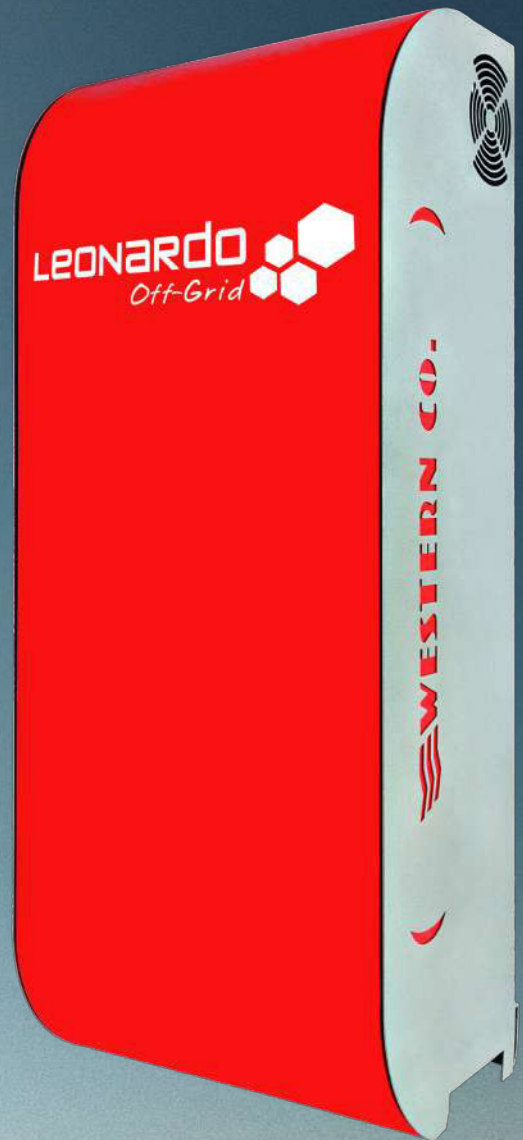


LEONARDO

Off-Grid



SOLAR OFF-GRID STORAGE SYSTEM

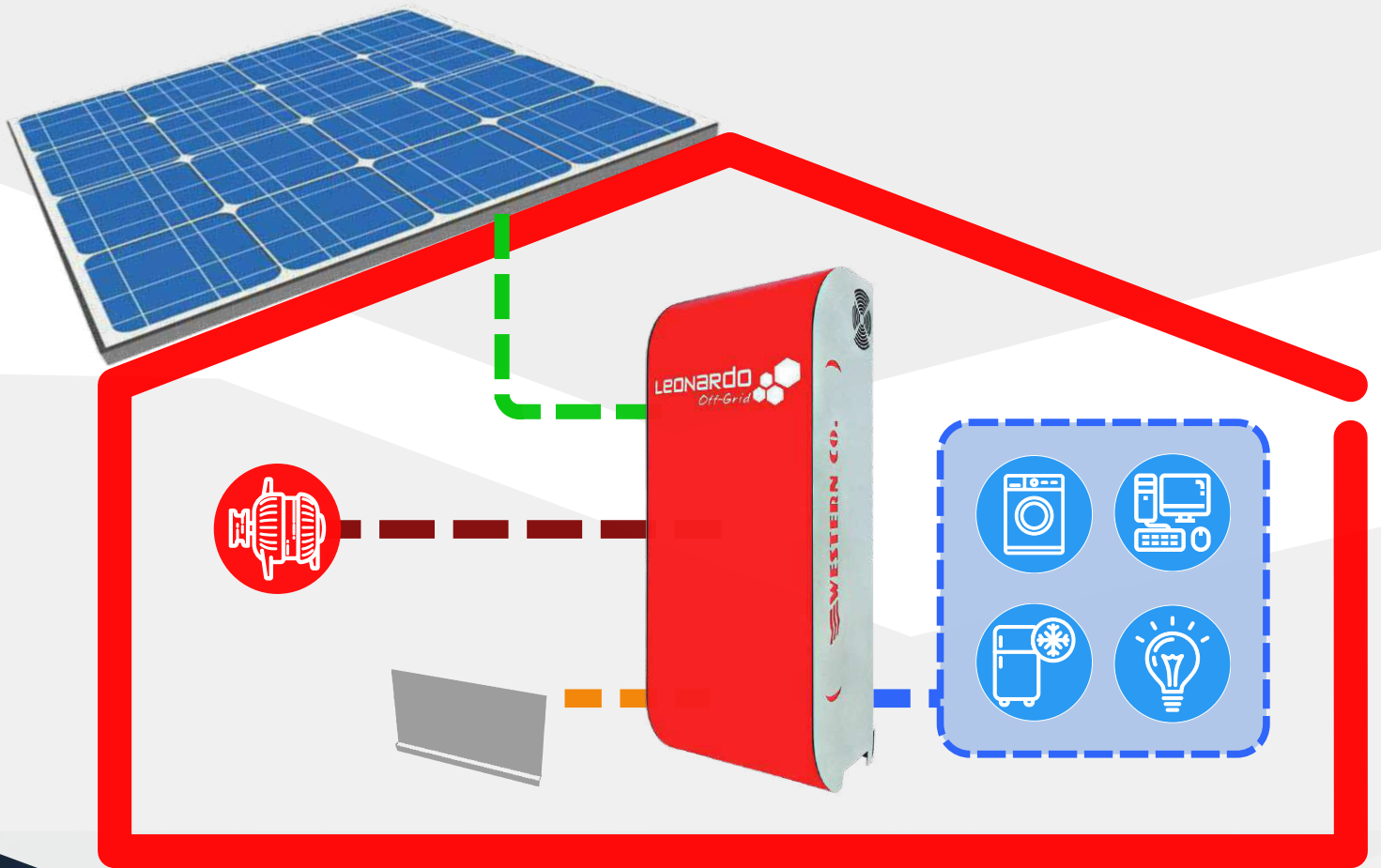
Pb Version



WESTERN CO.[®]
ELECTRONIC EQUIPMENTS - SOLAR SYSTEMS



Basic scheme



Features



1kW/1500/24 GE version

- Battery voltage: 24VDC
- Maximum PV power: 1kWp
- Output power: 1500VA
- Output maximum power: 3000W



4kW/3000/48 GE version

- Battery voltage: 48VDC
- Maximum PV power: 4kWp
- Output power: 3000VA
- Output maximum power: 6000W



4kW/5000/48 GE version

- Battery voltage: 48VDC
- Maximum PV power: 4kWp
- Output power: 5000VA
- Output maximum power: 10000W



8kW/8000/48 GE version

- Battery voltage: 48VDC
- Maximum PV power: 8kWp
- Output power: 8000VA
- Output maximum power: 16000W



MPPT charge controller technology



DC/AC pure sine wave inverter



Genset ATS automatic activation



Output Voltage 230 V, 50 Hz



94% Inverter efficiency



Protections:

- Low battery
- Over-temperature

Pb

OPzS - OPzV lead-acid batteries



Il **Leonardo Off-Grid GE** è stato concepito e appositamente sviluppato per la produzione e lo stoccaggio di energia; abbinato a moduli fotovoltaici e a batterie di accumulo provvede all'alimentazione della abitazione fino al suo **completo auto-sostentamento**, con l'ausilio di un gruppo elettrogeno (back-up) in caso di ridotta energia rinnovabile.

Il sistema prevede degli ingressi **MPPT** indipendenti tramite regolatore di carica dedicato: tale tecnologia implementa un circuito di ricerca della massima potenza in funzione della tensione e della corrente del modulo FV, massimizzando sempre l'energia erogata.

Collegando un **gruppo elettrogeno** all'ingresso AC input, il sistema garantisce la continuità di esercizio delle utenze senza percettibili discontinuità in caso di batteria scarica. Infatti, il gruppo elettrogeno gestisce simultaneamente l'alimentazione dei carichi e la carica del banco batterie.



The **Leonardo Off-Grid GE** was conceived and specially developed for the production and storage of energy; combined with photovoltaic modules and storage batteries, it provides power to the house until it is **fully self-sustained**, with the aid of a generator (back-up) in case of reduced renewable energy.

The system provides independent **MPPT** inputs through a dedicated charge controller: this technology implements a search circuit of maximum power depending on the voltage and current of the PV module, always maximizing the energy delivered.

By connecting a **generator** to the AC input, the system ensures continuity of operation of the users without perceptible discontinuity in case of low battery. In fact, the genset simultaneously manages the power supply of the loads and the charge of the battery bank.

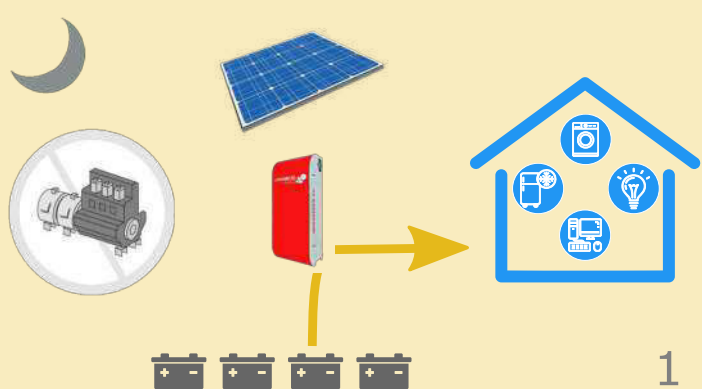
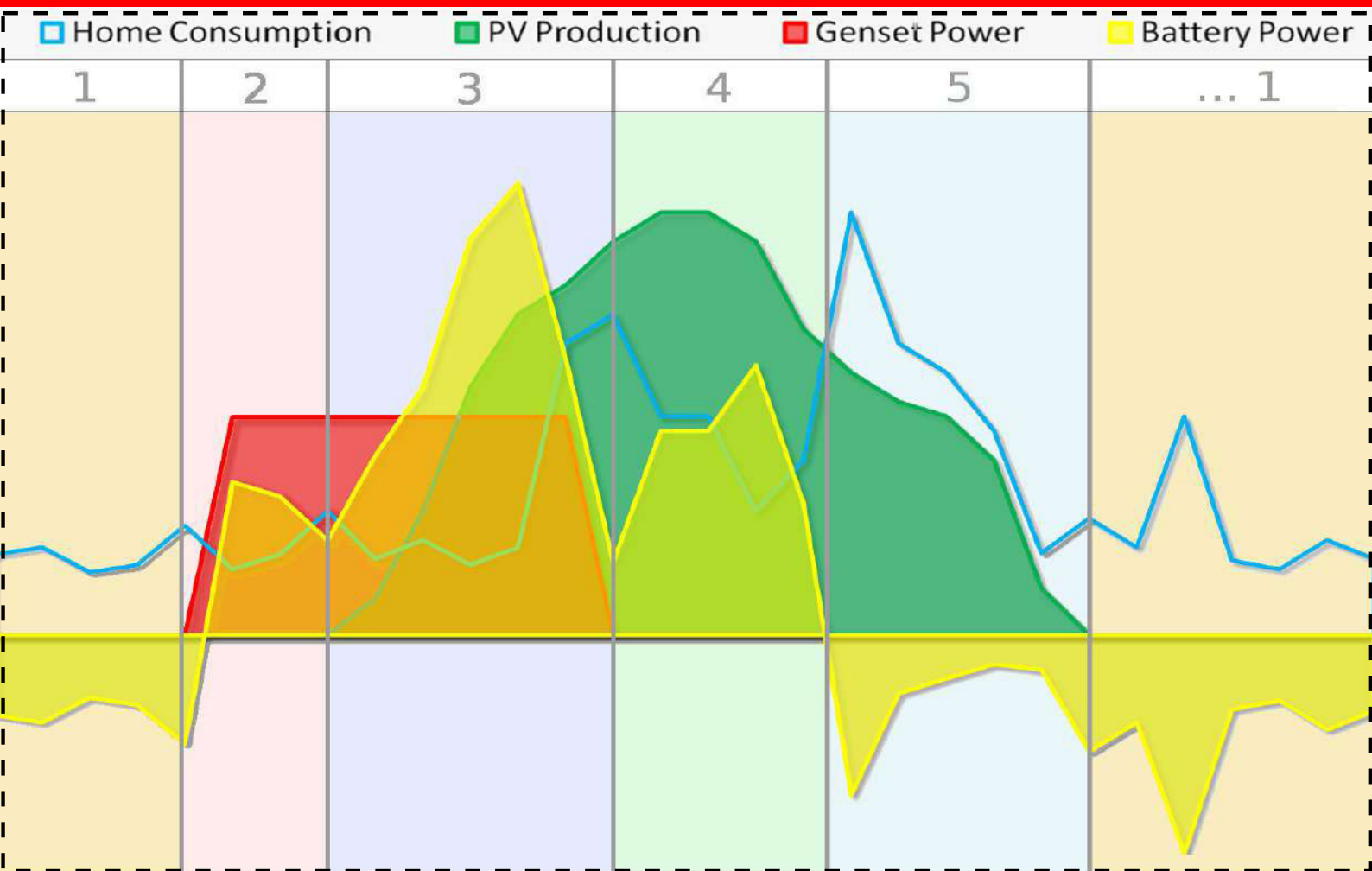


Le **Leonardo Off-Grid GE** a été conçu et spécialement développé pour la production et le stockage de l'énergie électrique dans les maisons; apparié aux modules photovoltaïques et aux batteries d'accumulateurs il pourvoit à la **complète autonomie électrique** de l'habitation, avec l'aide d'un groupe électrogène en cas de production réduite d'énergie renouvelable.

Ce système est doté de entrées **MPPT** indépendantes pour son propre régulateur de charge: Cette technologie comporte un circuit de recherche de la puissance maximale en fonction de la tension et du courant des modules PV, maximisant en tout cas l'énergie produite.

En insérant un **groupe électrogène** à travers l'entrée AC Input, le système garantit la continuité de service pour les utilisateurs évitant ainsi toute interruption perceptible en cas de batteries faibles. En effet le groupe électrogène se charge en ce cas de fournir l'énergie aux utilisateurs en pourvoyant à la recharge des batteries.

Working Logic

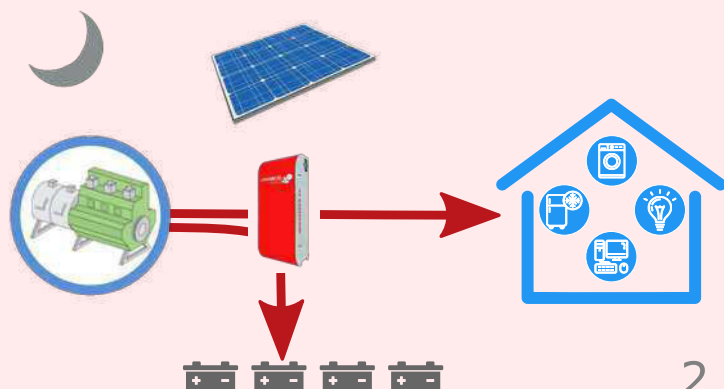


1

IT L'utenza domestica viene alimentata direttamente dalla batteria che si è caricata precedentemente dal fotovoltaico o dal gruppo elettrogeno
→ **autoconsumo da accumulo in batteria.**

UK The domestic utility is powered directly by the battery that was previously charged by the photovoltaic or genset
→ **self-consumption by accumulation in the battery.**

FR Les utilisateurs domestiques sont alimentés directement à partir des batteries qui ont été rechargées auparavant à partir de la source photovoltaïque ou groupe électrogène
→ **autoconsommation accumulation en batteries**

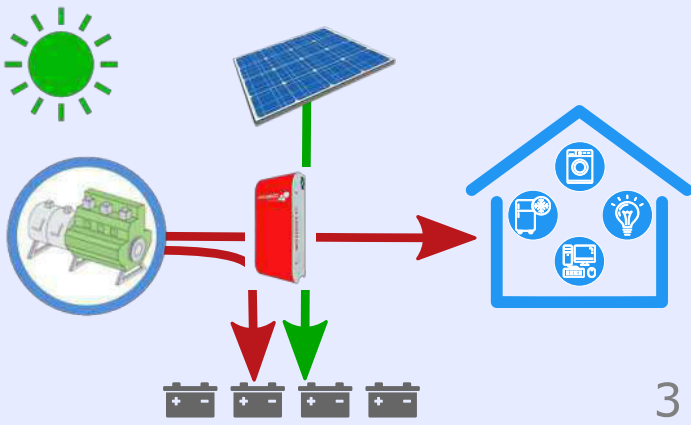


2

IT Nel momento in cui il SOC (State Of Charge) della batteria raggiunge circa il 40%, il contatto pulito per l'attivazione automatica permette l'accensione del gruppo elettrogeno, che gestisce la simultanea alimentazione di carichi e la ricarica della batteria
→ **soccorso da gruppo elettrogeno.**

UK When the SOC (State Of Charge) of the battery reaches about 40%, the clean contact for automatic activation allows the genset to start, which manages the simultaneous charging of loads and the recharging of the battery
→ **emergency from a genset.**

FR Dès que le SOC (état de charge) de la batterie descend jusqu'à 40%, le contact franc activation automatique déclenche le démarrage du groupe électrogène, qui gère simultanément l'alimentation des utilisateurs et la recharge des batteries
→ **groupe électrogène de secours**



3

■ Di giorno l'impianto FV inizia a produrre energia che contribuisce alla ricarica della batteria simultaneamente al gruppo elettrogeno, in modo da raggiungere rapidamente un SOC dell'85%. Nel frattempo, il gruppo elettrogeno continua ad alimentare direttamente l'utenza domestica

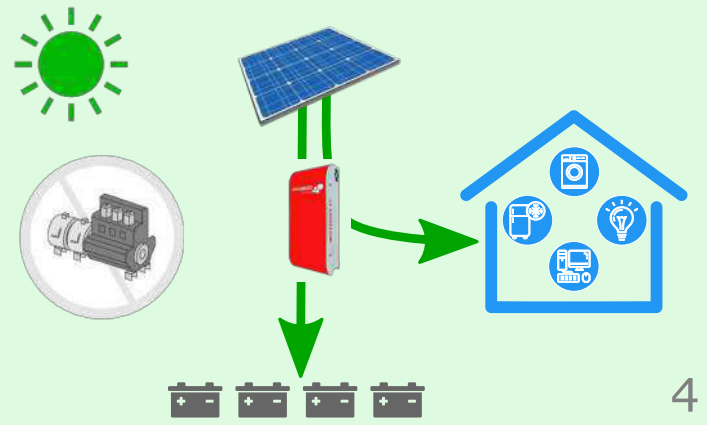
→ **soccorso da gruppo elettrogeno + ricarica da fotovoltaico.**

■ During the day, the PV system starts producing energy that contributes to charging the battery simultaneously with the genset, so as to quickly reach a SOC of 85%. In the meantime, the genset continues to power the domestic user directly

→ **emergency from a generator set + photovoltaic charge.**

■ Durant la journée l'installation PV produit l'énergie à contribution de la recharge des batteries simultanément au groupe électrogène pour arriver très rapidement à un SOC de 85%. Pendant ce temps, le groupe électrogène continue à alimenter directement les utilisateurs

→ **groupe électrogène de secours + recharge à partir de source photovoltaïque**



4

■ Raggiunto il SOC dell'85%, il contatto pulito per l'attivazione automatica permette lo spegnimento del gruppo elettrogeno, l'energia prodotta dall'impianto FV verrà utilizzata prioritariamente per autoconsumo diretto mentre l'energia prodotta in eccesso andrà a caricare la batteria

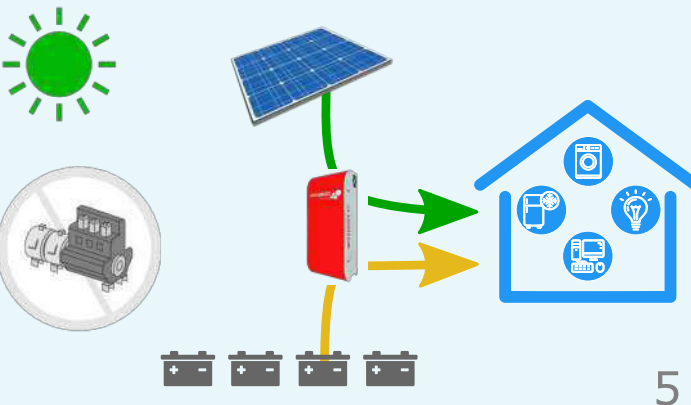
→ **autoconsumo diretto dai moduli FV + ricarica da fotovoltaico.**

■ Once the SOC has reached the 85%, the clean contact for automatic activation allows the genset to be turned off, the energy produced by the PV plant will be used primarily for direct self-consumption while the excess energy produced will load the battery

→ **self-consumption direct from PV modules + photovoltaic charging.**

■ Une fois arrivé au SOC de 85%, le contact franc pour activation automatique déclencherà l'arrêt du groupe électrogène, l'énergie produite par l'installation sera utilisée en priorité pour l'autoconsommation directe pendant que celle produite en excès servira pour la recharge des batteries

→ **autoconsommation directe des modules PV + recharge de source photovoltaïque**



5

■ Nei momenti in cui c'è una minore produzione di energia dall'impianto FV e l'energia richiesta dall'abitazione eccede la produzione, il sistema garantisce il soddisfacimento dei bisogni energetici miscelando l'energia dell'impianto FV con quella precedentemente immagazzinata in batteria

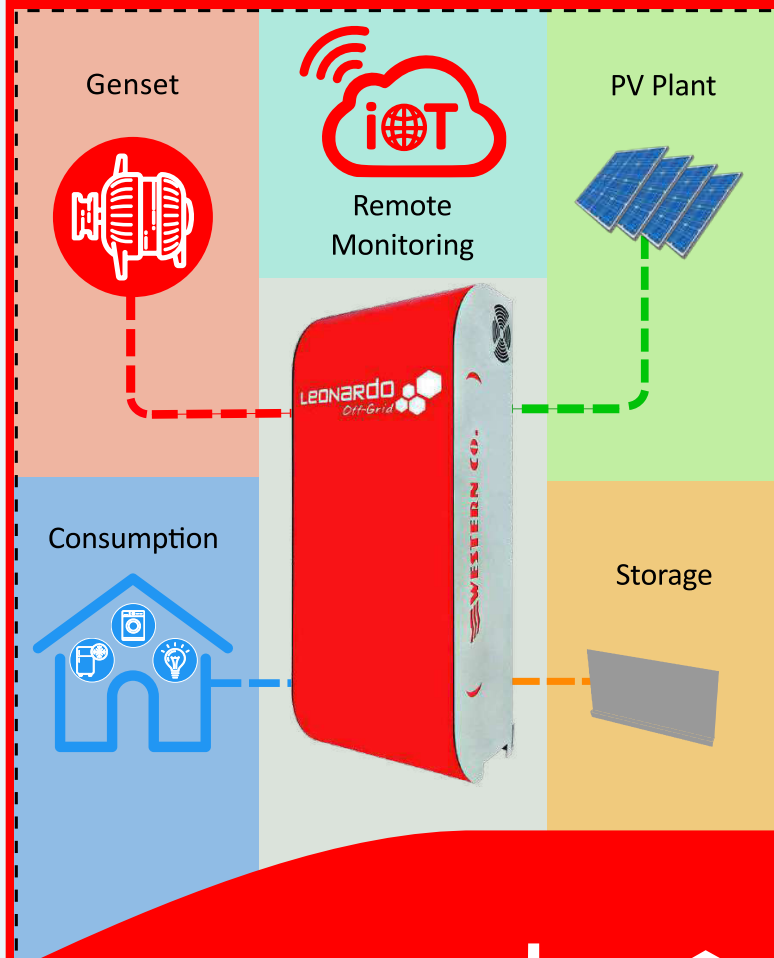
→ **autoconsumo diretto dai moduli FV + autoconsumo da accumulo in batteria**

■ In moments when there is less energy production from the PV plant and the energy required by the house exceeds the production, the system ensures the satisfaction of energy needs by mixing the energy of the PV plant with the previously stored in battery


→ **self-consumption direct from PV modules + self-consumption by accumulation in battery**


■ Si la production énergétique photovoltaïque est moindre alors que la demande dans l'habitation excède celle produite, le système garantira la satisfaction des besoins énergétiques en combinant l'énergie de l'installation PV avec celle déjà accumulée dans les batteries


→ **autoconsommation directe des modules PV + autoconsommation à partir de l'accumulation en batteries.**




Remote Monitoring

 Grazie al monitoraggio dei dati realtime si dispone, istante per istante, di un controllo preciso e accurato su produzione fotovoltaica, consumo, stato della batteria nonché prelievi dal gruppo elettrogeno. Inoltre è possibile visualizzare lo storico settimanale, mensile e annuale di produzione e consumo energetico.


 Thanks to the monitoring system, a precise and accurate control of photovoltaic production, consumption, battery status and sampling from the generator is available, moment by moment. Also you can view the weekly, monthly and annual history of production and energy consumption.

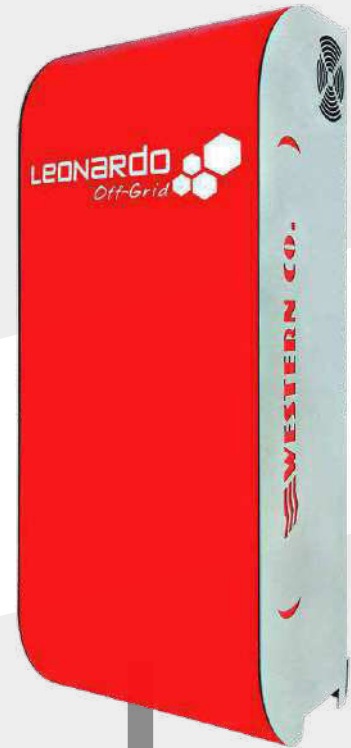
 Grâce au suivi permanent en temps réel des données, on dispose instant par instant d'un contrôle précis et fin de la production photovoltaïque, de la consommation électrique, de l'état de la batterie et bien sûr de l'apport énergétique du groupe électrogène. En outre il est possible de ressortir l'historique hebdomadaire, mensuel et annuel de la production et consommation énergétique.



Leonardo Monitor è il client di monitoraggio del sistema storage Leonardo. E' disponibile nelle versioni WEB,  APP Android e iOS.

Leonardo Monitor is the monitoring client of the Leonardo storage system. It is available in WEB,  Android and iOS apps.

Le Leonardo Monitor est un logiciel de suivi du système de stockage Leonardo. Il est disponible en versions Web,  applications Android et iOS.

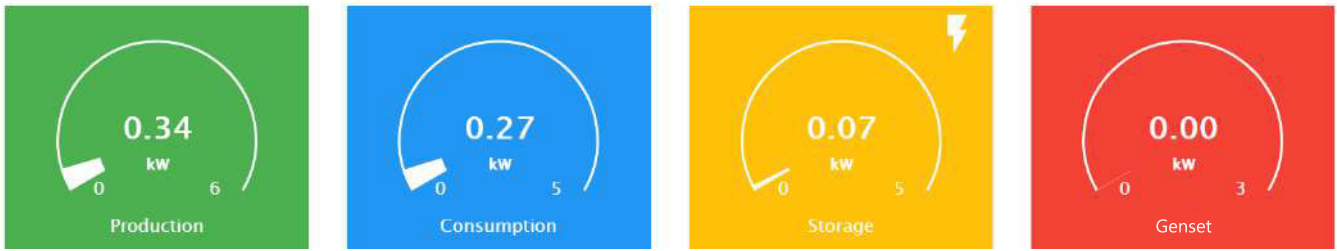


Leonardo Datalogger



Realtime Gauges

Single value analysis



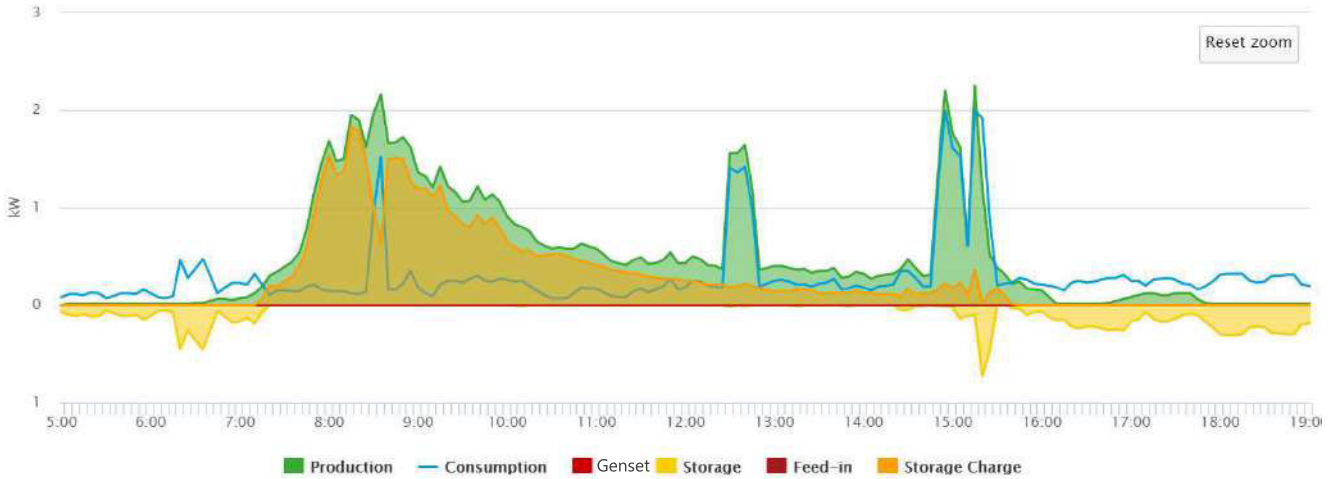
Power

DAY

← 2018-05-06 →



Power data



Energy (consumption)

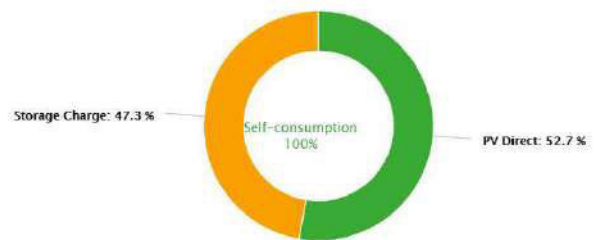
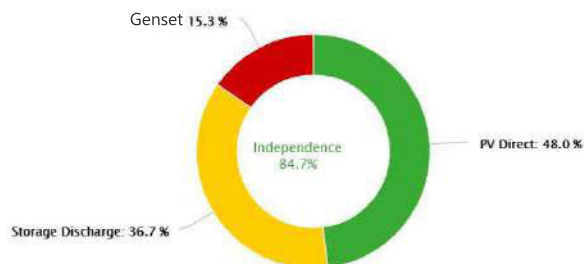
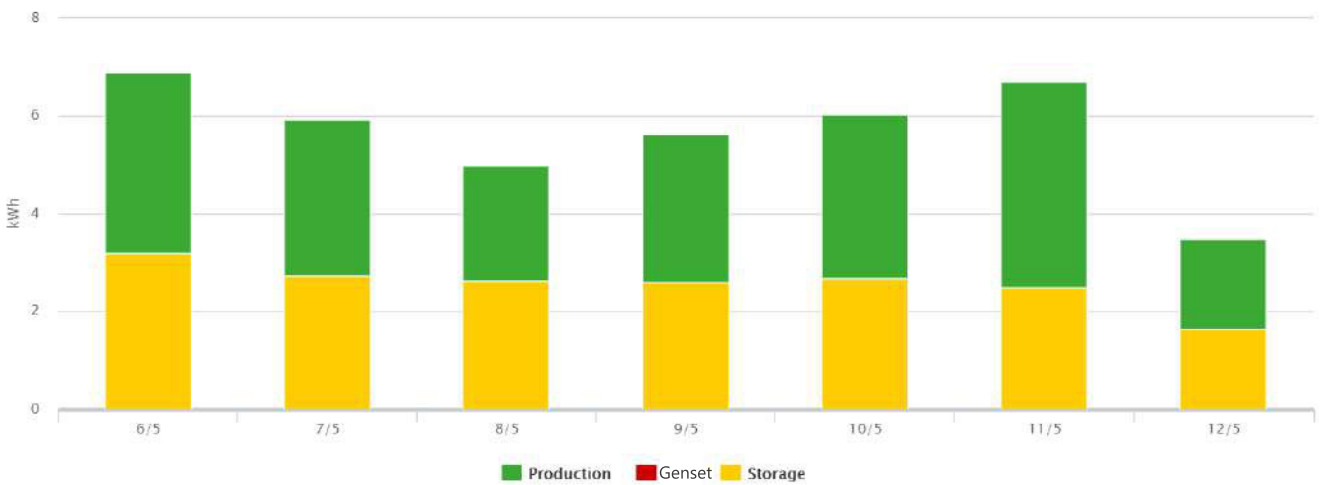
WEEK

MONTH

← 2018-05-06 | 2018-05-12 →



Consumption data



A modular system



System modularity

Il Leonardo Off-Grid GE è un sistema scalabile: utilizzando più inverter in parallelo può essere aumentata la potenza erogata.

Leonardo Off-Grid GE is a modular system: by using several inverters in parallel, the output power can be increased.

Le Leonardo hors réseau GE est un système extensible. En utilisant plusieurs onduleurs en parallèle, on pourra augmenter la puissance



Three phase connection



Il sistema di accumulo è disponibile anche per impianti industriali trifase.

The storage system is also available for three-phase industrial plants.

Le système de stockage est disponible aussi pour les installations industrielles en triphasé.

Genset specifications



Il Leonardo Off-Grid GE permette l'accensione automatica del gruppo elettrogeno senza la necessità di un quadro ATS.

La semplice predisposizione con plug 3 pin ATS a bordo del generatore è sufficiente al collegamento del sistema Leonardo Off-Grid GE attraverso la connessione dedicata.

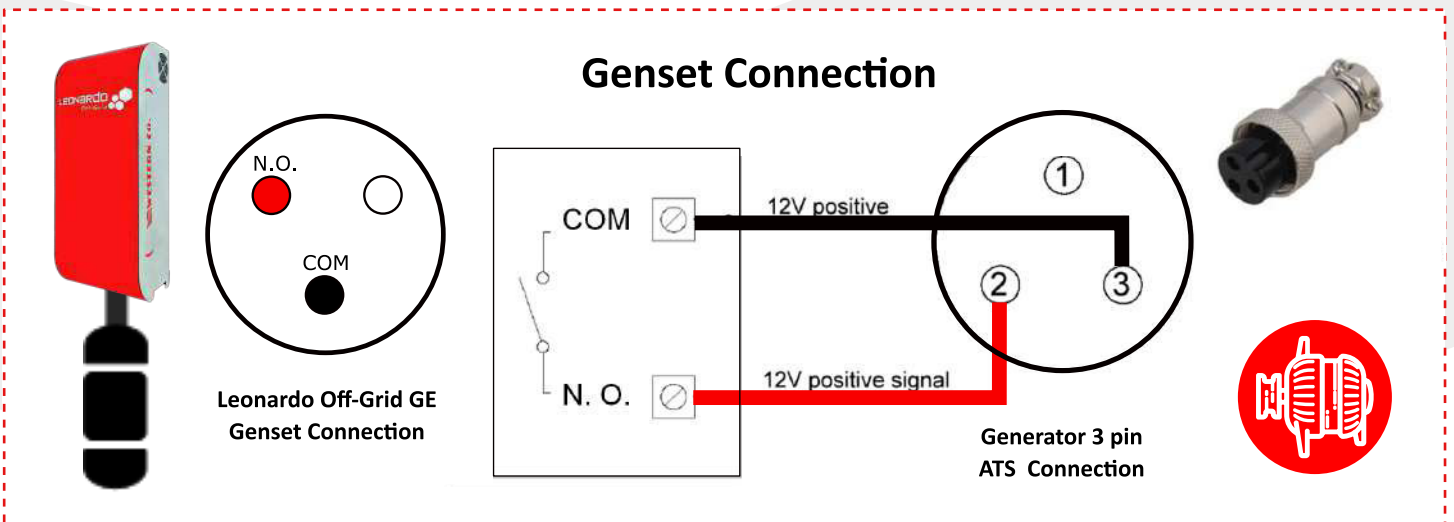


The Leonardo Off-Grid GE allows the automatic ignition of the generator without the need for an ATS switchboard. The simple set-up with 3-pin ATS plug on board of the generator is sufficient to connect the Leonardo Off-Grid GE system through the dedicated connection.



Le Leonardo hors réseau GE gère le démarrage automatique du groupe électrogène sans devoir passer par un inverseur. La simple dotation d'une fiche de 3 broches du générateur est suffisante pour la connexion du système Leonardo hors réseau GE par le biais d'un port dédié.

ATS plug



Genset power choice

La scelta del generatore va effettuata a seconda della taglia del sistema Leonardo:

The choice of the generator must be made according to the size of the Leonardo system:

Le choix opportun du générateur sera en fonction de la grandeur du système Leonardo:

Leonardo Off-Grid 1kW/**1500**/24 GE - **1500 VA** Genset Power

Leonardo Off-Grid 4kW/**3000**/48 GE - **3000 VA** Genset Power

Leonardo Off-Grid 4kW/**5000**/48 GE - **5000 VA** Genset Power

Leonardo Off-Grid 8kW/**8000**/48 GE - **8000 VA** Genset Power

LEONARDO OFF-GRID GE

TECHNICAL SPECIFICATIONS

		Leonardo Off-Grid 1kW / 1500/24 GE			Leonardo Off-Grid 4kW / 3000/48 GE			Leonardo Off-Grid 4kW / 5000/48 GE			Leonardo Off-Grid 8kW / 8000/48 GE			
		Min	Typ	Max	Min	Typ	Max	Min	Typ	Max	Min	Typ	Max	
INVERTER	Output power	Pout	-	1,500VA	3,000W	-	3,000VA	6,000W	-	5,000VA	10,000W	-	8,000VA	16,000W
	Battery Voltage	Vbatt	20.0V	24V	33V	40.0V	48V	66V	40.0V	48V	66V	40.0V	48V	66V
	Output voltage	Vac	-	230V	-	-	230V	-	-	230V	-	-	230V	-
	Output frequency	Fac	-	50Hz ± 0.1%	-	-	50Hz ± 0.1%	-	-	50Hz ± 0.1%	-	-	50Hz ± 0.1%	-
	Transfer time Inverter <> Bypass	Tsw	-	10mS	-	-	10mS	-	-	10mS	-	-	10mS	-
	Overload threshold	Poc	-	85%	-	-	85%	-	-	85%	-	-	85%	-
	Efficiency	Eff	-	94%	-	-	95%	-	-	95%	-	-	95%	-
	Absorption in bypass	Pbp	-	<4W	-	-	<5W	-	-	<6W	-	-	<6W	-
	Self-consumption in stand-by mode	Psb	-	10W	-	-	16W	-	-	25W	-	-	25W	-
	Switching threshold Inverter Mode / Bypass Mode	Tba	22.9V	23.0V	23.1V	45.9V	46.0V	46.1V	45.9V	46.0V	46.1V	45.9V	46.0V	46.1V
	Switching threshold Bypass Mode / Inverter Mode	Tbs	27.1V	27.2V	27.3V	54.3V	54.4V	54.5V	54.3V	54.4V	54.5V	54.3V	54.4V	54.5V
	Internal over- temperature alarm	Tot		65°C			65°C			65°C			65°C	
	Operating temperature	Tamb	-10°C	25°C	60°C	-10°C	40°C	60°C	-10°C	25°C	60°C	-10°C	25°C	60°C
PV CHARGER			Min	Typ	Max	Min	Typ	Max	Min	Typ	Max	Min	Typ	Max
	Battery Voltage	Vbatt	-	24.0V	-	-	48.0V	-	-	48.0V	-	-	48.0V	-
	MPPT Inputs	Nmpp	-	2	-	-	4	-	-	4	-	-	4	-
	Module current per channel	Ipan	-	-	13.0A	-	-	13.0A	-	-	13.0A	-	-	26.0A
	Open circuit module voltage	Vpan	-	-	150 V	-	-	150V	-	-	150V	-	-	150V
	Maximum power per channel	Pch	-	500W	-	-	1kW	-	-	1kW	-	-	2 kW	-
	Total maximum power	Pmax	-	-	1 kW	-	-	4 kW	-	-	4 kW	-	-	8 kW
	Charging voltage at 25° C (ABSORPTION)	VEoC	-	28.8V	-	-	57.6V	-	-	57.6V	-	-	57.6V	-
	ABSORPTION phase time	Tab	-	4h	-	-	4h	-	-	4h	-	-	4h	-
	Rest voltage (FLOAT)	Vflt	-	27.6V	-	-	55.2V	-	-	55.2V	-	-	55.2V	-
	Efficiency	Eff	-	97.2%	-	-	97.2%	-	-	97.2%	-	-	97.2%	-
	VEoC function compensation of battery temperature (Tbatt)	Vtadj	-	-96 mV/°C	-	-	-96 mV/°C	-	-	-96 mV/°C	-	-	-96 mV/°C	-
	Self-consumption	Iq	-	12 mA	-	-	12 mA	-	-	12 mA	-	-	12 mA	-
	Operating temperature	Tamb	-10°C	25°C	60°C	-10°C	25°C	60°C	-10°C	25°C	60°C	-10°C	25°C	60°C
	Power dissipation	Pdiss			66W			66W			66W			66W
ENCLOSURE			Min	Typ	Max	Min	Typ	Max	Min	Typ	Max	Min	Typ	Max
	Section of battery cables		-	25mm ²	-	-	25mm ²	-	-	35mm ²	-	-	50mm ²	-
	Length of battery cables		-	1.5mt	-	-	1.5mt	-	-	1.5mt	-	-	1.5mt	-
	Protection degree			IP20			IP20			IP20			IP20	
	Dimensions		315x750x130 mm			395x940x250 mm			395x940x250 mm			395x940x300 mm		
Weight		14 Kg			25 Kg			37 Kg			55 Kg			



WESTERN CO.
Via Pasubio, 1/3 – San Benedetto del Tronto (AP)
Tel: +39 0735.751248 Fax: +39 0735.751254

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