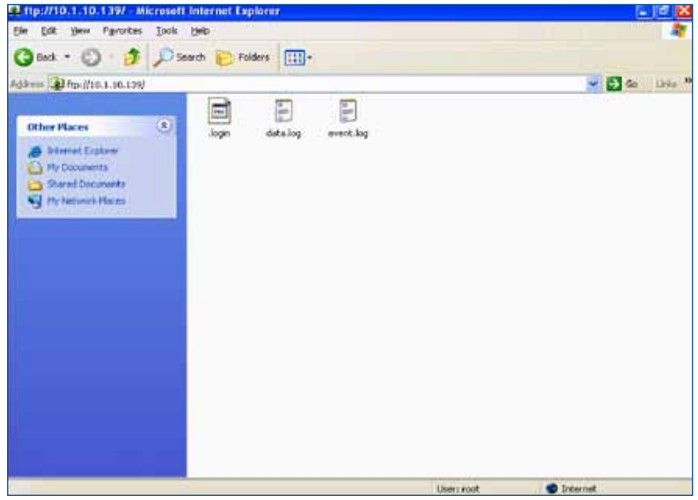


Figure 14:
Example of FTP connection

Emails
NetMan Plus PV can send notification e-mails when one or more alarm conditions occur. The e-mails can be sent to up to three recipients and can be sent for three different levels of alarm.
SMTP (Simple Mail Transfer Protocol) is the protocol used to send the e-mails, which are sent to an SMTP server on port 25.

Reports
NetMan Plus PV can send periodic e-mails with an attachment containing the inverter measurements and events log file.
This service can be used to save the log files periodically.
The "Email" service has to be enabled in order to send reports; reports are sent to all the addresses configured for this service.

Eventlog
The Eventlog service is always active; it records all the significant inverter events in the "event.log" file. This file can be downloaded via FTP or sent via e-mail by using the "Email report" service. The data are saved in a circular list procedure whereby the most recent data are saved by overwriting the older data.

Datalog
The Datalog service records the most important inverter data in the "data.snv" file. This file can be downloaded via FTP or sent via e-mail, using the "Email report" service. The following data are monitored:

- Temp: inverter temperature;
- Iac1: line 1 current;
- Iac2: line 2 current;
- Iac3: line 3 current;
- Vac1: line 1 voltage;
- Vac2: line 2 voltage;
- Vac3: line 3 voltage;
- Fac: line frequency;
- Pac: output power;
- Zac: line impedance (only for models that support this feature);
- Etot: total energy produced;
- Htot: total hours of operation;
- Vpv1: MPPT1 input voltage;
- Vpv2: MPPT2 input voltage (if present);
- Vpv3: MPPT3 input voltage (if present);
- Ipv1: MPPT1 current in input;
- Ipv2: MPPT2 current in input;
- Ipv3: MPPT3 current in input.

SUN VISION remote monitoring software

SUN VISION is a utility program for the configuration and monitoring of solar inverters. SUN VISION can provide a wealth of information, such as inverter status and the power fed into the grid, as well as allowing some machine parameters to be configured.
The software ensures efficient and intuitive management of the photovoltaic plant (up to 127 inverters), displaying all the electrical parameters subdivided into different access menus, the most important being:
- graphic monitoring of inverter status in instantaneous operating conditions;
- detailed display with all measurements;
- centralized control of PV inverters connected via serial port (RS232 or RS485), or via network;
- internal graphic data log, with two levels of detail;
- alarm notifications via e-mail and SMS;
- http functionality for remote control.

For more details on the capabilities of the software please turn to page 101.

Different configurations are required according to the network connection:

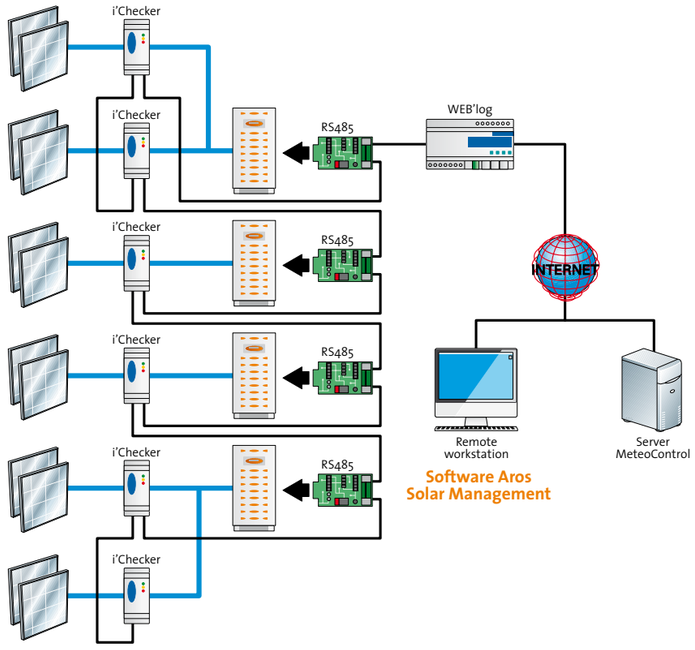
On the local network
In order to connect to SUN VISION from the same local network, it is sufficient to connect to the IP address of the computer running SUN VISION via a WEB browser. If the default port is changed, the port must be entered at the end of the IP address.

Via Internet:
- if SUN VISION is running on a PC connected to a local network.
The gateway, that is the device sharing the Internet connection (usually a router) must be configured to provide port-forwarding, so that the IP address of the PC running SUN VISION is associated in input with TCP ports 1098 and 1099 and with the default TCP port. It is recommended to use a static local IP address for this PC. Remote PCs must open the IP address of the gateway where the PC running SUN VISION is connected and the default TCP port. The gateway IP address may be replaced by a symbolic name if a dynamic DNS service is used or if an internet domain is owned.

- if the PC running SUN VISION is connected to the internet via a modem.
In this case TCP ports 1098, 1099 and the default TCP port must be opened in any firewall that may be installed on the PC. In this case too, the PC can be addressed directly through the public IP address or via a symbolic name if a dynamic DNS service is used or if an internet domain is owned.

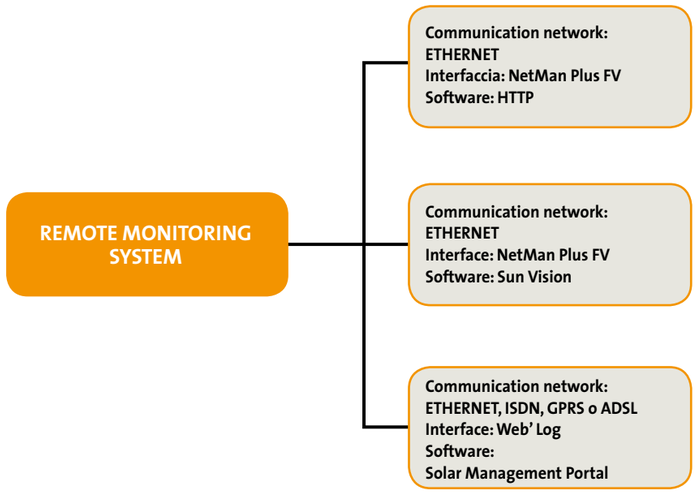
Aros Solar Management Portal

Connection via 485 BUS card
The RS485 card is an interface for communication with the inverters. It can be applied to all our photovoltaic inverter models and transmits data at a speed of 9,600 bps.
The RS485 card is compact and easy to install. The card's two RJ45 connectors (screw connectors) can be used to construct a serial communication BUS.



AROS Solar Management

MONITORING WITH STRING BOX

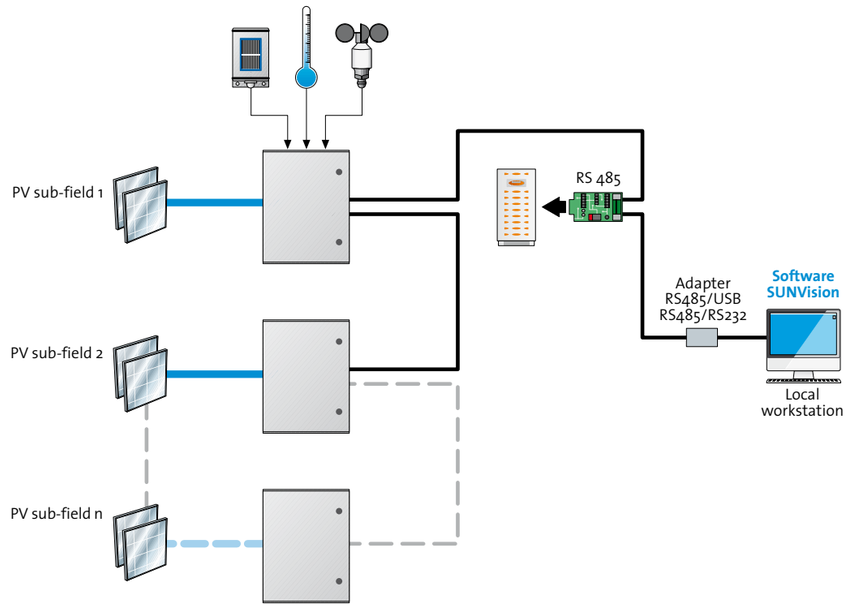


From the software point of view, the device is compatible with SUN VISION, which can display the status of the string current measurements and any alarms. It has 3 communication ports that are compatible with SUN VISION and ModBus.

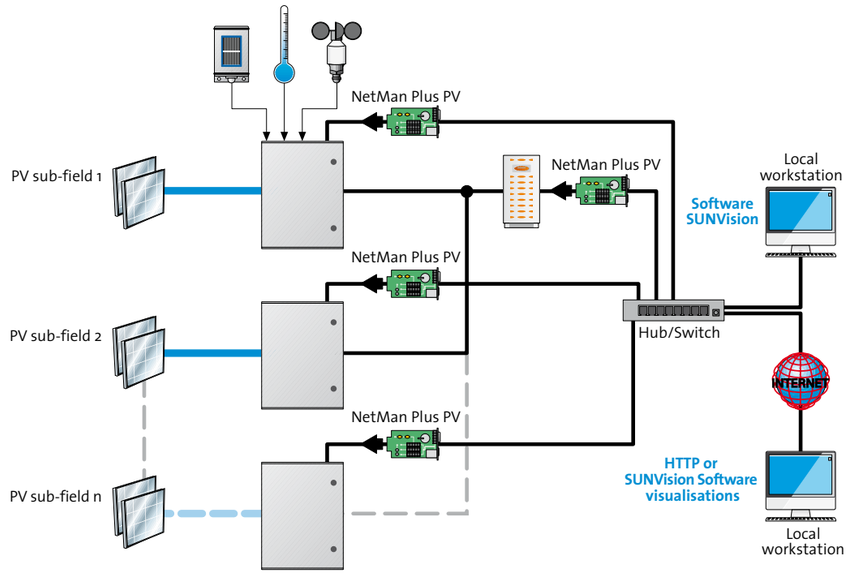
The following environment sensors, which have already been described on pages 96 and 97, can be connected to the device:

- environment temperature and photovoltaic modules (PT100);
- radiation;
- wind sensor (anemometer).

Local monitoring



Remote monitoring



Glossary

alternating current - Electric current in which the direction of flow is reversed at frequent intervals--usually 100 or 120 times per second (50 or 60 cycles per second or 50//60 Hz).

amorphous semiconductor - A non-crystalline semiconductor material. Easier and cheaper to make than crystalline, but less efficient and slowly degrades over time. Also called thin film.

ampere (A) or amp - The unit for the electric current; the flow of electrons. One amp is 1 coulomb passing in one second. One amp is produced by an electric force of 1 volt acting across a resistance of 1 ohm.

ampere-hour (AH) - Quantity of electricity or measure of charge. How many amps flow or can be provided over a one hour period. Most batteries are rated in AH.

array - Any number of photovoltaic modules connected together to provide a single electrical output. Arrays are often designed to produce significant amounts of electricity.

cell - The basic unit of a photovoltaic panel or battery

charge controller - An electronic device which regulates the voltage applied to the battery system from the PV array. Essential for ensuring that batteries obtain maximum state of charge and longest life.

combined collector - A photovoltaic device or module that provides useful heat energy in addition to electricity.

concentrator (module, array, or collector) An arrangement of photovoltaic cells that includes a lens to concentrate sunlight onto small-area cells. Concentrators can increase the power flux of sunlight hundreds of times.

conversion efficiency (cell or module) The ratio of the electric energy produced by a photovoltaic device (under one-sun conditions) to the energy from sunlight incident upon the cell.

current at maximum power (Imp) - The current at which maximum power is available from a module.

dc to dc converter - Electronic circuit to convert dc voltages (e.g., PV module voltage) into other levels (e.g., load voltage). Can be part of a maximum power point tracker (MPPT).

deep discharge - Discharging a battery to 20-percent or less of its full charge.

diffuse insolation--Sunlight received indirectly as a result of scattering due to clouds, fog, haze, dust, or other obstructions in the atmosphere. Opposite of direct insolation.

direct current (dc) - Electric current in which electrons flow in one direction only. Opposite of alternating current.

direct insolation - Sunlight falling directly upon a collector. Opposite of diffuse insolation.

discharge rate - The rate, usually expressed in amperes or time, at which electrical current is taken from the battery.

electric circuit - Path followed by electrons from a power source (generator or battery) through an external line (including devices that use the electricity) and returning through another line to the source.

electric current - A flow of electrons; electricity, amps.

electrical grid - An integrated system of electricity distribution, usually covering a large area. As in "off the grid".

grid-connected (PV system) - A PV system in which the PV array acts like a central generating plant, supplying power to the grid.

incident light - Light that shines onto the face of a solar cell or module.

inverters - Devices that convert dc electricity into ac electricity (single or multiphase), either for stand-alone systems (not connected to the grid) or for utility-interactive systems.

junction box - A PV generator junction box is an enclosure on the module where PV strings are electrically connected and where protection devices can be located, if necessary.

junction diode - A semiconductor device with a junction and a built-in potential that passes current better in one direction than the other. All solar cells are junction diodes.

kilowatt (kW) - 1000 watts.

kilowatt-hour (kWh) - One thousand watts acting over a period of 1 hour. The kWh is a unit of energy. 1 kWh=3600 kJ.

load - Anything in an electrical circuit that, when the circuit is turned on, draws power from that circuit.

maximum power point tracker (MPPT) - A power conditioning unit that automatically operates the PV-generator at its maximum power point under all conditions. An MPPT will typically increase power delivered to the system by 10% to 40%, depending on climate conditions and battery state of charge. You usually get more gain in winter and in colder weather due to the higher panel output. Most MPPT controllers are down converters - from a higher voltage to a lower one.

microgroove - A small groove scribed into the surface of a cell which is filled with metal for contacts.

module - A number of PV cells connected together, sealed with an encapsulant, and having a standard size and output power; the smallest building block of the power generating part of a PV array. Also called panel.

monolithic - Fabricated as a single structure.

multicrystalline - Material that is solidified at such as rate that many small crystals (crystallites) form. The atoms within a single crystallite are symmetrically arranged, whereas crystallites are jumbled together. These numerous grain boundaries reduce the device efficiency. A material composed of variously oriented, small individual crystals. (Sometimes referred to as polycrystalline or semicrystalline).

multijunction device - A photovoltaic device containing two or more cell junctions, each of which is optimized for a particular part of the solar spectrum, to achieve greater overall efficiency.

n-type semiconductor - A semiconductor produced by doping an intrinsic semiconductor with an electron-donor impurity (e.g., phosphorous in silicon).

ohm - The unit of resistance to the flow of an electric current.

peak load; peak demand--The maximum load, or usage, of electrical power occurring in a given period of time, typically a day.

peak watts (Wp) - See 'Photovoltaic peak watt.'

photon - A particle of light that acts as an individual unit of energy.

photovoltaic (PV) - Pertaining to the direct conversion of light into electricity.

photovoltaic (PV) array - An interconnected system of PV modules that function as a single electricity-producing unit. The modules are assembled as a discrete structure, with common support or mounting. In smaller systems, an array can consist of a single module.

photovoltaic (PV) cell - The smallest semiconductor element within a PV module to perform the immediate conversion of light into electrical energy (dc voltage and current).

photovoltaic (PV) conversion efficiency The ratio of the electric power produced by a photovoltaic device to the power of the sunlight incident on the device.

photovoltaic (PV) efficiency - The ratio of electric power produced by a cell at any instant to the power of the sunlight striking the cell. This is typically about 9% to 14% for commercially available cells.

photovoltaic (PV) generator - The total of all PV strings of a PV power supply system, which are electrically interconnected.

photovoltaic (PV) module - The smallest environmentally protected, essentially planar assembly of solar cells and ancillary parts, such as interconnections, terminals, [and protective devices such as diodes] intended to generate DC power under unconcentrated sunlight. The structural (load carrying) member of a module can either be the top layer (superstrate) or the back layer (substrate). [UL 1703]

photovoltaic (PV) panel - often used interchangeably with PV module (especially in one-module systems), but more accurately used to refer to a physically connected collection of modules (i.e., a laminate string of modules used to achieve a required voltage and current).

photovoltaic (PV) peak watt - Maximum "rated" output of a cell, module, or system. Typical rating conditions are 0.645 watts per square inch (1000 watts per square meter) of sunlight, 68 degrees F (20 degrees C) ambient air temperature and 6.2 x 10-3 mi/s (1 m/s) wind speed.

photovoltaic (PV) system - A complete set of components for converting sunlight into electricity by the photovoltaic process, including the array and balance of system components.

polycrystalline - See 'Multicrystalline.'

power conditioning equipment - Electrical equipment, or power electronics, used to convert power from a photovoltaic array into a form suitable for subsequent use. A collective term for inverter, converter, battery charge regulator, and blocking diode.

power factor - The ratio of the average power and the apparent volt-amperes. Affected by the inductance and capacitance of the load. A pure resistance, such as an electric heater would have a power factor of 1.00.

pulse-width-modulated (PWM) - A function of many of the newer charge controllers and battery chargers which instead of applying a steady DC voltage to the battery, sends out short pulses. The width of the pulses varies with the battery state of charge.

PV - Abbreviation for photovoltaic(s).

pyronometer - An instrument for measuring total hemispherical solar irradiance on a flat surface, or "global" irradiance; thermopile sensors have been generally identified as pyranometers,however, silicon sensors are also referred to as pyranometers.

rectifier - A device that converts ac to dc, as in a battery charger or converter. See inverter and diode.

semiconductor - Any material that has a limited capacity for conducting an electric current. Generally falls between a metal and an insulator in conductivity. Certain semiconductors, including silicon, gallium arsenide, copper indium diselenide, and cadmium telluride, are uniquely suited to the photovoltaic conversion process.

semicrystalline - See 'Multicrystalline.'

short-circuit current (Isc) - The current flowing freely from a photovoltaic cell through an external circuit that has no load or resistance; the maximum current possible.

silicon (Si) - A chemical element, atomic number 14, semi-metallic in nature, dark gray, an excellent semiconductor material. A common constituent of sand and quartz (as the oxide). Crystallizes in face-centered cubic lattice like a diamond. The most common semiconductor material used in making photovoltaic devices.

single-crystal material - A material that is composed of a single crystal or a few large crystals.

solar cell - See 'Photovoltaic cell.'

solar energy - Energy from the sun. The heat that builds up in your car when it is parked in the sun is an example of solar energy.

stand-alone (PV system) - An autonomous or hybrid photovoltaic system not connected to a grid. May or may not have storage, but most stand-alone systems require batteries or some other form of storage.

substrate - The physical material upon which a photovoltaic cell is made.

thin film - A layer of semiconductor material, such as copper indium diselenide, cadmium telluride, gallium arsenide, or amorphous silicon, a few microns or less in thickness, used to make photovoltaic cells. Commonly called amorphous.

transformer - Steps AC voltage up or down, depending on the application.

VAC - Volts ac

VDC - Volts dc

volt (V) - A unit of measure of the force, or 'push,' given the electrons in an electric circuit. One volt produces one ampere of current when acting a resistance of one ohm.

wafer - A thin sheet of semiconductor material made by mechanically sawing it from a single-crystal or multicrystal ingot or casting.

watt (W) - The unit of electric power, or amount of work (J), done in a unit of time. One ampere of current flowing at a potential of one volt produces one watt of power.

watt-hour (Wh) - See 'Kilowatt-hour.'

waveform - The shape of the curve graphically representing the change in the ac signal voltage and current amplitude, with respect to time.

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