

INSTALLATION AND USER MANUAL

ZHERO THREE-PHASE

STORAGE SYSTEM INSTALLATION AND OPERATING MANUAL
ZHERO THREE-PHASE S10



Dear customer, thank you for choosing UNE products.

Please do not hesitate to contact us at info@unesrl.com for any information that may help us improve this manual.

Before operating the UNE ZHERO S10, please read this manual and the safety instructions carefully.

These operating instructions are intended for all installers, maintainers and users of UNE ZHERO and are intended to provide guidance for the correct use of the system, in order to make it as efficient as possible.

These instructions are an integral part of the UNE ZHERO, which cannot be supplied without this document, and as such must be available at all times to those using the equipment.

Throughout the life of the UNE ZHERO S10, please keep this manual in a safe place and ensure that it is available to all technical personnel working on the UNE ZHERO S10.

All data given in this manual only describe TITAN Energy & Power, and are not, as stated data, legally binding.

The symbols for the chapters (installer, maintenance technician, user) are shown below:



"INSTALLER"

The following chapter must be read and understood by the UNE ZHERO S10 system installer



"MAINTENANCE TECHNICIAN"

The following chapter must be read and understood by the UNE ZHERO S10 system maintainer



"USER"

The following chapter must be read and understood by the user of the UNE ZHERO S10 system

SUMMARY

1.	   - GENERAL INFORMATION	7
1.1.	MANUAL RECIPIENTS	7
1.2.	SCOPE OF VALIDITY	9
1.3.	TERMS OF DELIVERY AND WARRANTY	9
1.4.	SYMBOLS USED	10
1.5.	DEFINITIONS USED	12
1.6.	GENERAL INFORMATION	14
1.7.	PERSONAL PROTECTION	16
1.8.	STORAGE SYSTEM	17
1.9.	LIMITS OF THE FIELD OF APPLICATION	19
1.10.	RESIDUAL RISKS	20
2.	   - GENERAL PRODUCT OVERVIEW	21
2.1.	GENERAL DESCRIPTION	21
2.1.1.	ON-GRID SYSTEM	22
2.1.2.	ON-GRID E OFF-GIRD SYSTEM	23
2.2.	NAMEPLATE OF UNE ZHERO S10	24
2.3.	TECHNICAL DATA	24
2.4.	BOX INVERTER	25
2.5.	BATTERY BOX	27
2.6.	SWITCH PANEL	29
2.7.	AC INPUT TERMINAL BLOCK	30
2.8.	COMMUNICATION CONNECTIONS	31
2.9.	PHOTOVOLTAIC CONNECTIONS	32
3.	 - OPERATIONS PRIOR TO INSTALLATION	34
3.1.	LIFTING AND TRANSPORTING	34
3.2.	TOOLS REQUIRED FOR INSTALLATION	36
3.3.	ENVIRONMENTAL AND GENERAL INSTALLATION CONDITIONS	37
3.4.	POSITIONING OF UNE ZHERO S10	38
3.5.	UNPACKING	40
3.6.	PRELIMINARY WORK ON ELECTRICAL CONNECTIONS	41
3.7.	DIMENSIONING THE PHOTOVOLTAIC SYSTEM	43

3.8.	STRING POLARITY CHECK	43
3.9.	MAIN SWITCH DOWNSTREAM OF THE CHANGEOVER COUNTER	44
3.10.	USER ELECTRICAL SYSTEM	44
3.11.	PRELIMINARY OPERATIONS	45
3.12.	FURTHER DESIGN GUIDELINES	45
3.13.	CONNECTION DIAGRAM OF UNE ZHERO S10	46
4.	 - INSTALLATION	49
4.1.	BATTERY INSTALLATION	49
4.2.	CONTROLLER SHELF INSTALLATION	54
4.3.	CONNECTING THE PHOTOVOLTAIC SYSTEM	56
4.4.	AC-SIDE CONNECTION	59
4.4.1.	CONNECTION: DISTRIBUTOR NETWORK/ GEN-SET	60
4.4.2.	CONNECTION: IN-OUT PRODUCTION COUNTER (IF APPLICABLE)	62
4.4.3.	CONNECTION: BACKUP LINE (IF APPLICABLE)	64
4.5.	CONNECTING THE METERS	66
4.5.1.	GAVAZZI ET340	67
4.5.2.	METER LOVATO DME D330	72
4.5.3.	METER FOR OFF-GRID APPLICATION	76
4.6.	INTERNET CONNECTION	77
5.	  - START-UP AND SHUTDOWN	80
5.1.	SWITCHING ON THE SYSTEM	80
5.2.	VERIFICATION WITH “ZHERO INSTALLER TOOL”	81
5.3.	SHUTTING DOWN THE SYSTEM	82
6.	 - MAINTENANCE	83
7.	  - PRODUCT SERVICE	84
8.	  - REGULATORY COMPLIANCE	85
9.	   - DISPOSAL	86
10.	 - OPERATION OF THE SYSTEM	87
10.1.	TIPS FOR OPTIMAL USE	87

10.2.	SECURITY CHECKS	90
10.2.2.	ON-BOARD INV SWITCH TEST	91
10.3.	SUPERVISION	92
10.3.1.	WEBSERVER & WEBAPP	92
10.4.	“STANDARD” FUNCTION	92
10.5.	“CYCLIC EQUALISATION” FUNCTION	92
10.6.	“CHARGE HYSTERESIS” FUNCTION	92
10.7.	“FEED SURPLUS ENERGY INTO THE GRID” FUNCTION	93
10.8.	“BLACKOUT” FUNCTION	93
10.9.	“POWER RAMP” FUNCTION	93
10.10.	“WARMUP, CHARGE AND DISCHARGE” FUNCTION	93
10.11.	“DEVICE IN STAND-BY” FUNCTION	94
10.12.	“OFF-GRID” FUNCTION	94
10.13.	“RETROFIT – HYBRID” FUNCTION	94
11.	   - FAILURE OR ANOMALY	96
11.1.	FAULT SIGNALLING	96
11.2.	MOST COMMON ANOMALIES	97
11.2.1.	LOW INSULATION RESISTANCE	97
11.2.2.	STRING ANOMALY	98
11.2.3.	BATTERY FAILURE	98
11.2.4.	CONTROLLER FAILURE	99
11.2.5.	INVERTER FAILURE	99
11.2.6.	WEBSERVER COMMUNICATION FAULT	99
11.2.7.	BYPASSING THE SYSTEM	102
11.2.8.	ON-BOARD RESIDUAL CURRENT CIRCUIT BREAKER RUPTURE	102
11.2.9.	FAILURE TO CONNECT TO THE DISTRIBUTOR/GENERATOR NETWORK	103
12.	   - APPENDICES	104
12.1.	SYSTEM STATUS TABLES	104
12.2.	PRODUCT DATA SHEET	107

1. - GENERAL INFORMATION

All operators must comply with safety regulations, considering and assessing all risks to themselves or others (the EMPLOYER must carry out a risk assessment).

1.1. Manual recipients

This manual contains important safety instructions which must be followed during the use of UNE ZHERO.

The original language of this document is Italian, in case of inconsistencies or doubts please request the original document from UNE srl.

Installation, commissioning and maintenance should only be carried out by qualified personnel.

Qualified personnel are defined as personnel considered fit to work on live electrical installations in accordance with the regulations in force in the country of installation (e.g. an IEP in the European Community) who have received the certificate of authorised installer for UNE ZHERO from UNE srl.

Personnel are authorised by UNE srl following adequate theoretical and practical training and an examination whereby they have demonstrated their skills and knowledge of the unit structure.



ATTENTION: Access to UNE ZHERO by persons with mitral valves, pacemakers, under the influence of alcohol or drugs is strictly prohibited.



ATTENTION: Anyone working on UNE ZHERO must use the means of protection prescribed by the law of the country in which the system is installed.

The installer and maintenance technician will, before commissioning the UNE ZHERO, provide the user with all the information required for correct use, including:

- **Instruction** on the dangers of using electrical equipment;
- **Instruction** on the use of an island system;
- **Instruction** on the safe use of batteries;
- **Instruction** on the safe switching off and disconnection of the system in the event of a fault;
- **Instruction** on securing the island system against reactivation;
- **Instruction** on maintenance and cleaning within its competence;
- **Knowledge of and compliance** with the operating instructions, including all safety warnings.

Additional warnings for the end user:



ATTENTION: The customer must always check that the installer is authorised by UNE srl, only personnel whose training is verified can be considered experienced and reliable in the installation and maintenance of UNE ZHERO.



ATTENTION: The client is responsible for checking the mental and physical state of those approaching their UNE ZHERO.



ATTENTION: It is forbidden to use the equipment in a way that does not comply with its field of application.



Figure 1 – UNE ZHERO S10, UNE ZHERO S10, battery box left, inverter box right

1.2. Scope of validity

These instructions for the installation, maintenance and use of UNE ZHERO apply to all firmware versions. The firmware version of your device can be consulted in your dedicated section on the site:

www.portal.zherosystem.com

or via web app in your smartphone/tablet under info.

This product may only be operated within its intended field of application, i.e., it is permitted for residential, commercial and industrial use, in **400V (three-phase) 50 Hz TT and TN-S networks, not IT or TN-C**.

For further information and questions, please contact UNE srl via the channels indicated in the contact section.

1.3. Terms of Delivery and Warranty

The guarantee conditions are described in the appropriate document supplied with the equipment; in particular, the guarantee conditions are only valid if:

- The installer and the maintenance technician must comply with all the instructions given in the manual;
- NO unauthorised operations or **operations not in compliance with this document are carried out on UNE ZHERO**;
- Only authorised personnel carry out "**open casing**" operations on UNE ZHERO;
- NO modifications are carried out on UNE ZHERO.

UNE srl will NOT be held responsible for defects or malfunctions deriving from:

- **Improper use of the equipment**;
- Alterations due to transport or to particular environmental conditions;
- Lack of or improper maintenance;
- Tampering or faulty repairs;
- Installation or maintenance carried out by unauthorised persons.

Furthermore, UNE srl disclaims all liability in the event that the regulations for correct installation in force in the country of installation are not complied with.

1.4. Symbols used

Below is a list of the symbols used in this manual:



"ATTENTION".

Non-observance can be life-threatening and cause damage to the device.



"WARNING"

Failure to observe the warning may hinder an operating phase and possibly prevent optimal operation of the device.



"READ CAREFULLY"

The following usage tips can make it easier for you to use UNE ZHERO and improve its performance depending on the installation site.



"EXAMPLE"

Here you will find more practical examples.



"NOTE"

The following usage tips can make it easier for you to use UNE ZHERO S10 and improve its performance depending on the installation site.



"DANGEROUS VOLTAGE"

The highlighted information relates to parts of the converter that may operate or may still be at high voltages.



" WARM TEMPERATURE "

Some surfaces may become hot; wear appropriate personal protective equipment (PPE) when working with this product.



"DANGER OF CRUSHING "

Indicates risks of crushing hands or limbs caused by cutting or pressing parts. Danger of death!



" PROHIBITION OF ACCESS "

Indicates that unauthorised persons cannot access the system area (technical room).



REPAIRS, MAINTENANCE OR LUBRICATION CANNOT BE CARRIED OUT WITH THE SYSTEM IN OPERATION (ACTIVE).



"PROHIBITION OF USING WATER TO EXTINGUISH FIRES"

It is forbidden to use water or any other fluid to fight a fire.



"COMPULSORY READING OF INSTRUCTIONS"

Anyone intending to use the system must read this manual and become familiar with all the controls and equipment.



"SYSTEM OPERATING RANGE"

This symbol indicates the operating range.



" WAITING TIME"

Wait a certain period of time before taking the indicated action.

IP20

"DEGREE OF PROTECTION"

Indicates the degree of protection provided by mechanical and electrical enclosures against the intrusion of solid particles and access of liquids.



" AC POWER SUPPLY"

Indicates that a circuit must be AC.



"CLASS II DEVICE"

Class II devices do not require one of the two poles to be earthed.



" GROUNDING "

Identifies an earthing terminal.



"NON-ORDINARY WASTE"



"ELECTRONIC WASTE"

1.5. Definitions used

Below is a list of the definitions used in this manual:

ELECTRICAL APPLIANCE

Object that absorbs electricity for its normal operation.

EXTRAORDINARY MAINTENANCE

Intervention to restore the system following a loss of performance or malfunctioning.

BMS

Battery Management System.

PHOTOVOLTAIC MODULE

A photovoltaic module is a device capable of converting incident solar energy into electrical energy through the photovoltaic effect.

DIRECT CURRENT

Type of current produced by the photovoltaic modules and with which the batteries operate.

MPPT

MAXIMUM POWER POINT TRACKER algorithm that optimises the energy input from the modules by matching the generator to the load so that the operating point corresponds to the maximum power point.

ALTERNATING CURRENT

Type of current output from the inverter and usable in single-phase and three-phase power grids.

PARALLEL WITH THE ELECTRICITY GRID

Condition in which a plant can feed the energy it produces into the local operator's grid.

DEALER

Your UNE ZHERO supplier.

AVAILABLE POWER

Amount of power the system can deliver simultaneously.

FIRMWARE

Firmware is a programme, i.e. a sequence of instructions, integrated directly into an electronic component in the broadest sense of the term.

SPD

Overvoltage protection.

INSTALLER

He who, after appropriate training, operates UNE ZHERO with competence and expertise.

STAND BY

Standby mode is the condition in which electrical/electronic devices are not operating but are ready to switch from temporary inactivity to operational mode.

OFF-GRID (STAND ALONE)

Plant completely independent of the public grid for the distribution of energy to the user, not in parallel with the local distributor's power grid.

PRODUCTION COUNTER

Bidirectional energy meter, installed by the electricity service provider, capable of measuring the energy produced by the photovoltaic system.

ROUTINE MAINTENANCE

Inspection of the system to check its integrity, with possible intervention to restore its working conditions and performance to the original level.

METER

Bidirectional energy meter, supplied by UNE, capable of measuring the energy produced by the photovoltaic system and exchanged with the grid.

INVERTER

An inverter proper is an electronic device capable of converting a direct current into an alternating current.

USER

Subject benefiting from the services offered by UNE ZHERO.

IRRADIATION

In thermodynamics and electromagnetism, radiation refers to the transfer of energy between two bodies by means of electromagnetic waves, (sunlight impinging on photovoltaic modules).

BACKUP

Functionality allowing in the event of a blackout by the distributor network to keep one or more lines in the home powered.

LED

In electronics, a light-emitting diode or LED is an optoelectronic device that exploits the optical properties of certain semiconductor materials to produce light.

WORKING MODE

This means the operating mode of UNE ZHERO, depending on how it is programmed it can be Off-Grid, On-Grid with backup.

$I_{\Delta n}$

Leakage current at which the earth leakage circuit breaker trips.

PROTECTION INTERFACE

System for disconnecting the photovoltaic system in the event of grid faults (e.g. SPI or NS protection).

PHOTOVOLTAIC GENERATOR

Set of photovoltaic modules that properly connected provides energy to your system.

RETROFIT

Installation of a storage system, in the electrical system, capable of charging its batteries from an existing external photovoltaic generator.

LOCAL NETWORK OPERATOR

The local grid operator is the legal entity entrusted with the operation of the electricity grid at the location.

EXCHANGE COUNTER

Bidirectional energy meter, installed by the electricity service provider, capable of measuring the energy withdrawn and sold in the grid.

STAND-ALONE SYSTEM

Plant completely independent of the public grid for the distribution of energy to the user, not in parallel with the local distributor's power grid.

PRODUCTION COUNTER

Bidirectional energy meter, installed by the electricity service provider, capable of measuring the energy produced by the photovoltaic system.

GRID CONNECTED PLANT

Traditional photovoltaic system in parallel with the local distributor's electricity grid.

EXCHANGE METER

Bidirectional energy meter, supplied by UNE, capable of measuring energy withdrawn and sold in the grid.

The safety instructions in these instructions must be observed at all times. Failure to do so may result in damage to the appliance and danger to persons and property.

Read the safety warnings carefully before operating the system.

1.6. General information

The UNE ZHERO S10 installer must bear in mind the following warnings:



ATTENTION: Always keep the safety warnings and manuals supplied with the UNE ZHERO at hand.



ATTENTION: UNE srl declines all responsibility in the event of failure to comply with the rules for correct installation and is not liable for the proper execution of the systems upstream or downstream of the equipment supplied by it.



ATTENTION: For obvious reasons it is not possible to foresee the variability of installations and environments in which the equipment might be installed; the customer must advise the authorised installer of particular installation conditions.



ATTENTION: If malfunctions are found during installation or daily use, it is absolutely forbidden to use the product.



ATTENTION: Installation under environmental conditions other than those indicated in the chap.3.3.

The maintainer of the UNE ZHERO S10 must bear the following warnings in mind:



ATTENTION: UNE srl disclaims all liability in the event of failure to comply with the rules for proper maintenance and is not liable for the proper maintenance of systems upstream or downstream of the equipment it supplies.



ATTENTION: It is necessary for the customer to notify the maintainer of particular problems or anomalies it has encountered during its use.



ATTENTION: For cleaning, DO NOT use corrosive products that damage parts of the equipment and products that generate electrostatic charges.



ATTENTION: In the event of malfunctions, it is forbidden to use the product during maintenance until it has been fully restored.

The user of the UNE ZHERO S10 should bear in mind the following warnings:



ATTENTION: In case of fire, use CO2 extinguishers and use personal protection suitable for enclosed spaces.



ATTENTION: Operations on UNE ZHERO "open external carter" may only be carried out by authorised personnel.



ATTENTION: Once the final positioning has been carried out by the installer, it is absolutely forbidden for the user to move and/or reposition it, even for short distances. If necessary, repositioning may only be carried out by authorised personnel.



ATTENTION: UNE srl has designed the product in such a way as to eliminate sharp edges and cutting parts wherever possible. This is not possible with all UNE ZHERO components and points; therefore the authorised installer must wear clothing and personal equipment in compliance with the regulations in the country of installation.



ATTENTION: The installer and/or maintenance technician must always pay attention to the environment in which they work, verifying that the minimum illuminance conditions necessary for correct vision in the system are in place.



ATTENTION: The installer and/or maintenance technician must always check that there is adequate space to guarantee the escape route.

1.7. Personal protection

The assessment of risks to workers' health and safety carried out in the workplace or on any of the equipment used, as well as the assessment of residual risks affecting the system, as described in this manual, enables the EMPLOYER to assess the need to provide workers with the most suitable and appropriate **Personal Protective Equipment (PPE)**.



ATTENTION: In case of fire, use CO₂ extinguishers and use personal protection suitable for enclosed spaces.



ATTENTION: Maintenance work must be carried out with the equipment disconnected from the grid, the photovoltaic generator and with the machine switched off, access to the system is only permitted 20 minutes after the power has been removed.



ATTENTION: Operations on UNE ZHERO "open external carter" may only be carried out by authorised personnel.



ATTENTION: Once the final positioning has been carried out by the installer, it is absolutely forbidden for the user to move and/or reposition it, even for short distances. If necessary, repositioning may only be carried out by authorised personnel.



ATTENTION: The installer and/or maintenance technician must always pay attention to the environment in which they work, verifying that the minimum illuminance conditions necessary for correct vision in the system are in place.



ATTENTION: The installer and/or maintenance technician must always check that there is adequate space to guarantee the escape route.

1.8. Storage system

Dangerous currents and voltages are present inside UNE ZHERO.

Complete protection against contact can only be achieved by observing the instructions for use and:

- The device is correctly mounted;
- All connections **have been made in a workmanlike** manner and in accordance with the instructions in this manual;
- The appliance is **correctly earthed** in relation to the place of installation and in accordance with the regulations in force;
- All **enclosures** are correctly closed;
- If you suspect the presence of a **fault**, contact the supplier/installer of the system directly.



ATTENTION: The installer must always report the presence of anomalies or deterioration due, for example, to wear and tear or ageing so that the initial conditions can be restored.



ATTENTION: UNE ZHERO is NOT designed to supply vital medical equipment.



ATTENTION: UNE ZHERO must not be used in installations where a power failure could cause personal injury.



ATTENTION: Open external carter operations must be performed with the system switched off.



ATTENTION: It is strictly forbidden to install the system where there are obvious traces of tampering and integrity of the original packaging. Installation will result in the definitive loss of the warranty.



WARNING: in the event that the system is delivered damaged, you must either not collect the system or sign it with reservation by immediately notifying UNE, otherwise the damage will not be covered by the warranty.

The battery may present a risk of high short-circuit current; the following precautions must be observed when working with batteries.



ATTENTION: it is strictly forbidden to open the battery in any of its parts; moreover, if it is at operating temperature ($>260^{\circ}\text{C}$), opening it may pose a burn hazard.



ATTENTION: even if the battery poses no risk of explosion or fire, it is strictly forbidden to violate its integrity in any way.

The Galvanic Transformer

Physically housed inside UNE ZHERO provides BASIC isolation from the mains supply.

The Residual Current Detection

O RCD is guaranteed by the isolation control with which UNE ZHERO is equipped and which is visible in the disconnecter panel at the top right, in the event of activation of the alarm the inverter can still **continue to operate safely**; however, you must contact your installer to check the cause of this signalling.

The isolation resistance is set at 50 kΩ. The system immediately warns of this by flashing the operating light, as well as signalling by e-mail the user and installer who registered on the webserver when the device was associated with their account.



ATTENTION: UNE ZHERO must be installed with all the necessary precautions to make it suitable for the installation site, in compliance with all local regulations and the rule of art.



ATTENTION: It is not possible to protect the user installation with UNE ZHERO's internal protections as they are not suitable. The user's electrical installation must be protected by appropriate equipment in accordance with local regulations.



ATTENTION: even if the battery has a maximum operating voltage of no more than 60V, it is still mandatory to ensure that it is switched off before performing any operation on it.



ATTENTION: It is forbidden to use the equipment in a way that does not comply with the field of application.



ATTENTION: In order to parallel the system with the local distributor's electricity grid, it is necessary to complete the technical and bureaucratic procedures required by the regulations in force in the country of installation.

1.9. Limits of the field of application

UNE ZHERO S10 is a complete intelligent power generation-storage-management system capable of working in different configurations depending on the user's needs, these configurations are indicated in the chap **Errore. L'origine riferimento non è stata trovata..**

The goal is to achieve the customer's energy independence, to be pursued through the production of energy from renewable sources, the storage of this and intelligent management to enable conscious and efficient use. **UNE ZHERO is to be used in residential, commercial and industrial environments, in 400V (single-phase) - 50 Hz TT and TN-S networks, not IT or TN-C.**

UNE ZHERO is capable of accepting the direct current from a correctly sized photovoltaic system, storing it internally and transforming it, when required, into alternating current suitable for use by the user. Any other use is considered unsuitable or dangerous.

In addition:

- **UNE ZHERO** cannot be used with photovoltaic modules which require one of the poles to be earthed;
- External batteries which have not been authorised by UNE srl cannot be connected to the system;
- **UNE ZHERO** can only be used in compliance with all the technical characteristics given in the technical data sheet;
- **UNE ZHERO** can only be used indoors where IP20 equipment is suitable, installation in adverse or unsuitable environmental conditions is prohibited;
- **Installation in places with a risk of fire or explosion** risk is prohibited;
- Installation in places with **particular flammable conditions is forbidden**;
- **It is forbidden** to deposit materials, particularly if flammable and/or explosive, in the vicinity of UNE ZHERO;
- **It is forbidden** to connect equipment outside the indicated limits of use;
- **It is forbidden** to use the equipment with the safety devices absent, not working or disabled; It is forbidden to use the protections incorporated in UNE ZHERO as the primary protection of the user installation;
- **It is forbidden** to use UNE ZHERO without having made the necessary connections to earth;
- **It is forbidden** to modify the working parameters of UNE ZHERO, particularly for On-Grid systems any variation must be agreed with the local distributor in compliance with the law;
- **It is forbidden** to use corrosive products or products which generate electrostatic charges for cleaning;
- **It is forbidden** to use the equipment without having read and understood the contents of the manuals;
- **It is forbidden** to obstruct the ventilation system; - It is forbidden to use UNE ZHERO as a UPS as it is not certified for this use;
- **It is forbidden** to use UNE ZHERO to supply vital medical equipment;
- The system is certified **PD II (indoor, conditioned)**, this means that the installation environment must be dry and free of condensation.

For more information contact your supplier.

1.10. Residual risks

Despite efforts to make the system secure, there are still residual risks that cannot be eliminated:

Mechanical hazards

Such as loss of stability, crushing, investment is minimised if handling and transport are carried out in accordance with the instructions in this manual and by performing a professional installation.

Electrical hazards

such as electrocution, contact with live parts, burns, etc. are minimised if installations are carried out according to the instructions in this manual and by performing a professional installation.

Thermal hazards

Such things as burns, scalds, overheating are reduced to a minimum if installations are carried out according to the instructions in this manual and by performing a professional installation.

Other environmental hazards

They are reduced to a minimum if installations are carried out according to the instructions in this manual and carried out in a workmanlike manner.



ATTENTION: Verify the adequacy and safety of the user's electrical installation.



ATTENTION: During the day, the photovoltaic generator by its nature always remains live even after disconnecting the system.

If, during the course of the work, the **maintenance technician** discovers **obvious safety deficiencies** whose removal is outside his remit (e.g. obstructions to ventilation, changes to external UNE ZHERO installations which could lead to serious risks to people's safety), these must be reported in writing, pointing out the need to **eliminate** them.

2. - GENERAL PRODUCT OVERVIEW

2.1. General Description

UNE ZHERO is a complete system whose objective is the achievement of the customer's energy independence, to be pursued through the **production of energy from renewable sources, the storage of this and intelligent management to enable conscious and efficient use.**

UNE ZHERO, once correctly sized and installed according to your needs provides the energy required to power your electrical consumers.

The UNE ZHERO S10 can operate in different modes depending on the needs of the customer and the installation site, some modes are not available in some countries, the external structure remains the same, but inside you can configure four types of system:



Figure 1 - UNE ZHERO S10 product view

FUNCTIONALITY	THREE-PHASE	RETROFIT	HYBRID	OFF-GRID
Line covered by backup	✓	✓	✓	✓
Line not covered by backup	✓	✓	✓	
Internal photovoltaic controllers	✓		✓	✓
External inverter		*	*	
internal UNE inverter	✓	✓	✓	✓
Exchange meter	✓	✓	✓	
Production meter		✓	✓	
Gen-Set connection				✓
Grid connection	✓	✓	✓	

LEGEND

DESCRIPTION

- +  The functionality **IS PROVIDED** in the product corresponding to its column;
- + The functionality **IS NOT PROVIDED** in the product corresponding to its column;
- + * The feature allows the energy produced by this device to be stored.

2.1.1. ON-Grid system

UNE ZHERO S10 Three-phase

The system works in parallel with an existing public grid to which the user is connected, thus becoming an active user.

Being in parallel, the power available to the user is the sum of the power made available by UNE ZHERO (which varies depending on the availability of the photovoltaic and the battery, up to a maximum of 10 kW) and the power made available by the distributor to the user.

UNE ZHERO S10 Retrofit or UNE ZHERO S10 Hybrid

The system works in parallel with an existing public grid and an external photovoltaic system to which the user is connected, thus becoming an active user.

Being certified in '0 feed-in', the system's feed-in power does not have to be added to that of the existing photovoltaic system.



ATTENTION: before proceeding with the installation of the Hybrid or Retrofit system, ensure its operation is in accordance with the country and place of installation; UNE accepts no responsibility for the place and method of connection.

In the event of a blackout

In the event of a distributor blackout, the system will automatically and dynamically switch to BACKUP mode, guaranteeing continuity of service along the 'backup' line until the batteries run out or the local distributor's network is restored. In the latter case, normal operation will resume.

In UNE ZHERO it is possible to enable the feed-in function, in accordance with local regulations in each country, to feed the surplus energy produced by the photovoltaic system into the grid.



ATTENTION: If a protection interface is present, brief disruptions caused by it along the 'backup' line are possible.



WARNING: In backup operation mode, the use of particularly energy-intensive electrical equipment could lead to system malfunction or increase operating costs. Contact your supplier to check the suitability of using particular equipment.

2.1.2. ON-GRID e OFF-GRID system

UNE ZHERO works independently of any external network, **creating its own network** and serving the users by relying only on it.

As there is no other network with which to work in parallel, the power available to the user is only that made available by UNE ZHERO, which varies according to the availability of the photovoltaic and battery, **up to a maximum of 6kVA**.

Should the system run out of power, it automatically enables the intervention of an emergency source such as a generator (if connected) or a public network (if connected, this must be permitted by local regulations).

The advantages of using UNE ZHERO are:

- Comprehensive **energy management system**;
- Increase in self-consumed energy for higher **energy independence**;
- Be less subject to energy price variations;
- Presence of **intelligent** logic management;
- Ideal for use in buildings designed to have electricity as the sole **energy source** (with heat pump heating, induction cookers, etc.);
- **Very low impact on the environment**.

Advice

NOTE: Carefully read cap.10.1 and scrupulously follow its advice to optimise the use of the system.

2.2. Nameplate of UNE ZHERO S10

Below is an example of a label that can be detected on the UNE ZHERO S10 system:

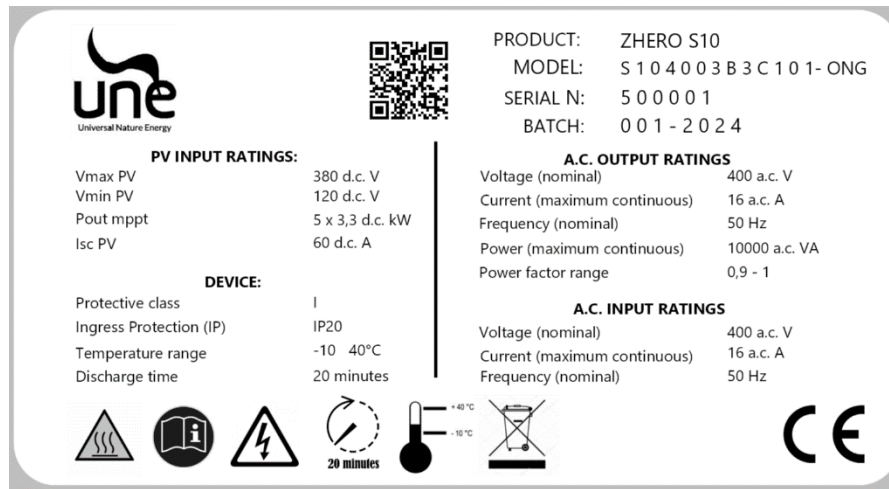


Figure 2 - UNE ZHERO S10 nameplate

2.3. Technical Data

The technical data of UNE ZHERO can be found in the datasheet.

2.4. BOX Inverter

Inverter BOX closed

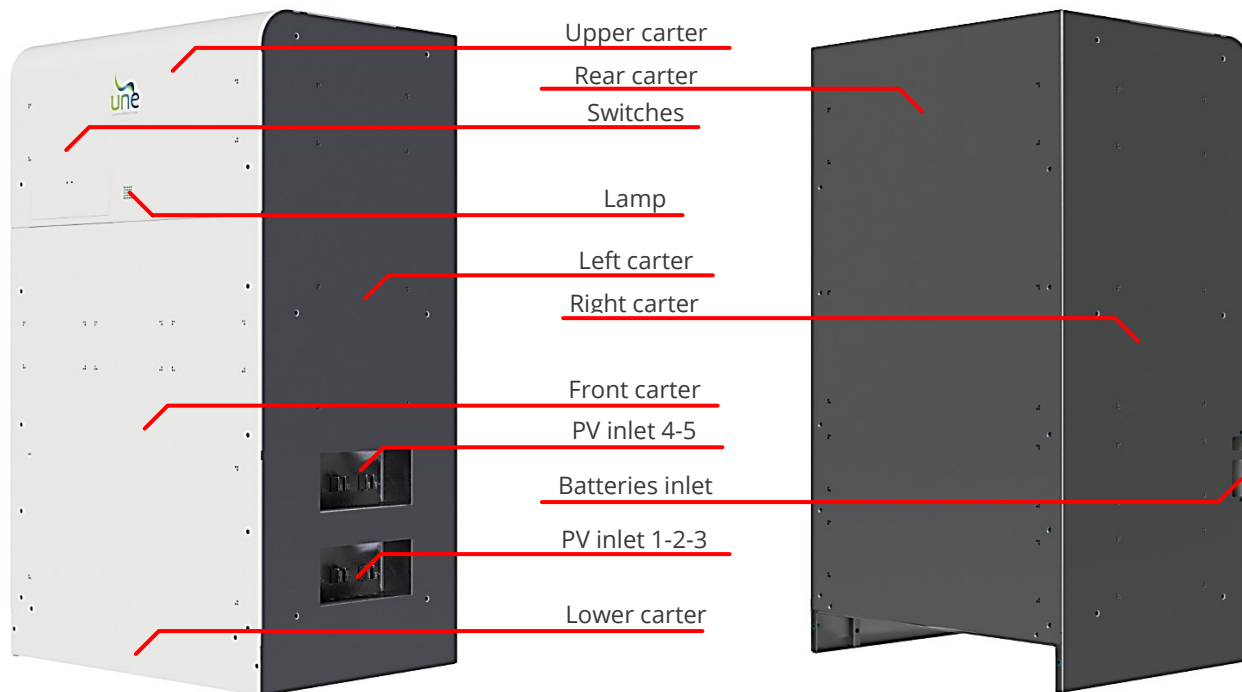


Figure 3 - Front view BOX Inverter

Figure 4 - Retro view BOX Inverter

The following is a legend of the components that make up the exterior of the BOX Inverter:

LEGEND	DESCRIPTION
+ Upper carter	Carter covering the inverter, can be removed;
+ Rear carter	Rear system casing, the only casing that cannot be removed;
+ Switches	Internal switch panel;
+ Lamp	System status lamp;
+ Left carter	Left side cover of the system, no need for removal;
+ Right carter	Left side cover of the system, no need for removal;
+ Front carter	Front cover controller and battery plug;
+ PV inlet 4-5	Photovoltaic input 4th and 5th controller;
+ Batteries inlet	Buttonhole for cable routing;
+ PV inlet 1-2-3	Photovoltaic input 1st, 2nd, 3rd controller;
+ Lower carter	Base cover.

Inverter BOX open

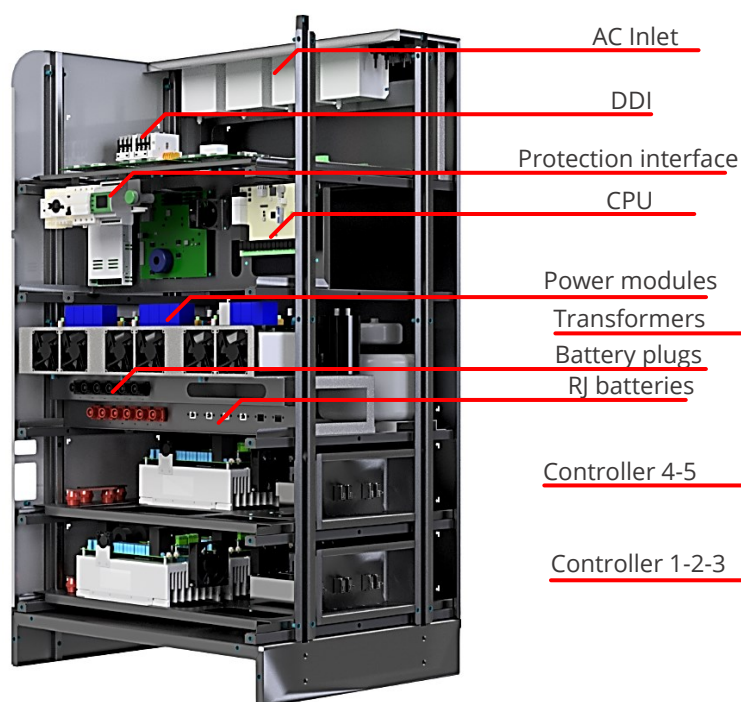


Figure 5 - Front view BOX Inverter



Figure 6 - Retro view BOX Inverter

Below is a legend of the components that make up the inside of the Inverter BOX:

LEGEND	DESCRIPTION
+ AC inlet	AC input/output terminals meter, network, backup;
+ DDI	AC protective contactors;
+ Protection interface	Network interface for network connection regulation;
+ CPU	System Control Board;
+ Power modules	Power modules for the 3 phases;
+ Transformers	Toroidal transformers with series inductance on primary side;
+ Battery plugs	Battery power connectors;
+ RJ batteries	RJ-45 connection for battery communication;
+ Controller 4-5	4th and 5th charge controllers with MPPT technology;
+ Controller 1-2-3	1st, 2nd and 3rd charge controllers with MPPT technology.

2.5. Battery BOX

BOX Inverter closed

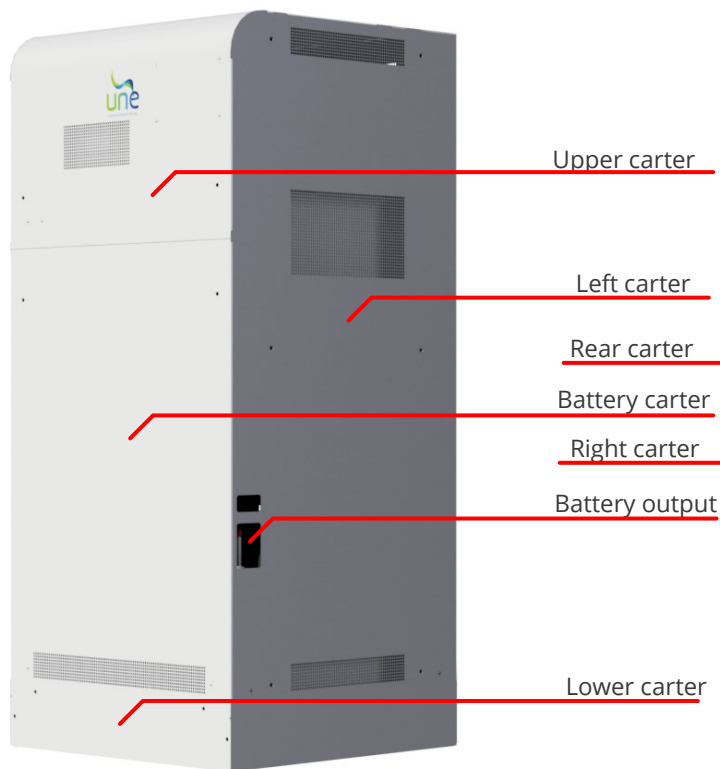


Figure 7 - Front view of battery box

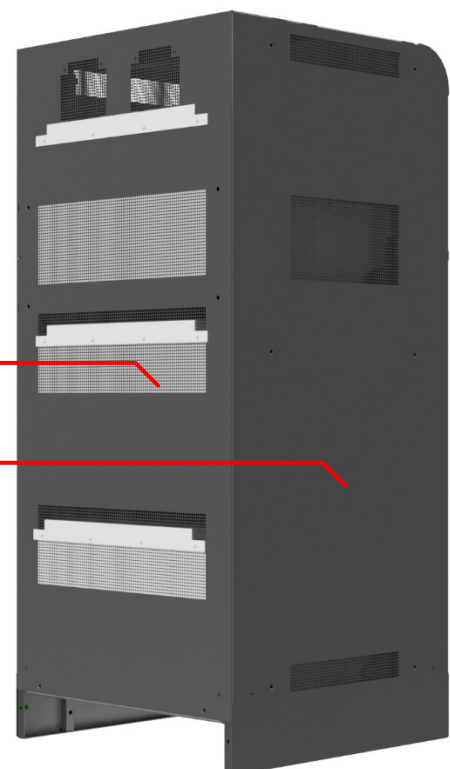


Figure 8 - Rear view of battery box

The following is a legend of the components that make up the outside of the battery box:

LEGEND	DESCRIPTION
+ Upper carter	Upper casing of battery box;
+ Left carter	Left battery box cover, (can only be removed during installation);
+ Rear carter	Left battery box cover (must never be removed);
+ Battery carter	Left battery box cover, (can only be removed during installation);
+ Right carter	Left battery box cover, (can only be removed during installation);
+ Battery output	Buttonhole allowing for cable routing;
+ Lower carter	Protective cover of the system base.

Open battery BOX

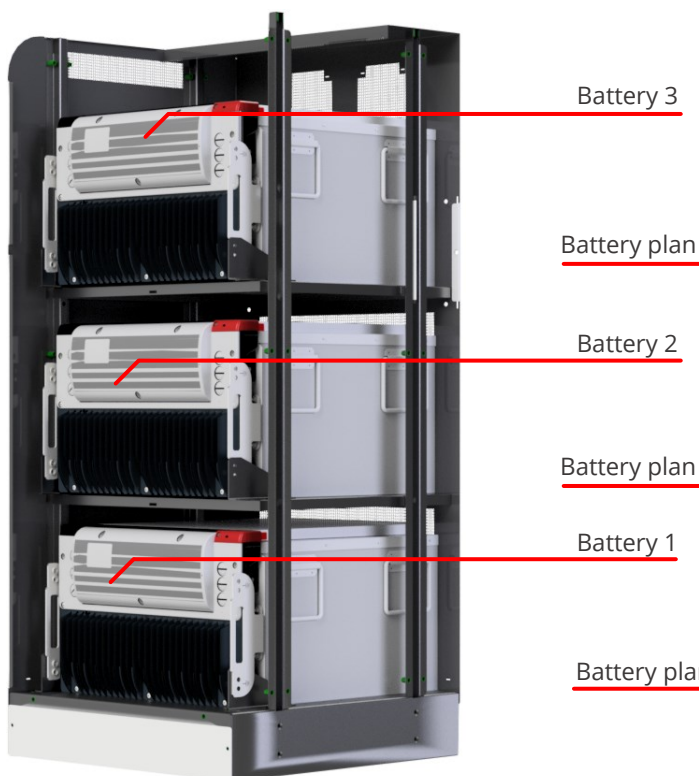


Figure 9 – Front view of the open battery box

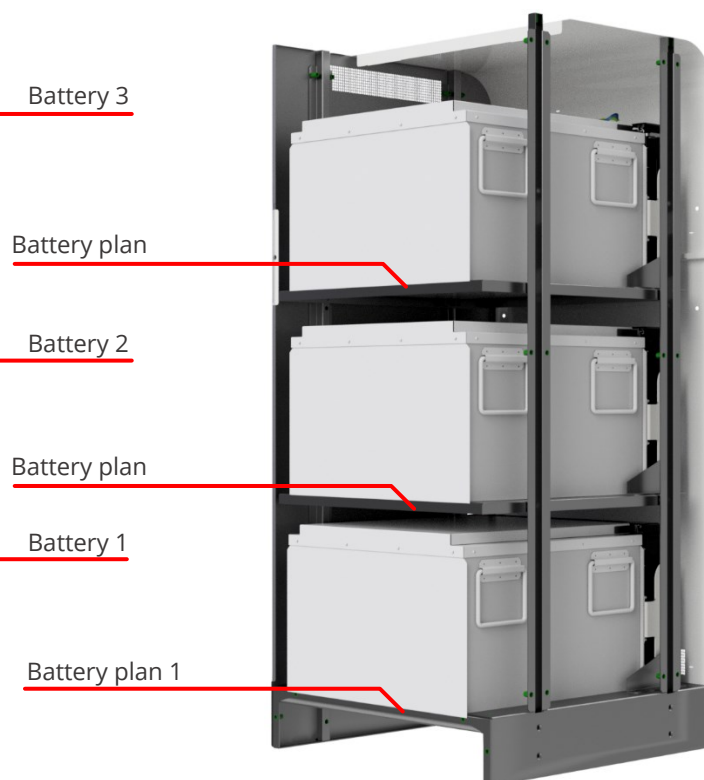


Figure 10 – Rear view of the open battery box

The following is a legend of the components that make up the inside of the battery box:

LEGEND	DESCRIPTION
+ Battery 3	Third battery;
+ Battery shelf 3	Third battery shelf;
+ Battery 2	Second battery;
+ Battery shelf 2	Second battery shelf;
+ Battery 1	First battery;
+ Battery shelf 1	First battery shelf.

2.6. Switch panel

The UNE ZHERO S10 switch panel of the ZHERO system can be accessed by removing the metal plate at the top on the left side of the system.

The position of the UNE ZHERO S10 switch panel is located where indicated in the figure opposite.



Figure 11 - Switch panel position

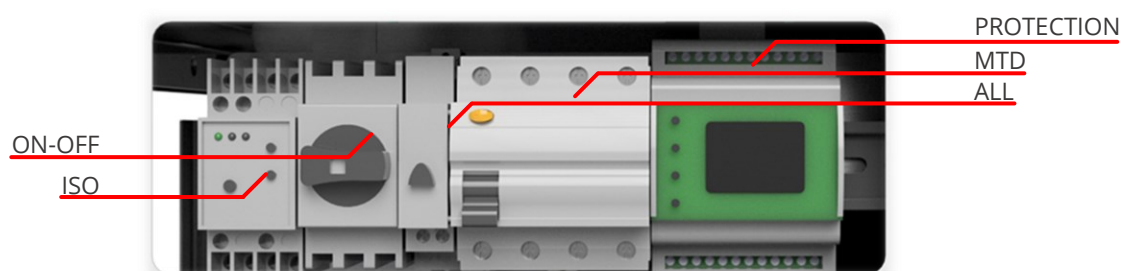


Figure 12 - Front view of the UNE ZHERO S10 Switch Panel

LEGEND	DESCRIPTION
+ PROTECTION	Protection interface for connection to the local distributor network;
+ MTD	Differential thermal-magnetic protection at the output of the system inverter;
+ ALL	Alarm reset button to reset the system after a fault;
+ ON-OFF	System ON-OFF switch;
+ ISO	DC-side isolation control for photovoltaic system safety.

2.7. AC input terminal block



Below is the legend of the AC connections allocated in the upper part of the BOX Inverter.

The position of the UNE ZHERO S10 switch panel is located where indicated by the figure opposite.

Figure 13 - Position of AC input terminal blocks



Figure 14 - Top view of the UNE ZHERO S10 system showing AC connections

LEGEND	DESCRIPTION
+ Cont. GRID side	Grid-side production meter connection terminal block;
+ Grid input	Grid connection terminal block from exchange meter;
+ Backup line	Outgoing backup line connection terminal block;
+ Cont. INVERTER side	INVERTER-side production meter connection terminal block.

2.8. Communication connections



The UNE ZHERO S10 communication connections are shown below.

The position of the UNE ZHERO S10 switch panel is located where indicated by the figure opposite.

Figure 15 – Signal input position

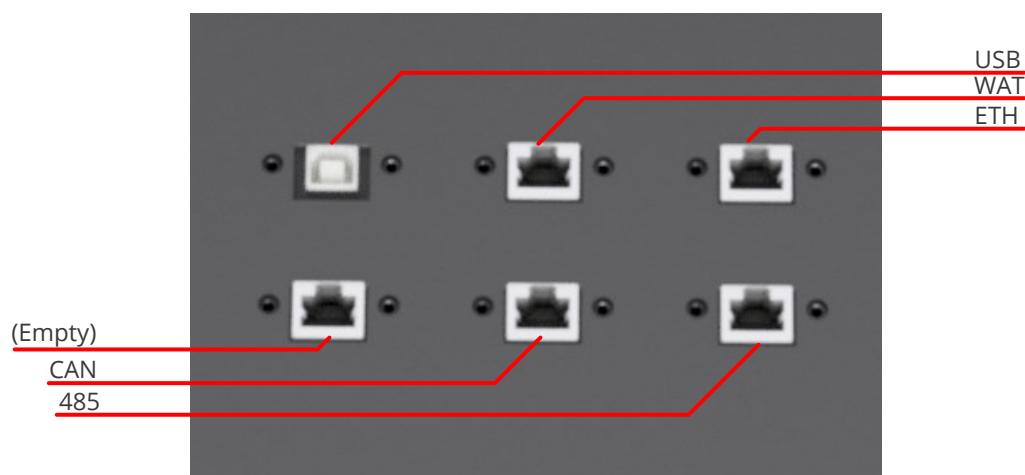


Figure 16 – View of the signal connections at the top of the BOX Inverter

LEGENDA	DESCRIZIONE
+ USB	USB connection port type B for system monitoring;
+ WAT	Communication connection port between the meter(s) and UNE ZHERO S10;
+ ETH	UNE ZHERO S10 internet communication connection port;
+ (Empty)	Unused;
+ CAN	CANBUS connection port for home automation (not implemented);
+ 485	485 connection port for home automation (not implemented).

2.9. Photovoltaic connections



ATTENTION: In the case of the presence of sunlight irradiating the photovoltaic modules, there will be DC voltage from the photovoltaic system.



Figure 17 – PV DC input position

Below is a legend of the components that the UNE ZHERO S10 photovoltaic input of the ZHERO system.

The position of the UNE ZHERO S10 photovoltaic input connection is located where indicated by the figure opposite.

Take care **not to reverse the order in which the battery poles** are connected and connect the batteries in the correct sequence.

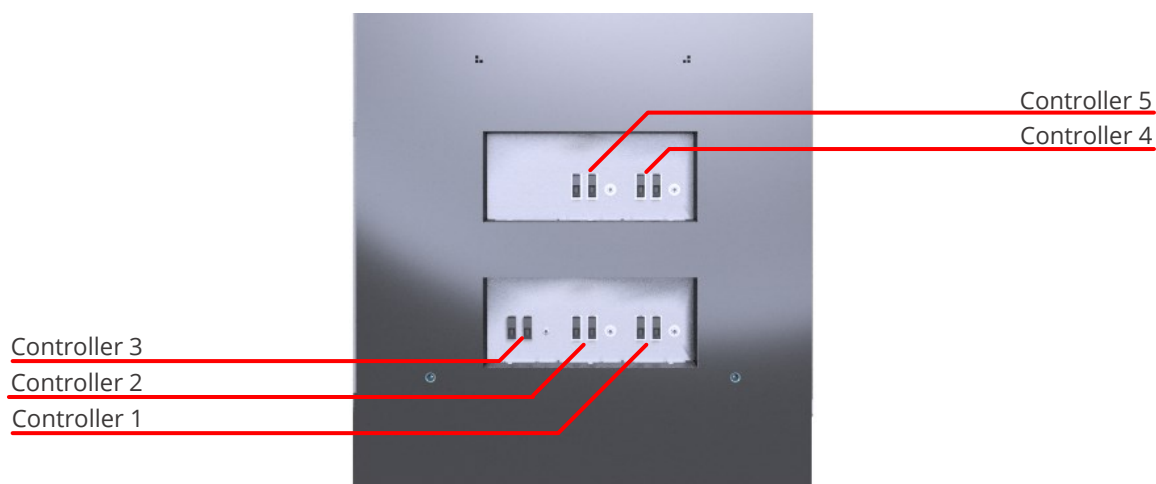


Figure 18 – View of left side casing for photovoltaic input

LEGEND	DESCRIPTION
+ Controller 5	Photovoltaic input of the 5th MPPT controller of UNE ZHERO S10;
+ Controller 4	Photovoltaic input of the 4th MPPT controller of UNE ZHERO S10;
+ Controller 3	Photovoltaic input of the 3rd MPPT controller of UNE ZHERO S10;
+ Controller 2	Photovoltaic input of the 2nd MPPT controller of UNE ZHERO S10;
+ Controller 1	Photovoltaic input of the 1st MPPT controller of UNE ZHERO S10.

BATTERY CONNECTIONS

Below is a legend of the UNE ZHERO S10's battery connections.

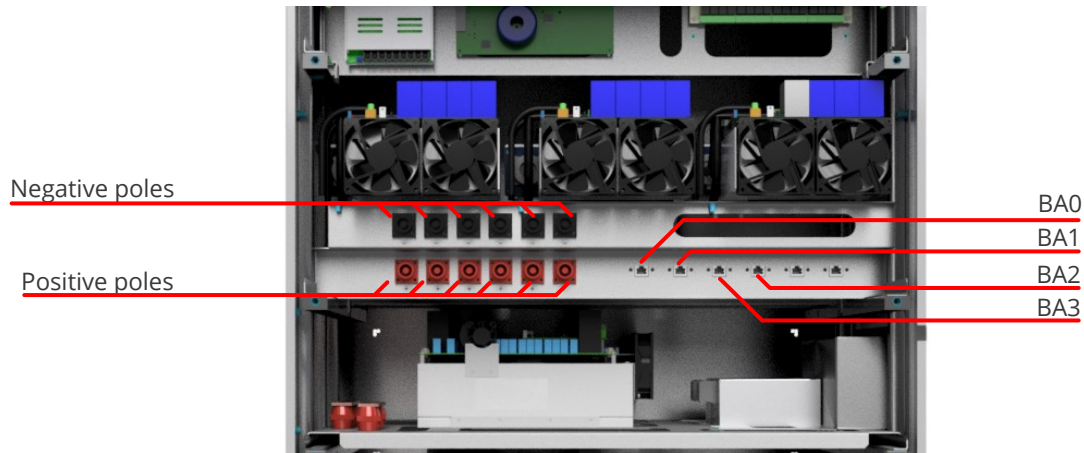


Figure 19 – View of power and signal connections of the UNE ZHERO S10 system

LEGEND	DESCRIPTION
+ Negative poles	Connection of the NEGATIVE battery poles;
+ Positive poles	Connection of POSITIVE battery poles.
+ BA0	RJ-45 port input for first battery communication;
+ BA1	RJ-45 port input for second battery communication;
+ BA2	Third battery communication RJ-45 port input;
+ BA3	RJ-45 communication port input of the fourth battery;

3. - OPERATIONS PRIOR TO INSTALLATION

The following chapter contains the complete installation instructions for the UNE ZHERO S10 product, do not proceed with the installation until you have fully understood the contents of the instructions below.

3.1. Lifting and transporting

UNE ZHERO is a very large and heavy product, so particular caution must be exercised during lifting, transport and handling so as not to cause hazards to property and persons.

Transport must be carried out using appropriate means, as UNE ZHERO contains components that could be sensitive to shocks, vibrations, etc.



Figure 20 – Suitable handling tools of UNE ZHERO S10

The product is delivered in packaging suitable for handling in order to facilitate its transport and handling must be carried out without the "Cover Panel".



Figure 21 – Position of the base cover that must be removed in order to move the two objects

The system may only be lifted from the base by hydraulic tools such as pallet trucks, forklifts, etc. and must be handled with care.



Figure 22 - **left:** Inverter BOX handling, **right:** Battery BOX handling



ATTENTION: The means used for lifting must be suitable for supporting the weight of the equipment in excess of 350 kg.



ATTENTION: Due to the weight and bulk of the UNE ZHERO it is always necessary to call in specialised personnel for transport, handling, loading and unloading.



ATTENTION: UNE ZHERO must be transported in an upright position.



ATTENTION: Although the battery does not present the transport hazards of normal batteries, it is still necessary to take the appropriate precautions dictated by the UNI 3292 standard for class 4.3 batteries. The battery is contained in its own dedicated IP55 casing to avoid contact with external liquids.

3.2. Tools required for installation

The following is a list of the main tools that an installer must be equipped with in order to properly install the UNE ZHERO S10 system.



"FUSES"

Suitable for the current and voltage of the photovoltaic system.



"SCREWDRIVER"

Slotted and star-shaped in various assortments.



"CURRENT CLAMP"

Capable of measuring alternating and direct current.



"ALLEN KEYS"

Complete set of Allen keys.



"SPANNER SET"

Complete spanner set.



"MC4 CONNECTORS"

Photovoltaic connectors to connect photovoltaic modules to the system.



"USB cable Type A-B"

This cable is necessary in order to be able to connect to the system and check its correct functioning and/or installation.



"NOTEBOOK"

Upgraded Windows PC with ZHERO Installer Tool monitoring software installed.



"ROUTER HOTSPOT"

Equip yourself with a mobile device that can provide a data network through which a technician can be connected in the event of a service request.

3.3. Environmental and General Installation Conditions

UNE ZHERO must be installed in accordance with the regulations in force in the country of installation.

The **professional installation** of the part of the system downstream of UNE ZHERO is not the responsibility of UNE srl.

Whoever is responsible for the electrical system of the house must consider UNE ZHERO as the local power supply point and act accordingly when choosing and installing the **appropriate electrical components**.



ATTENTION: UNE ZHERO must be installed with all the necessary precautions to make it suitable for the place of installation, in compliance with all local regulations and the rule of art. The installer must produce the necessary documentation required by local regulations.



ATTENTION: Please note that any open-cabinet operation on UNE ZHERO is only permitted to authorised and trained UNE srl personnel.

The **backup** function allows power to be supplied to the user without disruption in the event of a blackout or absence of the public grid.

However, **this function is not to be considered equal to a UPS** because UNE ZHERO is not certified as such but as a storage system with a backup function; moreover, it does not filter the public network and does not stabilise it.

Carefully check that the utilities connected under UNE ZHERO can accept any faults or be supplied directly from the grid voltage supplied by the distributor and not filtered. **UNE srl accepts no responsibility for the quality of the mains supply to the utilities.**

The authorised UNE ZHERO installer, during the inspection, will have to carry out **environmental checks** to determine, among the various possible options, which ones are compatible with the **characteristics of UNE ZHERO in terms of temperature, humidity, space, etc.**

It is also recalled that:

- UNE ZHERO can only be used indoors where IP20 equipment is suitable, installation in adverse or unsuitable environmental conditions is prohibited;
- **Do not expose UNE ZHERO to direct sunlight;**
- Do not install in locations where the presence of UNE ZHERO could affect or alter other things present;
- Do not install in a position where the **ventilation of UNE ZHERO would be obstructed;**
- **Do not install in places where there is a risk of fire or explosion and in general near inflammable or explosive materials;**
- Do not install in places where there is a continuous presence of people or where the **acoustic noise emitted by UNE ZHERO could cause discomfort;**
- **Never cover UNE ZHERO.**



ATTENTION: Installations above 2,000 metres can lead to greater criticality, so they must be evaluated on a case-by-case basis with UNE's technical staff.

3.4. Positioning of UNE ZHERO S10

Once the conditions of the previous point have been verified, the positioning point itself must be assessed.

Positioning UNE ZHERO S10:

- On a flat floor;
- In easily accessible places;
- In a position to guarantee access to switches;
- In a position to guarantee the necessary space to carry out maintenance operations;
- In floors suitable to support the weight of UNE ZHERO.



ATTENTION: The UNE ZHERO S10 must be anchored to the ground by means of the holes in the base to prevent it from tipping over.



ATTENTION: It is essential to assess the suitability of the floor on which UNE ZHERO is placed in order to determine its ability to support the weight of the system (approx. 250-350Kg) depending on the number of batteries.

In addition, to ensure the necessary ventilation, installation, maintenance and control operations, **the following distances must be observed:**



Figure 23 – Minimum distances of UNE ZHERO S10 for Battery Box and Inverter Box

MINIMUM DISTANCES	BOX INVERTER	BOX BATTERIE
Frontal distances	1500 mm	1500 mm
Rear distances	100 mm	100 mm
Distances on the left side *	500 mm	500 mm
Right-hand side distances *	500 mm	500 mm
Upper distance	500 mm	500 mm

** If the battery box is present, it **can be placed against the left side of the inverter**, not the left side as this is the connection side with the PV array.*

3.5. Unpacking

During the unpacking operation, preliminarily **check the integrity of the contents** and the presence of all components; if not, suspend all operations and contact UNE srl immediately.



ATTENTION: Some elements of the packaging such as cardboard, nails, etc. can be dangerous and lead to personal injury or property damage, so they must be removed by appropriate means.



ATTENTION: The packaging and components must not be within the reach of children, persons with limited abilities and in general anyone not entrusted with the installation of UNE ZHERO.

The system is delivered in the packaging shown in the figure below, the pallet may not be provided; below are the operations to be carried out to **free the Inverter BOX and Battery BOX from their packaging**:



Figure 24 - UNE ZHERO inside its packaging

- a) Position the product, still packed, on an even, **non-tilting surface near the final assembly point**;
- b) Cut the clamps;
- c) At this point it will be possible to **remove the cardboard** from the UNE ZHERO S10;
- d) If delivered on a pallet, using a pallet truck appropriate for the weight of the system purchased, lift the system and **position it at the exact point where you wish to install it**. For the correct use of the pallet truck, refer to the corresponding manual;
- e) It is mandatory to **anchor the rails to the floor** by means of the holes in the base.

3.6. Preliminary Work on Electrical Connections

In order to facilitate installation and maintenance of the UNE ZHERO S10, it is possible to remove all the painted external casings of the UNE ZHERO S10 system with the exception of the rear casing, which provides considerable resistance to diagonal deformation.

During both installation and maintenance, it is possible to remove both the batteries and the controller shelf by removing the special knurled fixing screws; except with prior authorisation from UNE, it is strictly forbidden to remove or dismantle the inverter cover.

Before working on the system, it is necessary to:



**"REMOVE RINGS OR OTHER
METAL OBJECTS"**



"REMOVE WATCHES"



**"WEAR INSULATING RUBBER
GLOVES"**



**"USE TOOLS WITH INSULATED
HANDLES"**



**"WEAR INSULATING RUBBER
BOOTS"**



**"IF NECESSARY, PROVIDE FOR
THE USE OF PROTECTIVE
GOGGLES"**

There are various types of **photovoltaic modules** on the market which are suitable for forming a photovoltaic generator compatible with UNE ZHERO.

All types of modules can be connected which do not require one of the poles of the electrical system to be earthed. If in fact one pole of the electrical system were to be connected to earth, the **UNE ZHERO's internal insulation resistance control** would detect an anomaly and block the feeding of energy from the generator.

The use of class II photovoltaic modules is obligatory, otherwise it will be impossible to guarantee the electrical insulation of the DC side of the system; check that the **"CLASS "II" DEVICE"** symbol is shown on the back of the label.



Figure 25 – Symbol CLASS II

The forms used must also:

- Comply with the **regulations in force** in the country of installation;
- Withstand an overall **system voltage $\geq 1000V$** ;
- Withstand a **reverse current $I_r \geq 15A$** .



ATTENTION: other restrictions due to specific installation conditions (particular classes of fire resistance, ammonia resistance, salt resistance, load resistance, etc.) must be assessed in advance by a competent technician.

As far as the integration of UNE ZHERO Retrofit is concerned, however, there are no such limitations, as the system will never be directly connected to the photovoltaic modules but will draw energy from the plant's AC grid.

3.7. Dimensioning the photovoltaic system

The modules chosen as a result of the above indications must be coupled in such a way as to allow correct operation with UNE ZHERO in compliance with the indications described below.

The strings connected to each MPPT must all be the same, have the same orientation and the same inclination.

The strings must be formed by a series of modules that in total work in a voltage range of your choice between:

- $100 < V_{oc} < 180$ – (DC-DC MPPT a low voltage);
- $120 < V_{oc} < 308$ – (DC-DC MPPT a medium voltage);
- $200 < V_{oc} < 600$ – (DC-DC MPPT ad high voltage).

to be specified at the time of purchase, dimensioning must be carried out considering voltage deviations due to temperature variations.

The maximum voltage **must not be exceeded even at no load**.



ATTENTION: in accordance with **EN 62109**, a photovoltaic arrester (SPD) must be installed, external to the machine, with an indication U_p (Voltage protection level) $\leq 2.5kV$.

For best results, the aim is to even out production as much as possible between summer and winter and throughout the day.



NOTE: For best results, the aim is to even out production as much as possible between summer and winter and throughout the day.



WARNING: Check that the inclination and positioning of the modules you intend to make can give satisfactory production even in winter. With the appropriate software you can check, based on the inclination and orientation of your modules, how much your system yields.

3.8. String polarity check

Before connecting the strings to the system, it must be verified that the **voltage of all strings** is within the voltage range indicated in the data sheet. In addition, the correct polarity must be checked before connecting.



ATTENTION: consider variations in module voltage as temperatures vary. Consult the technical data sheet of the photovoltaic modules that you intend to connect to UNE ZHERO.

3.9. Main switch downstream of the changeover counter

Immediately downstream of the metering unit of the energy supplied by the local distributor, there must be a **differential thermomagnetic device to protect the line from the distributor's meter to the UNE ZHERO inlet**.

A lightning risk assessment must also be carried out to ascertain the need for overvoltage protection.



ATTENTION: it is compulsory to always install an overvoltage protection device (SPD) in order to avoid quite considerable economic damage with $U_p \leq 1.5$ kV on the AC line entering the system.

The circuit breaker must have the following characteristics:

- Rated current: 16A;
- Differential current: 300mA;
- Class A;
- Curve D.

the breaking capacity must be greater than the maximum possible short-circuit capacity at the point of connection (given by the local distributor and/or local regulations).

A class A circuit breaker is recommended as a residual current circuit breaker; the **I Δ n must be coordinated with the earth-termination system and local regulations to enable correct tripping.**



ATTENTION: the switchboard containing UNE ZHERO is metallic; it is therefore mandatory to install the appropriate upstream residual current device.

The cable downstream of the aforementioned meter, in connection with UNE ZHERO, must be suitably chosen and sized according to the installation conditions on site and the regulations in force in the country of installation, which cannot be determined here, never less than 4 sq. mm, FG16 cable of 3G6 is usually recommended (purely indicative figure to be verified in accordance with local regulations in force).

3.10. User electrical system

Before connecting the UNE ZHERO, it is necessary to **check the electrical installation serving the customer**, the switch fitted at the output of the UNE ZHERO serves to make the connection between the UNE ZHERO and the circuit breakers upstream of the electrical installation's protections, **but in no way acts as protection for the user's electrical installation.**

Therefore, check that the user's electrical installation is protected in accordance with the regulations in force at the place of installation.



ATTENTION: UNE srl is not responsible for the professional installation of the system downstream of its outlet to the user. This must be installed by an electrical professional in coordination with the switch in UNE ZHERO and in compliance with the regulations of the country of installation.

3.11. Preliminary Operations

Before making the connections in UNE ZHERO, proceed as follows:

In the UNE ZHERO S10 switchboard:

- Set the "INV" differential circuit breaker to OFF;
- Set the "ON - OFF" switch to OFF (downwards).

In the switchboard downstream of the distributor's meter (not supplied):

- Disconnect the differential circuit breaker protecting the line.

In the utility main switchboard protecting the consumers (not supplied):

- Disconnect the circuit breaker(s) protecting the consumers so as to disconnect all the loads present.

In the string switchboard (not supplied):

- Open the photovoltaic circuit breaker(s)



ATTENTION: Carry out all connection operations without any live parts of the UNE ZHERO.



ATTENTION: Operations are to be carried out with the equipment disconnected from the grid, the photovoltaic generator and with the machine switched off, access to the system is only permitted 20 minutes after voltage removal.



ATTENTION: Remember that dangerous voltages will be present in UNE ZHERO even after all switches have been opened. Pay attention to all operations and follow the rules in the dedicated chapter.

3.12. Further Design Guidelines

The electrical designer and the installer of the installation in which UNE ZHERO is inserted, each for their own tasks in accordance with and in compliance with the regulations in force at the place of installation, must check:

- Whether it is necessary to include a system to **isolate the generator voltage in the perimeter of the generator installation site**; this precaution is necessary in case of emergency so that dangerous voltages do not remain in particular rooms through which the string cables pass;
- Whether it is safe to install in a basement before doing so;
- Whether the chosen installation site is free from the risk of flooding.



READ CAREFULLY: The above is not a substitute for professional advice but represents a useful indication to the person in charge of designing and positioning the system.

3.13. Connection diagram of UNE ZHERO S10

Below is the general connection diagram of the system, should you require further information please contact UNE srl directly (info@unesrl.com)

Below are the connection diagrams of the **4 available types** of **UNE ZHERO S10** systems:

- UNE ZHERO S10 **Trifase**;
- UNE ZHERO S10 **Retrofit**;
- UNE ZHERO S10 **Hybrid**;
- UNE ZHERO S10 **Off-Grid**.

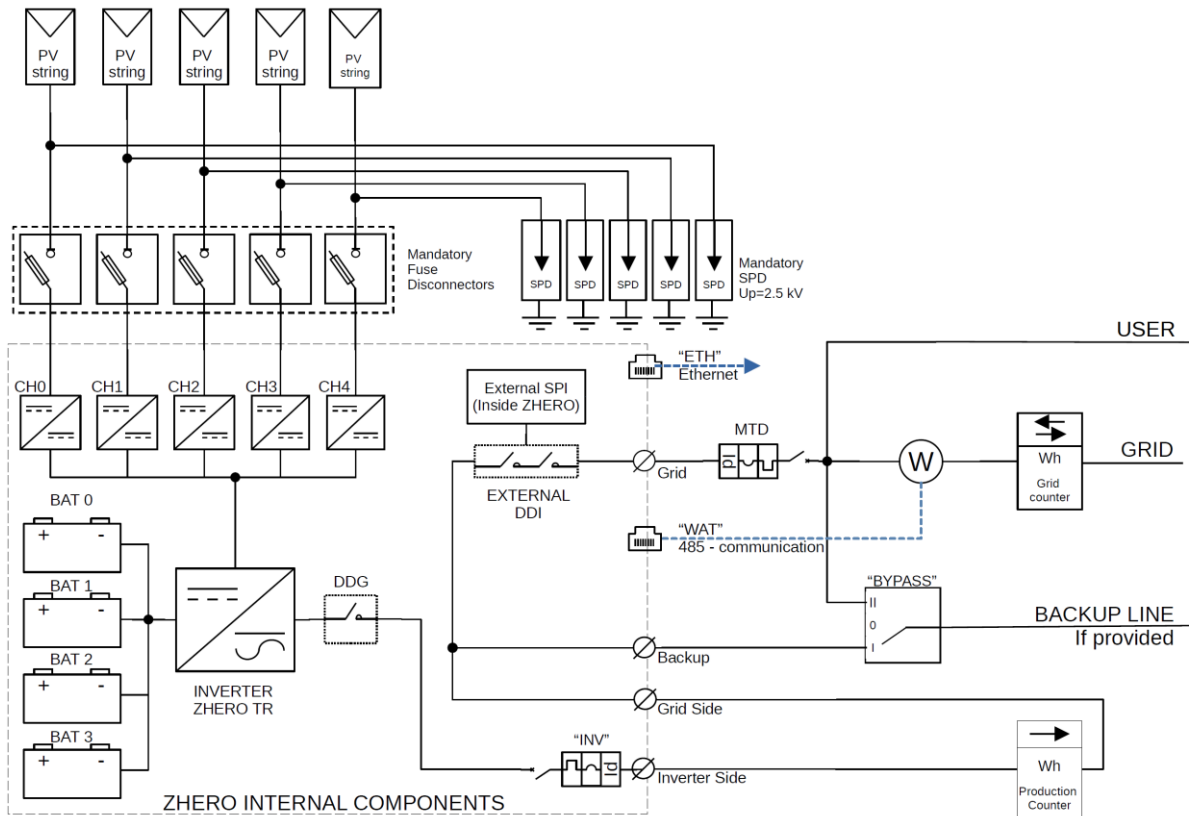


READ CAREFULLY: Before proceeding with the installation based on the diagrams below, make sure that the system you have purchased and the one to be installed match.

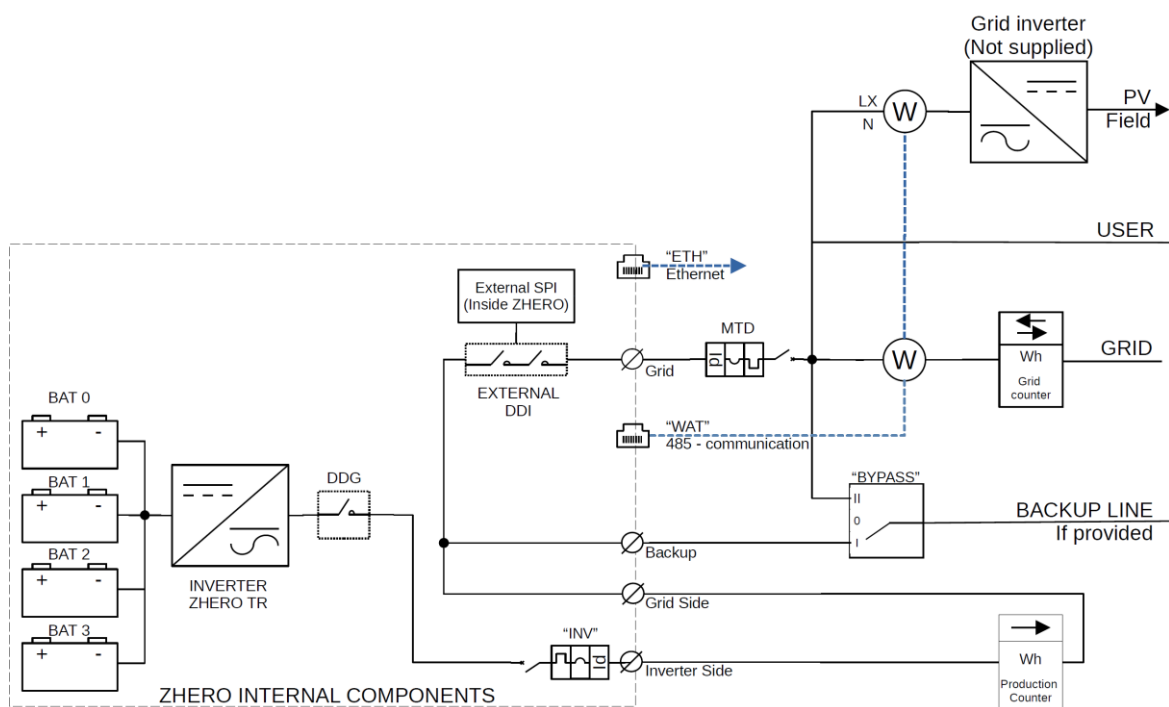
Advice

NOTE: In case of doubts or inconsistencies contact UNE.

BLOCK DIAGRAM - UNE ZHERO S10 THREE-PHASE



BLOCK DIAGRAM - UNE ZHERO S10 RETROFIT



4. - INSTALLATION



ATTENTION: Carefully follow the instructions in the following chapter before proceeding with the first start-up of the system.



ATTENTION: All operations in the following chapter must be performed with the system switched off and AC and DC inputs disconnected.



ATTENTION: Waiting time is **20 minutes** from off with AC and DC sources disconnected, before the system can be operated.

4.1. Battery installation

UNE ZHERO S10 comes complete with batteries.



ATTENTION: A battery can pose a risk of electric shock and high short-circuit current. The following precautions must be observed when working on batteries:

- Remove watches, rings, or other metal objects;
- Use tools with **insulated handles**;
- Wear rubber **gloves** and **boots**;
- Do not place tools or metal parts on top of batteries;
- Disconnect charging source before **connecting or disconnecting battery terminals**;
- Determine if battery is inadvertently grounded. If it is inadvertently grounded, remove the source from the earth;
- Contact with any part of a grounded battery can cause **electric shock**. The probability of such shocks can be reduced if such grounds are removed during installation and maintenance.

In some states it may still be necessary to transport separately. In this case, installation must be carried out as follows:

a) Remove the 2 front and top panels of the battery BOX



Figure 26 – Position of battery box fixing screws

To remove them, use a screwdriver or drill to remove the **8 locking screws** on the front and top panels.

To facilitate removal of the external carter, we recommend **starting with the top one** and then moving on to the bottom one.

The external carters are grounded; to disconnect the external carter completely, it will be necessary to unscrew the screws from the threaded inserts.

b) Battery insertion



Figure 27 – Battery insertion in the battery box

Place the battery on the pallet truck, bring it to the **height of the shelf** and slide it all the way down to the height of the side blocks for attachment.

It is recommended that **more than one person** perform this operation in order to have more control when inserting and/or removing the battery.

With reference to Section 2.5, the order of the batteries should be from bottom to top: **the bottom one is battery 0, above it battery 1, at the last level battery 2.**



ATTENTION: A suitable lifting system must be used to lift the battery, as it weighs more than 100 kg and cannot be handled manually.

c) Fixing batteries



Figure 28 – Battery fixing screw position

Once positioned, screw the batteries onto the **retaining lugs**, these are already screwed to the base of their corresponding plane, there are 2 for each battery.

Use an appropriate spanner to tighten an **M6 hexagon head screw**.

d) Opening the front casing of the Inverter BOX

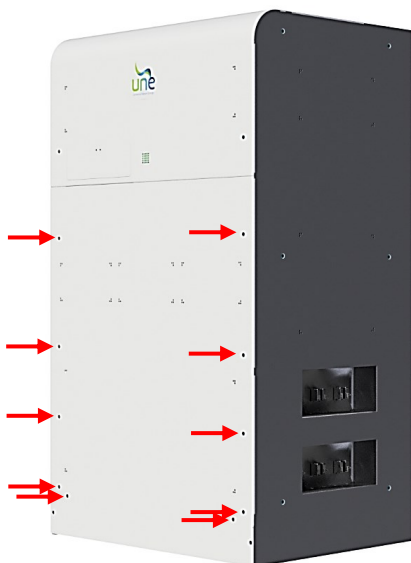


Figure 29 – Battery panel fixing screw position

To remove them, use a screwdriver or drill to remove the **10 locking screws** on the front and top panels.

The covers are grounded; to disconnect the covers completely, the screws must be unscrewed from the threaded inserts.

e) Connection of power cables

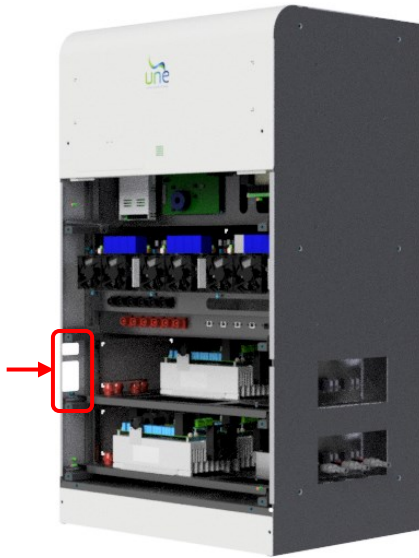


Figure 30 – Position of the battery cable hole

The cables exiting the battery poles (Positive, Negative and RJ-45 of Modbus 485) must be routed through the lower slot shown in the figure:

- In the upper slot RJ-45 signal cables;
- In the lower slot the + and - power cables.

f) Connection of communication cables

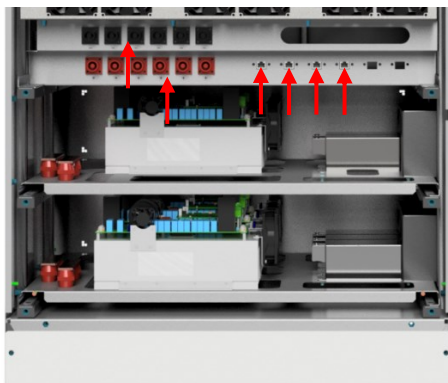


Figure 31 – Location of power and signal battery plugs

All plug connectors are in parallel, so there is no connection order.

Be very careful not to reverse the polarities of the plugs: respect both the symbols on the carpentry and the colour code:

- **Positive pole - Colour red - Symbol +**
- **Negative pole - Colour black - symbol -**

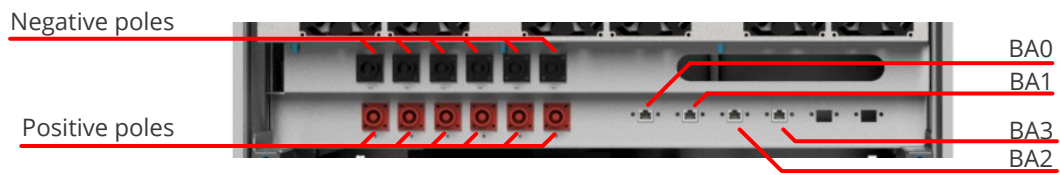


Figure 32 – Detail of power and signal battery plug connection



ATTENTION:

- **Power cables** can be connected in any pole of the respective connector;
- **Signal cables must NOT be interchanged.**

4.2. Controller shelf installation

UNE ZHERO S10 is supplied complete with controller shelf. In some states it may still be necessary to transport separately.



READ CAREFULLY: The MPPT shelf disassembly operation is identical for both MPPT shelves, however, be careful not to reverse the lower with upper shelves.

In this case, the installation must be carried out as follows:

- a) Switch off and disconnect any incoming photovoltaic strings to the system or AC sources;
- b) Remove external system carpentry



Figure 33 – Position of MC4 plugs for photovoltaic connection

- Locate on the left side of the UNE ZHERO S10 Inverter BOX the 2 connector housings for the photovoltaic.
- Remove the left side of the casing to facilitate the extraction of the controller panel.
- Remove the protective panel of the box, if present.

- c) Remove metal interface panel

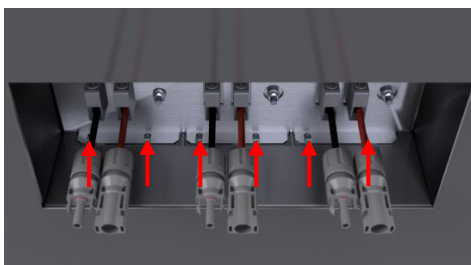


Figure 34 – Detail of MC4 connection

Unscrew the 6 M5 screws from the base of the shelf and remove the cover by pulling it outwards.

During the extraction procedure, feed the cables with photovoltaic MC4 connectors through the respective slots.

d) Disconnect the RJ-45 plug and power cables from the front panel

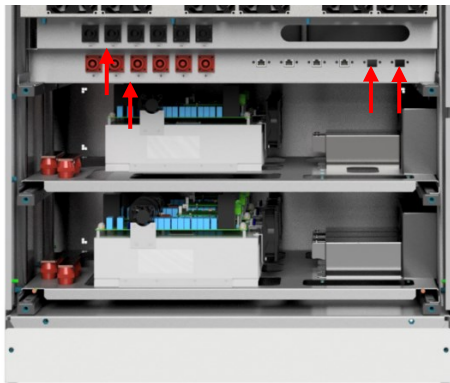


Figure 35 – Location of controller power and signal plugs

On the left, arrows indicate the position of the negative (top) and positive (bottom) power connectors.

Be very careful not to reverse the polarities of the plugs: respect both the symbolism on the carpentry and the colour code:

- **Positive pole - Colour red - Symbol +**
- **Negative pole - Colour black - symbol -**

On the right the RJ-45 connectors for communication.

e) Unscrew the screws on the front and pull out the shelf

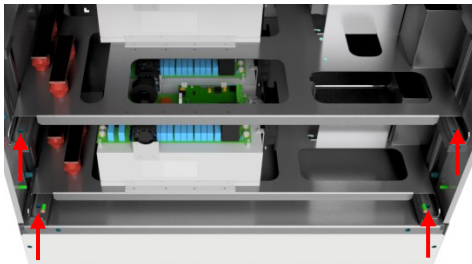


Figure 36 – Position of the fixing screws of the two controller shelves

Each shelf has 2 M6 hexagon head screws, you have to unscrew the 2 of the shelves you want to take out.

Take care not to invert the position of the shelves, **the main one is always at the bottom** and can take up to 3 controllers, while the **additional one is always at the top** and can take 2 more controllers.

4.3. Connecting the photovoltaic system

Once the preliminary checks described in the preceding paragraphs have been carried out, the connection between the UNE ZHERO and the PV generator can be made.

The number of strings that can be connected to the system varies depending on the model purchased, from 0 to 5.

The installation consists of connecting the cables coming from the PV to the MC4 of the charge controllers, taking care not to reverse the polarity.



Figure 37 – Left side view of BOX Inverter

To connect the photovoltaic strings, the positives and negatives must be screwed to the MC4 pairs at the terminals.

Take care **not to reverse polarities**:

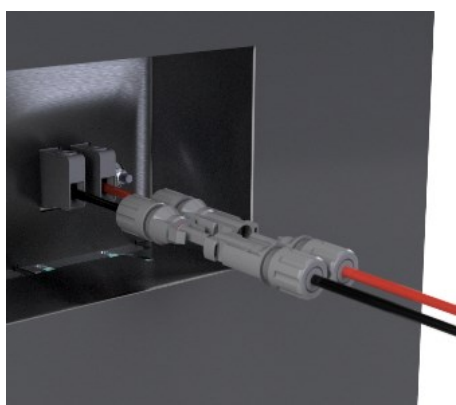


Figure 38 – MC4 connection detail

NETWORK CONNECTION (LEFT TO RIGHT)

Left connection	→	PV Inlet: Negative -
Right connection	→	PV Inlet: Positive +

LINE	COLOUR	SYMBOL	NOMENCLATURE
PV	Red		PV+
PV	Black		PV-



ATTENTION: The MC4 connectors used at the system input support a string current of up to 59 A nominal. Use only connectors compatible with this power and 6 or 10 sq. mm photovoltaic cables with double insulation for connection.



ATTENTION: Do not connect or disconnect the connectors under load and/or with UNE ZHERO switched on.

Cables laid outside UNE ZHERO, i.e. not protected by its enclosure, must be protected by **firmly anchored ducts** with a **degree of protection appropriate** to the installation site.

The **cross-section of the string cables** must be suitable to ensure the passage of current from the photovoltaic modules to the charge controllers inside UNE ZHERO.



ATTENTION: UNE accepts no liability for breakages and/or malfunctions caused by incorrect wiring of elements outside the system.



ATTENTION: It is mandatory to **protect the strings** (externally to UNE ZHERO) by means of an overvoltage arrester (SPD) suitably sized according to the type of installation being realised with an **Up 2.5 kV** rating.



ATTENTION: Fuse "G1014582" or equivalent must be used to protect UNE ZHERO from the photovoltaic generator.

The cables coming from the photovoltaic system, before being connected to the MC4 connectors protruding from the UNE ZHERO system, must be adequately filtered using the following material and carefully following the instructions below:

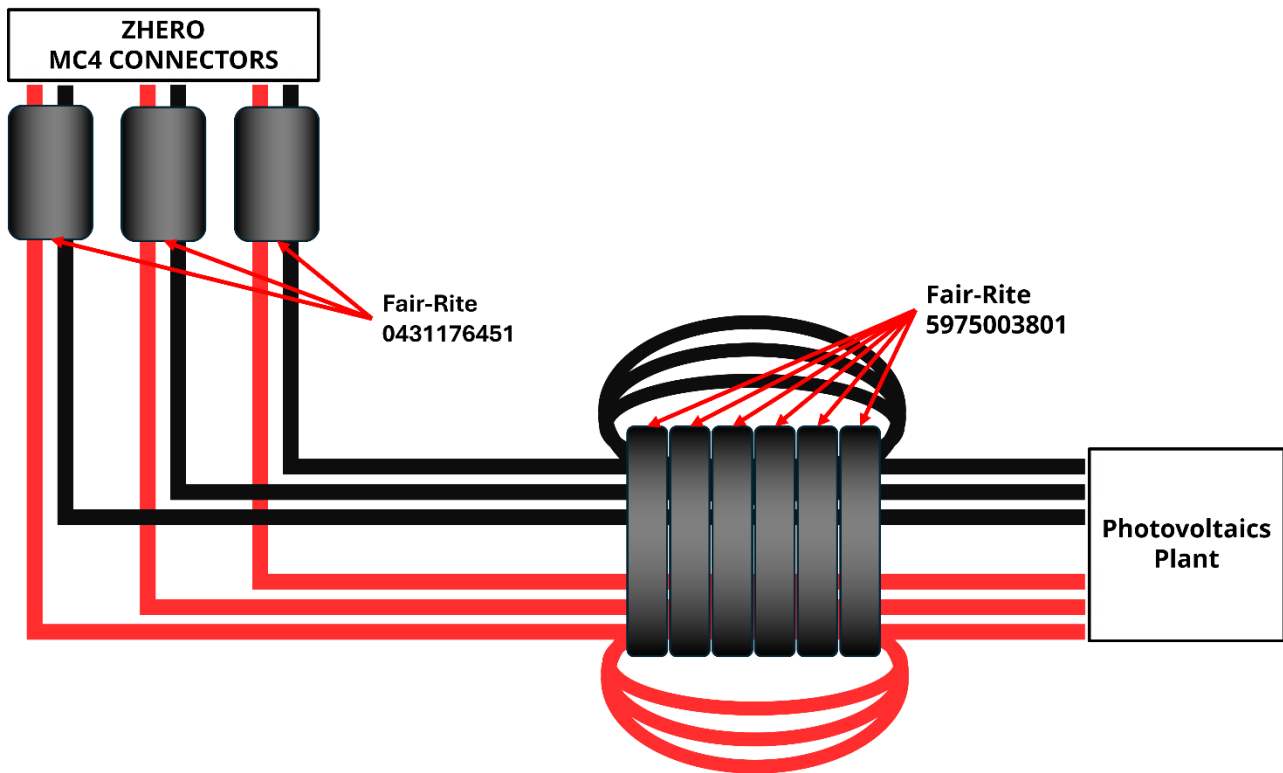


Figure 39 - Ferrites arrangement for photovoltaic strings at the input of the ZHERO system

All cables coming from the photovoltaics must make 2 passes through the **6 ferrites in series type 5975003801 or equivalent**.

The pairs corresponding to the same photovoltaic string, exiting from these windings, must be passed through an additional **ferrite type 0431176451 or equivalent**.

After these double steps, the MC4 connectors of the photovoltaic can be connected to the system.

4.4. AC-side connection

The connection of the three-phase alternating current must be made via the terminals protruding from the upper part of the system.

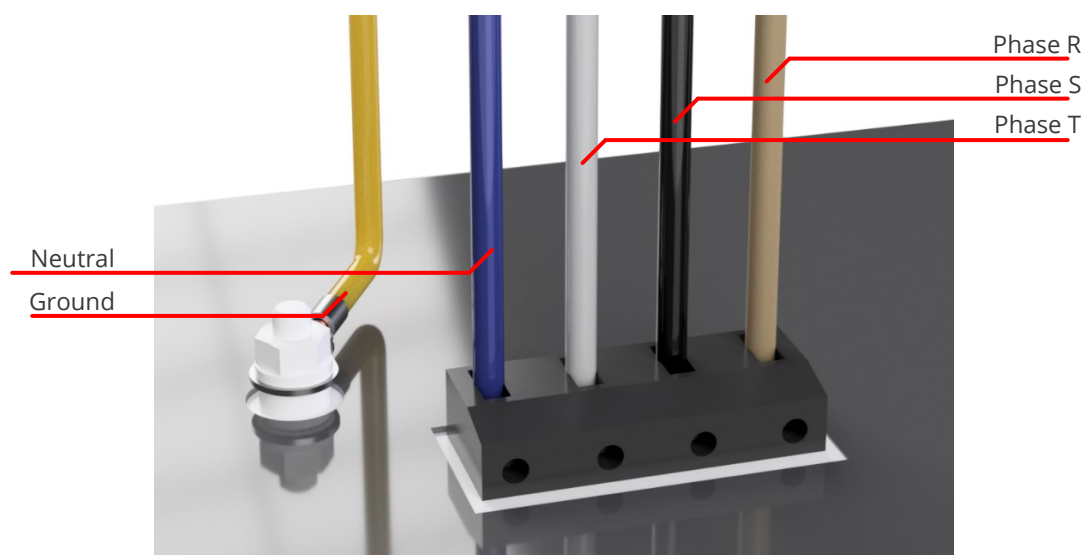


Figure 40 – Detail of terminal block AC connection

ATTENTION: the colour code used complies with EN 60446:

LINE	COLOUR	SYMBOL	NAME (generic)
R	Brown		R...
S	Black		S...
T	Grey		T...
N	Blue		N...
GND	Yellow		GND...

The three phases **R - S - T** and the **NEUTRAL**: it is necessary to head with suitable pre-insulated tubing and screw it to the protruding terminal block.

The EARTH cable: must be terminated with a pre-insulated eyelet with an M6 diameter hole.

Before proceeding with the connection, please pay attention to the following:



ATTENTION: do not reverse the phases or one of the phases with neutral.



ATTENTION: Cables laid outside UNE ZHERO, i.e. not protected by its enclosure, must be protected by conduits, firmly anchored, with a degree of protection appropriate to the installation environment and in compliance with the regulations in force at the place of installation.

4.4.1. Connection: distributor network/ Gen-set

This is a dedicated input to which the local distributor's electricity grid can be connected or, in the case of an isolated system not reached by a public grid, an auxiliary generator.

The system handles this input differently depending on the working mode set during production.



Figure 41 – Terminal block position

Network/Gen-set input is represented by the 4th connection group:

NETWORK CONNECTION (LEFT TO RIGHT)

Threaded insert	→	Grid/Gen-set: Ground;
First clamp	→	Grid /Gen-set: Neutral;
Second clamp	→	Grid /Gen-set: Phase T;
Third clamp	→	Grid /Gen-set: Phase S;
Fourth clamp	→	Grid /Gen-set: Phase R;

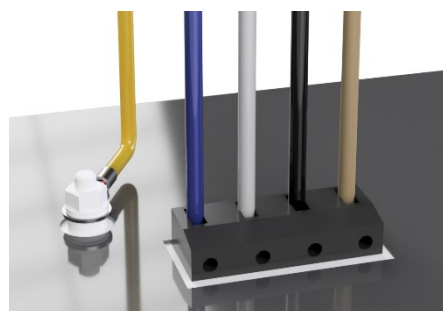


Figure 42 – Detail incoming AC grid connection

ATTENTION: the colour code used complies with EN 60446:

LINE	COLOUR	SYMBOL	NOMENCLATURE
R	Brown		RG
S	Black		SG
T	Grey		TG
N	Blue		NG
GND	Green		GNDG

If it is an "OFF-GRID" genset system that can be connected to UNE ZHERO it must have the following characteristics:

- **AC frequency** between 48.5 and 52.5 Hz to keep the connection active;
- **AC frequency** between 49 and 51 Hz to keep the connection active;
- **Voltage** 230V +/-10%;
- **Power:** at least 15% more powerful than the maximum power required.

In the event of frequency or voltage values outside this range, it is possible that UNE ZHERO disconnects from GE as its protection mechanism.

If it is an "ON GRID" system, this becomes the input for the public grid to which the system will connect, and the acceptance range will be that defined by the Grid code of the country in which it is installed.

AC cables coming from the mains (R, S, T, N and PE), before being connected to the above mentioned connector, must be properly filtered using the following material and carefully following the instructions below:

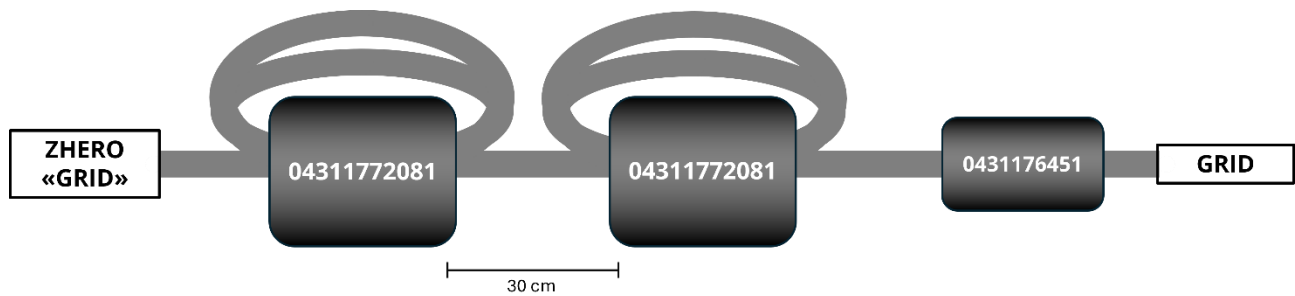


Figure 43 - Ferrite arrangement for the ZHERO system input network

The AC cables coming from the user's installation (R, S, T, N and PE) must make 2 passes within the **2 ferrites in series type 04311772081 or equivalent**, the 2 ferrites must be spaced 30 cm apart, in addition, the same cable must make a single pass within the **ferrite type 0431176451 or equivalent**.

4.4.2. Connection: in-out production counter (if applicable)

In some countries, regulations require the installation of a production meter at the same time as the installation of the photovoltaic system. This meter in many cases cannot be included in the system because it must be managed and supplied by the local distributor.



ATTENTION: In the case of OFF-GRID application the terminals will not be present.



ATTENTION: In the case of retrofit, hybrid or off-grid applications, the terminals will simply not be present externally. In the on-grid case it varies depending on the country of installation.



Figure 44 – Terminal block position

The meter entry-exit is represented 2nd and 3rd connection must be performed in the following order, from left to right:

NETWORK CONNECTION (LEFT TO RIGHT)

First screw	→	Inverter side: Neutral;
Second screw	→	Inverter side: Phase T;
Third screw	→	Inverter side: Phase S;
Fourth screw	→	Inverter side: Phase R.

NETWORK CONNECTION (LEFT TO RIGHT)

First screw	→	Grid side: Neutral;
Second screw	→	Grid side: Fase T;
Third screw	→	Grid side: Fase S;
Fourth screw	→	Grid side: Fase R.

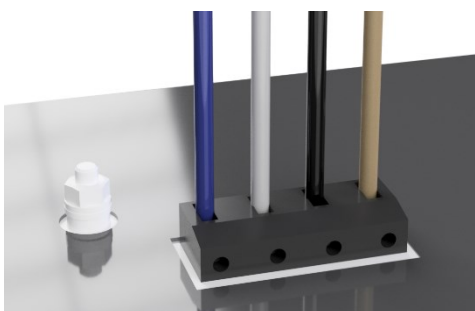


Figure 45 – Detail of AC connection in and out of the production counter

ATTENTION: the colour code used complies with EN 60446:

LINE	COLOUR	SYMBOL	NOMENCLATURE
R	Brown		R0 – R00
S	Black		S0 – S00
T	Grey		T0 – T00
N	Blue		N0 – N00

UNE ZHERO has been prepared for the installation of this external component; the procedure is as follows:

- Switch off UNE ZHERO by means of the "ON-OFF" disconnecting switch;
- Set the "INV" disconnecting switch to off;
- The input from the local distributor must be safely disconnected;
- d) Connect a Class II sheathed cable in "R00 - S00 - T00" and "N0" terminal block (tightening torque 2.4 Nm), the cable must be of a cross-section and capacity suitable for the system power and in accordance with local regulations;
- Connect the other end of the cable to the input of the production meter (tightening torque 2.4 Nm);
- Connect a class II-sheathed cable with the same characteristics as the previous one to the meter output and secure in the terminal block at "R0 - S0 - T0" and "N0" (tightening torque 2.4 Nm).

Depending on the countries in which the installation will be carried out, for the protection of its own technicians who will be installing the meter, the local distributor may require the insertion of two additional omnipolar disconnection switches at the inlet and outlet of the meter in order to have the disconnection operation carried out directly by its own operators.



ATTENTION: The installation of the inlet-outlet must be carried out following not only the rules in this manual, but also the regulations in force at the place of installation and the prescriptions of the local distributor who is to insert the meter.

4.4.3. Connection: **backup** line (if applicable)

The backup output is represented by the 1st connection group:



Figure 46 – Terminal block position

BACKUP CONNECTION (LEFT TO RIGHT)

Threaded insert	→	Backup: Ground;
First screw	→	Backup: Neutral;
Second screw	→	Backup: Phase T;
Third screw	→	Backup: Phase S;
Fourth screw	→	Backup: Phase R;

Take care not to reverse the order of connection.

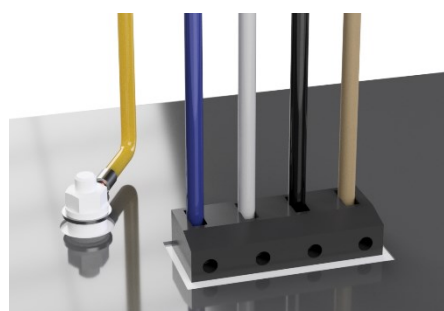


Figure 47 – Detail AC connection backup line (if applicable)

ATTENTION: the colour code used complies with EN 60446:

LINE	COLOUR	SYMBOL	NOMENCLATURE
R	Marrone		RC
S	Nero		SC
T	Grigio		TC
N	Blu		NC
GND	Verde		GNDC



ATTENTION: The 'backup' line shall have a peak power not exceeding 6 kW and spike not exceeding 50 A.

The output of the backup line shall be protected by a **differential magnetothermal switch** having the following characteristics:

- Rated current: 16A;
- Differential current: 300mA;
- Class A;
- Curve D.

AC cables to the backup utility, if any, (R, S, T, N and PE), before being connected to the above connector, must be properly filtered using the following material and carefully following the instructions below:

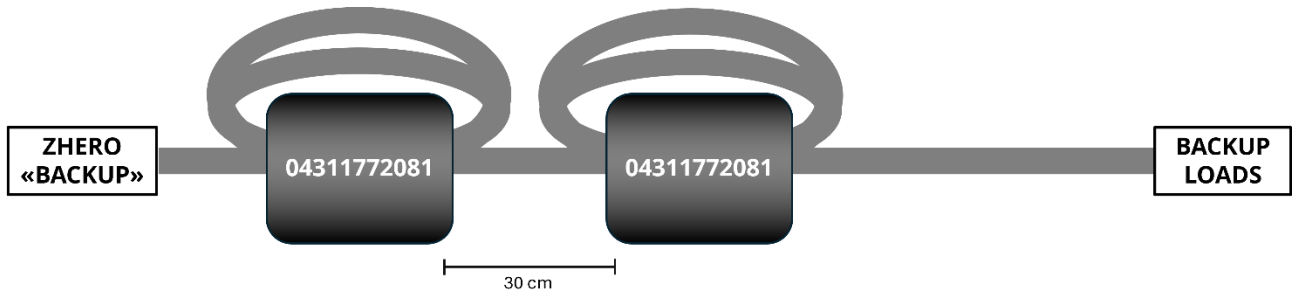


Figure 48 - Ferrite arrangement for UNE ZHERO backup output

AC cables coming from the user's installation (R, S, T, N and PE) must make 2 passes within the 2 ferrites in series type **04311772081** or equivalent, the 2 ferrites must be spaced 30 cm apart.

4.5. Connecting the meters



READ CAREFULLY: The number and configuration of Meters may change depending on the application for which the UNE ZHERO S10 system was ordered, please check the following carefully.

THE EXCHANGE METER

Present in all ON-GRID systems, this is a **meter external** to UNE ZHERO S10, which must be installed in series with the household/business exchange meter so that it measures exactly what is measured by the exchange meter. Its purpose is to **measure the energy exchanged by the exchange counter** and correctly account for energy withdrawn and sold between the home and the grid.

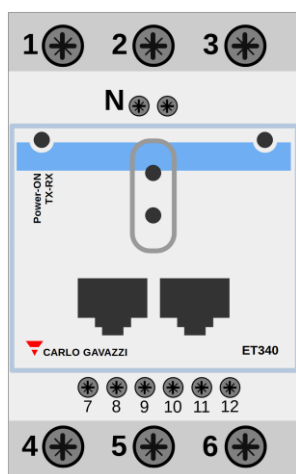
IL METER DI PRODUZIONE

Present only in Retrofit and Hybrid systems, it is a meter external to UNE ZHERO S10, which must be installed in series with the production meter of the grid inverter of the existing non-UNE inverter.

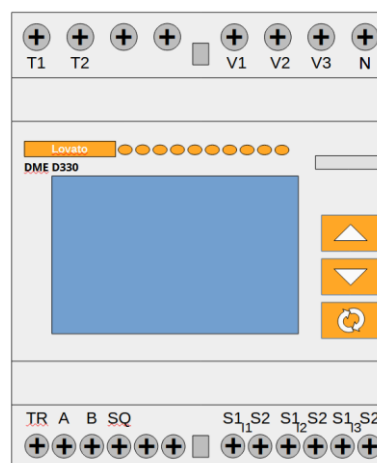
Its purpose is to measure photovoltaic production and correctly account for all measurements managed by UNE ZHERO S10.

APPLICATION	N° METER	EXCHANGE METER	PRODUCTION METER
UNE ZHERO S10 Three-phase	1	✓	✗
UNE ZHERO S10 Retrofit	2	✓	✓
UNE ZHERO S10 Hybrid	2	✓	✓
UNE ZHERO S10 Off-Grid	0	✗	✗

The models used by UNE ZHERO S10 are:



GAVAZZI
ET 340



LOVATO
DME D330

When provided:

- ET 340** : Three-phase systems with current up to 65 A per phase;
- DME D330** : Single-phase or three-phase systems where faster compensation is required and/or currents greater than 65 A per phase are expected.



ATTENTION: The cable connecting the Meter to the system must not exceed 100m in length.



ATTENTION: It is forbidden to connect 2 to different ZHEROs to the same Meter.



ATTENTION: Do not install more than one meter in series or in parallel with the same function (both exchange and production).

The meter is supplied together with the UNE ZHERO S10 product, the device is already parameterised, configured and tested.

DO NOT use a device that is not supplied unless explicitly agreed with UNE.

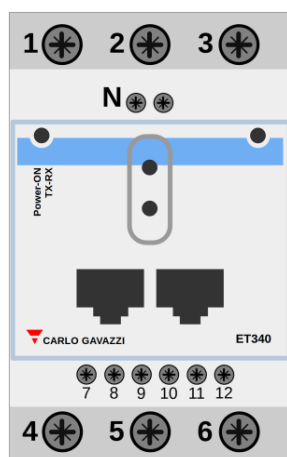
Be very careful **not to invert the production meter with the exchange meter and vice versa**, otherwise you will run into system malfunctions.

The meters will only count and measure the energy downstream of the device, everything upstream cannot be managed by UNE ZHERO.



READ CAREFULLY: Always use shielded RJ-45 FTP cables of category 5e or higher with a metal connector head.

4.5.1. GAVAZZI ET340



GAVAZZI
ET 340

Installing the exchange meter

The exchange meter is installed at the outlet of the exchange meter, so that the system is able to count the energy exchanged with it and zero the withdrawal.

Installing the production meter

The production meter is installed at the output of the external grid inverter, so that the system can count the energy produced and determine the energy that can be absorbed by the inverter.

Connection of 485 communication

Use an **RJ-45 FTP cable of category 5e or higher**, if running next to power cables or buried, use a suitable degree of shielding; also bear in mind that the cable used must be less than **100 m long** and use a **metal connector**.



READ CAREFULLY: use twisted cables; do not use cross cables.

The connection must be made, **irrespective of the colour code of the RJ-45 cables**, taking into consideration only the PIN number of the RJ-45 connector and inserted into the connector marked 'WAT':

COMMUNICATION CONNECTION - ZHERO STANDARD

The communication connection must be made by inserting the RJ-45 cable in the **WAT** port of the **UNE ZHERO S10** to the **RJ-45 port of the exchange meter**, as shown in the figure below:

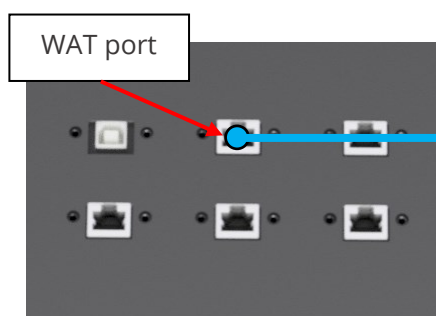


Figure 49 – Connecting the meter to the UNE ZHERO S10 panel.

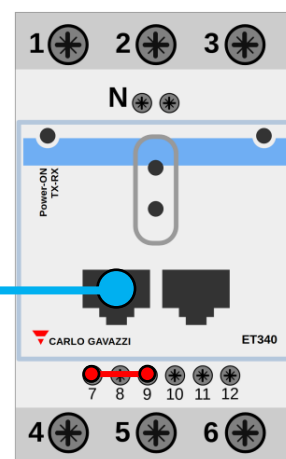


Figure 50 – RJ-45 connection of ET340 meter (blue) con terminator (red) on the last device.

Make a jumper between Pin 7 and 9 of the Meter (only on the last device).

In case you prefer to use the terminals for communication:

RJ-45 CABLES	COLOUR	METER SCREWS
6		10
5		9
4		8



WARNING: the Meters will count and measure what is connected downstream of the device, what happens upstream cannot be managed by UNE ZHERO.

To verify correct installation, once the Meter has been powered up and the UNE ZHERO system switched on, make sure that the LED shown in the figure flashes or check with the appropriate ZHERO Installer Tool software:

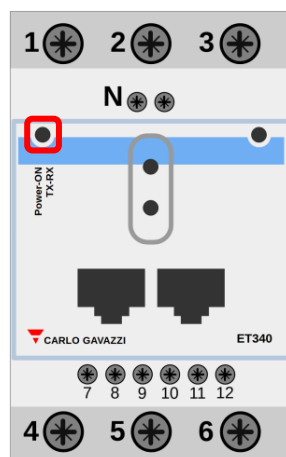
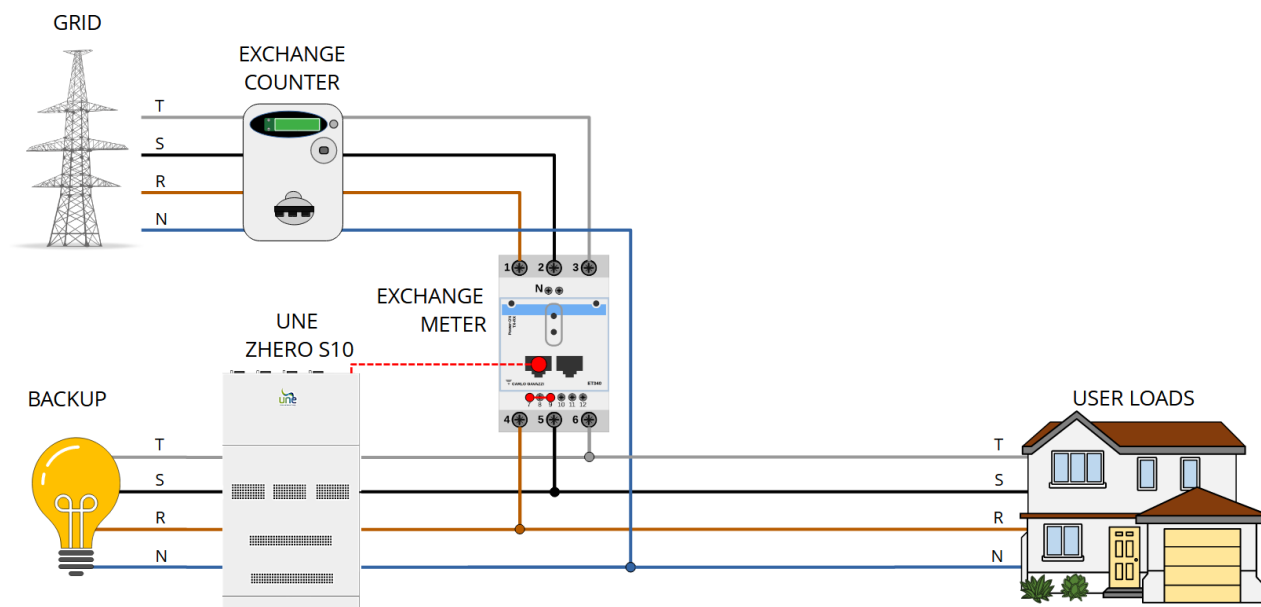


Figure 51 – Meter ET340 communication confirmation detail

POWER CONNECTION - ZHERO STANDARD



METER	SCREW	ORIGIN
EXCHANGE METER	1	Phase 1 from the exchange counter
	2	Fase 2 from the exchange counter
	3	Fase 3 from the exchange counter
	4	Phase 1 towards users and the ZHERO system
	5	Fase 2 towards users and the ZHERO system
	6	Fase 3 towards users and the ZHERO system

COMMUNICATION CONNECTION - ZHERO RETROFIT & HYBRID:

The communication connection must be made by inserting the RJ-45 cable in the **WAT** port of the **UNE ZHERO S10** to the **RJ-45 port** of the exchange meter, as shown in the figure below:

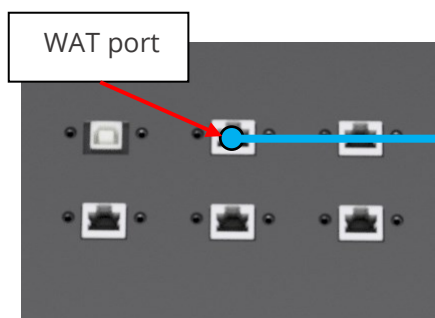


Figure 52 – Connecting the meter to the UNE ZHERO S10 panel.

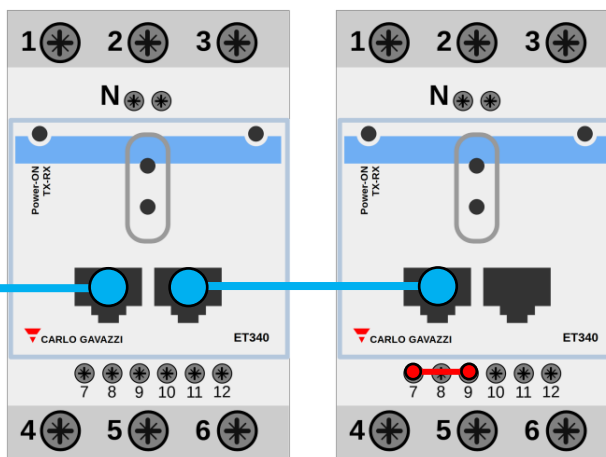


Figure 53 – RJ-45 connection of ET340 meter (blue) with terminator (red) on the last device.

Make a jumper between pins 7 and 9 of the Meter (only on the last device).

If you prefer to use terminals for communication:

SCREWS RJ-45	COLOUR	METER SCREWS
6		10
5		9
4		8



ATTENTION: Meters CANNOT be interchanged, while the order of communication connection via RJ-45 can.



WARNING: Meters will count and measure what is connected downstream of the device, what happens upstream cannot be managed by UNE ZHERO.

To verify correct installation, once the Meter has been powered up and the UNE ZHERO system switched on, make sure that the LED shown in the figure flashes:

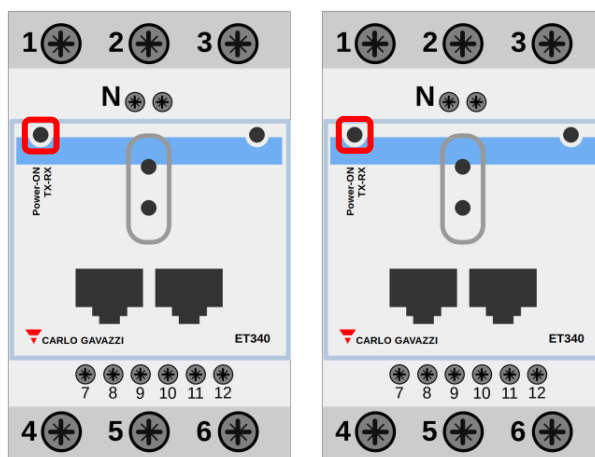
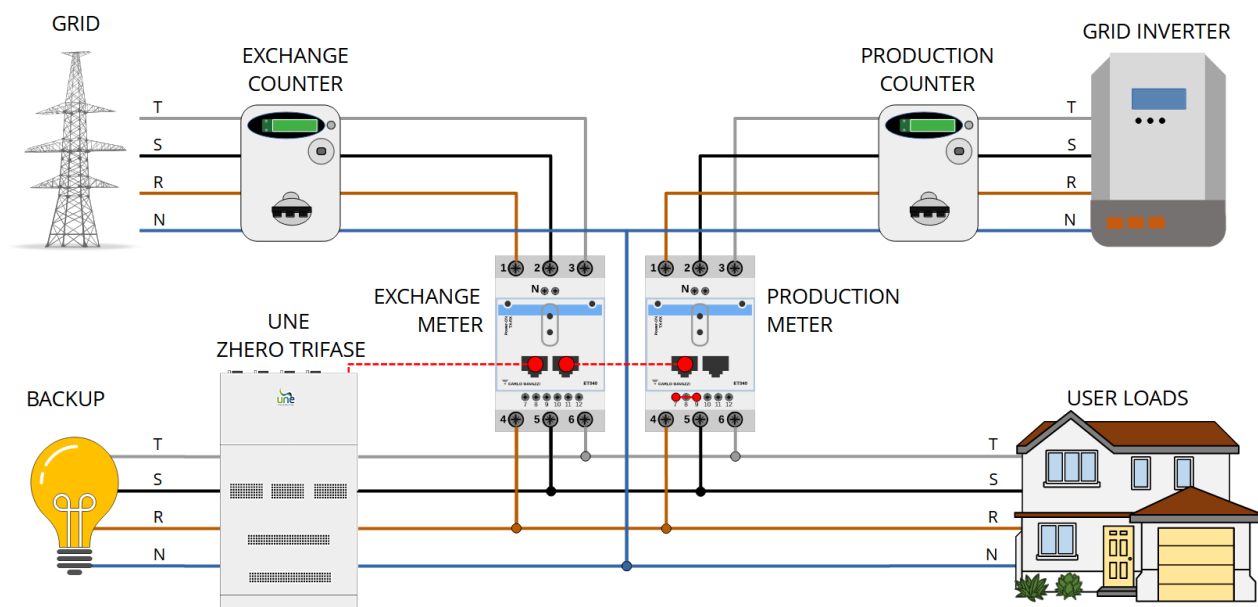


Figure 54 – Meter ET340 communication confirmation detail

or check with special ZHERO Installer Tool software.

POWER CONNECTION - ZHERO RETROFIT & HYBRID



METER	SCREW	ORIGIN
EXCHANGE METER	1	Phase 1 from the exchange counter
	2	Phase 2 from the exchange counter
	3	Phase 3 from the exchange counter
	4	Phase 1 towards users and the ZHERO system
	5	Phase 2 towards users and the ZHERO system
	6	Phase 3 towards users and the ZHERO system
PRODUCTION METER	1	Phase 1 from the external inverter
	2	Phase 2 from the external inverter
	3	Phase 3 from the external inverter
	4	Phase 1 towards users and the ZHERO system
	5	Phase 2 towards users and the ZHERO system
	6	Phase 3 towards users and the ZHERO system

4.5.2. Meter LOVATO DME D330



LOVATO
DME D330

Installing the EXCHANGE meter

The exchange meter is installed at the outlet of the exchange meter, so that the system is able to count the energy exchanged with it and zero the withdrawal.

Installing the PRODUCTION meter

The production meter is installed at the output of the external grid inverter, so that the system can count the energy produced and determine the energy that can be absorbed by ZHERO.

ZHERO STANDARD

Use an **RJ-45 FTP cable of category 5e** or higher, if running next to power cables or buried, use a suitable degree of shielding; also bear in mind that the cable used must be **less than 100 m long** and use a **metal connector**.



READ CAREFULLY: use twisted cables; do not use cross cables.

The connection must be made, irrespective of the colour code of the RJ-45 cables, considering only the PIN number of the **RJ-45 connector** and inserted into the connector marked 'WAT':

COMMUNICATION CONNECTION - ZHERO STANDARD

The communication connection must be made by inserting the RJ-45 cable in the WAT port of the UNE ZHERO S10 to the **RJ-45 port of the exchange meter**, as shown in the figure below:

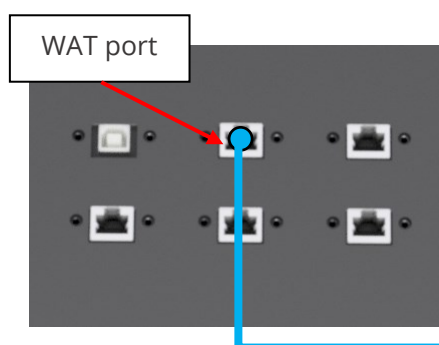
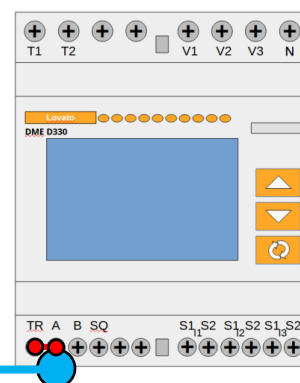


Figure 55 – Connecting the meter to the UNE ZHERO S10 panel.



EXCHANGE meter

Figure 56 – RJ-45 connection of the DME D330 meter (blue) with terminator (red) on the last device.

Use terminals for communication:

RJ-45 CABLES	COLOUR	METER SCREWS
5		A
4		B
8		SQ

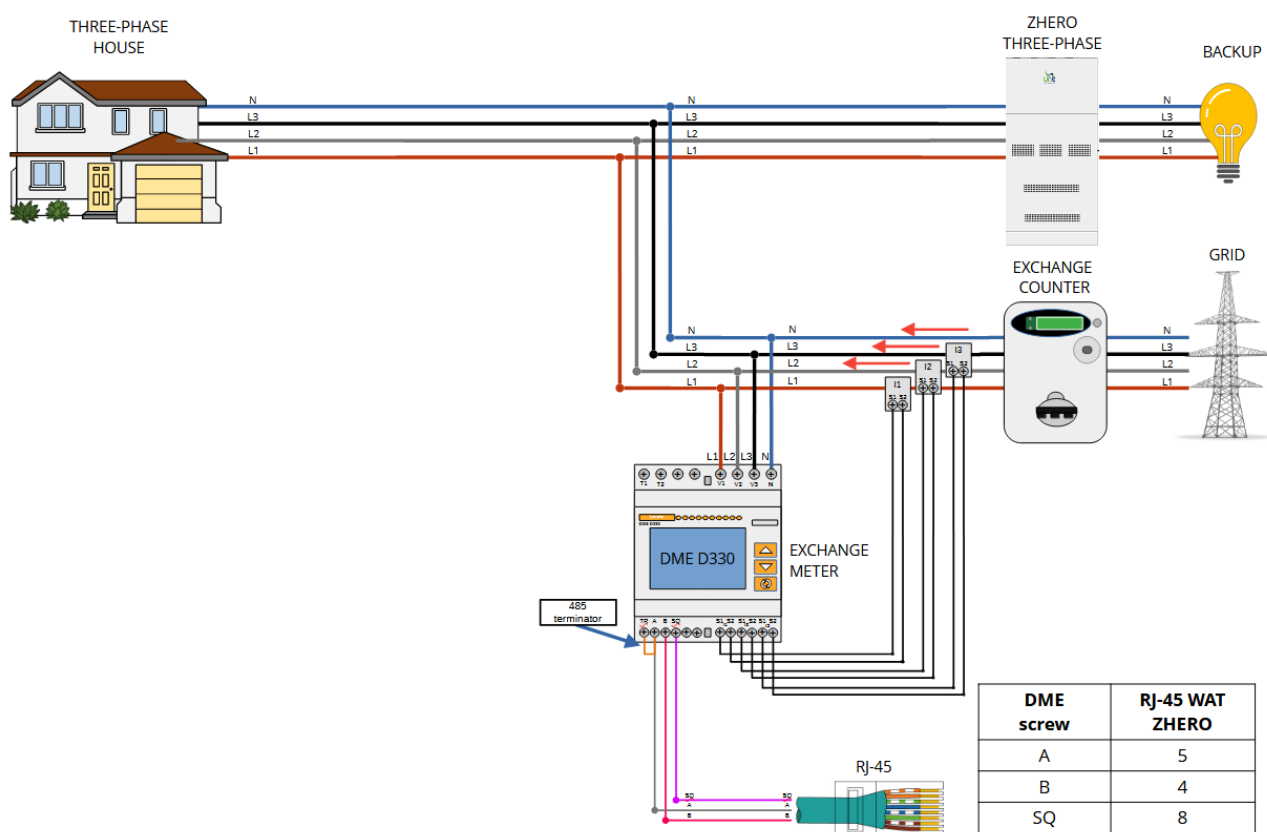
Make a jumper between pins TR and A of the Meter (only on the last device).



WARNING: the Meters will count and measure what is connected downstream of the device, what happens upstream cannot be managed by UNE ZHERO.

To verify correct installation, once the Meter has been powered up and the UNE ZHERO system switched on, check with the appropriate ZHERO Installer Tool software.

POWER CONNECTION - ZHERO STANDARD



Connection of mains voltage measurement:

METER	SCREW	ORIGIN
EXCHANGE METER	V1	Phase 1 from the exchange counter
	V2	Phase 2 from the exchange counter
	V3	Phase 3 from the exchange counter
	N	Neutral from the exchange counter
	I1 - S1	CT on phase 1 - arrow from the meter to the house
	I1 - S2	CT on phase 1 - arrow from the meter to the house
	I2 - S1	CT on phase 2 - arrow from the meter to the house
	I2 - S2	CT on phase 2 - arrow from the meter to the house

I3 – S1	CT on phase 3 – arrow from the meter to the house
I3 – S2	CT on phase 3 – arrow from the meter to the house

SIGNAL CONNECTION - ZHERO RETROFIT & HYBRID

The communication connection must be made by inserting the RJ-45 cable in the **WAT port** of the **UNE ZHERO S10** to the **RJ-45 port of the exchange meter**, as shown in the figure below:

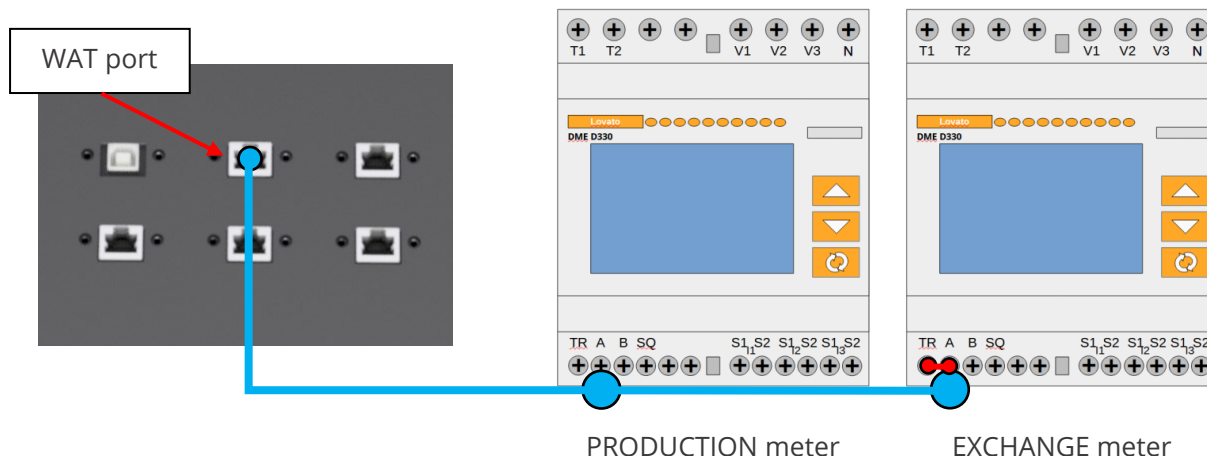


Figure 57 – Connecting the meter to the UNE ZHERO S6 panel.

Figure 58 – RJ-45 connection of ET340 meters (blue) with terminator (red) on the last device.

Make a jumper between pins **TR** and **A** of the meter (only on the last device). For the communication link between the first and second meter, it is possible to jumper directly on terminals **A**, **B** and **SQ** of the DME D330.

Use terminals for communication:

RJ-45 CABLE	COLOUR	METER CLAMPS
5		A
4		B
8		SQ



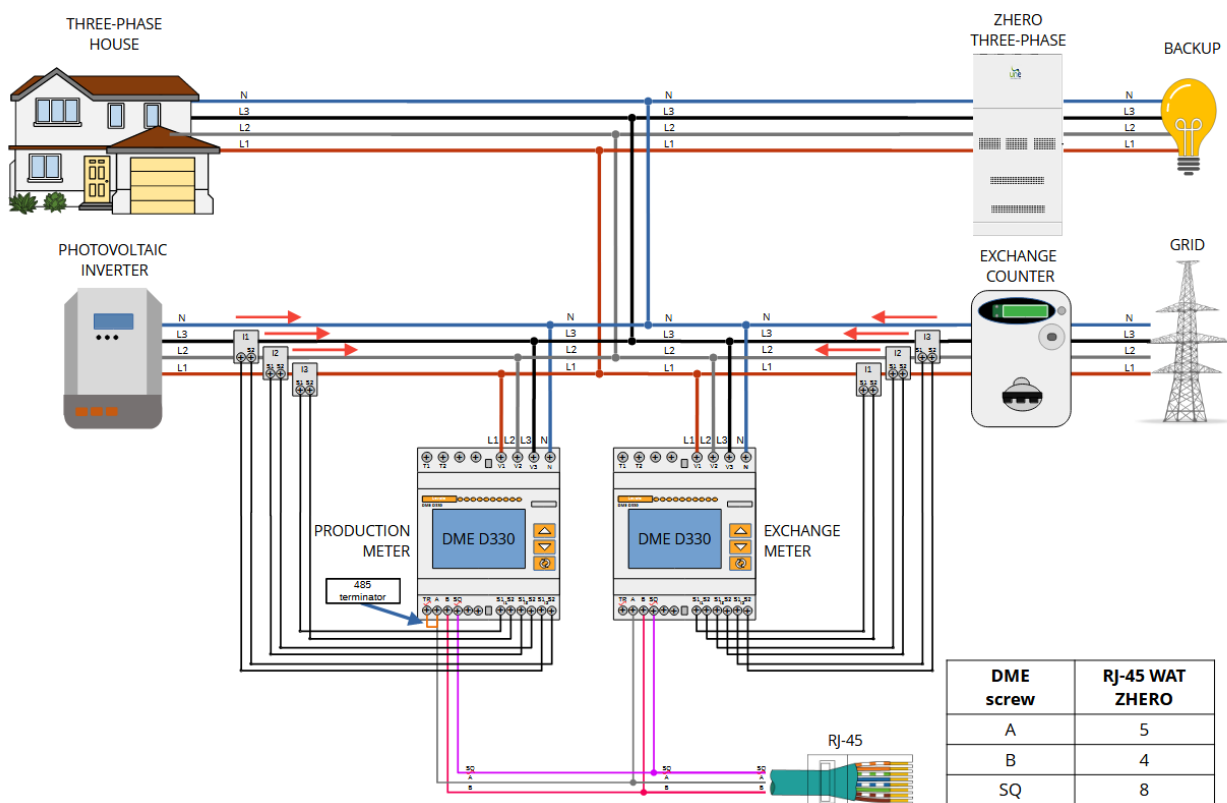
ATTENTION: Meters CANNOT be interchanged, while the order of communication connection via RJ-45 can.



WARNING: Meters will count and measure what is connected downstream of the device, what happens upstream cannot be managed by UNE ZHERO.

To verify correct installation, once the Meter has been powered up and the UNE ZHERO system switched on, check with the appropriate ZHERO Installer Tool software.

POWER CONNECTION – ZHERO RETROFIT & HYBRID



METER	SCREW	ORIGIN
EXCHANGE METER	V1	Phase 1 from the exchange counter
	V2	Phase 2 from the exchange counter
	V3	Phase 3 from the exchange counter
	N	Neutral from the exchange counter
	I1 – S1	CT on phase 1 – arrow from the meter to the house
	I1 – S2	CT on phase 1 – arrow from the meter to the house
	I2 – S1	CT on phase 2 – arrow from the meter to the house
	I2 – S2	CT on phase 2 – arrow from the meter to the house
	I3 – S1	CT on phase 3 – arrow from the meter to the house
	I3 – S2	CT on phase 3 – arrow from the meter to the house
PRODUCTION METER	V1	Phase 1 from the inverter
	V2	Phase 2 from the inverter
	V3	Phase 3 from the inverter
	N	Neutral from the inverter
	I1 – S1	CT on phase 1 – arrow from the inverter to the house
	I1 – S2	CT on phase 1 – arrow from the inverter to the house
	I2 – S1	CT on phase 2 – arrow from the inverter to the house
	I2 – S2	CT on phase 2 – arrow from the inverter to the house
	I3 – S1	CT on phase 3 – arrow from the inverter to the house
	I3 – S2	CT on phase 3 – arrow from the inverter to the house

4.5.3. Meter for OFF-Grid Application

The OFF-Grid configuration does not require the installation of any meters.

4.6. Internet connection

The system, whether for warranty, monitoring or service purposes, must be connected to the Internet; the **ETH** port on the **UNE ZHERO S10** is located where indicated in the figure below.

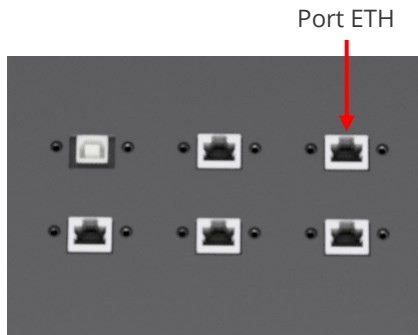


Figure 59 – Ethernet input position detail

Before making the connection, check that the cable connection is working, and if possible, check that the data communication on the webserver is successful.

The Ethernet cable coming out of the system must be **led directly to the router or a network switch connected to it** as shown in the figure:

Always use shielded **RJ-45 FTP cables of category 5e or higher with a metal connector head**.

Three different connection modes are possible between the UNE ZHERO S10 and the router:

a) RJ-45 cable connection

Before making the connection, check that the **cable connection is working**, and if possible, check that the data communication on the webserver is successful.

The Ethernet cable coming out of the system must be taken directly to the router or a network switch connected to it as shown in the figure below:



Figure 60 - Direct Ethernet connection

b) Connessione - Range extender

In the event that such a connection is not possible, a WIFI-REPEATER with an Ethernet port, configured as a range extender for your network, should be used.



Figure 61 - Connection via range extender

No special features are required of this device; however we recommend purchasing a mid-range product, possibly supporting **mesh networking**, **dual band 2.4 and 5 GHz** and with an antenna powerful enough to reach the router.

c) Connection – Powerline

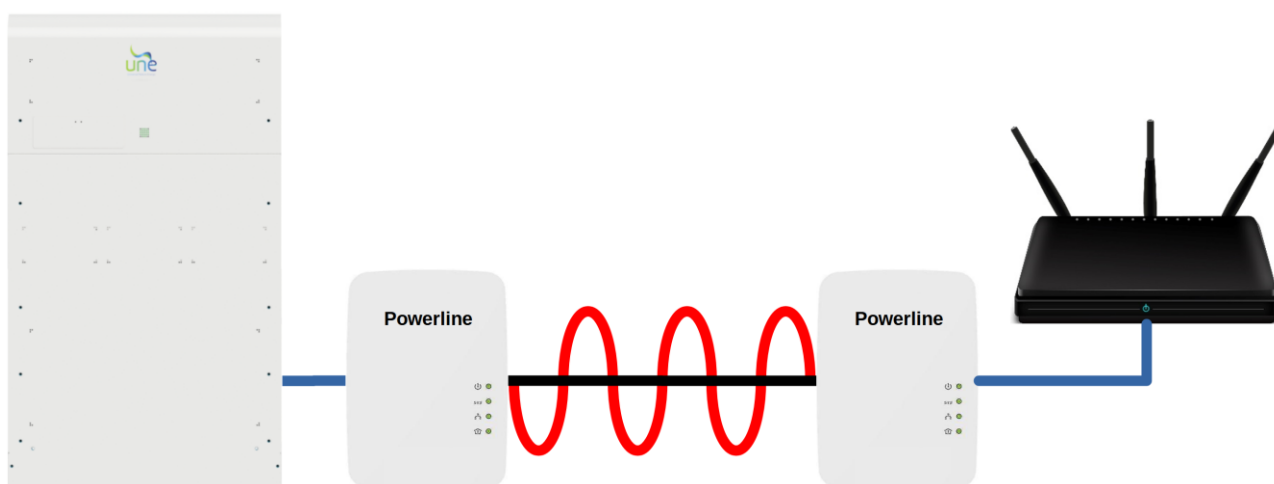


Figure 62 – Connection via powerline

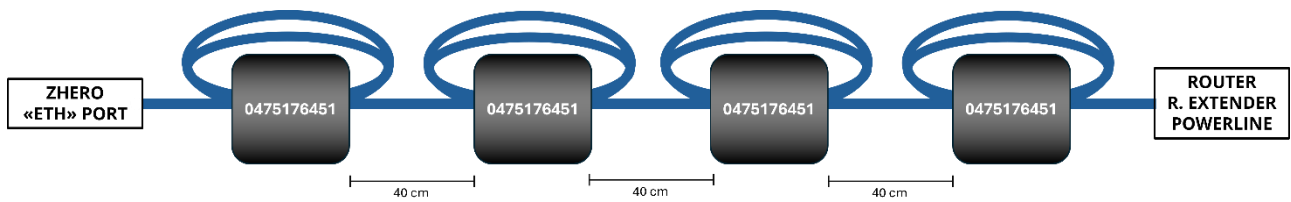
No special features are required of this device; however we recommend purchasing a good quality product.



READ CAREFULLY: powerline devices must necessarily be installed along the same phase of the power line.

In the event of connection problems, carry out the steps indicated in the par 11.2.6.

The section of RJ-45 cable exiting the ETH port of the UNE ZHERO system, before entering the router, range extender or powerline must be wound inside 4 ferrite rings **0475176451 or equivalent**, carefully following the instructions below:



The cable must be run 3 times inside each individual ferrite and the ferrites must be approximately 40 cm apart; these windings must be made outside the ZHERO three-phase inverter box.

5. - START-UP AND SHUTDOWN

5.1. Switching on the system

Preliminary verifications:

- **Verify** the electricity grid connection;
- **Verify** that the exchange meter and production meter are enabled;
- **Verify** that the meter power cables are correctly connected;
- **Verify** that the **485 meter** terminator is only on the last meter in the series;
- **Verify** that any **485/CAN** data lines are correctly connected;
- **Verify** the connection of the Internet cable to the "ETH" port;
- **Verify** the tightening of the screws on **the backup** line, if present;
- **Verify** that the **photovoltaic** system is enabled at the system input;
- **Verify** that the **grid inverter** is enabled (if present).

On-board operations:

- **Enabling the switch "INV";**
- **Enable** all users downstream and upstream of the system (external to the system);
- **Enable** the "ON-OFF" switch to "ON";

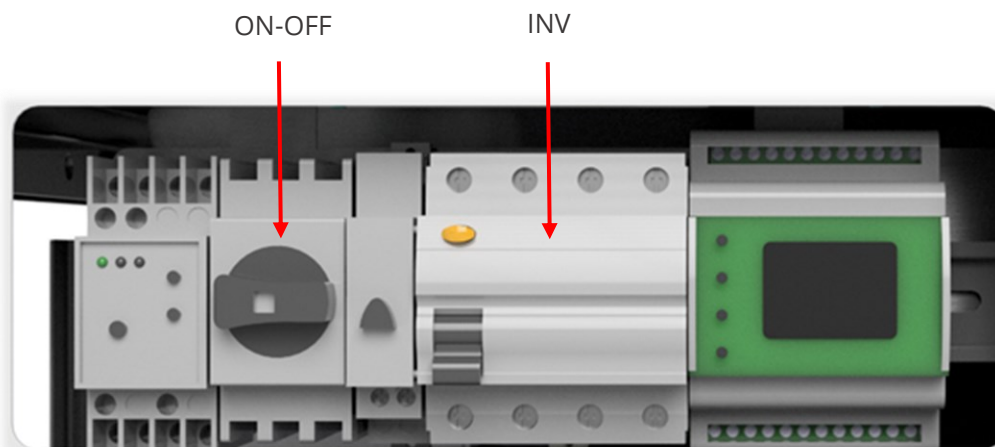


Figure 63 - Detail of switch panel of switch disconnectors to be enabled



ATTENTION: From this moment on, the backup line will be powered, otherwise something in the start-up phase has not been correctly executed.

The system will **warm-up the battery** to operating temperature (approx. 260°C).



ATTENTION: The Warmup phase of the batteries can last up to 14 hours and serves to raise the internal **temperature to 250°C / 260°C**. Once this temperature is reached, the system will proceed independently to normal operation; no further operations are required either by the user or the installer.



ATTENTION: During the Warmup phase, photovoltaic production will be limited to the consumption of the battery's internal heaters (always less than 1 kW); once the Warmup phase is over, production will reach normal working levels.

In the absence of photovoltaics if the machine does not complete the warm-up procedure after 24 hours, switch it off and contact your installer.

5.2. Verification with “ZHERO Installer Tool”

Following the first power-up, the correct installation must be **verified using the ZHERO Installer TOOL software**. The Warmup status will remain active until the Warmup is complete, at which point the system will begin normal operation.



Figure 64 - ZHERO Installer Tool opening logo



ATTENTION: In the event of malfunctions, switch off the system via the 'ON-OFF' switch and bypass any backup line via the external diverter wired by the installer.

The programme is necessary in order to be able to verify the correct installation of the UNE ZHERO system, since **verification of the correct installation** is not provided by the UNE operator, but only has to be contacted in the event of a serious anomaly.

The software can be downloaded free of charge from the official UNE website in the **download section**:

<https://unesrl.com/en/download/>

5.3. Shutting down the system

To switch off UNE ZHERO S10 you need to:

- Disable the "ON-OFF" switch by setting it "OFF";

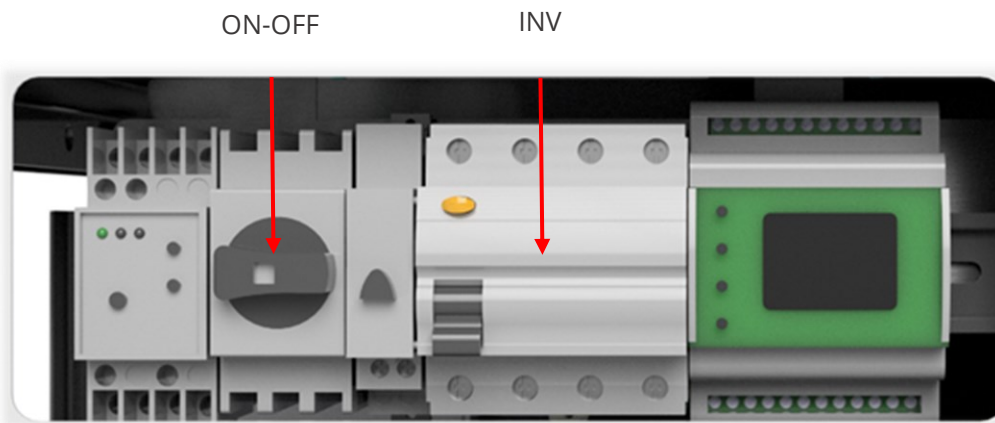


Figure 65 - Disable switch panel detail

If you intend to work on the system, you will also need to:

- Disable the "INV" circuit breaker by setting it "OFF";
- Disable the differential circuit breaker at the system input (not part of UNE ZHERO S10);
- Open the photovoltaic circuit breakers.



ATTENTION: Maintenance work must be carried out with the equipment disconnected from the grid, the photovoltaic generator and with the machine switched off, access to the system is only permitted **20 minutes after the power has been removed.**

6. - MAINTENANCE



There is no routine maintenance to be carried out on the system, but it is advisable to check the general state of cleanliness of the system and to visually inspect UNE ZHERO S10 annually to ensure that there are no obvious situations that could affect its proper functioning.

7. - PRODUCT SERVICE

Technical support for the UNE ZHERO storage system is provided by contacting UNE at:
assistenza@unesrl.com

The service department is aimed at providing **support to professionals** and **installers** to whom the private individual must, in any case, turn in case of need.

To speed up the procedure, the following data must be provided:

- **Serial number** (SN: XXXXXX);
- **Mail and Phone**;
- Indicative **date and time** of the event encountered;
- **Description**, as complete and detailed as possible, of the event/problem.

Once the email has been sent, UNE will receive the request for assistance and an operator will respond as quickly as possible.

8. - REGULATORY COMPLIANCE

SYSTEM - REGULATORY COMPLIANCE

Mark	+	CE
Certification	+	EN 62109-2
	+	EN 62109-3
	+	CEI EN 61000-6-1 (2007)
	+	CEI EN 61000-6-3 (2007)
	+	CEI 0-21: 2019-04
	+	VDE 4105 -0124 06/2020

9. - DISPOSAL

UNE srl is registered with COBAT (Consorzio Nazionale Raccolta e Riciclo) for the disposal of electrical waste. UNE ZHERO, at the end of its life cycle, must be stored and disposed of according to the regulations in force in the country of installation.

The following procedure must be followed for dismantling and subsequent scrapping:

- Have authorised personnel disconnect UNE ZHERO from all incoming and outgoing equipment;
- Consult the body responsible for the disposal of UNE ZHERO in accordance with the regulations in force in the country in which the system is installed;
- Have the dismantling of UNE ZHERO carried out by personnel authorised in the country in which the disposal is being carried out, taking care to separate the component materials according to their nature;
- Carry out the unloading of the components in accordance with the regulations in force at the disposal site (the various components that make up UNE ZHERO will be disposed of in different places, depending on whether they are solid, special or toxic waste depending on the classification in force at the disposal site).

Please refer to the enclosed battery manual for battery disposal.

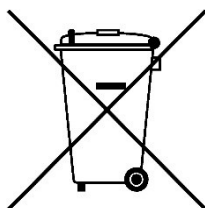


Figure 66 – Electronic waste symbol

10. - OPERATION OF THE SYSTEM

Below are some explanations on how the system works and tips on how to make the most of it according to your needs.

10.1. Tips for optimal use

In this section we will give you useful tips to make the most of your UNE ZHERO.

All it takes is a few tricks to be able to consume in a 'smart' way while saving energy and not giving up your comforts.

Advice

NOTE: To make the most of the advice in this paragraph, familiarise yourself with the supervision system, where you will find all the information you need.

First of all, it is necessary to introduce a few basic concepts with which you will be able to acquire the correct logic of use. **UNE ZHERO, when set to Off-Grid, is an off-grid system.**

Unlike grid-connected systems, it does not produce energy continuously when "fuel" (the sun) is present but produces energy when "fuel" is present and there is at the same time an appliance that requires that energy for its operation (the so-called load, e.g. a discharged battery, a household appliance, etc.).

When the sun is present there is a potential production, if the battery is charged and you are not using any appliance it is not exploited, therefore automatically lost.

If the system is set in on grid, the energy is not automatically lost but **sold to the local distributor** with a valorisation significantly lower than the self-consumed/stored energy in the battery.

The first objective is therefore to try to maximise the amount of energy used when the production capacity is high.

If there is simultaneity between production and consumption, the use of the battery will be less burdensome. Let us give some examples to make you understand the concept better.

We use the washing machine in 4 different situations, all with a fully charged battery:

- **During** the day with high irradiation;
- **During** the day with low irradiation in the morning;
- **During** the day with low irradiation in the evening;
- **During** the night.

DURING THE DAY WITH HIGH IRRADIATION

In the first case, the production capacity of the plant is higher than that required to operate the appliance. The washing machine will absorb all the energy required for its operation from the photovoltaic system, leaving the battery charge unchanged – **THIS REPRESENTS THE OPTIMAL USE.**

Advice

NOTE: The fact that there is sufficient production capacity to supply a household appliance with the energy it needs for operation does not mean that it occupies the entire production capacity. Check via supervision whether there is room to accommodate other loads at the same time.



WARNING: Please remember to respect the limits imposed by the purchased system concerning instantaneous absorption. Once this limit is exceeded, the system disconnects the loads.

DURING THE DAY WITH LOW RADIATION IN THE MORNING

In the second case, the production capacity is a part of that required to operate the appliance.

The washing machine will absorb partly from the photovoltaic system and partly from the battery, but the battery will have the rest of the day to recharge itself through the generator's capacity not used by other loads and be ready to face the night period – **QUESTO RAPPRESENTA UN BUON METODO DI UTILIZZO.**

DURING THE DAY WITH LOW IRRADIATION IN THE EVENING

In the third case, the production capacity is a part of that required to operate the appliance.

The washing machine will absorb partly from the photovoltaic system and partly from the battery, which will not have the rest of the day to recharge itself through the generator's productive capacity not used by other loads in use, but still allows the battery to discharge less and have more charge to cope with the night period – **THIS REPRESENTS A LESS VALID METHOD OF USE THAN THE PREVIOUS ONE, BUT STILL SHREWD.**

DURING THE NIGHT

In the fourth case, the production capacity is zero.

The washing machine will absorb all the energy it needs from the battery and will be one of those loads that will absorb some of the energy overnight.

This implies that if there was production capacity during the day, this will not be utilised and therefore lost; there will therefore be less energy available without grid intervention at night – **THIS REPRESENTS THE LEAST CAREFUL METHOD OF USE.**

Please note that this in no way affects the functionality of the system.

These are tips for optimal use, everything will continue to work smoothly even if the battery runs out.

Furthermore, the battery available in the UNE ZHERO S10 **has a high capacity**; it is likely that, no matter how much you consume with heavy appliances (ovens, washing machines, etc.), it will not last overnight to finish its charge.

However, it is necessary to remember that if **the weather conditions are bad and/or the loads used are particularly heavy**, we may not have a battery with sufficient charge the next day, forcing us to access the local distributor/generator's network with increased costs.

The rule, therefore, is always: use appliances when you have capacity.

Remember that, in the case of Off-Grid, if you do not consume unused capacity, this energy is lost.

The washing machine is just an example to show the logic of operation.

With this in mind, you should start using all the electrical appliances in your home (iron, Hoover, etc.), making sure that you have chosen the UNE ZHERO model with the appropriate battery **capacity for your uses**, so that this capacity is sufficient to cover your night-time needs.

It will therefore not be necessary to radically change your habits: you can comfortably use the oven for cooking in the evening, the lighting, televisions, personal computers, etc. exactly as before, but shrewd use can allow you to save money and only sporadically access the net.

It can be deduced that optimal utilisation is that which **allows the plant's production capacity to be utilised as much as possible**, while using the battery as little as possible, which is more than likely the case with judicious use.

This is even easier if one uses programmable and, logically, less energy-intensive appliances (class A or higher).

In addition to the above, we add some other **small tips** that you will have already heard in various situations, but it is **always best to remember**:

- If you have **programmable appliances**, make use of this function;
- When buying **new appliances**, choose those with the highest energy class;
- Only buy **energy-saving** light fittings;
- Remember to **switch off** lights and **appliances that are not in use**;
- Open the **refrigerator door** as infrequently as possible;
- Do as little **washing as possible with a full load**;
- Avoid leaving appliances on **stand-by**;
- Always carry out **maintenance** on existing appliances;
- **Avoid using the tumble dryer** in summer.

10.2. Security checks

To ensure proper functioning, it is advisable to carry out some checks on the system on a regular basis to avoid possible problems.

It is necessary:

- **Monitor** whether the system sends notification e-mails;
- **Check the cleanliness and integrity of the outer casing;**
- **Check that there are no obstructions or objects resting against the system and especially at the louvers;**
- **Carry out the safety tests listed in the following sub-sections.**

10.2.1. Insulation test

In order to check the tightness of the system's electrical insulation, the insulation control test must be carried out once a month to **verify the system's effective ability to detect and signal danger in good time.**

To carry out the test, simply press and hold the TEST button on the **"ISO"** insulation control module in the main switchboard for **"10 seconds"**.

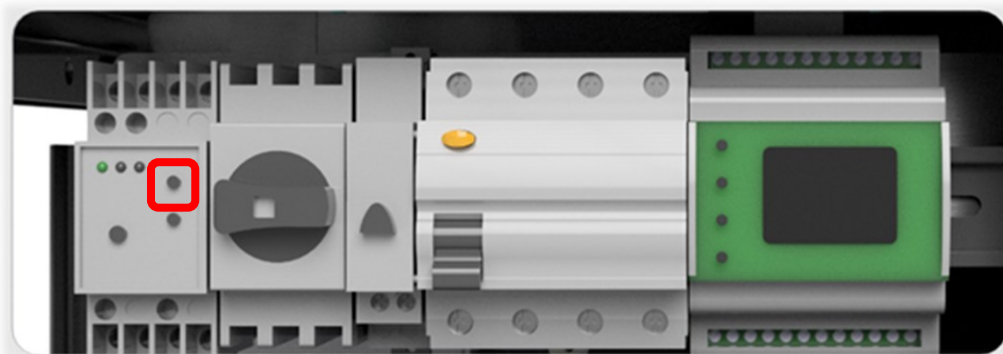


Figure 67 – ZHERO switchboard, isolation test button

The system's main alarm lamp will flash 3 times in sequence followed by a 1 second pause and again 3 flashes; this indicates the correct functioning of the insulation control detection and signalling.

To restore **normal operation**, simply stop pressing the test button.

10.2.2. On-board INV switch test

In order to verify the correct functioning of the ZHERO on-board life-saving device, it is necessary to:

- **Disconnect** as many loads as possible from the house;
- **Disconnect** the photovoltaic system;
- **Press the test button** on the 'INV' module as shown in the figure below.

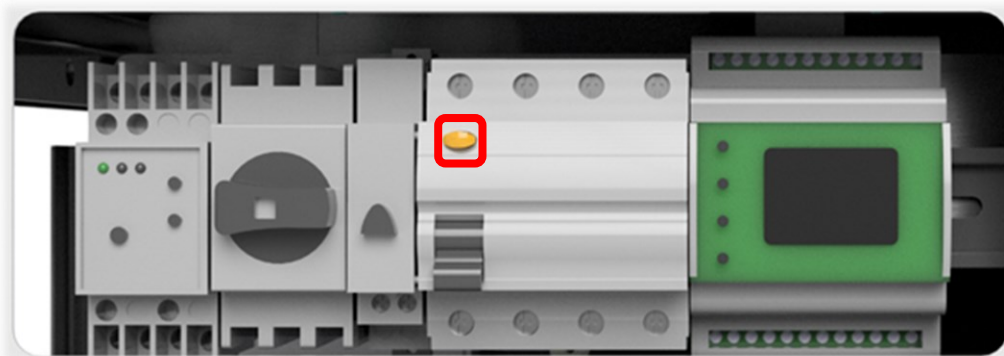


Figure 68 – ZHERO switchboard INV test button

An **immediate release** of the relevant switch should occur; to restore normal operation of the system, simply return the lever that has just been released to the upward position.

Once the test is complete, every **load in the house can be restored**.

The test should be carried out at least **once every six months**.

10.3. Supervision

The programme is necessary in order to be able to verify the correct installation of the UNE ZHERO system, since **verification of the correct installation is not provided by the UNE operator** but must only be contacted in the event of a serious fault.

The software is freely downloadable from the official website in the **download area**:

<https://unesrl.com/en/download/>

inside is its installer and instruction manual complete with the materials required for connecting UNE ZHERO - PC.

10.3.1. Webserver & Webapp

The use of the webserver is covered in depth in the portal's On-Line Course: UNE CAMPUS after registering for the portal by clicking on the following link:

<https://unecampus.thinkific.com/courses/corso-webserver-une>

10.4. "Standard" function



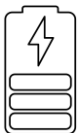
The system is designed to prioritise energy delivery to the user in this order:

- 1- **Photovoltaic energy;**
- 2- **Battery energy;**
- 3- **Grid energy.**

In normal operation, the system **attempts to supply the household by means of photovoltaic energy**, which, if absent or insufficient, is compensated by the battery; when this too is insufficient, the remainder is supplied by the distributor network.

Once the stored energy is exhausted, the house is fully supplied from the distributor's grid until the batteries are sufficiently charged to resume supply.

10.5. "Cyclic equalisation" function



For the system to function properly and for the battery to be managed correctly, the system must reach 100 per cent of its charge **every 15 days**. To do this, all loads are transferred to the distributor's grid and the **battery is recharged by the photovoltaic**.

In the event of **low production**, this process can take several days; however, this in no way affects the percentage of self-consumed energy or the total production. It simply shifts its use to later days.

10.6. "Charge Hysteresis" function



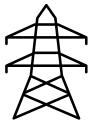
When the battery reaches its minimum charge level (**default 20%**), the supply from that source is interrupted and transferred to the distributor network.

Unless the system is in cyclic charging mode, it will only resume dispensing after it has reached the upper 5% charge level (**default 25%**).



ATTENTION: In the case of two batteries, the minimum charge level is not given by the average value read by the webserver, but by the lowest value of the charge of each of the batteries. Therefore, it is possible that the minimum SOC has a value slightly higher than the set minimum value (**default 20%**).

10.7. “Feed surplus energy into the grid” function



The system is configured to automatically **feed surplus energy into the grid**. When the batteries are recharged according to their charge curve, and the utility is powered, the rest of the energy is fed into the grid via **the on-site exchange**.

During the initial battery warm-up phase, this functionality is inhibited.

10.8. “Blackout” function



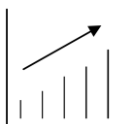
In the case of utilities not connected to the 'backup' line, any disruption cannot in any way be caused by the UNE ZHERO storage system.

In the case of utilities connected to the “backup” line (if provided), it can be checked whether:

- The network is not within the legal limits;
- There is a shortfall in the distributor network and the battery is too low to be able to deliver.

Should this situation **occur frequently**, it will be sufficient to **bypass the backup line** directly on the distributor network.

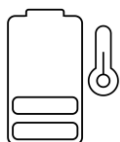
10.9. “Power ramp” function



In the event that the system has to operate **off-grid due to a blackout or a distributor network out of parameters**, it is possible that the connection of loads under the 'backup' line will generate a micro-interruption followed **by a restart of the power ramp-up that will produce a rapid flickering of the lights**.

This is normal operation, and the system will continue to supply power until its useful **energy is exhausted (default 10%)**.

10.10. “Warmup, charge and discharge” function



The completely cold **battery can take up to 14 hours** to come into operation; this is only done after:

- Startup;
- Restart of the system;
- Excessive discharge in the absence of a distributor network.

Once in operation, unless there are anomalies, the system **will no longer switch it off**.

The system is designed to **provide the user with all the energy stored**, but not necessarily always at maximum power; therefore, discharge is managed in a way that

is compatible with a 'soft' use of the battery that avoids excessive wear due to sudden discharges, but at the end of the cycle, returns all available energy to the user.

Battery recharging, like any other storage device, follows a precise curve and can reach a maximum of **2.16 kW to a minimum of 0.4 kW depending on the state of charge**; thus, a dual battery system can be recharged up to **4.32 kW and a minimum of 0.8 kW** and so on.

Photovoltaic production is in no way slowed down or inhibited, the utility always retains priority, and the surplus is sold to the distributor network via on-site exchange.

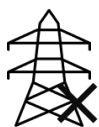
10.11. “Device in stand-by” function



Normally the “Device in stand-by” signalling, with the machine switched on, represents a **problem in communicating with the Internet**.

If the device shows the green lamp lit, the system is operating correctly, if it is red, it shows a fault (see cap. 11.2.6.), if switched off then the device is actually in the OFF condition.

10.12. “OFF-GRID” function



If UNE ZHERO is Off-Grid, the ways in which it can operate are changeable and the exact configuration must be discussed and validated with the UNE contact person.

You can set the system so that:

- Put on the **charger** whenever you detect the presence of the genset;
- Always remain connected but only recharge when necessary;
- **Automatically call up the genset when needed** (must be requested at the time of purchase for this configuration).

It is also possible to customise the system later by modifying:

- **Minimum charge level**;
- **Number of batteries**;
- **Number of controllers**;
- **Cyclic charge control frequency**;
- **Upgrade** for connection to the distributor network (paperwork and application handling not included);
- Other minor settings.

All operating modes of the 'backup' line are equivalent to the operating modes described for the On-Grid in the event of a blackout.

10.13. “Retrofit – Hybrid” function



UNE ZHERO Retrofit or Hybrid is set up to operate in such a way as to accumulate excess energy during the day and then distribute it to the user. Therefore, the user will first use the energy produced by its internal MPPT controllers (Hybrid configuration), then by the grid inverter, then that stored by the battery pack, and finally, only, if necessary, that from the distributor's grid.

The battery pack is recharged following its own charging curve, so it is common during the day for overproduction to be released to the grid even though the battery is charging.

This means that the optimal way to store the energy produced is on long days with average brightness, rather than short days with high production peaks.

11. - FAILURE OR ANOMALY

11.1. Fault Signalling

Alarm or fault signalling is carried out, both for the user and the installer, via these two modes, which require no additional installation, only WEB registration:

WARNING LIGHT ON BOARD UNE ZHERO S10

The **"RED"** indicator light indicates the presence of an active alarm in the system.

If the error is temporary, it will be automatically reset within a few hours, to speed up the reset you can **press the alarm reset button** located behind the switch plate on board the UNE ZHERO.

If this operation does not restore the normal operating state (lamp **"GREEN"**), you will have to contact your electrician.

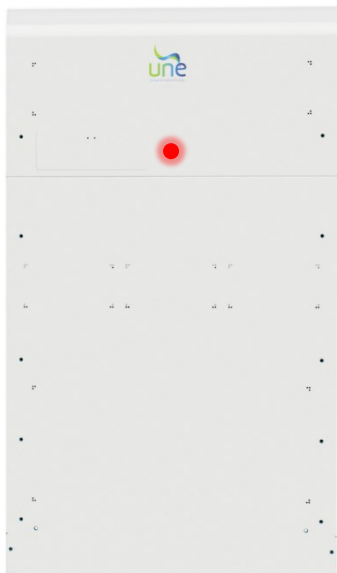


Figure 69 – Fixed red light detail on BOX Inverter

ZHEROSYSTEM DISPOSITIVO SN: SN CAMPO: ALL_SPI	
	do-not-reply@zherosystem.com
A	Mail cliente
ALLARME RIENTRATO PER IL SN: SN campo ALL_SPI	
Cliente :	Nome cliente Indirizzo del cliente

Figure 70 – Example of e-mail notification

SENDING E-MAIL TO USER AND/OR INSTALLER

By registering on the portal and entering a valid e-mail address, it will be possible to enable the reception of alarms activated on the system.

Next is an example of the signalling.

11.2. Most common anomalies

The following are the most frequent anomalies and recommended behaviours for the UNE ZHERO user.

11.2.1. Low Insulation Resistance



Event

In the event that UNE ZHERO, by means of the insulation resistance check, finds an earth fault in one of the two poles of the electrical system, it will have the following behaviour:

- a) Immediately send a message and an e-mail to the user of the presence of an earth fault in the electrical system.
- b) The system signals this by flashing the green/red light.

The system will continue to operate with the distributor network.



Reason for failure

Low insulation resistance occurs when an active part begins to leak to earth.

The most common reasons are:

- **Tearing of the insulation** of photovoltaic modules;
- **Tearing of the sheathing** of photovoltaic cables;
- **Aging** of photovoltaic string connectors.

In the event of adverse environmental conditions (particularly violent storms, etc.), moisture may penetrate the connectors giving a temporary dispersion which disappears once the site has dried. In this case, even if UNE ZHERO is able to restart regularly, a check must be carried out.



User behaviour

If the problem was transient, the system will reset immediately following the anomaly; if the problem occurs frequently, contact your installer.

11.2.2. String anomaly



Event

If, during normal operation of UNE ZHERO, a string stops delivering, a significant reduction in photovoltaic output should be noted.



Reason for failure

A string stops supplying current when there is a physical interruption in the circuit: a fuse in the PV strings may have blown; an internal charge controller in the system may have broken (if provided).



User behaviour

The user should contact their installer who will check.

11.2.3. Battery failure



Event

In the event of a critical battery error, UNE ZHERO will attempt a battery reset.

The system will disconnect the inverter and the user, if in Off-Grid, will be blacked out for a time of a few minutes.

In the meantime, the system will attempt to restore the battery; if successful, the system will return to operation. Otherwise, UNE ZHERO will only serve the user from the local distributor's grid (if On-Grid) or from the back-up generator (if Off-Grid).



Reason for failure

If the battery does not recover within 48h, contact your installer.



User behaviour

The user should contact their installer who will check.

11.2.4. Controller failure



Event

In the event that UNE ZHERO detects a fault in the controller this, together with the generator, will be immediately isolated from the rest of the system. The system will continue to run on battery power as long as energy is available. Once this is over, UNE ZHERO will only serve the user from the local distributor's grid (if On-Grid) or from the back-up generator (if Off-Grid).



Reason for failure

The fault is due to an internal failure of UNE ZHERO.



User behaviour

Contact your installer for an inspection.

11.2.5. Inverter failure



Event

In the event of a fault in the inverter, UNE ZHERO will no longer be able to supply current from either the generator or the battery. In the most serious cases, it will not even be able to keep you connected to the local distributor's grid (if On-Grid) or to the backup generator (if Off-Grid), along the "backup" line.



Reason for failure

The fault is due to an internal failure of the inverter.



User behaviour

First of all, call your installer to carry out a quick intervention. In order not to leave the user in blackout, bypass the system using an external bypass.

11.2.6. Webserver communication Fault



Event

If the system is not switched off and has suddenly interrupted the initially functioning communication, then in all likelihood the problem can be traced back to a communication breakdown.



Reason for failure

This is a problem that can occur with some service providers who may mistake the UNE ZHERO data exchange as spam and cut off communication. As we are not system administrators and do not deal with the customer's Internet networks, we unfortunately cannot intervene directly to resolve the problem and must contact the service provider.



User behaviour

The problem was found to be more frequent for routers with sim cards and low signal levels rather than traditional routers connected to the telephone line.

Note:

Connected device: 'Zhero' storage system interrogating (or being interrogated by) an external webserver (UNE webserver) via a Modbus **TCP/IP protocol on port 9090 TCP and UDP**. Communication is bi-directional.

The Zhero device is configured in DHCP so that once it is connected to a network, it is assigned a local IP address associated by the router.

The router/firewall sees Zhero with a hostname called "lwip".

It is requested to open this communication channel, i.e. to open the hostname "lwip" and its corresponding IP on port 9090 TCP and UDP to data traffic.

The problem could be in one of the following places:

a) Switch lockdown

- Connect UNE ZHERO directly RJ of the router (if network switches are present), to remove any hardware between router and UNE ZHERO.

b) Open router ports

Check the following fields:

- i) Router set in DHCP;
 - ii) Opening TCP and UDP ports: 9090 related to the IP address associated with the UNE ZHERO by the router (in DHCP);
 - iii) (iii) Add to the navigation exclusions the URL "HTTPS:\\portal.zherosystem.com".
- Verify that UNE ZHERO is seen in the router's LAN network;
 - Verify the associated IP address and remove any filters associated with its MAC address/IP address, verify DHCP does not re-associate an address each time without open ports;
 - Try removing any protection each filter from the entire router to verify resumption of communication.

Attention: data communication takes place every 15 minutes, and it can take up to several hours for communication to resume.

c) Router lockdown

We have no solutions to propose, if the ETH module is seen in the network, they have to open all traffic to and from the module.

Usually one has to insist with internet service providers to check the filters and get an expert technician to intervene, not generic call centres that always deny the presence of filters a priori.

d) Hardware integrity of wiring harnesses

Check the integrity of the RJ45 communication cable by trying to navigate the LAN from the cable that would enter the ETH port of the UNE ZHERO.

e) Changing the connection network:

Connect the UNE ZHERO to another network and see if communication resumes from there (wait at least 30 minutes), at which point the UNE ZHERO hardware problem would be definitively ruled out. (hotspot your mobile phone to a wi-fi repeater with an RJ port connected directly to the UNE ZHERO for example).

f) Replacing the communication board.



ATTENTION: Replacement must be carried out by qualified UNE personnel.



ATTENTION: If the replacement of the communication equipment does not solve the problem after 6 months, the cost will be charged to the person requesting the intervention.

11.2.7. Bypassing the system



Event

Should UNE ZHERO have a critical malfunction, first contact your installer for verification via the internal monitoring system connected to your UNE.



Reason for failure

The reasons for the failure could be various and not perfectly determinable.



User behaviour

If there is no possibility of an immediate reset, UNE ZHERO can be excluded by manually switching to the distributor's mains via an external diverter, which the installer must provide in the event of a backup line being present.

11.2.8. On-board residual current circuit breaker rupture



Event

In the event that the "INV" earth leakage circuit breaker on the machine does not trip in the event of a test or no longer remains active, you must immediately contact your electrician to have it replaced.



Reason for failure

The earth leakage circuit breaker may be defective.



User behaviour

In the event that the "INV" earth leakage circuit breaker on the **machine does not trip in the event of a test or no longer remains active**, you must immediately contact your electrician to have it replaced.

For more information, **please contact UNE at:**

assistenza@unesrl.com

11.2.9. Failure to connect to the distributor/generator network



On-Grid

If the system does not connect to the distributor network, it is possible that the voltage or frequency is outside the ranges accepted by UNE ZHERO, see cap. 5.9.3.

Off-Grid System

If the system does not connect to the genset, it is possible that the voltage or frequency is outside the ranges accepted by UNE ZHERO.



On-Grid

It is advisable to check that the grid parameters are within the accepted ranges and if not, to involve the energy supplier itself.

Sistema Off-Grid

It is advisable to check that the genset is working properly.



User behaviour

Unfortunately, there are no user operations that can solve the problem, in case of failures along the backup line, it is recommended to bypass the system by connecting loads under the network, the system will still compensate for consumption under the backup line.

12. - APPENDICES

12.1. System Status Tables

SUMMARY - STATUSCYCLE - Agen					
	bit	ALARM NAME	BLOCKING ALARM	POSSIBLE CAUSE	POSSIBLE SOLUTION
STATUSCYCLE - Agen0	0	ALL_UNDERV_DC	NO	There is no photovoltaic production and the battery is off	if it does not reset within ten minutes, reset using the "ALL" button, if this does not work, contact: assistenza@unesrl.com
	1	ALL_OVERV_DC	YES	Possible overvoltage from the controller or inverter.	Disconnect one controller at a time and check the cause, if the alarm persists, the cause could be the inverter, in this case contact assistenza@unesrl.com.
	2	ALL_ISOLAMENTO	NO	Possible loss of insulation of the photovoltaic system.	check that by disconnecting the photovoltaic system the alarm is reset; at that point check the integrity of the photovoltaic system.
	3	ALL_SENS_IRR	NO	The sensor is dirty, covered or not connected.	Check the integrity of the photovoltaic system and electrical connections.
	4	ALL_OVERLOAD	NO	User connected too high load.	Disconnect high load and perform alarm reset.
	5	ALL_OVERV_AC_IN	YES	Power surge from the network. Reset the alarm using the "ALL" button; if possible, perform a system restart.	If frequent, it is recommended to install AC arresters to protect the line.
	6	ALL_BATTERY_LOW	YES	the system has dropped below its minimum charge level because it was disconnected from the distributor network	Check the presence of the distributor network and verify that the rated voltage and frequency are always within the limits of the regulations.
	7	EMPTY		Not used	Not used
STATUSCYCLE - Agen8	8	WAR_CARICA_CICLICA	NO	If the battery does not reach 100% within 7 days, the system stops discharging the battery until the photovoltaic system has fully recharged it.	No action is required.
	9	WAR_CP1	NO	High theoretical calculated irradiation and additional energy available; requires irradiation sensor.	No action is required.
	10	WAR_WARMUP	NO	The system battery is warming up to bring it to a temperature of 265 ° C can take up to 14h, once completed the system will begin to work regularly.	No action is required.
	11	WAR_BACKUP	NO	the system has dropped below its minimum charge level because it was disconnected from the distributor network: either due to voltage outside the 230 +/- 10% range or due to a distributor network blackout.	If the event occurs frequently, contact your distributor.
	12	ALL_SYSTEM_DISCONNECTED	YES	Generic system alarm.	contact: assistenza@unesrl.com.
	13	WAR_UPLOAD_AVAILABLE	NO	A firmware update is available	Restart the system
	14	ALL_T_AMB_OUT_OF_RANGE	YES	The ambient temperature in which the ZHERO system is installed is out of range.	All the necessary precautions must be taken so that the ambient temperature of the system in which ZHERO is located remains in the range -10 + 40 ° C.
	15	ALL_SENS_T_AMB	NO	Ambient temperature sensor not present or disconnected.	if present, check the wiring, if not supplied, no operation is necessary.
STATUSCYCLE - Agen16	16	ALL_OG_GENERALE		Not used	Not used
	17	ALL_RETE_ENEL	YES	Distributor network not present, phase / neutral inverted, earth not correctly connected.	Check the correct connection of the distributor network.
	18	ALL_RETE_OG		Not used	Not used
	19	ALL_SPI	NO	SPI interface forces the system to disconnect from the distributor network because it is absent or outside the parameters of the regulations.	If frequent, contact the local energy distributor for a network check.
	20	TEST_SPI	NO	The "ALL" button was pressed for more than 15 seconds.	Press and hold the "ALL" button for 15 seconds.
	21	ALL_DISSERVIZIO_USER	YES	Excessive consumption of the users along the backup line or battery shutdown during a blackout of the distributor network.	Check the loads connected under the backup line.
	22	WAR_SOC_MIN	NO	It represents a state of operation, no activity is required.	No action is required.
	23	ALL_EEPROM	NO	The EEPROM memory of the CPU board is corrupted, it is necessary to request the replacement of the board.	Contact assistenza@unesrl.com to have the board replaced.
	24	WAR_RIARMO_BATTERIA_ATTIVO		The battery pack has been restarted, must wait for the end of the cycle charge before resuming normal operation.	Only if frequent, contact: assistenza@unesrl.com
STATUSCYCLE - Agen24	25	EMPTY			
	26	EMPTY			
	27	EMPTY			
	28	EMPTY			
	29	EMPTY			
	30	EMPTY			
	31	EMPTY			

SUMMARY - STATUSCYCLE - Adevice					
	bit	ALARM NAME	BLOCKING ALARM	POSSIBLE CAUSE	POSSIBLE SOLUTION
STATUSCYCLE - Adevice0	0	ALL_B0_FERMA	YES	Too many battery reset occurred in a short time. If the problem persists, there may be a problem with the battery.	Reset the alarm using the "ALL" button. If the problem turns out to be frequent, contact: assistenza@unesrl.com.
	1	ALL_B0_BLOCCO	NO	Possible battery anomaly or inappropriate use. If the events are sporadic it's not necessary to perform any operations.	No action is required.
	2	ALL_B0_PRE_OL	NO	The user has connected a load that is too high and the system reports it.	if the problem occurs frequently, contact: assistenza@unesrl.com.
	3	ALL_B0_LIMP_STRING	NO	The battery works with reduced storage capacity.	Contact assistenza@unesrl.com only if this reduction occurs within 2 years of installation.
	4	ALL_B1_FERMA	YES	Too many battery reset occurred in a short time. If the problem persists, there may be a problem with the battery.	Reset the alarm using the "ALL" button. If the problem turns out to be frequent, contact: assistenza@unesrl.com.
	5	ALL_B1_BLOCCO	NO	Possible battery anomaly or inappropriate use. If the events are sporadic it's not necessary to perform any operations.	No action is required.
	6	ALL_B1_PRE_OL	NO	The user has connected a load that is too high and the system reports it.	if the problem occurs frequently, contact: assistenza@unesrl.com.
	7	ALL_B1_LIMP_STRING	NO	The battery works with reduced storage capacity.	Contact assistenza@unesrl.com only if this reduction occurs within 2 years of installation.
STATUSCYCLE - Adevice8	8	EMPTY			
	9	EMPTY			
	10	EMPTY			
	11	EMPTY			
	12	ALL_COM_INV0	NO	possible data cable disconnection or general anomaly.	Possible breakage of the power board or interruption of the CPU - INVERTER communication cable; to contact: assistenza@unesrl.com.
	13	EMPTY			
	14	EMPTY			
STATUSCYCLE - Adevice16	15	ALL_COM_B0	NO	Probable battery shutdown due to restart.	try to reset the alarm by pressing the "ALL" button; restart the system, if this is not restored, contact: assistenza@unesrl.com.
	16	ALL_COM_B1	NO	Probable battery shutdown due to restart.	Reset the alarm by pressing the "ALL" button; restart the system, if this is not restored, contact: assistenza@unesrl.com.
	17	Vuoto			
	18	ALL_COM_CH0	NO	with lack of photovoltaic production the controller is not communicating; if production is present, check the integrity of the communication cable	If the communication cable is intact and the photovoltaic voltage is present but there is no communication, contact: assistenza@unesrl.com.
	19	ALL_COM_CH1	NO	without photovoltaic production the controller is not communicating; if production is present, check the integrity of the communication cable.	If the communication cable is intact and the photovoltaic voltage is present but there is no communication, contact: assistenza@unesrl.com.
	20	ALL_COM_CH2	NO	with lack of photovoltaic production the controller is not communicating; if production is present, check the integrity of the communication cable.	If the communication cable is intact and the photovoltaic voltage is present but there is no communication, contact: assistenza@unesrl.com.
	21	ALL_INV0_OFF	YES	The inverter is in protection mode.	Reset the alarm or restart the system, if the problem does not disappear contact: assistenza@unesrl.com.
	22	ALL_INV0_OVERTEMP	NO	System placed in a too hot place.	Disconnect loads and allow system to cool. Place it in a cool, dry and ventilated place.
	23	ALL_INV0_GENERALE	YES/NO	Check the inverter alarm table.	
STATUSCYCLE - Adevice24	24	EMPTY			
	25	EMPTY			
	26	EMPTY			
	27	EMPTY			
	28	EMPTY			
	29	EMPTY			
	30	ALL_INV_DERATING	YES	Power supplied by the battery reduced due to the high temperature of the inverter.	Consider improving the ventilation of the room where the ZHERO is installed.
	31	ALL_INV_FERMO_BLOCCO	YES	Probable inverter breakdown.	contact: assistenza@unesrl.com.

SUMMARY - INV0 - alarms

	bit	ALARM NAME	BLOCKING ALARM	POSSIBLE CAUSE	POSSIBLE SOLUTION
INV0 - alarms0	0	RELE	YES	Relay stuck or distributor mains voltage too high	Contact: assistenza@unesrl.com
	1	PH_OVC	YES	Excessive inrush current	Check that your backup line does not have loads with spikes greater than 50A, intervene to reduce the starting point of the devices connected to the ZHERO backup line.
	2	BUS_OVV	YES	Possible overvoltage on the DC BUS	If it happens frequently contact: assistenza@unesrl.com
	3	ISO	NO	Loss of electrical insulation on the DC side of the machine	Check the insulation of the photovoltaic strings
	4	RCD	YES	Inverter malfunction during start-up	Contact: assistenza@unesrl.com
	5	TEMP	YES	Inverter overtemperature	Improve ventilation of the room where ZHERO is installed, temporarily reduce line loads.
	6	COM	YES	Inverter communication error	Possible breakage of the power board or interruption of the CPU - INVERTER communication cable; contact: assistenza@unesrl.com
	7	EEPROM	YES	Corrupted EEPROM memory	Contact: assistenza@unesrl.com
INV0 - alarms8	8	BAT_UNV	YES	Possible battery shutdown	Contact assistenza@unesrl.com only if the problem persists
	9	BAT_OVV	YES	Possible overvoltage caused by the charge controllers or the battery	Contact assistenza@unesrl.com only if the problem persists
	10	OUT_UND	YES	Possible disruption caused by the inverter	Contact assistenza@unesrl.com only if the problem persists
	11	OUT_OVV	YES	Possible overvoltage from the grid	Contact assistenza@unesrl.com only if the problem persists
	12	FREQ	YES	Distributor network frequency error	If the problem persists, contact the energy distributor
	13	PB_BATT		possible breakdown of the inverter internal power supply	Contact: assistenza@unesrl.com
	14	SW_PH_OVC	NO	Excessive inrush current	Check that your backup line does not have loads with spikes greater than 50A.
	15	START	YES	Generic startup error	Contact assistenza@unesrl.com only if the problem persists
INV0 - alarmsh_0	0	EXT_COM	NO	communication between ZHERO and Exchange meter is broken	Check that ZHERO and Meter are powered, check integrity and correct connection of the cables
	1	EXT_COM1	NO	Communication between ZHERO and Production meter is broken	Check that ZHERO and Meter are powered, check integrity and correct connection of the cables
	2	Empty			
	3	Empty			
	4	Empty			
	5	Empty			
	6	Empty			
	7	Empty			
INV0 - alarmsh_8	8	Empty			
	9	Empty			
	10	Empty			
	11	Empty			
	12	Empty			
	13	Empty			
	14	Empty			
	15	Empty			
	16	Empty			
	17	Empty			

12.2. Product data sheet

UNE ZHERO S10 – DATASHEET

UNE ZHERO S10 is a 100% renewable storage system for residential and industrial use based on the use of salt batteries.

The system allows the photovoltaic system and salt batteries to be connected to the network; the system is also equipped with a backup line capable of powering utilities even in the event of a blackout.

- + Conformal coating on electronic boards;
- + No harmful gas emissions;
- + Redundant safety devices (chemical, cells, battery module and BMS);
- + Free of toxic materials;
- + Sustainable and recyclable device.



INVERTER BOX – DC SPECIFICATIONS

Input power	d.c. kW	1 – 16,5
N° PV input strings	N°	0 – 5
N° MPPT tracker	N°	0 – 5
Input voltage (Vcc) (Depending on availability)	d.c. V	100 – 180 120 – 308 200 – 600
P max output per MPPT (kW)	d.c. kW	3,3
Max current per MPPT (A)	d.c. A	40
ISC	d.c. A	60

INVERTER BOX – AC SPECIFICATIONS

Rated voltage AC	a.c. V	400
Output power	a.c. kW	10
Rated frequency	Hz	50
Output connection	N°	1 (Backup)
Maximum output power "Backup"	a.c. kW	18 (For few seconds)
Harmonic distortion	%	< 3
Allowed cos φ	φ	0,9 – 1
Short-circuit current (Phase-Neutral)	a.c. A	52
Short-circuit current (Phase-Ground)	a.c. A	11
Type of network		Three-phase
Net type		TT / TN-S
Components efficiency	%	over 97

INVERTER BOX – GEN-SET CONNECTION

Frequency connection range	Hz	49 - 51
Frequency connection range	Hz	48,5 – 52,5
Voltage connection range	a.c. V	342 – 418

BATTERY BOX – DATA

Rated voltage	d.c. V	48
Storage capacity	kWh	9,6 – 38,4
Depth of discharge (Off-grid)	%	90
Depth of discharge (On-grid)	%	80
Battery type	Sodium chloride – Nickel	
Expected battery life	Years	20
Battery warranty	Years	10

SYSTEM – ENVIRONMENTAL SPECIFICATIONS

Ingress protection	IP	20
Maximum working temperature	°C	+ 40
Minimum working temperature	°C	- 10
Relative humidity	%	5 - 85
Pollution degree	PD	II
Maximum altitude	m	2000 A.S.L.

SYSTEM - SAFETY / PROTECTIVE DEVICE

Galvanic insulation		Yes
Protective class	CLASS	I
AC overvoltage category	OVC	III
Dc overvoltage category	OVC	II
Differential protection AC	a.c. A	0,3
CC SPD (U _p) – Not supplied	kV	2,5
AC SPD (U _p) – Not supplied	kV	1,5

SYSTEM - REGULATORY COMPLIANCE

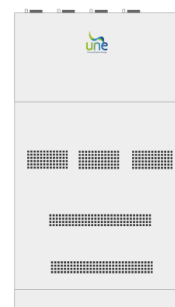
Marking	+	CE
Certifications	+	EN 62109-2
	+	EN 62109-3
	+	CEI EN 61000-6-1 (2007)
	+	CEI EN 61000-6-3 (2007)
	+	CEI 0-21: 2019-04
	+	VDE 4105 -0124 06/2020

SYSTEM - MONITORING

REMOTE MONITORING	ETHERNET
LOCAL MONITORING	USB – MODBUS - CANBUS

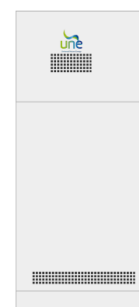
INVERTER BOX – MECHANINICAL SPECIFICATIONS

Dimensions	mm	780 (W) x 600 (D) x 1360 (H)
Weight	kg	240
Inverter for each box	N°	1
Acoustic emissions	dB	≤ 35
Ventilation		Forced

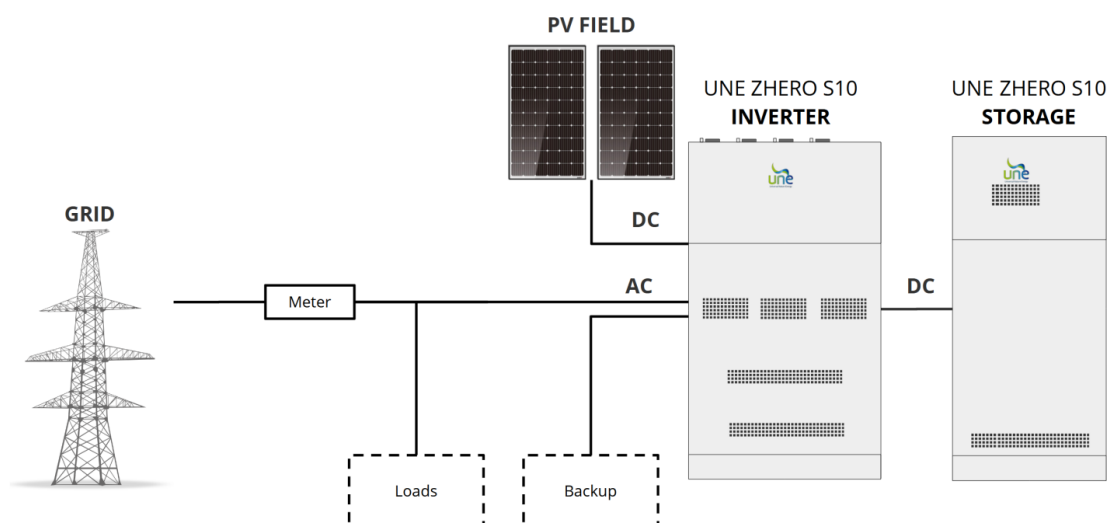


BATTERY BOX – MECHANINICAL SPECIFICATIONS

Dimensions	mm	600 (W) x 600 (D) x 1360 (H)
Weight	kg	40 - (Without batteries)
Battery weight	kg	100 - (Each battery)
Acoustic emissions	dB	≤ 30
Air ventilation		No
Maximum batteries supported	N°	4
Maximum N° of batteries per box	N°	3



TYPICAL CONFIGURATION:



12.3. Annexes

- Battery Manual;
- Maintenance certificate;
- Datasheet.



U N I V E R S A L N A T U R E  e N E R G Y

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