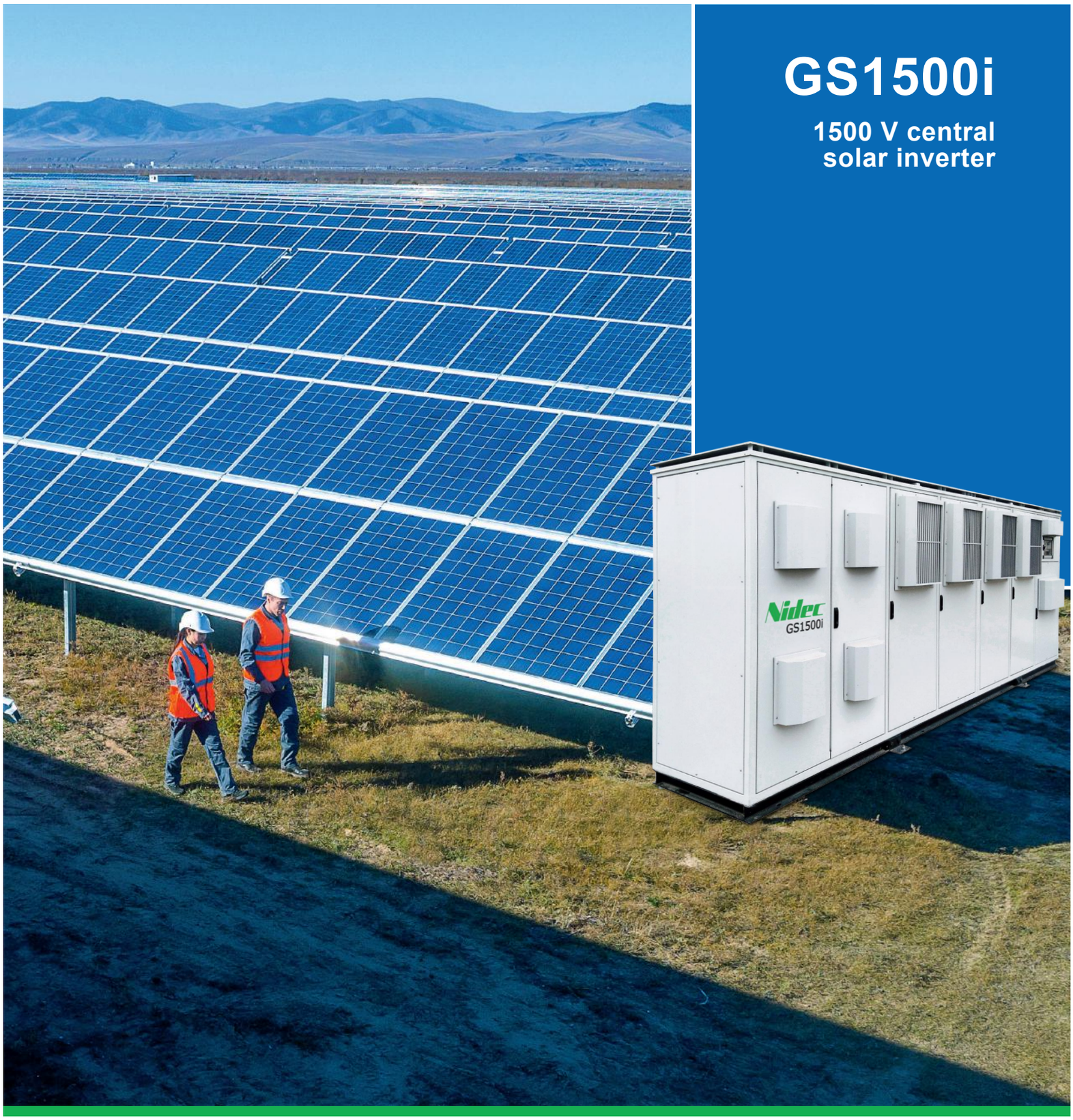
Nidec

All for dreams

GS1500i

1500 V central solar inverter



Introduction

High-performance central solar inverter for large photovoltaic power plants

Highlights

- 1500 VDC up to 10 MW_{AC}
- Modular configuration from 0.5 MW_{AC}
- Max efficiency: 99%
- Outdoor or indoor solution
- Air cooled or water cooled
- Modular power design with redundancy
- Integrated protected PV inputs with current monitoring
- Proactive grid support functions

The new GS1500i is ideal for system integrators and end users who require high-performance solar inverters for large photovoltaic plants and are interested in reducing installation time and the overall complexity of the plant to enhance power production and performance. The three-level inverter architecture provides high performance for the entire life cycle of the plant with very high levels of reliability. This is the result of Nidec Industrial Solutions' consolidated experience in the market of industrial frequency converters. In addition, our inverter includes all of the latest grid support and and monitoring features, including active power limitation, reactive power control, frequency ride-through (FRT), voltage ride-through, and Q-night function.

Tangible value you can count on

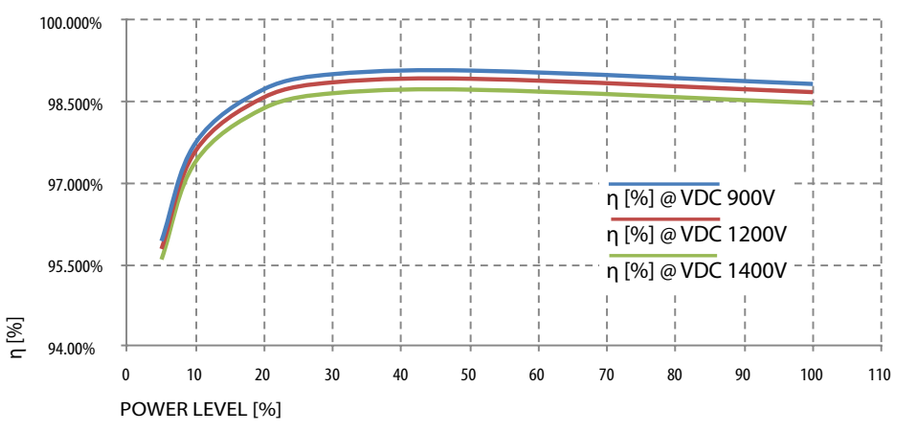
No hidden inefficiencies

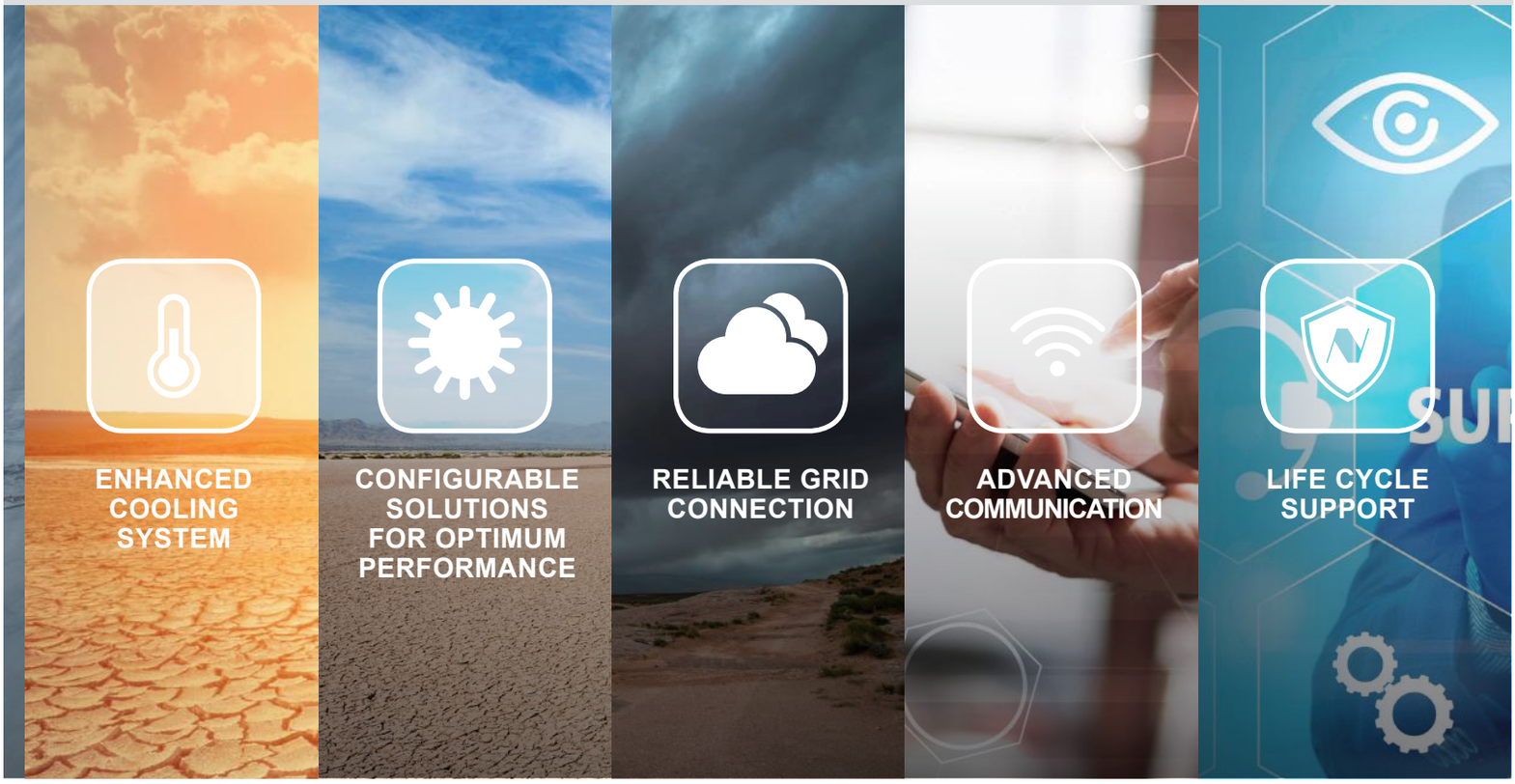
Multi-level inverter topology together with high quality power filters offers improved conversion efficiency with very low harmonics. Thanks to an innovative modular design and advanced air cooling system auxiliary power consumption is minimized. Our GS1500i inverter offers one of the highest efficiencies available on the market today.

MAX EFFICIENCY	99.0%
EU EFFICIENCY	98.8%
CEC EFFICIENCY	98.9%

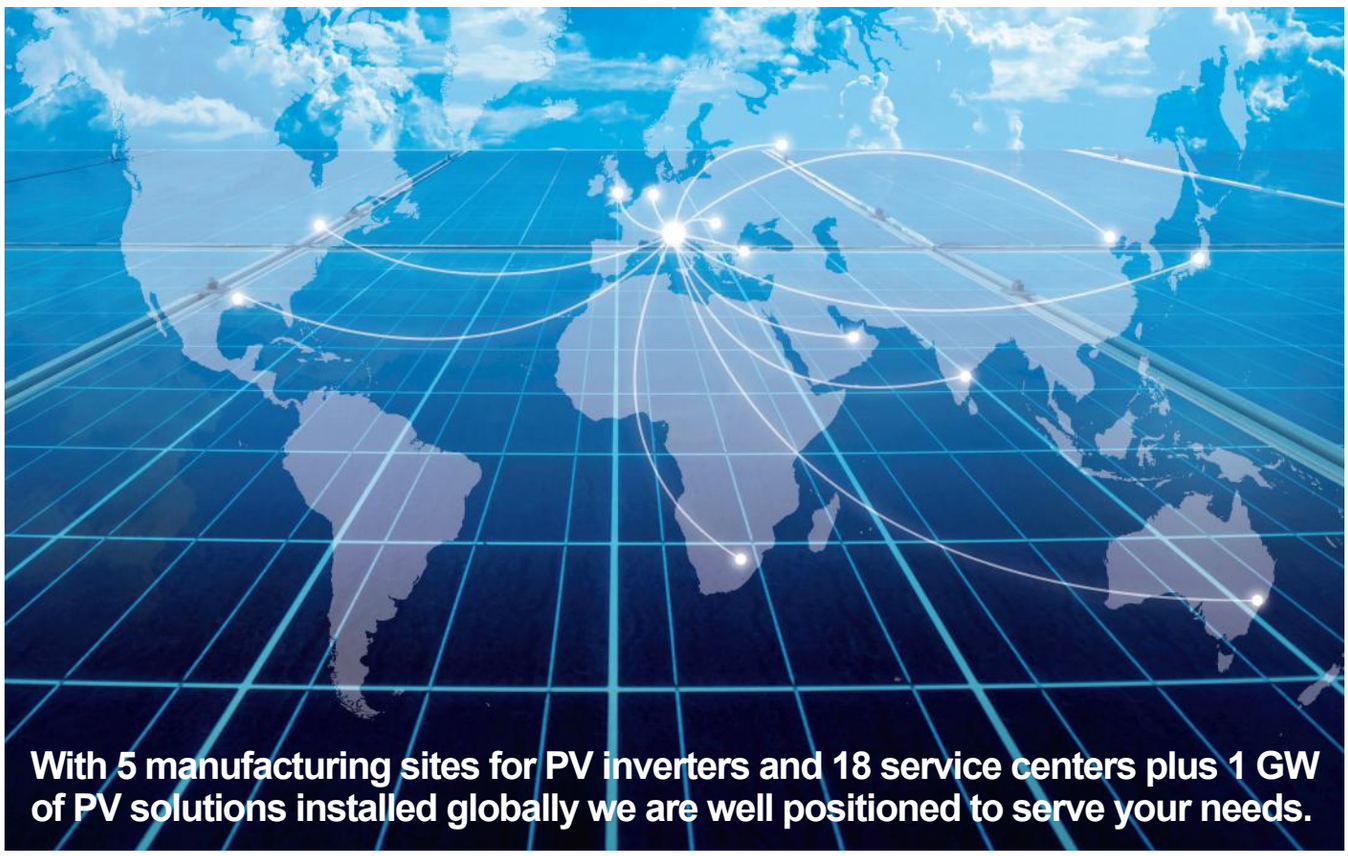
Efficiency vs Power Level Curves

(with auxilary power consumption)





Thanks to our 150 years of experience worldwide in inverter manufacturing for heavy industry, we deliver solutions that perform well in any environment and which meet country-specific standards and directives.



Robust inverter, built to endure

Outstanding performance, even in harsh conditions

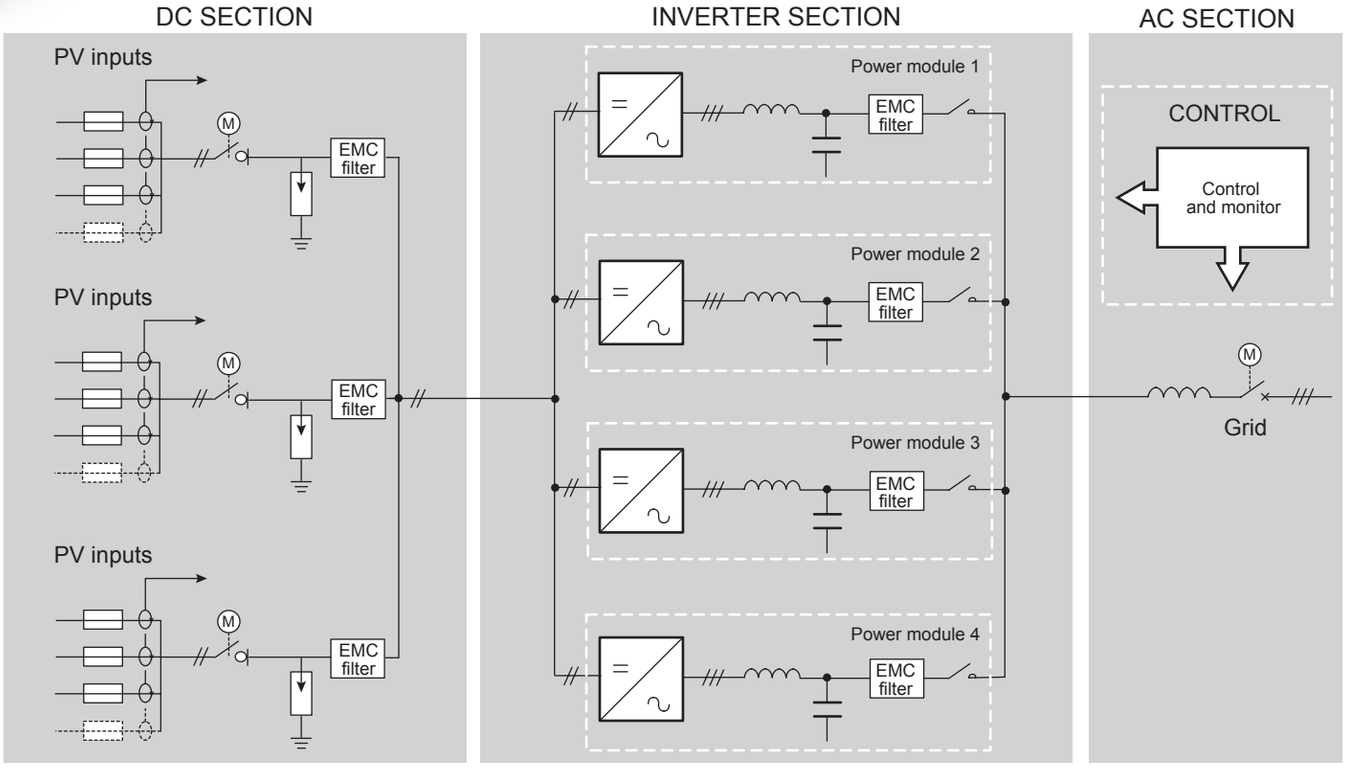
GS1500i is built to operate outdoors in harsh environments, with a minimum operating life of 25 years. The inverter housing was designed for direct outdoor installation and can withstand extreme conditions where high reliability and minimum maintenance are mandatory. One of the most outstanding features of the inverter is its innovative air cooling system that makes GS1500i the ideal choice for remote areas. An innovative air flow and careful material selection allow our inverters to excel in harsh weather conditions.

Rugged features:

- **ENCLOSURE PAINTING:** anti-corrosive powder coating, C4 UNI EN ISO 12944
- **SURFACE TREATMENT FOR UNPAINTED METAL SHEET:** Fe/Zn 12C zinc plating 12µm thick CrIII chromated according to I600.271.
- **BASE FRAME:** UPN painted according to I600.294 (liquid, C4 UNI EN ISO 12944)
- **MATERIAL FOR PAINTED FRAME, DOORS, SIDE AND REAR PANELS:** roof galvanized sheet DX51D + Z275 UNI EN 10142; for other unpainted surfaces: metal sheet DD11 UNI EN 10111
- **THICKNESS:** frame 2.5mm; doors 2.0mm; side panels 1.5mm; roof and rear panels 2.0mm
- **SUN PROOF ROOF:** protected from solar rays and water infiltrations
- **CONFORMAL COATING OF THE ELECTRONIC BOARDS**

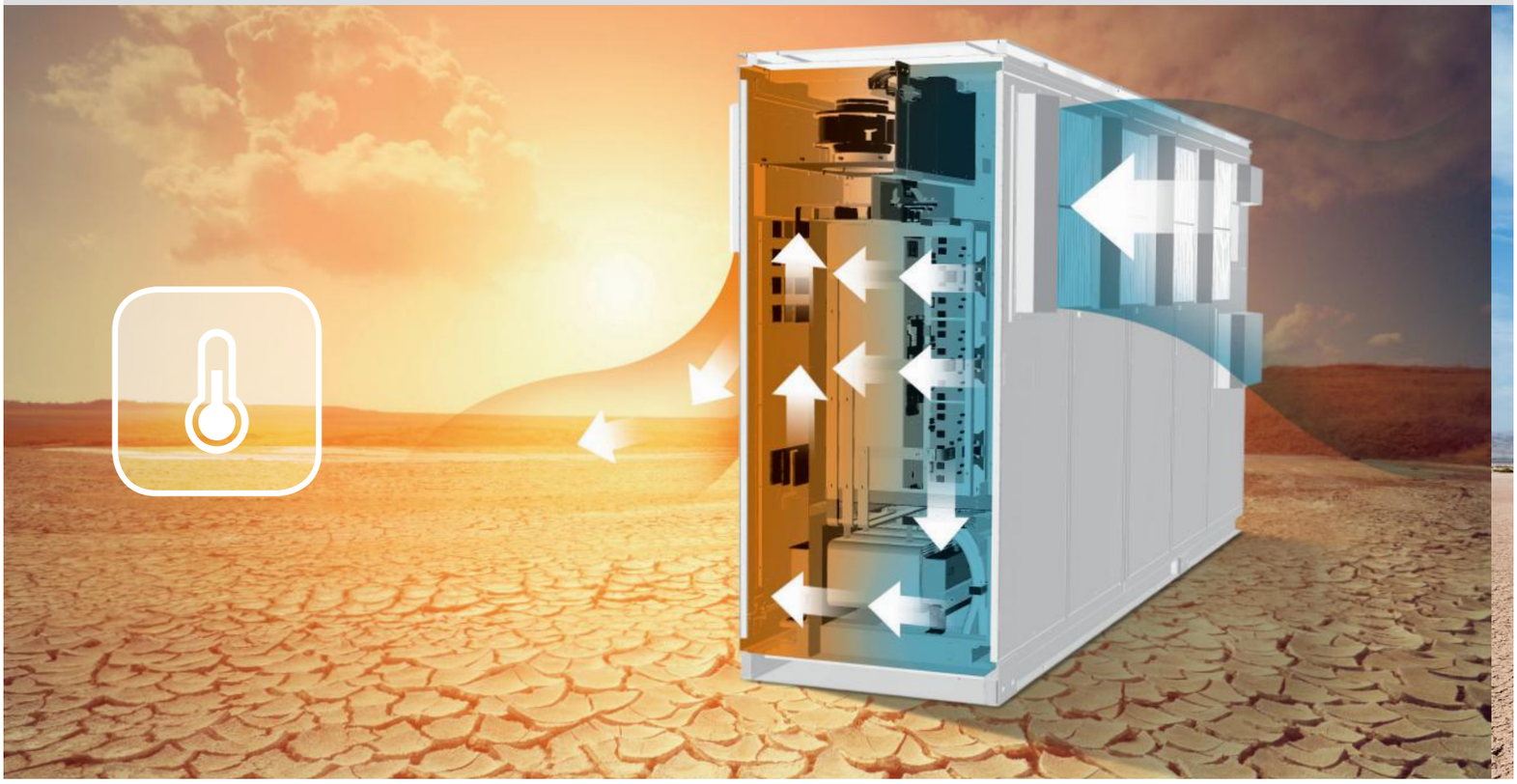
The GS1500i has been designed to obtain the greatest quantity of power from your PV plant, thereby enabling fast return on investments

The GS1500i includes:
- Control system with a wide range of fieldbus connections
- Inverter power modules
- DC and AC side protections
- Configurable number of PV inputs with current monitoring



General schematic diagram for 3.2 MW

Enhanced cooling system



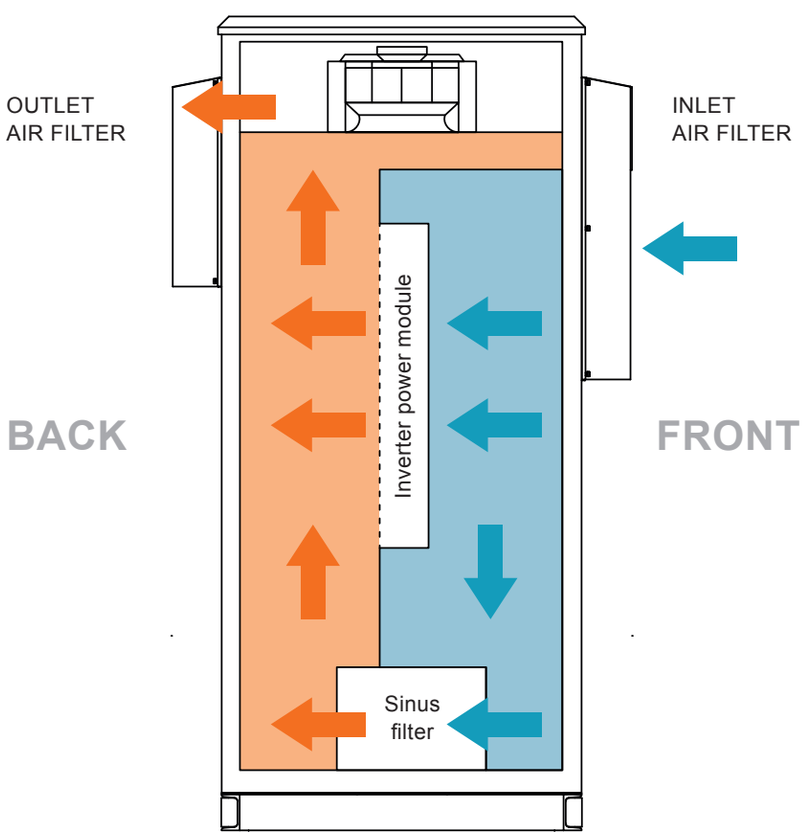
Advanced cooling for high efficiency

One of the most outstanding features of the inverter is its innovative air cooling system which significantly reduces auxiliaries consumption maximizing the availability of energy to be sold to the grid. Indoor solutions and/or water cooling are also available upon request.

Key features

- Top air inflow minimizes dust suction from the ground
- Modular ventilation for each power module
- Isolated cooling circuit for the control system
- Separated cooling circuit for each power module
- Fan speed regulation according to power and temperature
- Air filters designed for easy maintenance while the inverter is running
- Insulating panels to minimize the thermal effect of solar radiation
- Self-cleaning dust filters

Inverter power module cooling circuit



Configurable solution for optimum performance

The right fit to minimize total cost of ownership

GS1500i is based on a modular design that allows us to configure a single inverter up to 5 MW_{AC}. By placing power modules in parallel we can fit the solution to your power needs. Providing the right power solution for an application helps guarantee optimum performance.

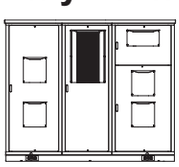
The innovative design allows us to offer outstanding performance on both stand-alone inverters and turn-key power stations up to 10 MW_{AC}. The GS1500i was developed with a focus on Total Cost of Ownership, which means it offers the following benefits:

- Reduced MTTR
- Reduced spare parts
- Maximum availability
- High efficiency at low power

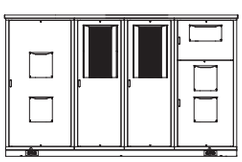
Easy maintenance and reduced spare count

GS1500i inverters combine high performance and high power with easy maintenance. The layout is specifically developed to simplify accessibility to all major components. Independent inverter modules enable the customer to own a unique spare kit and perform localized intervention while keeping the rest of the system in operation. The inverter's PC tools gather operational data on the status of the inverters to manage commissioning and maintenance.

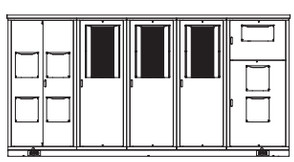
Power customized on your needs



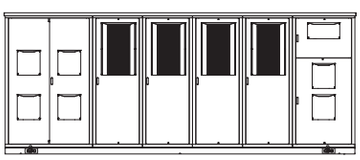
AC power: 0.5-0.8 MW



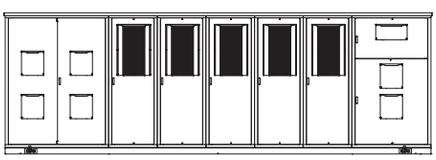
AC power: 1-1.6 MW



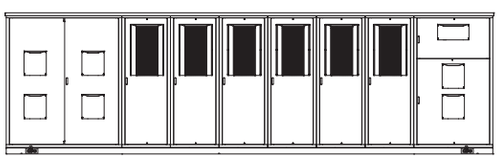
AC power: 2.4 MW



AC power: 3.2 MW

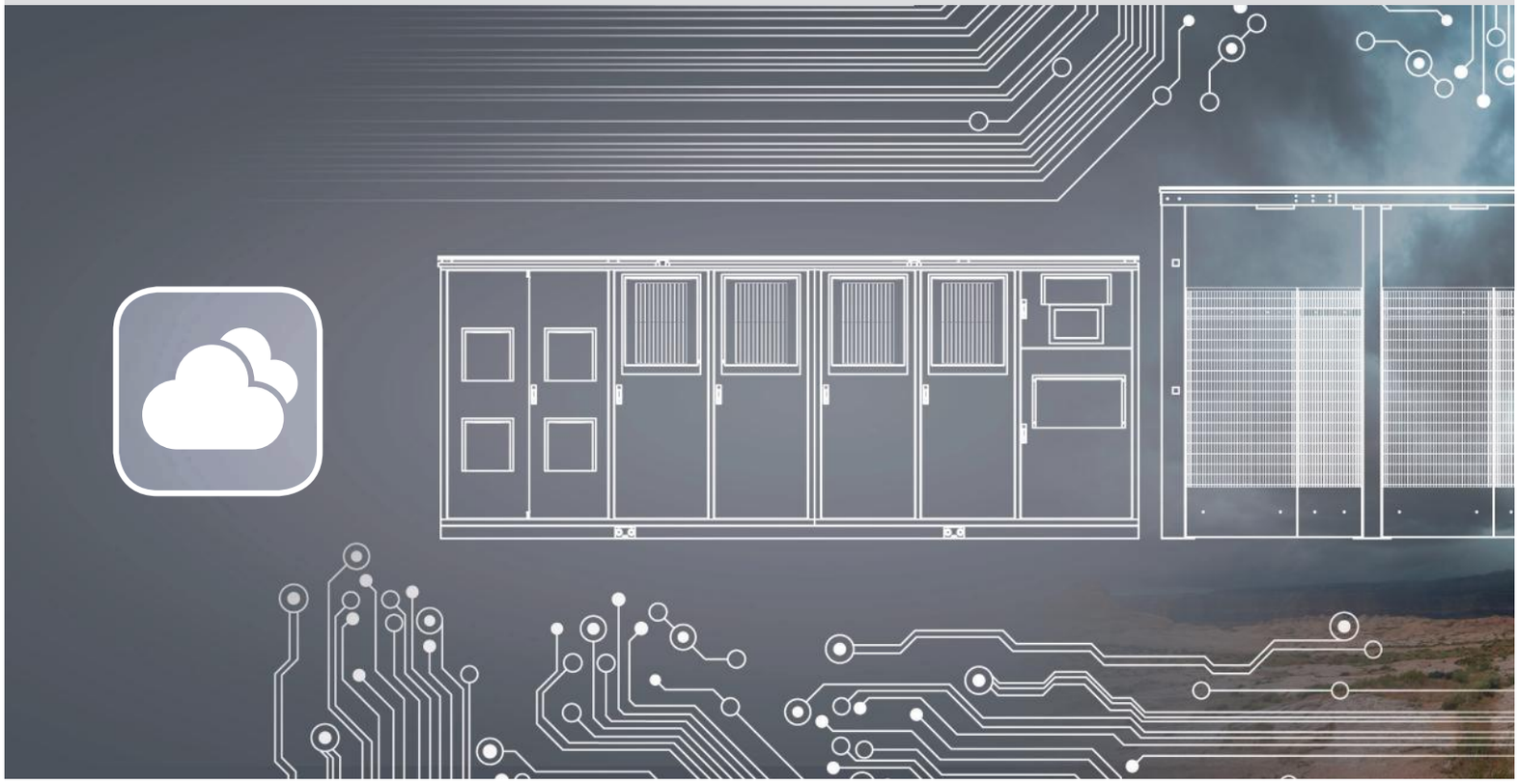


AC power: 4 MW



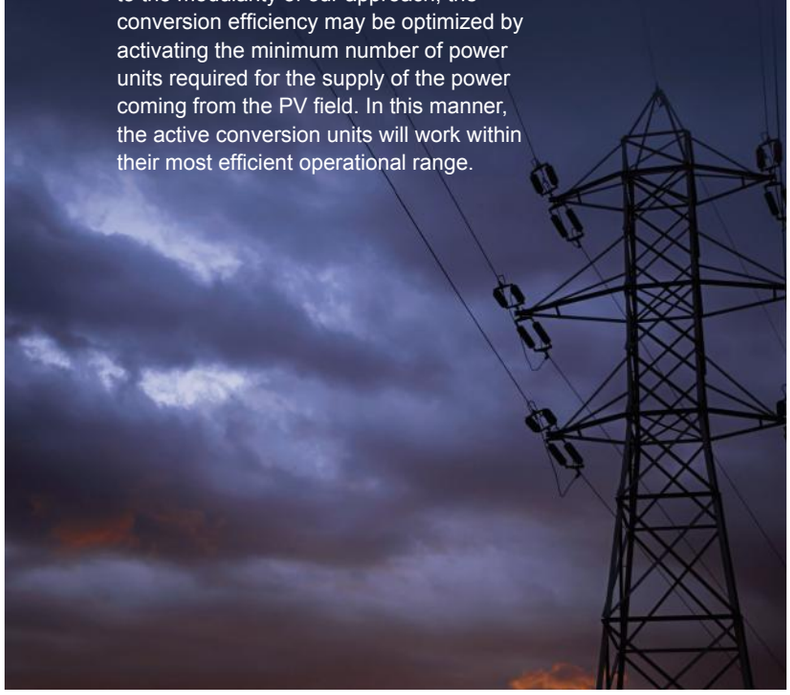
AC power: 4.8 MW

Reliable grid connection



Performance optimization under poor weather conditions

The “MIRO” function of GS1500i significantly increases the efficiency of the system, in particular under conditions of partial insolation of the system. Thanks to the modularity of our approach, the conversion efficiency may be optimized by activating the minimum number of power units required for the supply of the power coming from the PV field. In this manner, the active conversion units will work within their most efficient operational range.



Grid features

The GS1500i firmware has a wide range of dynamic network support features, all configurable.

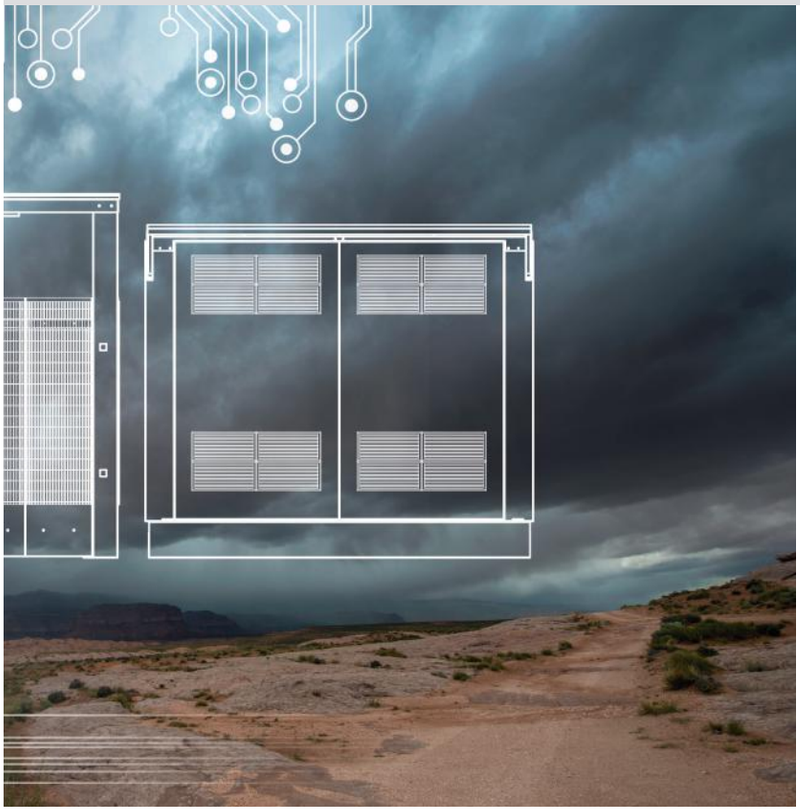
AC LINE MONITOR
(with different threshold sets for start and running mode)

LOW AND HIGH FREQUENCY RIDE THROUGH
(L/HFRT)

LOW AND HIGH VOLTAGE RIDE THROUGH
(L/HVRT - with injection of reactive current during voltage dip)

POWER RAMP RATE

POWER FACTOR CONTROL FUNCTION



This allows the inverter to satisfy the distributors' (TSOs) or utilities' requirements.

Q — **REACTIVE POWER REGULATION FROM EXTERNAL SET POINT**

Q-V — **DYNAMIC VOLTAGE REGULATION** (Q-V curve)

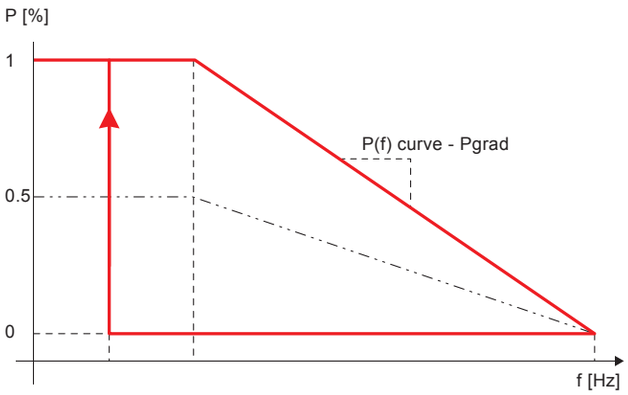
P-f — **ACTIVE POWER LIMITATION** (P-f curve)

Q- NIGHT (optional)

ANTI-ISLANDING

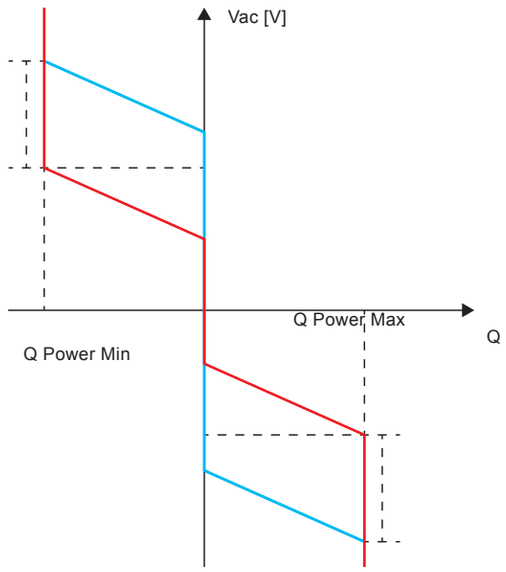
Active power limitation

(P-f curve)



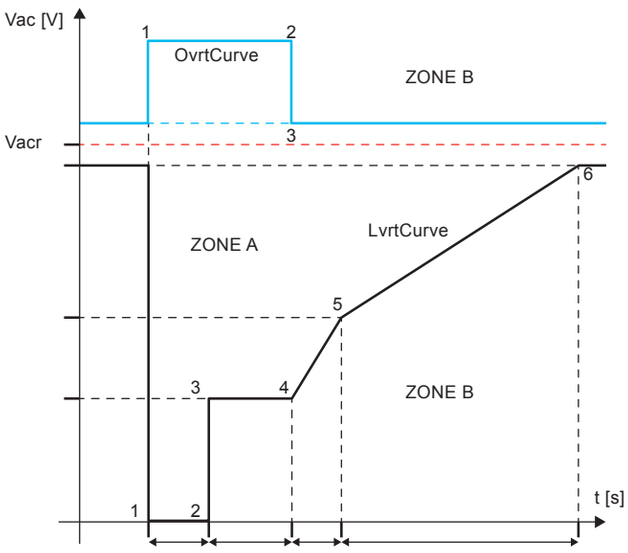
Dynamic voltage regulation

(Q-V curve)



Low and high voltage ride through

(L/H VRT)



Advanced communication

Wide communication options

GS1500i integrates numerous industrial communications protocols that allow full compatibility with all control solutions.

A dedicated optical fiber pair for fast Ethernet connection, is available to connect each single GS1500i with the main equipment (Local SCADA, Power Plant Controller, etc.).

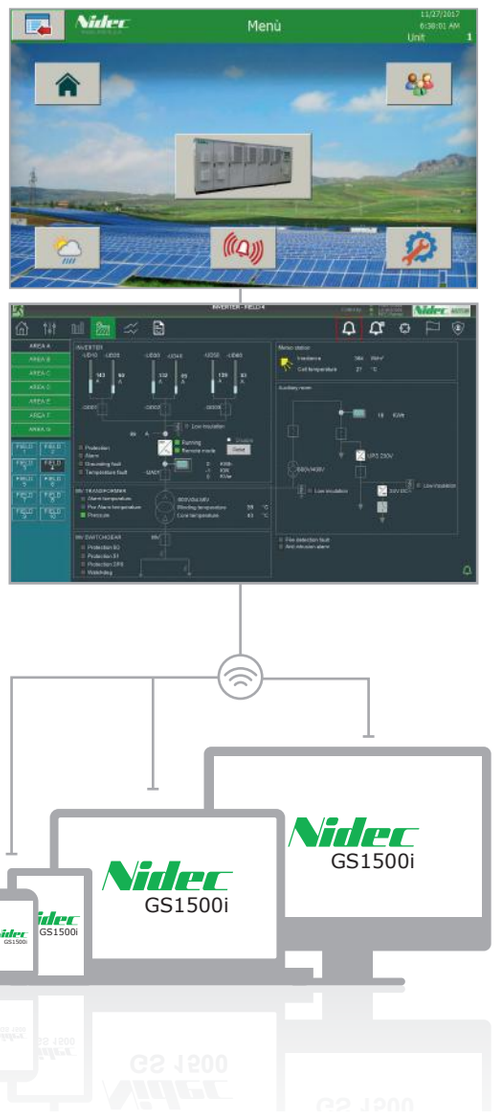
Other communication options for SCADA connections and remote monitoring available are:
- Modbus TCP
- Modbus RTU
- Ethernet IP (optional)
- Profinet (optional)
- Profibus (optional)

Real time control & diagnostics

GS1500i can easily be integrated inside plant control and monitoring systems, such as Data Loggers, SCADA and Power Plant Controller, to guarantee the centralized control of the generation plant and the required performances at the point of common coupling with the main grid.

Using ARTICS Smart Energy, Nidec's power and energy management suite, plant production can be optimized and integrated with the other components of the electrical grid, DER generators, and storage systems and loads to obtain a seamless smart grid control.

The suite provides a full set of applications, covering SCADA/ HMI functions with historical data and event acquisition, reporting, diagnostic tools for predictive and preventive maintenance, data security and encryption and local/ remote access control.



Life cycle support

Reliable, even in the management of your plant

Service plus
Our staff of highly qualified supervisors, as well as our service engineering team, are available to oversee complex interventions should the need arise 24 hours per day, 7 days per week.

Maintenance Contracts
Nidec offers a complete range of customized service contracts with varying durations so the experience and professionalism of our highly qualified technical personnel is available to you. Our service guarantees continuing efficiency of your system.

Warranty Extension
Warranty extensions are available so you can continue to make use of warranty benefits.

Extensive experience in renewables

Energy Storage Systems & Smart Micro-Grids

Nidec Industrial Solutions is a one stop shop for renewable energy solutions. We can provide new equipment for BESS and microgrids or retrofit existing plants with our advanced technologies. We are able to follow complete projects from conceptual design to the end of plant's life cycle. Nidec is the ideal partner for rural electrification as well as large scale commercial and industrial applications.

Nidec Industrial Solutions is working with customers and communities across the globe to install smart microgrids which integrate existing power generation assets with renewable sources to meet local energy demand. When coupled with battery energy storage solutions, we offset peak demand and manage loads to ensure grid stability in a dynamic, constantly changing environment.

500 MWh installed and in operation

Our activities include

LOAD PROFILE MAPPING
understanding energy needs

OPTIMAL SOURCE CONFIGURATION
based on availability of wind, solar, diesel, etc…

ELECTRICAL DESIGN OF THE MICRO-GRID

PROCUREMENT & PROJECT MANAGEMENT

CUSTOMIZATION OF THE POWER & ENERGY MANAGEMENT FUNCTIONS
in ARTICS Smart Energy

GRID CONNECTION & COMMISSIONING

INSTALLATION

ASSISTANCE
including remote diagnostics

Nidec Industrial Solutions, a tradition of excellence

With over 150 years of experience in the energy, metal, environmental, marine and industrial markets, Nidec Industrial Solutions has the experience to deliver process oriented power quality and control solutions, from components to complete engineered systems.

Nidec is a global supplier of power electronic equipment and automation systems as well as electric motors and generators. This combination of technologies and background is the base of our expertise in engineering flexible, customized solutions for global industrial markets at competitive prices.

Inverter technical data

RATED VOLTAGE 560 V AC

INVERTER TYPE		PV500A60	PV800A60	PV1K0A60	PV1K6A60	PV2K4A60	PV3K2A60	PV4K0A60	PV4K8A60
INPUT (DC)									
Maximum DC voltage	V	1500							
MPP voltage range (at cosφ =1)	V	840 ÷ 1400							
Number of MPPT	-	1							
Maximum continuous current (at 40°C)	A	544	860	1088	1720	2580	3440	4300	5160
Maximum continuous current (at 25°C) (1)	A	595	946	1190	1892	2838	3784	4730	5676
Maximum short-circuit current	A	1000	1500	2000	3000	4500	6000	7500	9000
Number of protected DC inputs with fuses	-	4	5	8	10	14	18	24	28
OUTPUT (AC)									
Output AC power (at 50°C)	kW	439	700	878	1400	2100	2800	3500	4200
Output AC power (at 40°C)	kW	470	750	940	1500	2250	3000	3750	4500
Output AC power (at 25°C) (1)	kW	517	826	1034	1652	2478	3304	4130	4956
Output AC current (at 40°C)	A	488	774	976	1548	2322	3096	3870	4644
Rated output voltage	V	560							
Output frequency	Hz	50/60							
Harmonic current distortion (THDI)	%	< 3% at rated power							
Power factor	-	> 0.99 at rated power							
Distribution network type	-	IT- Unearthed							

RATED VOLTAGE 600 V AC

INVERTER TYPE		PV500A60	PV800A60	PV1K0A60	PV1K6A60	PV2K4A60	PV3K2A60	PV4K0A60	PV4K8A60
INPUT (DC)									
Maximum DC voltage	V	1500							
MPP voltage range (at cosφ =1)	V	900 ÷ 1400							
Number of MPPT	-	1							
Maximum continuous current (at 40°C)	A	544	860	1088	1720	2580	3440	4300	5160
Maximum continuous current (at 25°C) (1)	A	595	946	1190	1892	2838	3784	4730	5676
Maximum short-circuit current	A	1000	1500	2000	3000	4500	6000	7500	9000
Number of protected DC inputs with fuses	-	4	5	8	10	14	18	24	28
OUTPUT (AC)									
Output AC power (at 50°C)	kW	470	750	940	1500	2250	3000	3750	4500
Output AC power (at 40°C)	kW	500	800	1000	1600	2400	3200	4000	4800
Output AC power (at 25°C) (1)	kW	555	885	1110	1770	2655	3540	4425	5310
Output AC current (at 40°C)	A	488	774	976	1548	2322	3096	3870	4644
Rated output voltage	V	600							
Output frequency	Hz	50/60							
Harmonic current distortion (THDI)	%	< 3% at rated power							
Power factor	-	> 0.99 at rated power							
Distribution network type	-	IT- Unearthed							

Notes: (1) valid only for "UR" version: refer to Power/temperature diagram on p.18

RATED VOLTAGE 640 V AC

INVERTER TYPE		PV500A60	PV800A60	PV1K0A60	PV1K6A60	PV2K4A60	PV3K2A60	PV4K0A60	PV4K8A60
INPUT (DC)									
Maximum DC voltage	V	1500							
MPP voltage range (at cosφ =1)	V	960 ÷ 1400							
Number of MPPT	-	1							
Maximum continuous current (at 40°C)	A	544	860	1088	1720	2580	3440	4300	5160
Maximum continuous current (at 25°C) (1)	A	595	946	1190	1892	2838	3784	4730	5676
Maximum short-circuit current	A	1000	1500	2000	3000	4500	6000	7500	9000
Number of protected DC inputs with fuses	-	4	5	8	10	14	18	24	28
OUTPUT (AC)									
Output AC power (at 50°C)	kW	502	800	1004	1600	2400	3200	4000	4800
Output AC power (at 40°C)	kW	540	858	1080	1716	2574	3423	4290	5148
Output AC power (at 25°C) (1)	kW	591	944	1182	1888	2832	3776	4720	5664
Output AC current (at 40°C)	A	488	774	976	1548	2322	3096	3870	4644
Rated output voltage	V	640							
Output frequency	Hz	50/60							
Harmonic current distortion (THDI)	%	< 3% at rated power							
Power factor	-	> 0.99 at rated power							
Distribution network type	-	IT- Unearthed							

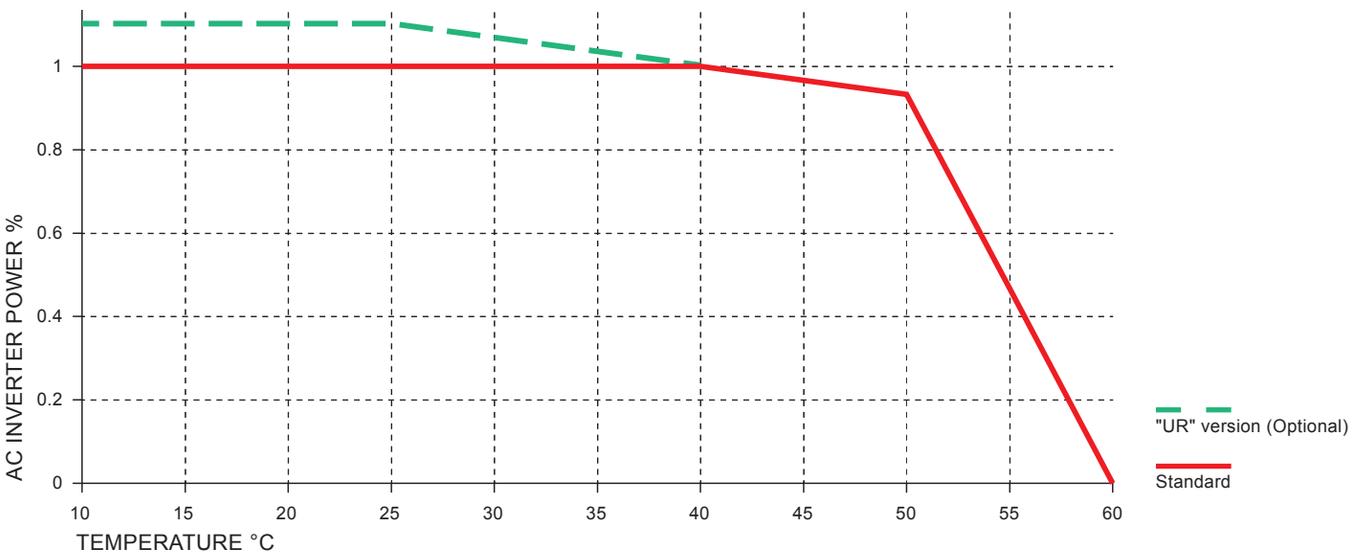
RATED VOLTAGE 690 V AC

INVERTER TYPE		PV500A60	PV800A60	PV1K0A60	PV1K6A60	PV2K4A60	PV3K2A60	PV4K0A60	PV4K8A60
INPUT (DC)									
Maximum DC voltage	V	1500							
MPP voltage range (at cosφ =1)	V	1035 ÷ 1400							
Number of MPPT	-	1							
Maximum continuous current (at 40°C)	A	544	860	1088	1720	2580	3440	4300	5160
Maximum continuous current (at 25°C) (1)	A	595	946	1190	1892	2838	3784	4730	5676
Maximum short-circuit current	A	1000	1500	2000	3000	4500	6000	7500	9000
Number of protected DC inputs with fuses	-	4	5	8	10	14	18	24	28
OUTPUT (AC)									
Output AC power (at 50°C)	kW	541	862	1082	1742	2586	3488	4310	5172
Output AC power (at 40°C)	kW	583	925	1166	1850	2775	3700	4625	5550
Output AC power (at 25°C) (1)	kW	638	1018	1276	2036	3054	4072	5090	6108
Output AC current (at 40°C)	A	488	774	976	1548	2322	3096	3870	4644
Rated output voltage	V	690							
Output frequency	Hz	50/60							
Harmonic current distortion (THDI)	%	< 3% at rated power							
Power factor	-	> 0.99 at rated power							
Distribution network type	-	IT- Unearthed							

Inverter technical data

INVERTER TYPE		PV500A60	PV800A60	PV1K0A60	PV1K6A60	PV2K4A60	PV3K2A60	PV4K0A60	PV4K8A60
EFFICIENCY AND POWER CONSUMPTION									
Maximum (η_{MAX})	%	99.0	99.0	99.0	99.0	99.0	99.0	99.0	99.0
Euro efficiency (η_{EU})(2)	%	98.7	98.7	98.8	98.8	98.8	98.8	98.8	98.8
Self consumption in operation(3)	W	943	943	1875	1875	2807	3739	4670	5603
Standby consumption	W	83	83	155	155	227	299	370	443
ENVIRONMENTAL LIMITS									
Installation	-	Outdoor							
Degree of protection	-	IP54 (Outdoor)							
Operating temperature range(4)	°C	-20 ÷ + 50							
Maximum ambient temperature	°C	60							
Maximum altitude (above sea level)	m	2000 (derating 1% for each 100m over 2000, max. 4000)							
Relative humidity	%	4 ÷ 100							
Maximum noise level(5)	dBA	76	78	78	78	78	78	< 80	< 80
PROTECTION									
Motorized DC on-load switch disconnectors		Yes							
DC Overvoltage and surge arrester (Type II)		Yes							
Ground fault monitoring		Yes							
AC circuit breaker (short circuit and overload)		Yes							
Anti-islanding		Yes							
Grid monitoring		Yes							
GENERAL DATA									
Overall dimensions (W/H/D)	mm	W 2800 H 2260 D1280	W 2800 H 2260 D 1280	W 3800 H 2260 D 1280	W 3800 H 2260 D 1280	W 4600 H 2260 D 1280	W 5800 H 2260 D 1280	W 7300 H 2300 D 1280	W 8100 H 2300 D 1280
Weight	kg	2750	2750	3800	3800	4600	5700	8000	8500
Cooling system		Forced air							
Color /Painting cycle		RAL7035 / C4							
Local user interface		HMI with graphic LCD display backlighted, PC tool (DVM)							
Communications		Modbus RTU, Modbus TCP/IP, Profibus DP (optional: Profinet , Ethernet /IP)							
Safety Standards and efficiency		IEC EN 62109-1, IEC EN 62109-2 IEC EN 61683, EN 50530 UL 1741, IEEE 1547, IEEE 1547.1, UL 1998 (UL 1741 SA supplement and CSA 22.2 No. 107 in progress)"							
EMC Standards and harmonics		IEC EN 61000-6-2, EN 61000-6-4, EN 55011, CISPR 11, IEC EN 61000-3-12							
Environmental Standards		IEC EN 60529, IEC EN 60068-2-78							
Certifications and grid approvals		Mexico, C-UL, IEC, BDEW, CEI (6)							
Compliance attestation		TUV Sud, UL							
Grid support functions		Reactive power generation, L/HFRT, L/HVRT, Power ramp rate, Power Curtailment, Power factor control function.							
Options		Multiple MMPT, “Miro” function, grounding kit, “Q-night” function, Power uprating, AC power analyzer, AC Ground fault monitoring, DC input current monitoring, HMI, indoor version.							

POWER/TEMPERATURE DIAGRAM



Notes: (2) Internal witness test with self consumption (ref. IEC 61683) - (3) at rated power (4) refer to Power/temperature diagram above
(5) Sound pressure level at at distance of 1 mt at full power (ISO3746) - (6) Contact NIS for more information

DEP2018.03.13.00EN

Nidec

All for dreams

INDUSTRIAL SOLUTIONS