



W-HHS-3000/3680/5000/6000 Series

Single-Phase Hybrid Inverters

USER MANUAL

V1.02

CONTENTS

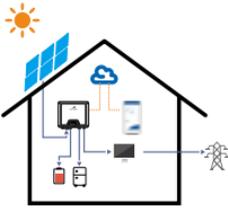
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1. INTRODUCTION

1.1 Operation Modes

W-HHS normally has the following operation modes based on your configuration and layout conditions.



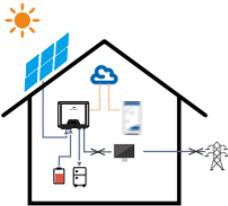
Mode I

The energy produced by PV is used to charge the battery, then exported to grid.



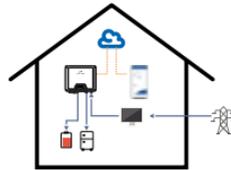
Mode II

When there is no PV, and the battery is sufficient, it can supply the load with the grid together.



Mode III

When grid fails, the system automatically switches to Back-Up mode, the Back-Up load could be supported by PV and battery.



Mode IV

Battery could be charge by grid, and charge time/power could be set flexibly on my Leonardo App and web platform

1.2 Symbols on the label

	DANGER, WARNING AND CAUTION		RECYCLABLE AND REUSABLE
	HIGH VOLTAGE AVOID CONTACT		AVOID DAMP AND MOISTURE
	HIGH TEMPERATURE AVOID CONTACT		SHIPMENT STACK LIMIT: 8
	CE MARKS		DO NOT DISPOSE WITH HOUSEHOLD WASTE
	PROCEED OPERATIONS AFTER 5 MINUTES DISCHARGE		BREAKABLE ITEM
	PLACE UPWARDS		USER MANUAL IN PACK

2. SAFETY AND WARNINGS

1. All persons who are responsible for mounting, installation, commissioning, maintenance, tests, and service of WESTERN CO inverter products must be suitably trained and qualified for corresponding operations. They MUST be experienced and have knowledge of operation safety and professional methods. All installation personnel must have knowledge of all applicable safety information, standards, directives, and regulations.
2. The product must ONLY be connected and operated with PV arrays of protection class II, in accordance with IEC 61730, application class A. The PV modules must also be compatible with this product. Power resources other than compatible PV arrays MUST not be connected and operate with the product.
3. When designing or constructing a PV system, all components MUST remain in their permitted operating ranges, and their installation requirements MUST always be fulfilled.
4. Under exposure to sunlight, the PV array may generate dangerous output in DC voltage. Contacts with the DC wires, conductors and live components in the inverter may result in lethal shocks.
5. High voltages in inverter could cause lethal electrical shocks. Before proceeding any work, including maintenance and/or service, on the inverter, fully disconnect it from all DC input, AC grid and other voltage sources. There MUST be a 5-minute waiting time after the full disconnection.
6. The DC input voltage of the PV array MUST never exceed the maximum input voltage of the inverter.
7. DO NOT touch parts of the inverter during operation as heat will be induced and these parts will exceed 60°C.
8. There are installations where multiple inverter energy systems are used and electrical installation connects at a single point of supply to the grid, please refer to the requirements of Appendix B.
9. Safe Transport / Handling:
 - Find the mark of PLACE UPWARDS on the inverter container and keep it upward.
 - The inverter container should be tied or fixed during transportation.

- The transport of the inverter requires two people for lifting, there is one handle on the left and one on the right.
- The inverter should be protected from heavy vibrations and shocks during transportation.

10. Compatible Battery Models

Brand	Model
Pylontech	Force-H1
	Force-H2
	Powercube X1
	Powercube X2
	Powercube H1
	Powercube H2
Dyness	Tower T10/T14/T17/T21

3. UNPACKING

3.1 Scope of Delivery

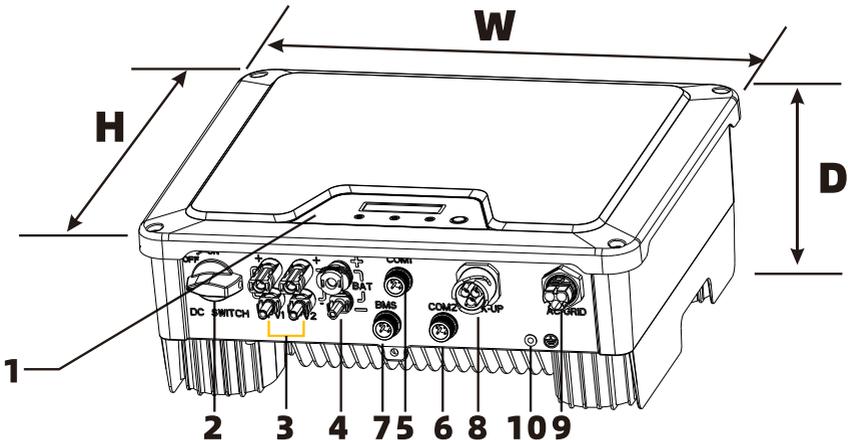
Please inspect and check for completeness in the scope of delivery. Confirm with purchase order.

									
Inverter	Mounting Bracket	Mounting Accessories	PV Plugs	Battery Plugs (SUNCLIX)	BACK-UP Connector	AC-GRID Connector	M	Warranty Card	Documents
1	1	1	2	1	1	1	2	1	1

3.2 Product Overview

The total size of W-HHS-3000/3680/5000/6000 is 425(width) × 351(height) × 160(depth) mm. It has 2 pairs of PV input terminals, 1 pair of Battery input terminals and 3 communication ports. It also has an LCD&LED (or just LED, determined by user) for getting information and setting parameters at field.

The detail description is shown below:

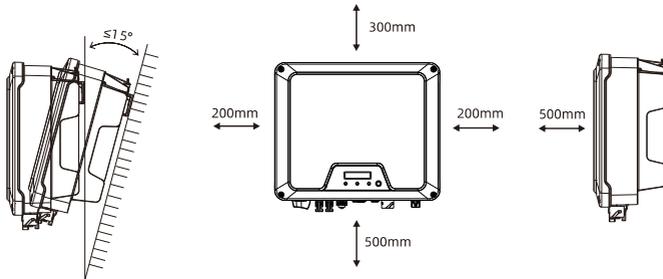


Mark Num.	Component	Description
1	LCD&LED or LED	Display and setting device at field
2	DC Switch	For switch on/off the inverter
3	PV Terminal (s)	Connected with PV Panel
4	Battery Terminal (s)	Connected with Battery Panel
5	COM1: Wi-Fi /GPRS	Alternative distant communication method
6	COM2: DRED/CT	DRED and CT
7	BMS: CAN	For CAN
8	BACK-UP Terminal	Connected with BACK-UP
9	AC Terminal	Connected with AC Grid
10	Secondary PE Terminal	For Grounding Protection

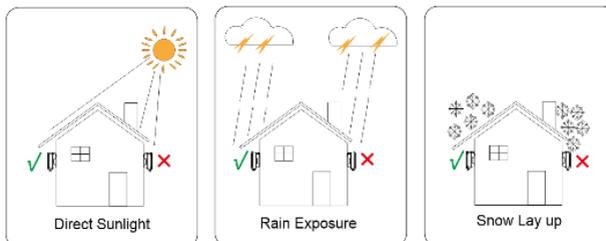
4. INSTALLING

4.1 Installation Requirement

1. Please install the inverter(s) in places that can avoid inadvertent contact.
2. Installation method, location and surface must be fitting for the inverter's weight and dimensions.
3. Please install the inverter in an accessible location for operation, future maintenance and service.
4. The inverter performance peaks at ambient temperature lower than 45°C.
5. When installing in residential or domestic environment, it is recommended to install and mount the inverter on a solid, concrete wall surface. Mounting the inverter on composite or plaster boards or walls with similar materials would induce noise during its operation and is therefore not recommended.
6. DO NOT cover the inverter NOR place any objects on top of the inverter.
7. To ensure sufficient room for heat dissipation and maintenance, the clearing space between inverter(s) and other surroundings is indicated below for reference:

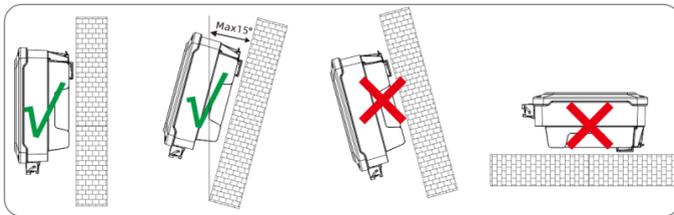


8. Avoid direct exposure to sunlight and rain and snow layup.



4.2 Mounting Location

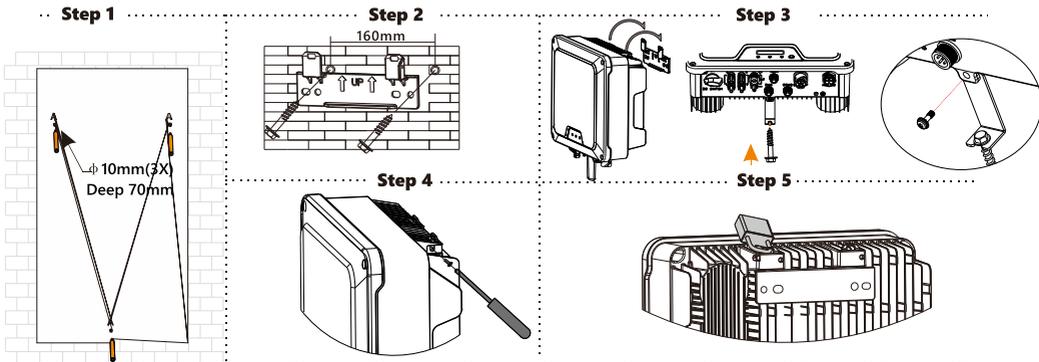
1. DO NOT mount the inverter near any inflammable materials.
2. DO NOT mount the inverter near any explosive materials.



3. DO NOT mount the inverter on tilting surface over 15° backwards. Please mount the inverter on a vertical wall surface.
4. DO NOT mount the inverter on any surfaces tilting forward or to both sides.
5. DO NOT mount the inverter on a horizontal surface.
6. For easy installation and operation, please mount the inverter on a height that the display could match eye level.
7. The bottom side where all commissioning terminals are equipped MUST always point downwards.

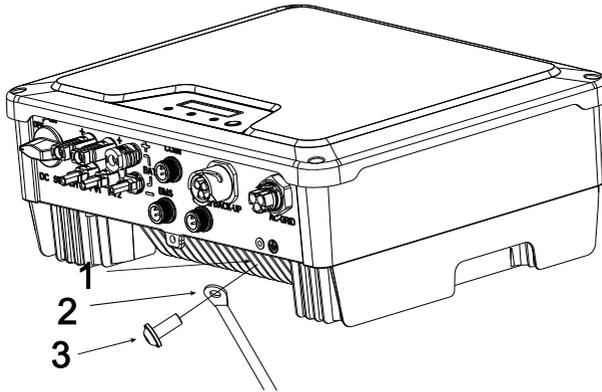
4.3 Mounting

1. Use the mounting paper guide to mark holes on the wall,
Drill three holes in the marked position of 10mm diameter and 70mm depth.
2. Fix the expansion bolts and mount the main bracket with the screws in mounting accessories.
3. Attach the inverter to the mounting bracket. Mount the supporting bracket at the bottom of the inverter and tilt it slightly forward. Hang up the inverter and attach it to the mounting bracket.
4. Check both sides of the heat sink to ensure the inverter is stably attached.
5. Use M5 screws (T25 screwdriver, torque 2.5 Nm) to attach the heat sink fins to the mounting bracket.
6. It is recommended to attach the anti-theft lock to the inverter. Lock diameter $\varphi 4-5.5\text{mm}$ recommended.



4.4 Installing the PE cable

1. Insert the grounding conductor into the suitable terminal lug and crimp the contact.
2. Thread the M5 * 13 screw through the terminal lug.
3. Tighten it firmly into the housing (screwdriver type: T25, torque: 2.5Nm).



Information on grounding components:

Object	Description
1	Housing
2	M5 terminal lug with protective conductor
3	M5×13 pan head screw

PE Conductor cross-section: 6mm²

4.5 Cable Specification

Cable Specifications

No	Item	Type	Specifications
1	PE cable	Single-core outdoor copper cable	<ul style="list-style-type: none"> • Conductor cross-section: 6 mm²
2	AC-GRID Output cable	Outdoor copper cable	<ul style="list-style-type: none"> • Cross-section: 10 mm² • Cable outer diameter: 13-18 mm
3	BACK-UP Output cable	Outdoor copper cable	<ul style="list-style-type: none"> • Cross-section: 6 mm² • Cable outer diameter: 9-14 mm
4	PV Input cable	Standard outdoor PV cable, PV1-F Model recommended	<ul style="list-style-type: none"> • Conductor cross-section: 4-6 mm² • Cable outer diameter: 5-8 mm
5	Battery Input cable	Standard outdoor PV cable, PV1-F Model recommended	<ul style="list-style-type: none"> • Conductor cross-section: 6 mm² • Cable outer diameter: 8 mm
6	RS485/CT/DRED	Two-core outdoor shielded twisted pair cable	<ul style="list-style-type: none"> • Conductor cross-section: 0.14-1.5 mm² • Cable outer diameter: approx. 6 mm

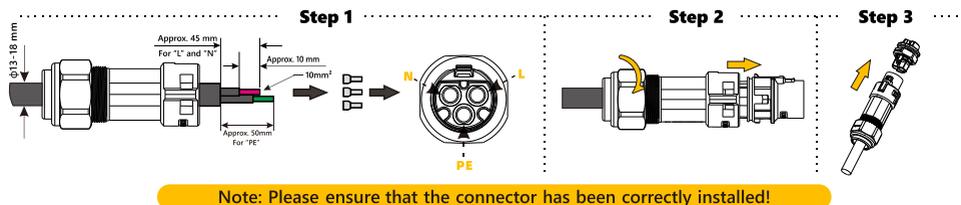
5. COMMISSIONING

5.1 Safety Instructions

1. Measure the frequency and voltage of grid connection and make sure they follow the inverter's grid connection specifications.
2. An external circuit-breaker on the AC side (or a fuse) at 1.25*AC rated current is strongly recommended.
3. Reliability of all earth connections must be tested and valid.
4. Before commissioning, disconnect the inverter and the circuit-breaker or fuse, and prevent accidental reconnection.

5.2 AC Wire Assembly and Connection

5.2.1 AC Commissioning



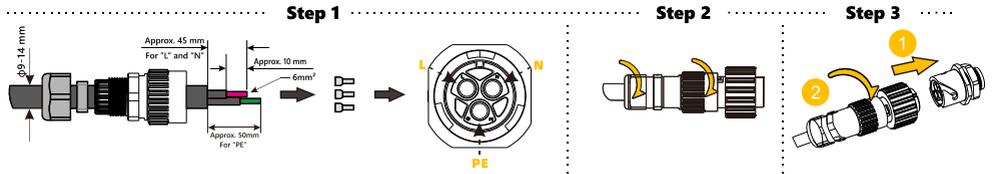
5.2.2 AC Switch Types

Please install an individual 2-stage miniature circuit breaker according to the following specifications.

Model	Maximum output current (A)	AC Breaker Rated current (A)
W-HHS-3000	15	50A/230V AC
W-HHS-3680	16	50A/230V AC
W-HHS-5000	23	63A/230V AC
W-HHS-6000	27.3	63A/230V AC

5.3 BACK-UP Wire Assembly and Connection

5.3.1 BACK-UP Commissioning



Note: Please ensure that the connector has been correctly installed!

5.3.2 AC Switch Types

Please install an individual 2-stage miniature circuit breaker according to the following specifications.

Model	Maximum output current (A)	AC Breaker Rated current (A)
W-HHS-3000	15	50A/230V AC
W-HHS-3680	16	50A/230V AC
W-HHS-5000	23	63A/230V AC
W-HHS-6000	27.3	63A/230V AC

5.4 PV Wire Assembly and Connection

1. PV modules of the connected strings must be of: the same time, identical alignment and tilting angle.
2. Before commissioning and connecting the PV arrays, the DC switch MUST be open.
3. Parallel strings must have the same number of modules.
4. It is mandatory to use the DC connectors within package for the connection of PV arrays.
5. The polarity of the PV arrays MUST be compatible to the DC connectors of the inverter.
6. The DC input voltage AND DC input current of the PV array MUST never exceed the maximum input allowance of the inverter.

<p>Step 1</p> <p>Strip off the insulation</p>	<p>Step 2</p> <p>Assemble the MC4 cable ends</p> <p>Positive terminal</p> <p>Negative terminal</p> <p>Assemble the D4 cable ends</p> <p>NOTICE</p> <p>Note: Don't crimp this part!</p> <p>Positive terminal</p> <p>Negative terminal</p> <p>Crimp pliers to cable ends</p>	<p>Step 3</p> <p>Assemble the connectors</p> <p>2.6-2.9 N-m</p> <p>Positive</p> <p>Negative</p> <p>Please check if the cables are securely installed by pulling outwards</p>
<p>Step 4</p> <p>Check the polarities of the PV strings</p> <p>Check the open-circuit voltage is less than inverter input limit 600V</p>	<p>Step 5</p> <p>Remove the waterproof caps from PV terminals</p> <p>If there is an unused terminal, please seal it with the cap</p>	<p>Step 6</p> <p>Insert the connectors into the terminal till you hear an audible click.</p> <p>click</p> <p>click</p>

5.5 Battery Wire Assembly and Connection

1. If your inverter is Battery-Ready, do not connect the battery to the inverter before activating the battery function, otherwise it will stop working.
2. Make sure there is an external DC breaker ($\geq 40A$) connected for battery without build-in DC breaker.
3. Make sure battery breaker is off and battery nominal voltage is less than 480V before connecting battery to inverter and make sure inverter is totally isolated from PV and AC power.
4. If the Battery connectors are not assembled properly and locked into place, arc or overheat may be induced.

<p>Step 1</p> <p>Open the spring using a blade screwdriver</p>	<p>Step 2</p> <p>Insert the stripped wire with twisted wires. The wire ends have to be visible in the spring. Make sure the spring is closed firmly.</p> <p>48mm</p> <p>15mm</p> <p>6mm²</p>	<p>Step 3</p> <p>Use a suitable and calibrated torque wrench, size 15. Use an open-jaw wrench, size 16, to hold the connector in place.</p> <p>2N-m</p>
<p>Step 4</p> <p>Check the polarities of the PV strings</p> <p>Check the open-circuit voltage is less than inverter input limit 480V</p>	<p>Step 5</p> <p>Remove the waterproof caps from PV terminals</p> <p>If there is an unused terminal, please seal it with the cap</p>	<p>Step 6</p> <p>Insert the connectors into the terminal till you hear an audible click.</p> <p>click</p> <p>click</p>

5.6 Residual Current Protection

This product is equipped with residual current protection device internally, in accordance with IEC 60364-7-712. An external residual current protection device is not needed.

If the local regulation demands otherwise, it is recommended to install a 30mA Type B residual current protection device.

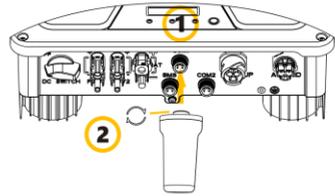
6. COMMUNICATION

6.1 System monitoring via Wi-Fi Stick - RS485/Wi-Fi /GPRS

6.1.1 Wi-Fi Stick Installation

Unpack the Wi-Fi Stick from package.

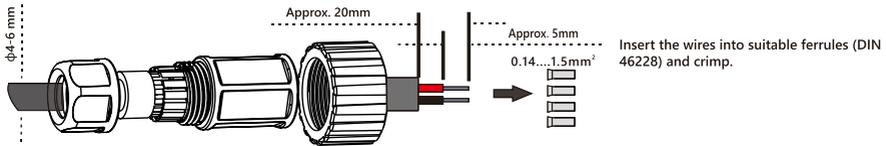
1. Unscrew the cap in COM1 port.
2. Plug the Wi-Fi Stick in and tighten.



For user guidance and configuration of Wi-Fi Stick please refer to the corresponding Wi-Fi Stick Guide manual, which is available in printed form inside Documents pack, or on Western CO. website at www.western.it/en

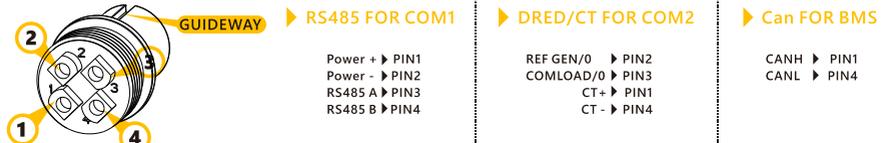
6.1.2 RS485 / CT / DRED Connection

Step 1



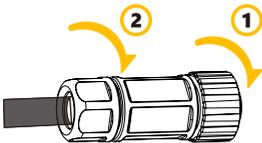
Step 2

Insert the crimped conductors accordingly into their corresponding terminals and tighten the screws.



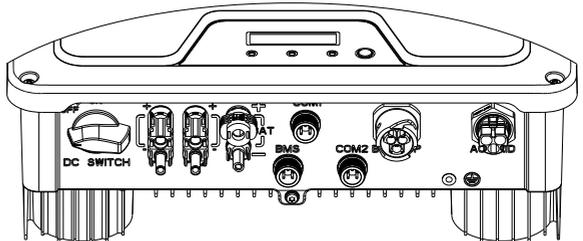
Step 3

Assemble the locking cap, threaded sleeve and swivel nut together.



Step 4

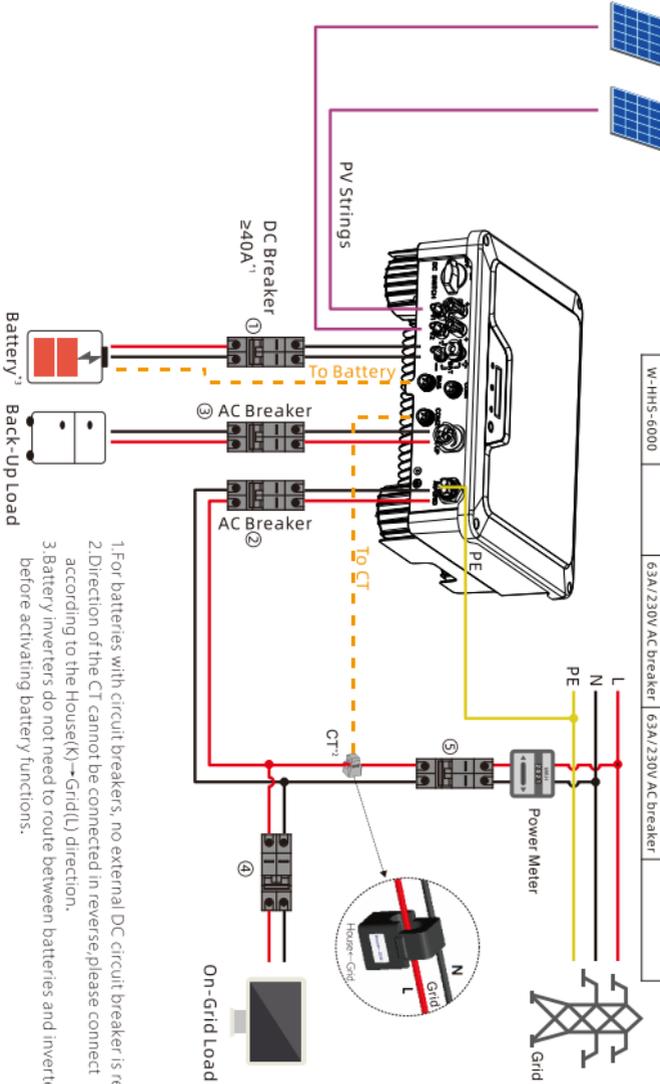
Screw the connector into the corresponding socket and tighten firmly.



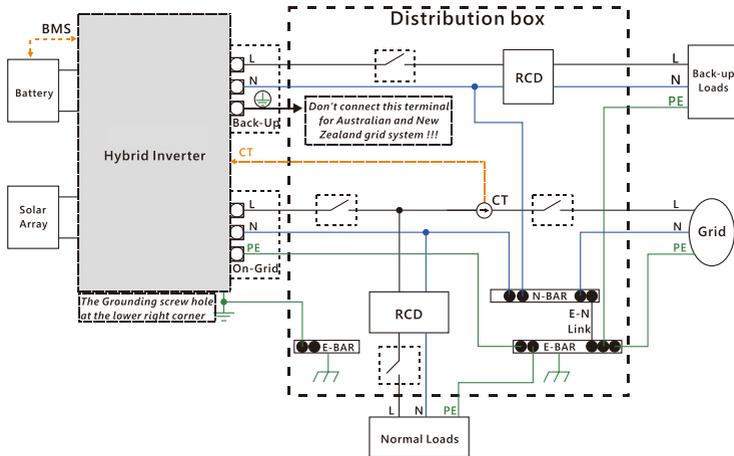
6.1.3 System Connection Diagrams

Wiring system for W-HHS series Hybrid inverter

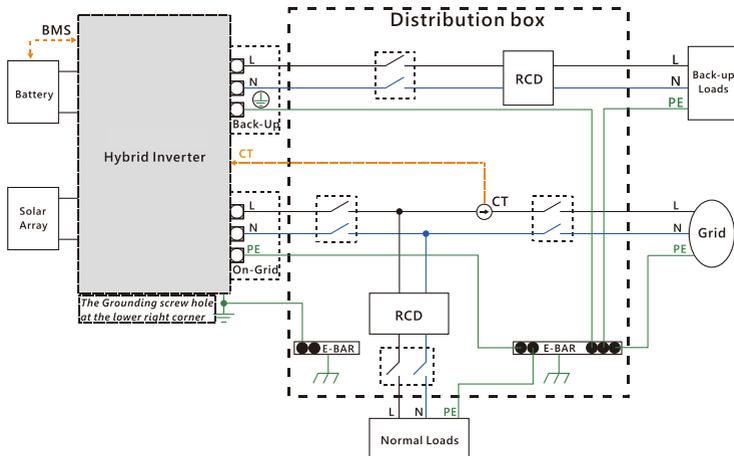
Model	Breaker	①	②	③	④	⑤
W-HHS-3000			50A/230V AC Breaker	50A/230V AC Breaker	Depends on	
W-HHS-3680	40A/600VDC breaker		50A/230V AC Breaker	50A/230V AC Breaker	household loads	
W-HHS-5000			63A/230V AC Breaker	63A/230V AC Breaker		
W-HHS-6000			63A/230V AC Breaker	63A/230V AC Breaker		



1. For batteries with circuit breakers, no external DC circuit breaker is required.
2. Direction of the CT cannot be connected in reverse, please connect according to the House(K) → Grid(L) direction.
3. Battery inverters do not need to route between batteries and inverters before activating battery functions.



This diagram is an example for Australia , South Africa and New Zealand grid system.



This diagram is an example for grid system without requirement on electrical wiring connection.

Note: The back-up PE line and rack earth must be grounded properly and effectively. Otherwise the back-up function may be abnormal when the grid fail.

6.2 Auto Test (ONLY for Italian Market)

Auto-Test

1. The default setting of this function is disabled which can only be available in Italy safety, Short press the button until first Line of LCD displays "Auto Test", and long press (>2s) the button to start this function. First line of LCD displays "Auto Testing" and the second line of LCD displays "Start". Release the button for more than 10s, LCD will automatically switch to display the information about testing.
2. If auto test is finished, short press the button, Second line of LCD switches between "Start" and "Result". Under the "Result" display interface then release the button for more than 10s, LCD will automatically switch to display the result of auto test. and short press button to display test result one by one.
3. Auto test begin after the inverter relays close successfully. And LCD show the information about testing. If sub test finishes and second line of LCD displays "Test **** OK", The first line of LCD displays voltage or frequency test value and the value of protection time. Inverter relay breaks off and reconnect to grid automatically according to CEI 0-21 requirement, Then the next test starts. Test order is 81>.S1(maximum over frequency), 81>.S2(maximum over frequency), 81<.S1(minimum under frequency), 81<.S2(minimum under frequency), 59.S1(maximum voltage over 10min), 59.S2(maximum over voltage), 27.S1(minimum under voltage), 27.S2(minimum under voltage).

7. START UP AND OPERATION

7.1 Safety Check Before Start Up

Please check before switching on any voltage resources connected to the inverter and closing inverter's DC switch:

1. Grid Voltage: Check the grid voltage at point of connection at the inverter complies with permitted range of the inverter.
2. Mounting Bracket: Check if the mounting bracket is properly and securely installed.
3. Mounting of the inverter: Check if the inverter is properly mounted and attached to the mounting bracket.
4. DC Connectors: Check if the DC connectors are installed correctly on terminals.
5. AC Connectors and Wire Assembly: Check if wires are assembled correctly on the AC side and if the AC connector is properly and securely installed. Check if the AC connector is firmly plugged into AC terminal.
6. Cables: Check if all cables are reliably connected. Check if the connections are effective, while the insulations are undamaged.
7. Groundings: Check all groundings using multimeter and if all exposed metal parts of the inverter are properly grounded.
8. DC Voltage: Check if the largest open-circuit voltage of PV arrays complies with the permitted range.
9. DC Polarity: Check if the wires from DC voltage resource are connected to terminals with correct polarity.
10. Grounding Resistance: Check if the grounding resistance of PV strings $>1\text{M}\Omega$ using a multimeter.

After all installation and checks, close the AC circuit-breaker, then the DC switch. The inverter will start to operate when DC input voltage and grid conditions meet the requirements of inverter startup.

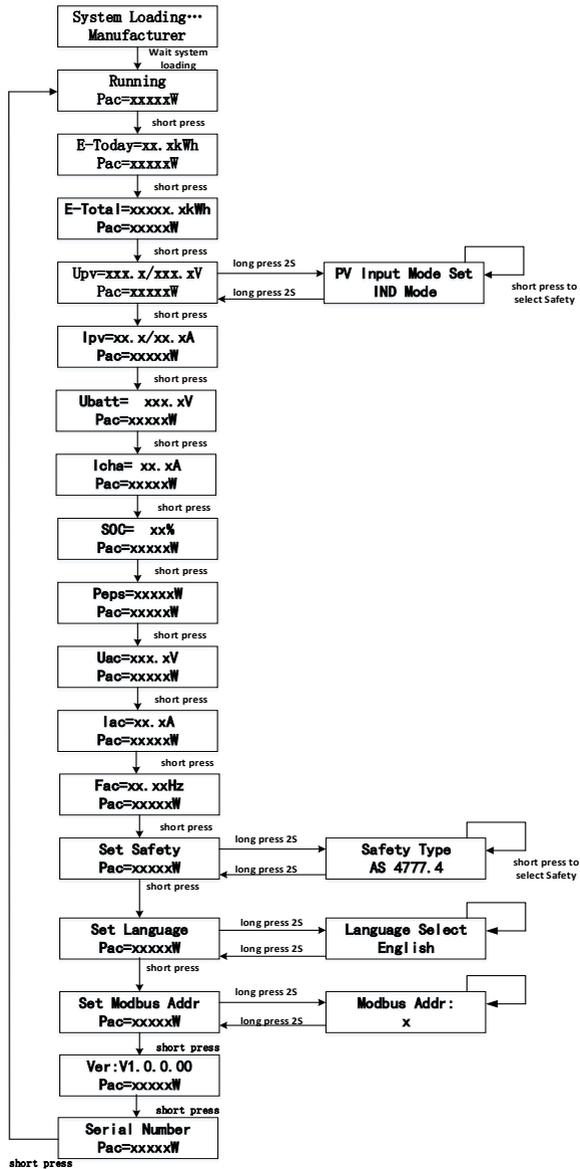
7.2 Inverter LED Indicators

When the inverter operates, LED symbols on display have the following meanings:

 POWER	<ul style="list-style-type: none"><input checked="" type="radio"/> ON Inverter Power ON and Feeding Power to Grid<input type="radio"/> Blink Inverter Power ON. Not Feeding Power to Grid<input type="radio"/> OFF Inverter Power OFF. DC Disconnected
 FAULT	<ul style="list-style-type: none"><input checked="" type="radio"/> ON Inverter is Faulty<input type="radio"/> OFF No Fault
 COM	<ul style="list-style-type: none"><input type="radio"/> Blink Communication Device Connected<input type="radio"/> OFF Communication Device Disconnected

7.3 Display and Control Logics

When inverter starts up and operates, there is a control button beside LCD Display of the inverter. Please follow the logics listed below.



There are three items can be set via display, Set safety type, Set language and Set Modbus addr.

After commissioning, please check the Safety Type to comply with the local regulation. To view the safety type please select the Safety Type again via display or the monitoring Web or APP. The grid settings can be viewed via the monitoring Web or App.

The firmware version can be viewed via display, example Ver:1.0.0.00.

8. DISCONNECTING FROM VOLTAGE SOURCES

Before proceeding any operations on inverter, please disconnect the inverter from all voltage resources as described in this manual.

Following these steps in described sequence are mandatory.

1. Disconnect miniature circuit-breaker and prevent from unintentional reconnections.
2. Open the DC switch and prevent the switch from closing unintentionally.
3. Use clamps to ensure there is no electrical current in DC wires.
4. Disconnect all DC connections and resources. Unplug the DC connectors, and DO NOT pull the cables.



5. Use multimeter to ensure the voltage on DC terminals of inverter is 0.
6. Unscrew and remove the AC connector.



Danger to life due to high voltages.

Inverter capacitors need 5 minutes to be completely de-energized.

When an error occurs, DO NOT remove the cover of the inverter onsite. Improper operations and attempts may induce electric shock.

9. TECHNICAL PARAMETERS

Model (Hybrid Inverter)	W-HHS 3000	W-HHS 3680	W-HHS 5000	W-HHS 6000
Battery Input data				
Battery Type	Li-Ion			
Battery Voltage Range(V)	80~480			
Start Up voltage (V)	70			
Max. Charging/discharging Current(A)	25/25			
Charging strategy for Li-Ion battery	Self-adaption to BMS			
Input (DC)				
Max. PV power (Wp)	4950	5520	7500	9000
Max. input voltage(V)	600			
MPP voltage range(V)	80-520			
Min. input voltage(V)	70			
Nominal DC-Input voltage(V)	360			
Max. input current(A)	13/13			
Max. short DC current(A)	20/20			
No. of independent MPPT inputs	2			
No. of PV strings per MPPT	1			
Output AC for On-grid				
Rated Power to grid(W)	3000	3680	5000	6000
Max. apparent AC power to grid (VA)	3300	3680	5500	6600
Max. apparent AC power from grid (VA)	6600	7360	8500	10000
Rated grid voltage (Vac)	220/230/240			
Rated power frequency (HZ)	50/60			
Max. output current to grid(A)	15	16	23	27.3
Max. AC current from grid(A)	30	32	36	40
Adjustable displacement power factor	0.8ind to 0.8cap			
THDi at rated power	<3%			

Output AC for Back-up	
Max. apparent output power (VA)	3300
Peak apparent output power (VA) @60sec	3960
Rated power frequency(HZ)	50/60
Max. output current(A)	15
Automatic Switch Time (ms)	<10
Nominal Output Voltage (V)	230 (±2%)
Nominal Output Frequency (Hz)	50/60(+/-0.2%)
THDV at linear load	<3%
Efficiency	
PV Max. Efficiency	97.9%
PV Euro. Efficiency	97.4%
PV Max. MPPT Efficiency	99.9%
Battery Charged by PV Max. Efficiency	98.0%
Battery Charge/discharge From/To AC Max. Efficiency	97.0%
Protection	
Anti-Islanding	Integrated
Insulation Resistor detect	Integrated
Residual current monitor	Integrated
Output over current	Integrated
Over voltage protection	Integrated
Grid output short	Integrated
Surge Protection	Optional
General Data	
Dimensions(W*H*D) mm	425*351*160
Weight(kg)	13.8
Noise emission(typical) dB	<25
User Interface	LED&LCD
DC connection type	MC4 (SUNCLIX, D4 optional)
Battery connection type	SUNCLIX

AC connection type	Plug-in Connector included
Communication with Portal	Wi-Fi Stick included
Communication with BMS	CAN,RS485
Communication with Power meter	RS485
Cooling method	Fanless
Operating ambient temperature range	-25℃...+60℃
Allowable relative humidity range	0% to 100%
Max. operating altitude(m)	3000(>3000 derating)
Degree of protection (IEC 60529)	IP65
Climatic category (IEC 60721-3-4)	4K4H
Isolation method	Transformerless
Power loss in stand-by	<5W

Inverter power quality response modes	
Power quality response modes	Default operation per AS/NZS 4777.2:2020
Volt-watt response mode	Default: Enabled
Volt-var response mode	Default: Enabled
Fixed power factor mode	Default: Disabled
Reactive power mode	Default: Disabled
Characteristic power factor curve for $\cos \phi$ (P)	Default: Disabled

10. TROUBLE SHOOTING

Earth Fault Alarm

This inverter complies with IEC 62109-2 clause 13.9 for earth fault alarm monitoring.

If an **Earth Fault Alarm** occurs, the **error code 6** will be displayed on the LCD. Red LED indicator will also light up.

Full Error Code and Corrective Measures

When the PV system does not operate normally, we recommend the following solutions for quick troubleshooting. If an error occurs, the Error code will be displayed on the inverter's screen, the red LED will light up. The corresponding corrective measures are as follows:

Error Code	Fault Name	Description	Corrective Measures
1	Functional fault in Micro-Controller Unit (MCU)	MCU abnormal self-check in start process	Disconnect the inverter from the utility grid and the PV array, and reconnect it after LED turns off. If this fault is still being displayed, please contact service.
2	A faulty current sensor detected	AC current sensor detect current abnormal in the start process	Disconnect the inverter from the utility grid and the PV array, and reconnect it after LED turns off. If this fault is still being displayed, please contact service.
3	Ground fault circuit interrupter (GFCI) sensor error	GFCI sensor self-check abnormal	Disconnect the inverter from the utility grid and the PV array, and reconnect it after LED turns off. If this fault is still being displayed, please contact service.
4	A faulty grid relay detected	The difference between INV voltage and output voltage exceeds limit.	1. Disconnect the inverter from the utility grid and the PV array, and reconnect it after LED turns off. 2. If the fault persists, measure the phase to phase voltage and phase to zero and zero to ground voltage with a multimeter to ensure that the voltage is normal and the zero to ground voltage value should not be greater than 10V. 3. Disconnect the inverter from the utility grid and the PV array, and reconnect it after LED turns off. If this fault is still being displayed, please contact service.

5	PV voltage too high	When the PV voltage of any circuit is greater than 600V, it is determined as the PV voltage is too high.	Check the open-circuit voltages of the strings and make sure it is below the maximum DC input voltage of the inverter. If the input voltage lies within the permissible range while the fault occurs, please contact the service.
6	Surface insulation resistance error	In the process of power on and start-up, the insulation impedance of PV + and PV - to ground is detected. When the detection insulation impedance is less than 200kohm, it is judged as insulation fault.	<p>1. If it happens occasionally, it may be caused by rainy or humid environment. After the fault is eliminated, the inverter can resume normal operation without other actions.</p> <p>2. If there is continuous alarm, please check the PV array's insulation to ground and make sure that the insulation resistance to ground is greater than 200KΩ. Otherwise, visual inspection of all PV cables and modules. Make sure the grounding connection of the inverter is reliable.</p> <p>If all above are normal, please contact the service.</p>
7	Ground fault circuit interrupter (GFCI) exceeds the permissible range	residual current over the permission range	<p>1. Make sure the grounding connection of the inverter is reliable.</p> <p>2. Make a visual inspection of all PV cables and modules.</p> <p>If this fault is still shown, contact the service.</p>
8	Inverter temperature too high	Heat sink and internal environment temperature higher than 85 degree	<p>Please confirm:</p> <p>1. Whether the airflow to the heat sink is obstructed.</p> <p>2. Whether the installation site is in direct sunlight and ambient temperature around the inverter is too high.</p> <p>If all above is normal, contact the service.</p>
9	Utility grid disconnected	inverter detected grid voltage failed	<p>1. If it happens occasionally, it belongs to the short-time abnormality of the power grid, the inverter will return to normal operation after detecting that the power grid is normal, and there is no need to deal with it.</p> <p>2. If it cannot be recovered for a long time, please confirm:</p> <p>① whether the AC circuit breaker is disconnected</p> <p>② whether the AC terminal or fuse is in good contact</p> <p>③ whether the power supply line is normal</p> <p>If this fault is still being shown, contact the service.</p>

10	Grid voltage exceeds the permissible range	grid voltage exceeds the Safety regulations	<p>1.If it happens occasionally, it belongs to the short-time abnormality of the power grid, the inverter will return to normal operation after detecting the normal power grid, and there is no need to deal with it.</p> <p>2. In case of frequent occurrence but automatic recovery, please confirm if the grid voltage is outside the permissible range due to local grid conditions, try to modify the values of the monitored operational limits after informing the electric utility company first.</p> <p>3.If it cannot be recovered for a long time, please confirm:</p> <p>①whether the AC circuit breaker is disconnected</p> <p>②whether the AC terminal is in good connection</p> <p>③whether the power supply line is normal</p> <p>④whether the AC cable wiring (such as wire length and wire diameter) complies with the user manual guidance</p> <p>⑤whether the safety regulation settings are normal</p>
11	Grid frequency exceeds the permissible range	grid frequency exceeds the Safety regulations	<p>1.If it happens occasionally, it belongs to the short-time abnormality of the power grid, the inverter will return to normal operation after detecting the normal power grid, and there is no need to deal with it.</p> <p>2. In case of frequent occurrence but automatic recovery, please confirm if the grid voltage is outside the permissible range due to local grid conditions, try to modify the values of the monitored operational limits after informing the electric utility company first.</p> <p>3.If it cannot be recovered for a long time, please confirm:</p> <p>①whether the AC circuit breaker is disconnected</p> <p>②whether the AC terminal is in good connection</p> <p>③whether the power supply line is normal</p> <p>④ whether the safety regulation settings are normal</p>
12	DC component of the electricity exceeds the permissible range	the current exceeds 1A in stastic state and 4A in dynamic state	Disconnect the inverter from the utility grid and the PV array, and reconnect it after LED turns off. If this fault is still being displayed, please contact the service.

13	EEPROM Error, e.g. transition disturbance	Micro CPU read EEPROM failed	Disconnect the inverter from the utility grid and the PV array, and reconnect it after LED turns off. If this fault is still being displayed, please contact the service.
14	Internal communication fault	Master CPU communicate with slave CPU abnormal	Disconnect the inverter from the utility grid and the PV array, and reconnect it after LED turns off. If this fault is still being displayed, please contact the service.
15	Bus-voltage too high	Bus-voltage is greater than 600V	Check the open-circuit voltages of the strings and make sure it is below the maximum DC input voltage of the inverter. If the input voltage lies within the permissible range while the fault occurs, please contact the service.
16	Bus-voltage too low	Bus-voltage is 20V lower than standard Bus-voltage	Check the open-circuit voltages of the strings and make sure it is below the maximum DC input voltage of the inverter. If the input voltage lies within the permissible range while the fault occurs, please contact the service.
17	DRM S9 Error	DRM switch S9 fault	Check the connection of DRM device. If the DRM device is connected normally while this fault occurs, please contact the service.
18	DRM S0 Error	DRM switch S0 fault	Check the connection of DRM device. If the DRM device is connected normally while this fault occurs, please contact the service.
19	N PE line Error	Voltage between N and PE is over limit	Check the connection of line N and the connection of the line PE. If both connections are correct, please contact the service.
20	Bus Unbalance Error	Bus voltage is over limit	Disconnect the inverter from the utility grid and the PV array, and reconnect it after LED turns off. If this fault is still being displayed, please contact the service.

21	BMS Communication Error	Battery BMS communication interrupted	Check the connection of BMS cable with storage inverter. If the BMS cable is connected normally while this fault occurs, please contact the service.
22	CT Null Error	Current transducer not connected	Check the connection of CT device. If the CT device is connected normally while this fault occurs, please contact the service.
23	CT Reverse Error	Current transducer reverse connection	Try to change the direction of CT device. If the CT device is connected correctly while this fault occurs, please contact the service.
24	Battery Null Error	Battery disconnection	Check the connection of battery. If the battery is connected normally while this fault occurs, please contact the service.

11. SYSTEM MAINTENANCE

For the inverter's long-term performance, it is suggested to maintain your inverter regularly:

NOTICE:

HEAT SINK MIGHT INDUCE INJURY

When the inverter is operating, the heat sink might exceed 60°C

- Please disconnect all electrical cables and connections. Wait for the inverter to cool down completely.
- Use compressed air cleaning or a soft brush to clean the inverter heat sink.
- ALL aggressive chemicals, cleaning solvents or strong detergents are FORBIDDEN

Content	Maintenance Measures	Cycle
System Cleaning	<ul style="list-style-type: none"> • Check if the heat sink is covered and dusted • Maintenance of DC Switch can be performed at night. Turn the switch to ON and OFF positions for 4~5 times. • Use a wet cloth to clean the display 	Annually OR Half a year
System Status	<ul style="list-style-type: none"> • Inspect the enclosure for damage/deformation • Listen for abnormal noises during operation • Check if the parameters are normal during operation 	Half a year
Commissioning	<ul style="list-style-type: none"> • Check if the cables are loose • Check if the cable insulations are damaged, especially the parts in contact with metal surfaces 	Half a year after first commissioning Annually OR Half a year
Grounding	<ul style="list-style-type: none"> • Check if the cables are securely grounded 	Half a year after first commissioning Annually OR Half a year

12. RESTARTS

When reconnecting the inverter for electrical power supply, please follow the commissioning procedures and safety instructions as described in **Section 5** when applicable (e.g. DC Wires need to be reassembled).

Please run safety checks as described in **Section 7** before closing the DC Switch and starting up again.

13. APPENDIX

Appendix A

Where a load break switching device that is part of or within the inverter is a switch-disconnector, it shall-

- a) Be rated for independent manual operation;
- b) Have a utilization category at least AC-21B where the port is suitable for a d.c. energy source;
- c) Have a current rating where rated operational current (I_e) and $I(\text{make})$, and $I_c(\text{break})$ rated current are rated such that the disconnector is capable of interrupting the maximum rated normal and fault current for the Photovoltaic port.

There is a DC Switch within the inverter can be used as an isolating device, the rating as below, please find:

Model	GHX5-32P
Rated insulation voltage	1500V
Rated impulse withstand voltage	8000V
Suitability for isolation	Isolating device
Rated operational current	32A
Utilization category/PV utilization category	DC-21B/DC-PV1
Rated short-time withstand current (I_{cw})	700A
Rated short-circuit making capacity (I_{cm})	1400A
Rated breaking capacity	I_c/I_e : 43 U_r/U_e : 1.5

Appendix B

There are installations where multiple inverter energy systems are used and the electrical installation connects at a single point of supply to the grid. Inverter energy systems are often comprised of multiple inverters used in combination to provide the desired inverter energy system capacity or to ensure that voltage balance is maintained in multiple-phase connections to the grid.

The minimize current imbalance or protective method shall be complied with the local regulation or directive. For Australia and New Zealand, the maximum current imbalance in a multiple-phase inverter energy system comprised of either individual single-phase inverters connected on separate phases or a combination of single-phase inverters and multiple-phase inverters shall not exceed 21.7A for more than 15s. The combination is not tested, external devices should be used in accordance with the requirements of AS/NZS 4777.1.

14. LEGAL WARRANTIES

Western CO. srl guarantees the good quality and the good construction of the Products by obliging itself, during the warranty period of 5 (five) years, to repair or replace at its sole discretion, free of charge, parts which, due to bad quality of the material or manufacturing defects, prove to be defective.

The defective product must be returned to Western CO. srl or to a company delegated by Western CO. srl to service the product, at the customer's expense, together with a copy of the sales invoice, both for repair and guaranteed replacement. The costs of re-installation of the material will be borne by the customer.

Western CO. srl will bear the shipping costs of the repaired or replaced product.

The warranty does not cover Products which, at our discretion, are defective due to natural wear and tear, failures caused by inexperience or negligence on the customer's end, imperfect installation, tampering, or incorrect maintenance of the system or interventions other than the instructions provided by us.

The warranty is also forfeited in the event of damage resulting from:

-transport and/or poor conservation of the product.

-force majeure or catastrophic events (freezing temperatures below -20°C, fire, floods, lightning, vandalism, etc.).

All the above warranties represent the only agreement that supersedes any other proposal or verbal or **written agreement and any other communication between the manufacturer and the purchaser in respect of the above.**

Any dispute is resolved by the competent court of Ascoli Piceno.

15. WASTE DISPOSAL

Western CO. as a manufacturer of the electrical device described in this manual, and in accordance with Italian L.D. no. 151 25/07/05, informs the purchaser that once this product is disposed of, must be delivered to an authorised collection centre or, if equivalent equipment is purchased, it can be returned free of charge to the distributor of the new equipment.



Penalties for disposing of electronic refusals illegally will be applied by the individual municipalities.



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