

# LEONARDO

## PRO X



### ONE PRODUCT FOR ALL SOLUTIONS

*ON-GRID RETROFIT  
ON-GRID NEW PLANTS  
OFF-GRID*



# Leonardo PRO X

3000/5000/8000

## Caratteristiche prodotto



230V AC 50 Hz  
Storage System



3000VA/5000VA/8000VA  
Output Power



95% Inverter  
Efficiency



Integrated LCD Display

[eng]

## Product features



App and Web Platform for  
Monitoring and Control



Ethernet Connection



Battery Voltage 48 VDC



Expandable for power  
extension and three-phase  
systems

[fra]

## Caractéristiques du produit



Compatible with Major  
Battery Manufacturers:

**CEI 0-21**

**Pylontech**

(both On-Grid and Off-Grid configurations)

**CEI 0-21**

**Horien**

(only On-Grid configurations)

**Soluna**

(both On-Grid and Off-Grid configurations)

**Sunwoda Atrix**

(both On-Grid and Off-Grid configurations)



## A MODULAR SYSTEM

*Aumenta la potenza  
quando vuoi*

[eng]

*Increase the power  
whenever you want*

[fra]

*Augmentez la puissance  
quand vous le souhaitez*

### Leonardo PRO X 3000

On-Grid and Off-Grid



#### UP TO 18kW

(1 Master + 5 Slave)

Espandibile fino a a 6 moduli per una potenza totale di 18kW

[eng]

Expandable up to 6 modules for a total power of 18kW

[fra]

Extensible jusqu'à 6 modules pour une puissance totale de 18kW

### Leonardo PRO X 5000

On-Grid and Off-Grid



#### UP TO 30kW

(1 Master + 5 Slave)

Espandibile fino a a 6 moduli per una potenza totale di 30kW

[eng]

Expandable up to 6 modules for a total power of 30kW

[fra]

Extensible jusqu'à 6 modules pour une puissance totale de 30kW

### Leonardo PRO X 8000

Only Off-Grid



#### UP TO 48kW

(1 Master + 5 Slave)

Espandibile fino a a 6 moduli per una potenza totale di 48kW

[eng]

Expandable up to 6 modules for a total power of 48kW

[fra]

Extensible jusqu'à 6 modules pour une puissance totale de 48kW

# AC Configuration

## Descrizione

Il **Leonardo PRO X** è la soluzione ideale per aggiungere un sistema di accumulo su impianti fotovoltaici già dotati di inverter di stringa AC On-Grid (Configurazione AC lato post-produzione) senza alterare la quantità di energia prodotta ed incentivata dall'impianto esistente. In caso di blackout della rete elettrica, il Leonardo PRO X alimenta le utenze collegate all'uscita EPS, con la potenza di targa dell'inverter senza limitazioni, con un tempo di ripristino inferiore ai 10 ms. È possibile abbinare al Leonardo PRO X la versione Slave, per espandere la potenza disponibile e/o per gestire impianti trifase. Disponibile in 2 versioni: 3000VA e 5000VA. I sistemi sono compatibili con i principali brand di batterie di accumulo al litio.

[eng]

## Description

**Leonardo PRO X** is the ideal solution for adding a storage system to an existing photovoltaic systems already equipped with On-Grid AC string inverters (AC configuration on the post-production side) without changing the amount of energy produced and stimulated by the existing system. In case of blackout of the grid, Leonardo PRO X feeds the loads connected to the EPS output, based on inverter power without limitations, with a recovery time of less than 10 ms. It is possible to combine a Slave version with Leonardo PRO X, to expand the available power and / or to manage three-phase systems. Available in 2 versions: 3000VA and 5000VA. These systems are compatible with the main brands of lithium storage batteries.

[fra]

## Description

**Leonardo PRO X** est la solution idéale pour ajouter un système de stockage à un système photovoltaïque existant déjà équipé d'onduleurs string AC On-Grid (configuration AC côté post-production) sans changer la quantité d'énergie produite et stimulée par le système existant. En cas de panne du réseau, Leonardo PRO X alimente les charges connectées à la sortie EPS, sur la base de la puissance de l'onduleur sans limitation, avec un temps de récupération inférieur à 10 ms. Il est possible de combiner une version Slave avec Leonardo PRO X, pour augmenter la puissance disponible et / ou pour gérer des systèmes triphasés. Disponible en 2 versions: 3000VA et 5000VA. Ces systèmes sont compatibles avec les principales marques de batteries de stockage au lithium.

## Caratteristiche prodotto



EPS anti-blackout function (for privileged loads) with recovery time <10ms



PEAK SHAVING function to increase the power available in the home system

[eng]

## Product features



AC overload and short circuit protection



Monitoring and parameter setting directly from the display (or remote console App My Leonardo)

[fra]

## Caractéristiques du produit



Booster function for increase grid power disponibility

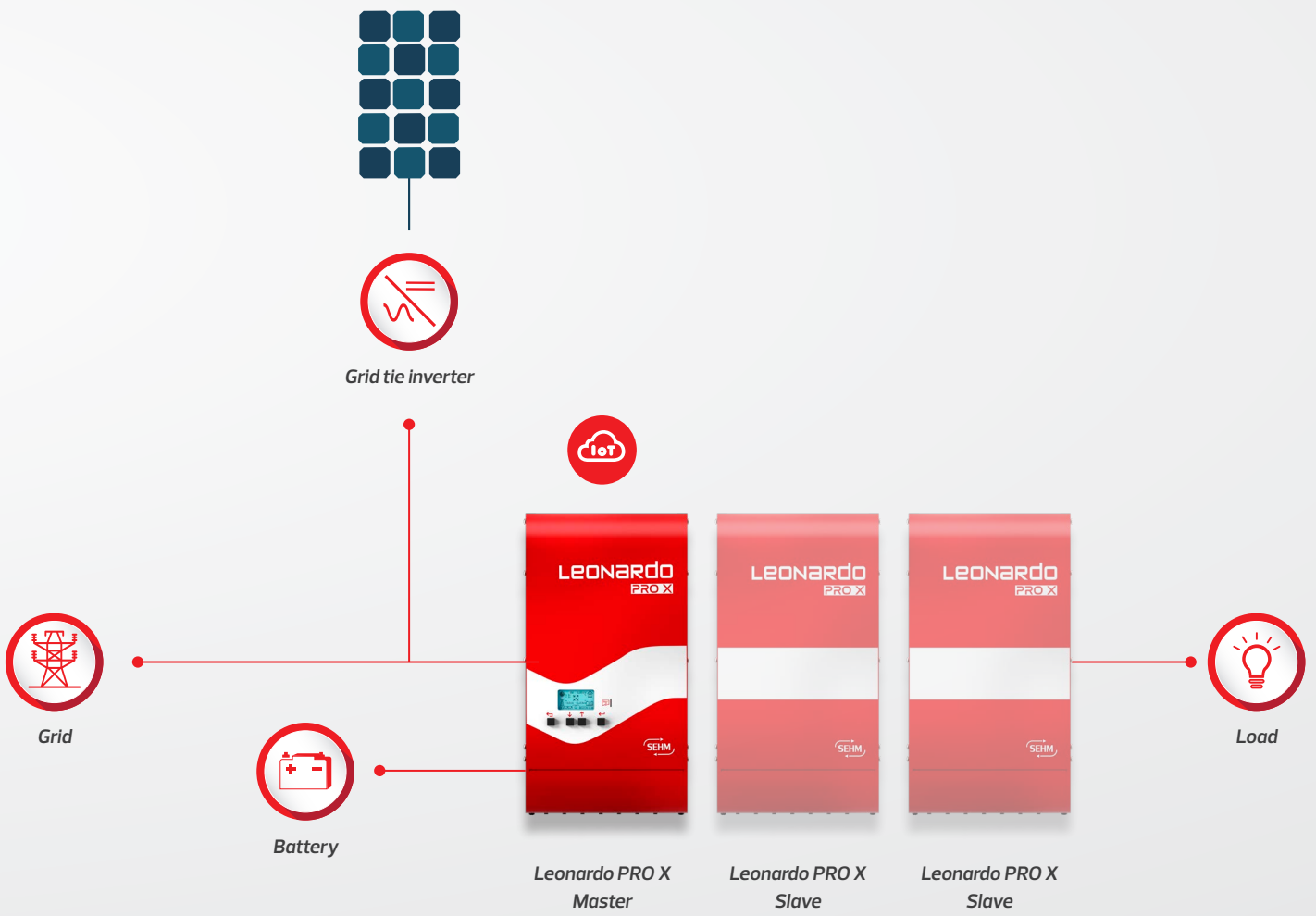


Remote control and integrated function management (to decrease on site operation maintenance)

**Schema logico**

*[eng]*  
Logic diagram

*[fra]*  
Schéma logique



# DC Configuration

## Descrizione

Il **Leonardo PRO X** può essere accoppiato al regolatore di carica WRM60 X SL o WRM30+ che gestiscono la potenza fotovoltaica, così da essere utilizzati per la realizzazione di nuovi impianti FV con batteria di accumulo (configurazione DC/AC). È possibile abbinare al Leonardo PRO X la versione Slave, per espandere la potenza disponibile e/o per gestire impianti trifase. Disponibile in 2 versioni: 3000VA e 5000VA. Grazie alla gestione del fotovoltaico a 48Vdc, in caso di blackout, oltre alla disponibilità della batteria, sarà possibile prelevare tutta l'energia istantanea generata dai moduli FV. I sistemi sono compatibili con i principali brand di batterie di accumulo al litio.

[eng]

## Description

**Leonardo PRO X** can be paired with WRM60 X SL or WRM30+ charge controllers which manage the photovoltaic power, in order to be used for new PV systems with storage battery (DC/AC configuration). It is possible to combine Slave version with Leonardo PRO X, to expand the available power and / or to manage three-phase systems. Available in 2 versions: 3000VA and 5000VA. Thanks to the 48Vdc photovoltaic management, in case of a blackout, in addition to battery availability, it is possible to withdraw all the instantaneous energy generated by the PV modules. The systems are compatible with main brands of lithium storage batteries.

[fra]

## Description

Le **Leonardo PRO X** peut être couplé aux contrôleurs de charge WRM60 X SL ou WRM30+ qui gèrent la puissance photovoltaïque, afin d'être utilisé pour la construction de nouveaux systèmes PV avec une batterie de stockage (Configuration DC/AC). Il est possible de combiner la version Slave avec Leonardo PRO X, pour augmenter la puissance disponible et / ou pour gérer des systèmes triphasés. Disponible en 2 versions: 3000VA et 5000VA. Grâce à la gestion photovoltaïque 48Vdc, en cas de panne du réseau, en plus de la disponibilité de la batterie, il est possible de retirer toute l'énergie instantanée générée par les modules PV. Les systèmes sont compatibles avec les principales marques de batteries de stockage au lithium.

## Caratteristiche prodotto



EPS anti-blackout function (function (Inverter Max Power disponibility) with recovery time <10ms



PEAK SHAVING function to increase the power available in the home system

[eng]

## Product features



AC overload and short circuit protection



Monitoring and parameter setting directly from the display (or remote console App My Leonardo)

[fra]

## Caractéristiques du produit



Booster function for increase grid power disponibility

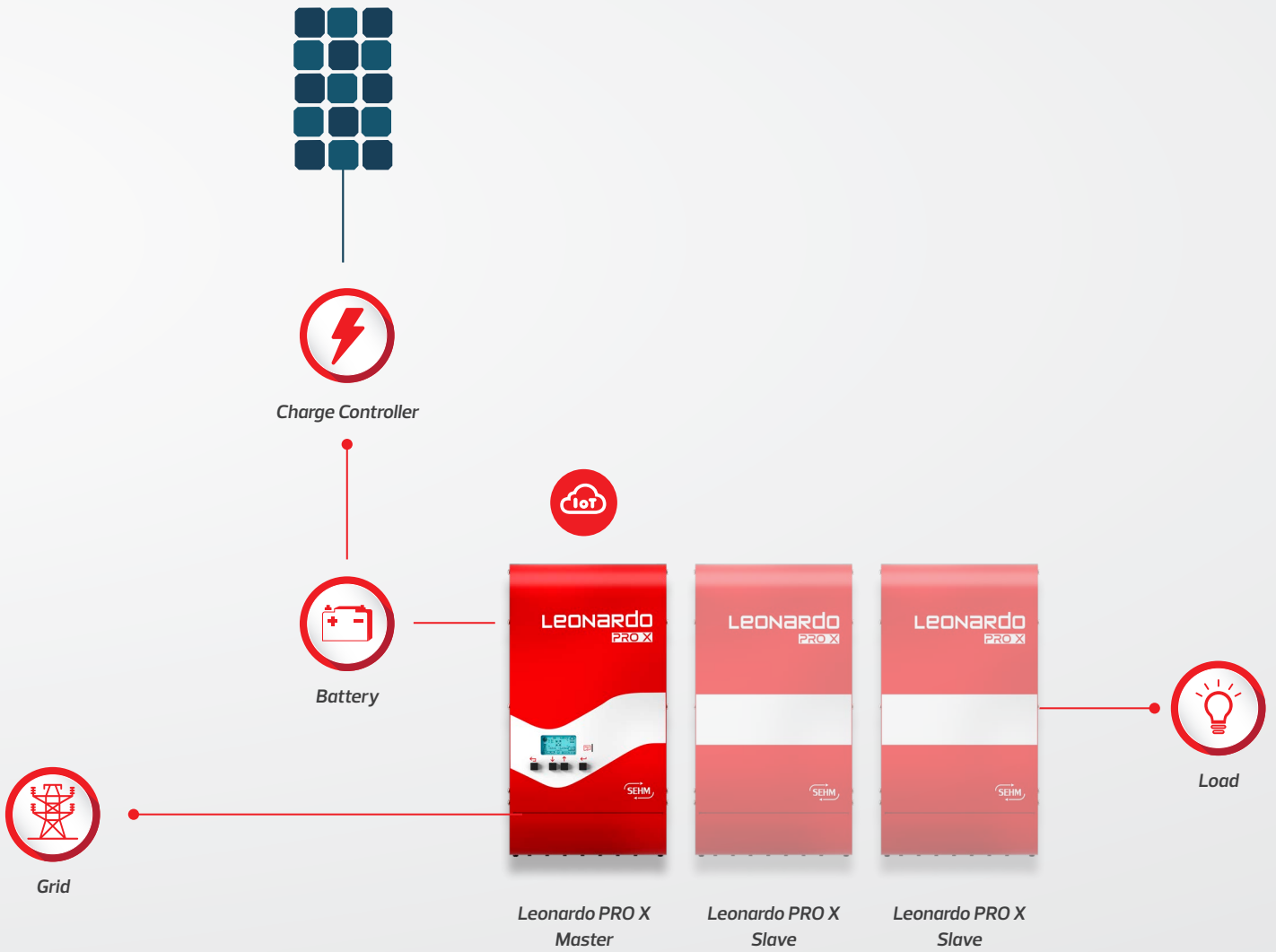


Remote control and integrated function management (to decrease on site operation maintenance)

**Schema logico**

[eng]  
Logic diagram

[fra]  
Schéma logique



# Off-grid

## Descrizione

Il **Leonardo PRO X** assieme ai regolatori di carica esterni WRM60 X SL o WRM30+ può essere configurato anche in modalità off-grid (direttamente dal display) con backup di emergenza su Genset.

Il Leonardo PRO X rende facile ed immediato l'utilizzo di energia prodotta da moduli fotovoltaici, per l'alimentazione di utenze domestiche o isolate, con l'ausilio di un gruppo elettrogeno (back-up) in caso di ridotta energia rinnovabile. 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 a causa della ridotta energia rinnovabile disponibile. Infatti, il gruppo elettrogeno gestisce simultaneamente l'alimentazione dei carichi e la carica del banco batterie.

È possibile abbinare al Leonardo PRO X la versione Slave, per espandere la potenza disponibile e/o per gestire impianti trifase. Disponibile in 3 versioni: 3000VA, 5000VA e 8000VA.

I sistemi sono compatibili con i principali brand di batterie di accumulo al litio (tecnologia piombo con aggiunta WBM).

[eng]

## Description

**Leonardo PRO X** together with WRM60 X SL or WRM30+ external charge controllers can also be configured in off-grid mode (directly from the display) with emergency backup on Genset. Leonardo PRO X makes it easy and immediate to use the energy produced by photovoltaic modules, to power domestic or isolated users, with the help of a generator (back-up) in the event of reduced renewable energy. By connecting a generator to the AC input, the system ensures continuity of operation of the utilities without perceptible discontinuity in the event of a low battery due to the reduced renewable energy available. In fact, the generator simultaneously manages the power supply of the loads and the charge of the battery bank.

It is possible to combine the Slave version with Leonardo PRO X, to expand the available power and / or to manage three-phase systems.

Available in 3 versions: 3000VA, 5000VA and 8000VA.

The systems are compatible with main brands of lithium storage batteries (lead technology with WBM addition).

[fra]

## Description

Le **Leonardo PRO X** avec les contrôleurs de charge externes WRM60 X SL ou WRM30+ peut également être configuré en mode hors réseau (directement depuis l'écran) avec une sauvegarde d'urgence sur le groupe électrogène. Leonardo PRO X permet d'utiliser facilement et immédiatement l'énergie produite par les modules photovoltaïques, pour alimenter des utilisateurs domestiques ou isolés, à l'aide d'un générateur (back-up) en cas d'énergie renouvelable réduite. En connectant un générateur à l'entrée AC, le système assure la continuité de fonctionnement des services publics sans discontinuité perceptible en cas de batterie faible en raison de la réduction des énergies renouvelables disponibles. En effet, le générateur gère simultanément l'alimentation des charges et la charge du banc de batteries. Il est possible de combiner la version Slave avec Leonardo PRO X, pour augmenter la puissance disponible et / ou pour gérer des systèmes triphasés. Disponible en 3 versions: 3000VA, 5000VA et 8000VA.

Les systèmes sont compatibles avec les principales marques de batteries de stockage au lithium (technologie au plomb avec ajout WBM).

## Caratteristiche prodotto



AC input for Genset bypass (switch <10ms)



Contact for automatic ignition of the Genset

[eng]

## Product features



AC overload and short circuit protection



Monitoring and parameter setting directly from the display (or remote console App My Leonardo)

[fra]

## Caractéristiques du produit

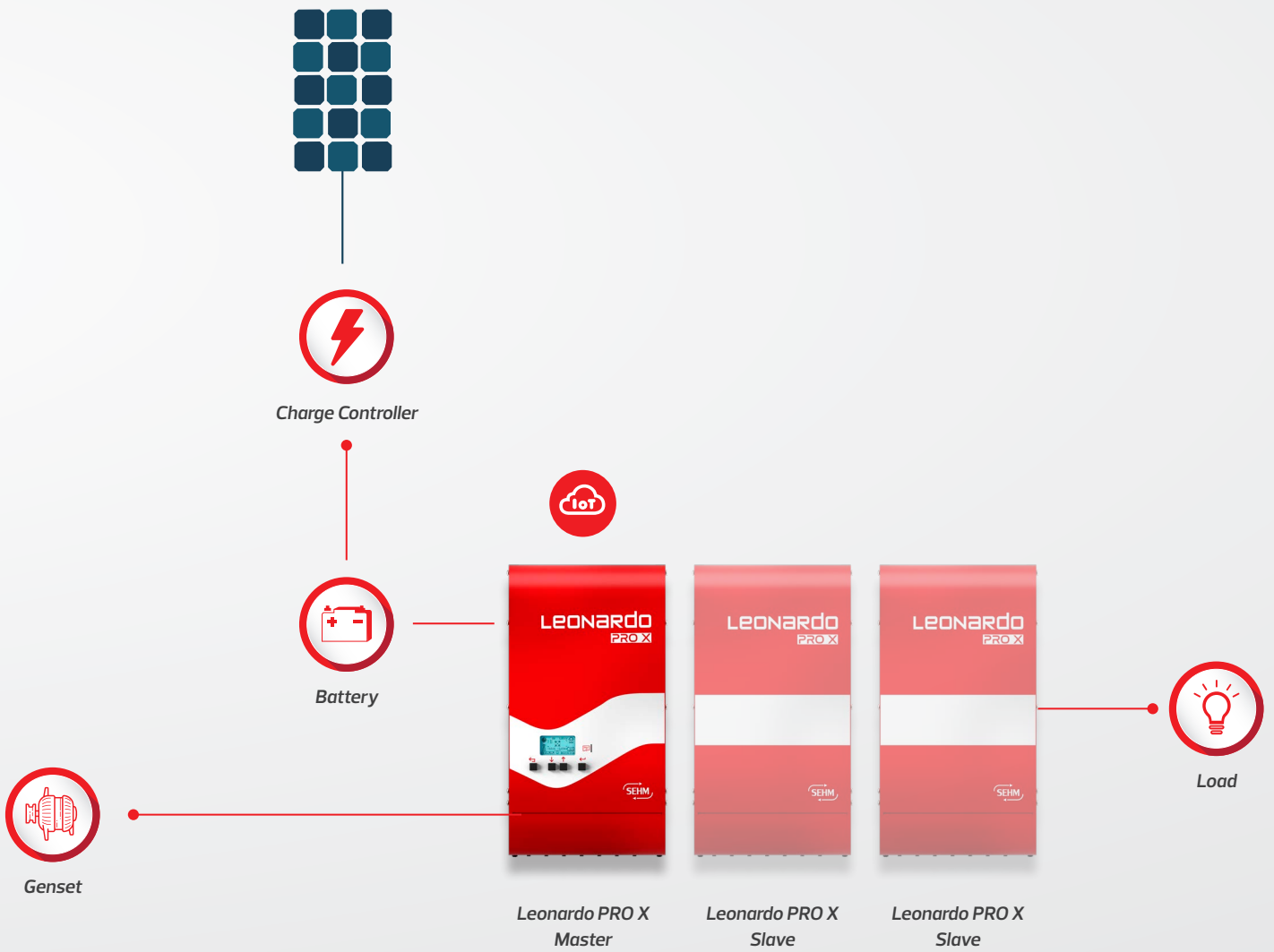


Remote control and integrated function management (to decrease on site operation maintenance)

**Schema logico**

[eng]  
Logic diagram

[fra]  
Schéma logique



# Monitoring and control for installers

## Realtime

[eng]

[fra]

Attraverso la intuitiva visualizzazione Realtime, è possibile prendere visione, a seconda della tipologia di impianto installato, di tutti i parametri del sistema:

- Produzione fotovoltaica distinta in componenti retrofit e regolatori di carica
- Potenza immessa o prelevata dalla rete elettrica o prelevata dal gruppo elettrogeno
- Flusso di potenza in carica o scarica dalla batteria, e stato di carica della batteria.
- Potenza in tempo reale dei propri consumi.
- Report produzione/prelievo/consumi, giornaliero

Through the intuitive Realtime view, it is possible to visualize, depending on the type of system installed, all the system parameters:

- Photovoltaic production divided into retrofit components and charge controllers
- Power fed in or taken from the grid or taken from the genset
- Charging or discharging power flow from the battery, and battery charge status.
- Real-time power of consumption.
- Daily Report of production / withdrawal / consumption

Grâce à la vue intuitive en Realtime, il est possible de visualiser, selon le type de système installé, tous les paramètres du système:

- Production photovoltaïque divisée en composants de retrofit et contrôleurs de charge
- Puissance injectée ou prélevée sur le réseau ou prélevée sur le groupe électrogène
- Flux d'alimentation de charge ou de décharge de la batterie et état de charge de la batterie.
- Puissance de consommation en temps réel.
- Rapport quotidien de production / retrait / consommation:

## Advanced

[eng]

[fra]

Nella sezione Advanced, l'utente ha la possibilità di monitorare l'andamento di tutte le grandezze che caratterizzano il proprio impianto.

Per tutti gli utenti:

- Bilancio in potenza del sistema
- Tensione, corrente e stato di carica batteria

Per installatori:

- Tensione, corrente di ciascuna stringa PV
- Tensione, corrente di ciascuna fase (per impianti trifase)

In the Advanced section, user has the ability to monitor the progress of all the quantities that characterize the system.

For all users:

- System power balance
- Voltage, current and battery charge status

For installers:

- Voltage, current of each PV string
- Voltage, current of each phase (for three-phase systems)

Dans la section Advanced, l'utilisateur a la possibilité de surveiller la progression de toutes les quantités qui caractérisent le système.

Pour tous les utilisateurs:

- Balance de puissance du système
- Tension, courant et état de charge de la batterie

Pour les installateurs:

- Tension, courant de chaque chaîne PV
- Tension, courant de chaque phase (pour les systèmes triphasés)

## Notifications

[eng]

[fra]

Con le notifiche push (su app Android e iOS) ed e-mail, il cliente è costantemente aggiornato in caso di:

- batteria scarica
- blackout
- attivazione del gruppo elettrogeno
- sovraccarico del sistema.

With push notifications (on Android and iOS apps) and e-mail, customer is constantly updated in case of:

- low battery
- blackout
- activation of the generator
- system overload.

Avec les notifications push (sur les applications Android et iOS) et les e-mails, le client est constamment mis à jour en cas de:

- batterie faible
- panne du réseau
- activation du générateur
- surcharge du système.

## Energy Rates

[eng]

[fra]

Grazie ai diagrammi energetici, è possibile conoscere il proprio report di produzione e consumo.

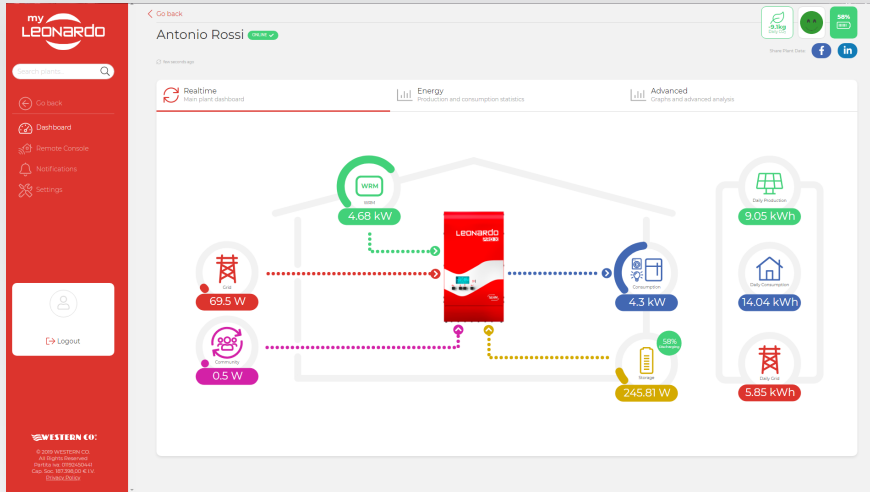
Sono disponibili filtri temporali, settimanali, mensili e annuali relativi ai dati di energia prodotta, consumata, immagazzinata in batteria, prelevata o immessa dalla rete elettrica.

Thanks to the energy diagrams, it is possible to know your own production and consumption report.

Time filters on weekly, monthly and annual basis are available relating to the data of energy produced, consumed, stored in the battery, taken or fed from the electricity grid.

Grâce aux diagrammes énergétiques, il est possible de connaître votre propre rapport de production et de consommation.

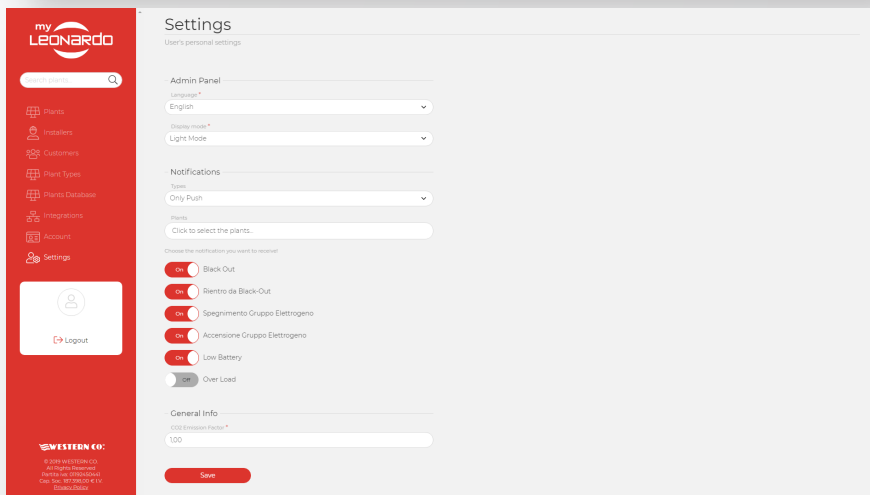
Des filtres horaires hebdomadaires, mensuels et annuels sont disponibles concernant les données d'énergie produite, consommée, stockée dans la batterie, prélevée ou alimentée sur le réseau électrique.



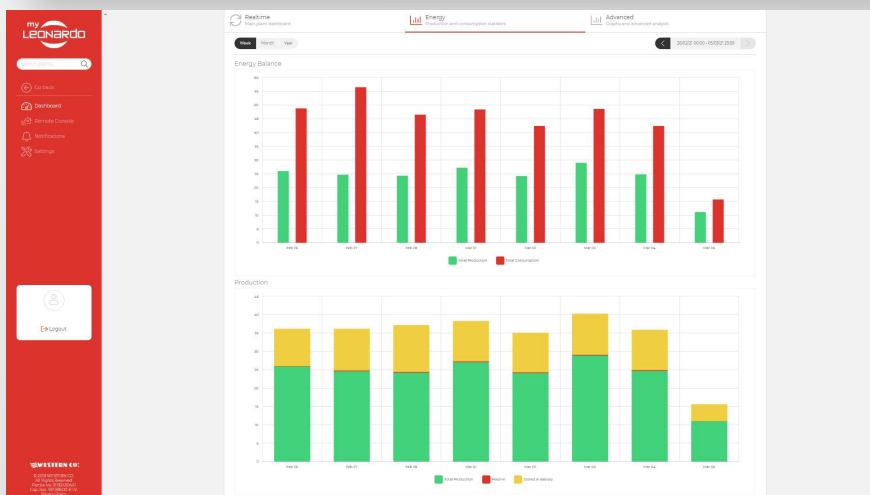
Realtime



Advanced



Notifications



Energy

# Monitoring and control

[eng]

Attraverso le App mobile tutte le informazioni riguardo il proprio impianto di accumulo **Leonardo PRO X** sono a portata di mano in qualsiasi momento. Le App sono disponibili per smartphone o tablet iOS e Android.

Through mobile Apps, all information about your **Leonardo PRO X** storage system is at your fingertips at any time. *The Apps* available for iOS and Android smartphones or tablets.

[fra]

Grâce aux applications mobiles, toutes les informations sur votre système de stockage **Leonardo PRO X** sont à portée de main à tout moment. Les applications sont disponibles pour les smartphones ou tablettes iOS et Android.

## APP INSTALLATORI



my Leonardo

[eng]

## APP INSTALLERS

[fra]

## APP INSTALLATEURS



## APP UTENTI FINALI



W-Cloud

[eng]

## APP END USERS

[fra]

## APP UTILISATEURS FINAUX



[eng]

Grazie alla console remota non si è mai soli in caso di assistenza, modifica impostazioni operative e check-up dell'impianto.

Thanks to the remote console, you are never alone in the event of assistance, changing operational settings and system check-up.

[fra]

Grâce à la console à distance, vous n'êtes jamais seul en cas d'assistance, de modification des paramètres de fonctionnement et de vérification du système.



# Batteries



## Descrizione

Il **Leonardo PRO X** è compatibile con i principali brand di batterie di accumulo al litio.

[eng]

## Description

**Leonardo PRO X** is compatible with main brands of lithium storage batteries.

[fra]

## Description

**Leonardo PRO X** est compatible avec les principales marques de batteries de stockage au lithium.

**Pylontech**

**CEI 0-21 COMPLIANT**



MODEL	CAPACITY
US3000C	3.5kWh
US5000	4.8kWh

## US3000C/US5000

Fino a 8 batterie parallelabili (on-grid) fino a 40 batterie parallelabili (off-grid)

[eng]

## US3000C/US5000

Up to 8 batteries in parallel (on-grid) up to 40 batteries in parallel (off-grid)

[fra]

## US3000C/US5000

Jusqu'à 8 batteries en parallèle (on-grid) jusqu'à 40 batteries en parallèle (off-grid)



MODEL	CAPACITY
Force L1	3.55kWh
Force L2	3.55kWh

## Force L1/L2

Fino a 7 batterie parallelabili (on-grid) fino a 35 batterie parallelabili (off-grid)

[eng]

## Force L1/L2

Up to 7 batteries in parallel (on-grid) up to 35 batteries in parallel (off-grid)

[fra]

## Force L1/L2

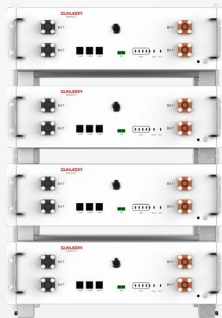
Jusqu'à 7 batteries en parallèle (on-grid) jusqu'à 35 batteries en parallèle (off-grid)

**Horien****CEI 0-21 COMPLIANT**

MODEL	CAPACITY
48TL200	9.6 kWh

**Soluna****SOLUNA**

MODEL	CAPACITY
EOS-5KPack	5.12kWh
10K Pack LV	10.24kWh

**Sunwoda Atrix****SUNWODA ENERGY**

MODEL	CAPACITY
Atrix	5.0kWh

**Lead-acid batteries**

Grazie al **WBM** le batterie al piombo diventano "smart".

Il WBM misura la corrente di batteria, la tensione di batteria e la temperatura. Implementa appositi controlli per gestire in modo oculato la batteria, massimizzando la sua vita utile.

I dati vengono così trasmessi al Leonardo PRO X e sono facilmente visualizzabili sia sul display integrato che sul portale web e app my Leonardo.

*[eng]*

Thanks to **WBM** lead-acid batteries become "smart".

The WBM measures battery current, battery voltage and temperature. Implement specific controls to manage the battery wisely, maximizing its useful life.

The data is thus transmitted to Leonardo PRO X and can be easily viewed both on the integrated display and on the web portal and my Leonardo app.

*[fra]*

Grâce à **WBM**, les batteries plomb-acide deviennent «intelligentes».

Le WBM mesure le courant, la tension et la température de la batterie. Mettez en œuvre des contrôles spécifiques pour gérer la batterie avec sagesse, maximisant sa durée de vie utile.

Les données sont ainsi transmises à Leonardo PRO X et peuvent être facilement visualisées à la fois sur l'écran intégré et sur le portail Web et my Leonardo app.

# Charge controllers

## Descrizione

Nel caso di installazione di nuovi impianti FV on-grid o impianti FV off-grid è necessario abbinare al Leonardo PRO X i regolatori di carica WRM30+ o WRM60 X SL. In questi casi, infatti, il sistema si collega in DC ai regolatori di carica esterni WRM30+ o WRM60 X SL.

[eng]

## Description

In case of installation of new on-grid PV systems or off-grid PV systems, it is necessary to combine Leonardo PRO X with WRM30+ or WRM60 X SL charge controllers. In these cases, in fact, the system is connected in DC to the external charge controllers WRM30+ or WRM60 X SL.

[fra]

## Description

En cas d'installation de nouveaux systèmes PV sur réseau ou de systèmes PV hors réseau, il est nécessaire de combiner Leonardo PRO X avec des régulateurs de charge WRM30+ or WRM60 X SL. Dans ces cas, en effet, le système est connecté en DC aux contrôleurs de charge externes WRM30+ or WRM60 X SL.

WRM30+



WRM60 X SL



## Caratteristiche prodotto



2 Independent MPPT PV inputs

[eng]

## Product features



WBUS protocol with RS485 communication port

[fra]

## Caractéristiques du produit



Protections:  
Low voltage load disconnect  
Over-temperature  
Battery polarity inversion  
Output overload protection

## Caratteristiche elettriche

[eng]

## Electrical specifications

[fra]

## Fonctionnalités électroniques

		WRM30+			WRM60 X SL		
		Min	Typ	Max	Min	Typ	Max
Battery voltage	$V_{batt}$	40.0V	48.0V	64.0V	40.0V	48.0V	64.0V
Max PV open circuit voltage	$V_{pan}$	-	-	180V	-	-	180V
Max PV current for each MPPT channel	$I_{pan}$	-	-	13A	-	-	26A
Max PV power for each channel	$P_{chMax}$	-	-	900W	-	-	1800W
Battery charge current	$I_{ch}$	-	-	30A	-	-	30A
Self-consumption	$I_q$	-	12mA	-	-	15mA	-
Operating temperature	$T_{amb}$	-40°C	-	+50°C	-40°C	-	+50°C
Max power loss	$P_{loss}$	-	-	66W	-	-	130W
Efficiency	$\eta$	96.0%	-	97.2%	96.0%	-	97.2%
Battery wires / connections		35mm <sup>2</sup>			M8 screws		
PV module wires / connections		10mm <sup>2</sup>			MC4		
Protection degree		IP20			IP20		
Weight		1.1kg			2.2kg		
Dimensions		178x283x84mm			260x290x80mm		

# Electrical specifications

			Leonardo PRO X 3000/48 Li	Leonardo PRO X 5000/48 Li	Leonardo PRO X 8000/48 Off-Grid
<b>INVERTER</b>	Nominal power	P <sub>nom</sub>	3kVA	5kVA	8kVA
	Continuous power at 25 °C	P <sub>con1</sub>	2.4kW	4.0kW	6.4kW
	Continuous power at 40 °C	P <sub>con2</sub>	2.2kW	3.7kW	5.5kW
	Battery voltage	V <sub>bat</sub>	48V	48V	48V
	Battery voltage range	V <sub>dc</sub>	40 – 66V	40 – 66V	40 – 66V
	AC voltage and frequency	V <sub>nom</sub>	230Vac – 50Hz	230Vac – 50Hz	230Vac – 50Hz
	AC voltage range	V <sub>ac</sub>	187 – 265Vac	187 – 265Vac	187 – 265Vac
	AC input current	I <sub>ac</sub>	32A	50A	100A
	Harmonic distortion	T <sub>hd</sub>	< 3%	< 3%	< 3%
	Nominal power factor	P <sub>i</sub>	1	1	1
	Min. load Maximum efficiency DC-> AC	E <sub>ds</sub>	95%	96%	96%
	Max. load Maximum efficiency DC-> AC		80%	80%	80%
	Connectable load power on EPS out	E <sub>ps</sub>	2.4kW	4.0kW	6.4kW
	EPS transfer time on grid blackout	T <sub>sw</sub>	10ms	10ms	10ms
	Power consumption in by-pass mode	P <sub>bp</sub>	< 2W	< 2W	< 15W
	Topology	T <sub>op</sub>	Toroidal isolation transformer	Toroidal isolation transformer	Toroidal isolation transformer
	Cooling	V <sub>en</sub>	Forced ventilation	Forced ventilation	Forced ventilation
PV production meter	M <sub>is</sub>	40A with direct connection	40A with direct connection	--	
Consumption current sensor	T <sub>a</sub>	100A split core current transformer	100A split core current transformer	--	
<b>AC CHARGER</b>	Maximum charge power	P <sub>ch</sub>	2.1kW	3.5kW	5.5kW
	Maximum charge current	I <sub>ch</sub>	35A	70A	110A
	Maximum efficiency AC-> DC	E <sub>ch</sub>	95%	95%	95%
	Charging curve	Al <sub>g</sub>	BMS self-adaptive	BMS self-adaptive	BMS self-adaptive
	Battery communication	Co <sub>m</sub>	CAN BUS	CAN BUS	CAN BUS
<b>INTERFACES</b>	PV production meter connection	Meter	2 x 2.5mm <sup>2</sup> screw terminals	2 x 2.5mm <sup>2</sup> screw terminals	--
	VE-Bus Master/Slave port	VE-Bus	RJ45	RJ45	RJ45
	WBUS service port	WBUS	RJ11	RJ11	RJ11
	Battery communication port	CAN	RJ10 with 1.5m supplied cable	RJ10 with 1.5m supplied cable	RJ10 with 1.5m supplied cable
	Internet communication port	Ethernet	RJ45	RJ45	RJ45
	Current sensor port	Current Sense	3.5mm jack with 1m cable	3.5mm jack with 1m cable	3.5mm jack with 1m cable
<b>ENCLOSURE</b>	Weight	kg	18	29	42
	Dimensions	mm	271x502x143	317x560x143	355x649x225





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# WRM60 X [SEHM]

Code  
WRM60 X Master: 017742  
WRM60 X Slave: 017741



## Descrizione prodotto

Il **WRM60 X** è uno smart charge controller per la carica di batterie da moduli fotovoltaici e utilizzato in impianti domestici o grandi impianti a isola. È adatto per sistemi a **24V/48V** e la sua modularità, attraverso l'aggiunta dei WRM60 X Slave, permette di gestire una potenza fotovoltaica **fino a 50kW**. Gli utenti, grazie al collegamento con la rete internet possono controllare da remoto il funzionamento del regolatore, modificare le impostazioni e aggiornare il software. Una piattaforma dedicata permette, infatti, diverse funzionalità: monitoraggio, controllo e gestione del sistema. Questo modello implementa un circuito di ricerca della massima potenza del modulo FV (**MPPT**) e permette la gestione di due stringhe FV indipendenti. È compatibile con batterie dotate di **BMS** (con comunicazione **CAN**) o con batterie tradizionali grazie al Western Battery Monitor (**WBM**).

## [eng] Product description

**WRM60 X** is a smart charge controller for charging batteries from PV modules and used in domestic or large stand-alone systems. It is suitable for **24V/48V** systems and its modularity, through the addition of the WRM60 X Slave, allows to manage a photovoltaic power **up to 50kW**. Users, thanks to the Internet connection, can remotely control the operation of the controller, change the settings and update the software. In fact, a dedicated platform allows different functions: monitoring, control and management of the system. This model implements a search circuit of the maximum power of the PV module (**MPPT**) and allows the management of two independent PV strings. It is compatible with batteries equipped with **BMS** (with **CAN** communication) or with traditional batteries thanks to the Western Battery Monitor (**WBM**).

## [fra] Description du produit

Le **WRM60 X** est un contrôleur de charge intelligent qui permet de charger les batteries à partir de modules photovoltaïques destinés à être utilisés pour des installations domestiques ou de grande taille en site isolé. Il est indiqué pour des systèmes à **24/48V** et vu sa modularité, grâce à l'ajout du WRM60 X Slave, on peut arriver à gérer des puissances **jusqu'à 50kW**. Il se connecte à internet, cela permet aux utilisateurs de contrôler à distance le fonctionnement du contrôleur, d'en modifier les réglages et de mettre à jour le logiciel. Une plateforme dédiée permet en effet plusieurs fonctionnalités : surveillance, contrôle et gestion du système. Ce modèle est doté d'un circuit de recherche de point de puissance maximale du module PV (**MPPT**) qui maximise l'énergie extraite du module et chargée en batterie et permet la gestion de deux chaînes photovoltaïques indépendantes. Il est compatible avec des batteries équipées de **BMS** (avec communication **CAN**) ou avec des batteries traditionnelles grâce au Western Battery Monitor (**WBM**).

## Caratteristiche prodotto



2 MPPT string inputs



Max PV module power:  
1800W for 24V battery  
3600W for 48V battery



Cloud IoT Technology

## [eng] Product features



Advanced online data monitoring & control



Enhanced display user interface



Smart battery profiles

## [fra] Caractéristiques du produit



24V/48V battery auto-detect voltage



Protections:  
Over temperature  
Battery polarity inversion  
Temperature derating



Pb-lead acid, Pb-AGM  
Pb-gel batteries and  
Lithium batteries

## Portale di monitoraggio

**my Leonardo:** portale di monitoraggio utilizzato nella gestione del proprio sistema energetico da remoto. Il portale permette anche la gestione delle impostazioni del proprio impianto o di più impianti in maniera aggregata.

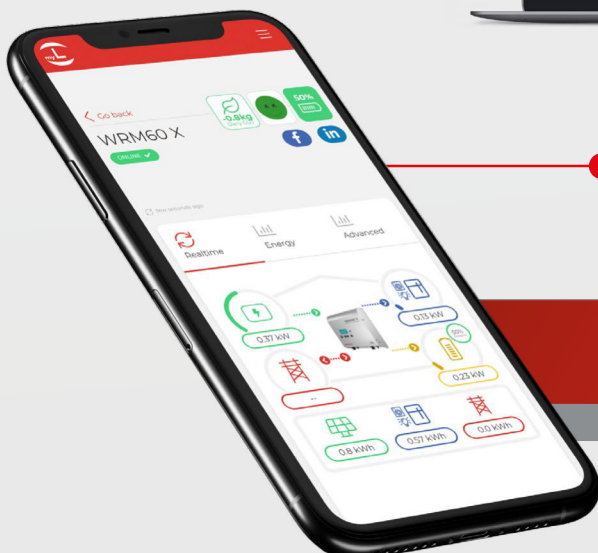
## [eng] Monitoring platform

**my Leonardo:** monitoring platform used for the remote management of your energy system. The portal also allows the management of the settings of your plant or of more than one in an aggregate manner.

## [fra] Portail de suivi

**my Leonardo:** portail de surveillance utilisé dans la gestion à distance de votre système énergétique. Le portail permet également de gérer de manière agrégée les réglages de votre installation ou de plusieurs installations.

## Realtime Monitoring



## Energy statistics



USER MANUAL  
WRM60

**Schema logico**

[eng]  
Logic diagram

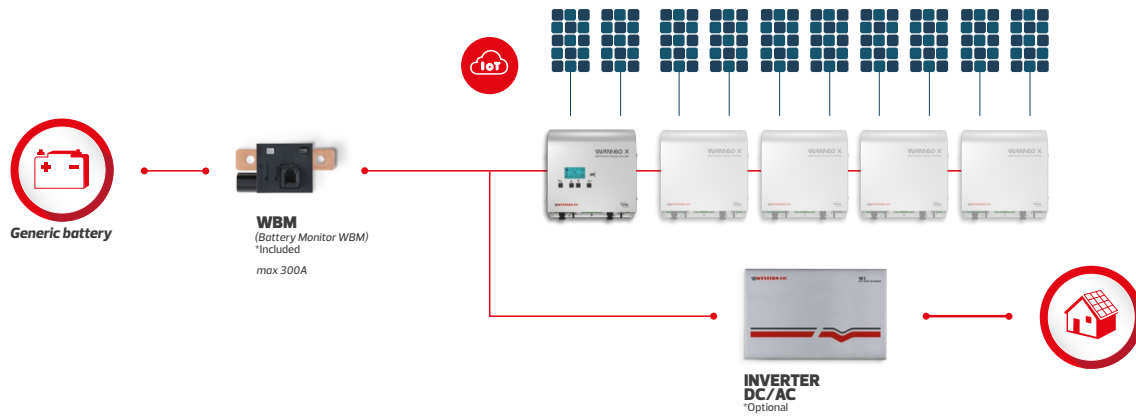
[fra]  
Schéma logique

# WRM60

**SHUNT  
Configuration**



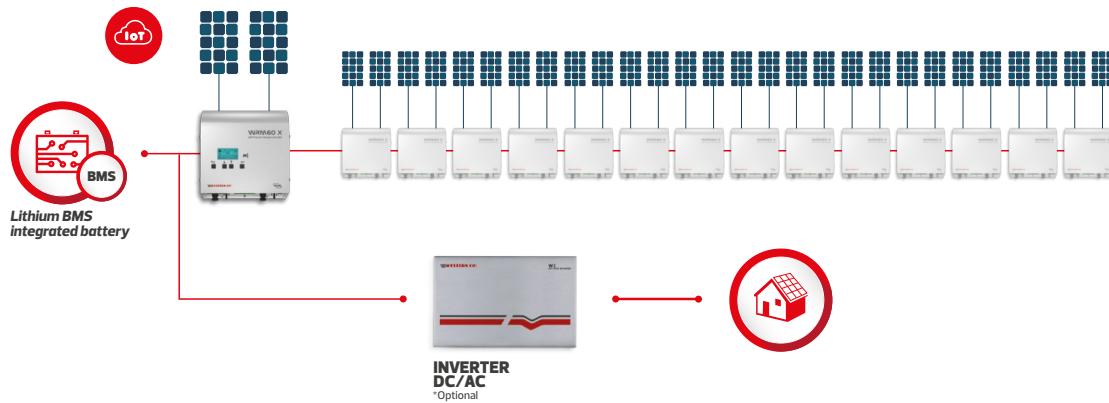
**UP TO  
8.5KW@24V  
17KW@48V**



**CAN  
Configuration**



**UP TO  
25KW@24V  
50KW@48V**



## Caratteristiche elettriche

[eng]  
Electrical specifications

[fra]  
Fonctionnalités électroniques

	SYMB	WRM60 X
Nominal battery voltage		24/48V autodetect
Battery voltage range (24/48V)	$V_{bat}$	20 ÷ 32 / 40 ÷ 64V
Max charge current	$I_{ch}$	60A
Max charge power (24/48V)	$P_{ch}$	1800/3600 W
Max open circuit voltage of PV string	$V_{oc}$	180V
Max short circuit current of each PV string input	$I_{sc,n}$	26A
Independent MPPT PV string input	$PV_{,n}$	2
Max power of each PV string input (24/48V)	$P_{pv,n}$	900W/1800W
Self - consumption	$P_q$	2W
Operating temperature	$T_{amb}$	-10°C ÷ +50°C
Max power dissipated (24/48V)	$P_{loss}$	112/132W
Efficiency @max charge current	$\eta$	93.5% ÷ 95.2%/96.0% ÷ 97.2%
Parallel slave operation		Controlled via W-BUS
Weight		2.5kg Master) 2.2kg (Slave)
Dimension		287x261x105mm (Master) 287x261x83mm (Slave)
Degree of protection		IP20



High Power Output  
Low LCOE

Maximum Power  
515W+

# TWMNH

N-type Half-cell  
Bifacial Module (54)

## 54HD495-515W

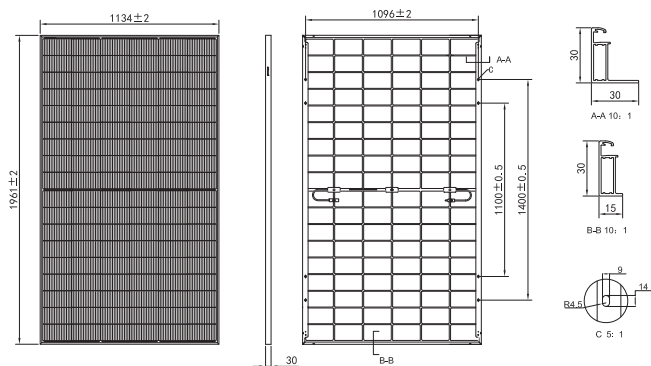


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Learn More

**DRAWINGS (Unit: mm)**



**ELECTRICAL CHARACTERISTICS (STC)**

Module Type: TWMNH-54HDXXX					
Maximum Power: Pmax [W]	495	500	505	510	515
Open Circuit Voltage: Voc [V]	39.88	40.06	40.24	40.42	40.60
Short Circuit Current: Isc [A]	15.86	15.89	15.92	15.95	15.98
Voltage at Maximum Power: Vmp [V]	33.45	33.70	33.94	34.19	34.43
Current at Maximum Power: Imp [A]	14.80	14.84	14.88	14.92	14.96
Module Efficiency: η [%]	22.3	22.5	22.7	22.9	23.2

\* STC: Irradiance 1000W/m<sup>2</sup>, Cell Temperature 25°C, Air Mass1.5

**ELECTRICAL CHARACTERISTICS (NMOT)**

Maximum Power: Pmax [W]	374	378	381	385	389
Open Circuit Voltage: Voc [V]	37.97	38.14	38.31	38.48	38.65
Short Circuit Current: Isc [A]	12.80	12.83	12.85	12.88	12.90
Voltage at Maximum Power: Vmp [V]	31.30	31.56	31.73	31.96	32.21
Current at Maximum Power: Imp [A]	11.95	11.98	12.01	12.05	12.08

\* NMOT: Irradiance 800W/m<sup>2</sup>, Ambient Temperature 20°C, Air Mass1.5, Wind Speed 1m/s

**Electrical characteristics with different rear side power gain**

5%	Maximum Power: Pmax [W]	519	525	530	535	540
	Module Efficiency: η [%]	23.3	23.6	23.8	24.1	24.3
15%	Maximum Power: Pmax [W]	569	575	580	586	592
	Module Efficiency: η [%]	25.6	25.9	26.1	26.4	26.6
25%	Maximum Power: Pmax [W]	618	625	631	637	643
	Module Efficiency: η [%]	27.8	28.1	28.4	28.6	28.9

**TEMPERATURE RATING**

Temperature Coefficient of Pmax	-0.28%/°C
Temperature Coefficient of Voc	-0.24%/°C
Temperature Coefficient of Isc	+0.046%/°C
NMOT	45±2°C

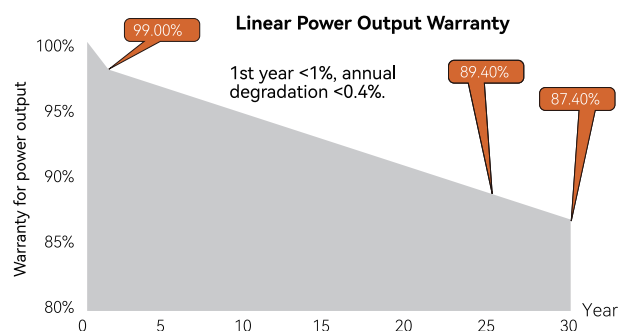
**OPERATING PARAMETERS**

Operating Temperature	-40°C~+85°C
Maximum System Voltage	1500V DC
Maximum Series Fuse Rating	30A
Power Output Tolerance	0~+3%

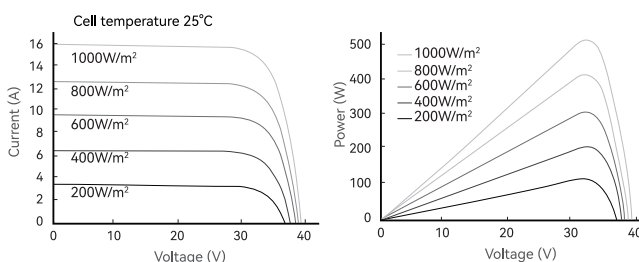
**MECHANICAL PARAMETERS**

Cell Type	TNC (N Type Monocrystalline Cell)
Cell Orientation	108[6×18]
Dimensions	1961±2×1134±2×30mm
Weight	27.4 kg
Front Glass	2.0mm AR coated heat strengthened glass
Rear Glass	2.0mm heat strengthened glass
Frame	Anodized aluminum alloy frame
Junction Box	IP68, 3 diodes
Cable	4.0mm <sup>2</sup>
Cable length	±1200mm, length can be customized
Wind/Snow load	2400Pa/5400Pa
Packaging	36pcs per pallet, 864pcs per 40'HC

**WARRANTY**



**I-V CURVE**



**CERTIFICATIONS**

**Quality Management System and Product Certification**

- ISO 9001: 2015/Quality management system
- ISO 14001: 2015/Environmental management system
- ISO 45001: 2018/Occupation health safety management system
- ISO 50001: 2018/Energy management system
- IEC 62941: 2019/Quality system for PV module manufacturing
- IEC 61215/61730, IEC 62804(PID), IEC 61701(Salt), IEC 62716 (Ammonia), IEC 60068-2-68(Sand)



The 5K batteries could be rack-mounted in **Soluna Liberty Cabinet** for up to 6x batteries in parallel and offers **30kWh** storage capacity.

The Cabinet Kits pre-wired for a very fast installation at customer site, and with the IP 54 rate cabinet could be outdoor installed also save the installation space which is preferred for off-grid applications.

### Liberty 30K

Capacity (kWh)	30.72
Voltage (V)	51.2
Max. charge/discharge (A)	180
DoD (%)	90
Height (mm)	1340
Width (mm)	600
Depth (mm)	650
Weight (kg)	430



## BATTERY MODULE EOS 5K PACK

### TECHNICAL SPECIFICATION



**Soluna EOS 5K Pack** is a 48V battery solution ideal for Residential and small Commercial energy storage applications.

The model is adopting by latest **LiFePO<sub>4</sub>** technology with intelligent BMS integrated inbuilt blackout protection for energy security, offering a **5kWh** capacity that can be installed in parallel with up to 12 batteries enabling 60 kWh of total storage.

With a **10-year** warranty and up to 6000 long cycle life, the EOS 5K Pack is a flexible, reliable, high-performance battery storage solution.

**Low Voltage**



**Scalable to 600kWh**

**Safest LiFePO<sub>4</sub> battery**



**Long lifespan**

**Easy Installation**



**Floor, Wall Mountable  
Rack Mountable**



## TECHNICAL SPECIFICATIONS

### PHYSICAL CHARACTERISTICS

Height (mm)	595
Width (mm)	438
Depth (mm)	165
Weight (kg)	60
Installation	Floor-stand, Wall-mounted, Rack-mounted

### ELECTRICAL CHARACTERISTICS

Battery type	Lithium LFP
Nominal capacity (kWh)	5.12
Nominal voltage (V)	51.2
Voltage range (usable) (V)	40 to 58.4
Max. charge/discharge current (A)	100
Depth of discharge (DoD) (%)	90
Internal resistance (mΩ)	≤60
Cycle life	6000
Battery pack round-trip efficiency (%)	>95
DC disconnect	Contacteur fuse

### BMS

Power consumption	<3 W (work) <100 mW (sleep)
Monitoring parameters	System voltage System current Cell voltage Cell temperature CAN-WiFi, RS 485
Communication	

### OPERATING CONDITIONS

Operating temperature (°C)	-10 to 50
Operating temperature (recommended) (°C)	15 to 30
Storage temperature (recommended) (°C)	15 to 30
Humidity conditions (%)	5 to 95
Altitude (m)	Max. 2,000
Cooling strategy	Natural convection

### RELIABILITY AND CERTIFICATION

Certification	Cell: UL1642 Battery module: IEC62619 & UL1973
Hazardous materials classification	Class 9
Transportation	UN38.3
Ingress protection rating	IP 65
System configuration	1 to 120 parallel

### WARRANTY

Product and performance	10-year standard warranty
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