RTDW

Digital Three-Phase Rectifier | Battery Charger

User's Manual

User's Manual

Series: Digital Three-Phase Rectifier | Battery Charger

Language: English

Document: 10008805781 / 01

Model: RTDW

Publication Date: 08/2023

Summary of Reviews

The information below describes the revisions made to this manual.

Version	Review	Description
-	R00	First edition
-	R01	Layout update

1 SAFETY INSTRUCTIONS

This manual contains the necessary information for the correct use of this product. The following instructions are extremely important for the good performance of the product and must be strictly followed during installation, maintenance and operation. Failure to comply with the product instructions may cause operating accidents and damages to the environment, to the product and to the equipment connected to it, in addition to voiding the warranty.

1.1 SAFETY WARNINGS IN THE MANUAL

The following safety warnings are used in this manual:

DANGER!
Failure to comply with the procedures recommended in this warning may lead to death, serious injuries and considerable material damages.

ATTENTION!
Failure to comply with the procedures recommended in this warning may cause material damages.

NOTE!
The text aims at providing important information for the full understanding and proper operation of the product.

1.2 SAFETY WARNINGS ON THE PRODUCT

The following symbols are attached to the product as safety warnings:

High voltages are present.

Components sensitive to electrostatic discharges. Do not touch.

Mandatory connection to the protective ground (PE).

Connection of the shield to the ground.

1

1.3 PRELIMINARY RECOMMENDATIONS

The following are some preliminary recommendations, which should be read before starting the product installation and operation procedures.

DANGER!
Failure to comply with the safety instructions may result in risk of death and/or damage to the equipment. The product has its own power source (batteries). Therefore, the output connections and/or terminals may be energized even if the input power is not available or connected to the equipment. This equipment has potentially hazardous voltages.

DANGER!
Do not block or insert objects into the ventilation fins. Never cover the equipment with other materials or objects, as it may cause overheating and risk of fire. All repairs and maintenance jobs must be performed with the equipment completely de-energized and only by technicians of the WEG Authorized Technical Assistants.

DANGER!
Always disconnect all power sources (main and battery) before touching any electrical parts connected to the equipment.
Many components may remain charged with high voltages and/or moving (fans) even after the battery has been disconnected.
Wait for at least 10 minutes to ensure the full discharge of the capacitors.

DANGER!
Batteries must be recycled. Never dispose of batteries by means of incinerators, crushers, trash compactors, ordinary trash cans or by throwing them directly into the environment. There are risks of explosion or fire when they are exposed to flame, subjected to pressure or come into contact with energy-carrying materials (metals or liquids), in addition to contaminating the environment due to the materials part of their composition.

DANGER!
When in operation, electric energy systems, such as transformers, converters, motors and cables, generate electromagnetic fields (EMF). Therefore, there is risk for people with pacemakers or implants who stay near those systems. Thus, such people must stay at least 2 meters away from this kind of equipment.

ATTENTION!
In order to reduce the risk of fire and electric shock, install the product indoors in an environment with controlled humidity and temperature, free of pollutants and explosive agents, not exposed to direct sunlight. Do not install the product in a place where the temperature and humidity are out of the technical specifications indicated in Chapter 7 TECHNICAL DATA on page 7-1.

ATTENTION!
The performance and safety of the system are directly related to the correct sizing and execution of the electrical design, which must comply with ABNT standards, especially NBR 5410 (Low Voltage Electrical Installations).

ATTENTION!
Before installing the product, make sure that the available infrastructure is suitable and complies with the product technical specifications. (input supply voltage, output, battery and load).

ATTENTION!
Electronic boards have electrostatic discharges sensitive components. Do not touch the components or connectors directly. If necessary, first touch a grounded metallic frame or wear a suitable grounding strap.

ATTENTION!
The operation and installation of this equipment requires detailed instructions provided in the User Manual and and Electrical Design. The manuals are available for download on the website: **www.weg.net**.

NOTE!
In case of battery replacement, the package of the new batteries can be used to store the old ones or put them in individual plastic bags and deliver them directly to your supplier. In case the supplier does accept them, contact the battery manufacturer or distributor, as they are responsible for the collection. The batteries replaced by WEG Authorized Service Centers are collected by WEG and sent to the respective suppliers for proper recycling.

NOTE!
Read this manual thoroughly before installing or operating this equipment. After reading this document, keep it in an easily accessible place for the other users of the product.

2 GENERAL INFORMATION

2.1 ABOUT THE MANUAL

This manual contains the information for the proper installation and start-up, main technical characteristics and how to find and correct the most usual problems of the product.

This manual is available for download on WEG website: **www.weg.net**.

2.2 TERMS AND DEFINITIONS USED IN THE MANUAL

- ABNT: Associação Brasileira de Normas Técnicas (Brazilian Association of Technical Standards).
- Amp, A: ampere.
- AVG: short for *"Average"*, average value.
- AC: alternating current.
- BPS: backup power source (Spare Power Supply).
- bps: bits per second.
- CT: current transformer.
- °C: degrees Celsius.
- cd: candela.
- cm: centimeter.
- CONAMA: Conselho Nacional do Meio Ambiente (National Environment Council).
- DC: direct current.
- DC Link: direct current circuit obtained at the output of the thyristor rectifier, which is also connected to the battery bank.
- DCU: drop converting unit.
- DDU: drop diode unit.
- EMF: electromagnetic field.
- h: hour.
- Hz: hertz.
- HMI: human-machine Interface; device that allows controlling, viewing and changing the Rectifier parameters. The HMI of the RTDW has control keys, navigation keys and a graphic LCD display.
- Heatsink: metal part designed to dissipate the heat generated by power semiconductors.
- IGBT: insulated gate bipolar transistor; component used in the output DC/DC converter. They work as an electronic switch in the saturated (closed switch) and cut-off (open switch) modes.
- kg: kilogram = 1000 grams.

- LCD: liquid crystal display.
- LED: light emitting diode.
- LSB: least significant bit/byte.
- LVD: low voltage disconnect.
- m: meter.
- mA: milliampere = 0.001 ampere.
- min: minute.
- mm: millimeter.
- MSB: most significant bit/byte.
- MTTR: mean time to repair.
- MPS: main power source.
- NO: normally open.
- NC: normally closed.
- N/A: not applicable.
- NTC: resistor whose resistance value in ohms decreases proportionally to the temperature drop; used as temperature sensor on power modules.
- PE: protective earth.
- PTC: resistor whose resistance value in ohms increases proportionally with the temperature.
- PWM: pulse width modulation.
- Pre-charge circuit: charges DC link capacitors with limited current.
- rms: root mean square; effective value.
- Switching Frequency: switching frequency of the IGBTs, usually given in kHz.
- s: second.
- THD: total harmonic distortion.
- USB: universal serial bus.
- V: volts.
- VA: volt-ampere; apparent power.
- W: watt; active power.
- Ω: ohm; resistance or impedance.

3 PRODUCT DESCRIPTION

3.1 INTRODUCTION

The line of Digital Three-phase Rectifiers RTDW has double energy conversion and full digital control. Those innovations add to the RTDW significant improvement in performance, efficiency, operation and reliability in comparison to conventional rectifiers.

3.2 GENERAL CHARACTERISTICS

3.2.1 Output Types

The RTDW can operate with three types of output converters: DCU, DDU or Direct. By default, the system used is the DCU, allows a more precise and effective control of the consumer voltage.

3.2.1.1 DCU Converter (Default Configuration)

The DCU system is based on the use of a DC/DC converter to regulate the output voltage. This configuration allows a precise and stable regulation of the consumer voltage.

3.2.1.2 DDU Outputs (Optional Configuration)

It uses diodes in series with the output, divided and controlled by up to four stages to ensure that the voltage remain within the specified minimum and maximum limits.

3.2.1.3 Direct Output (Optional Configuration)

In this model, the rectifier output is directly connected to the consumer, and the output voltage will be the same as the battery voltage, according to charge, recharge and discharge variations.

3.2.2 System Components

The RTDW system is sturdy and highly reliable, consisting basically of three blocks: Thyristor rectifier, the external battery bank and the output block. The output block vary according to constumer's choice and can be the following: DCU - Drop Converting Unit, DDU - Drop Diode Unit or Direct Output. The Figure 3.1 on page 3-2, Figure 3.2 on page 3-2 and Figure 3.3 on page 3-3 present the rectifier schematic when using DCU, UDC and direct output, respectively.

3.2.3 Operation

In Normal mode (AC power supply present), the first converter (rectifier) supplies energy to charge/maintain the battery bank and simultaneously supplies energy to the converting unit DCU, DDU or directly to power the consumer, according to the project. If the AC power supply fails, the consumer starts receiving uninterrupted power from the batteries. When the AC power supply is restored, the rectifier returns to normal operation, charging the battery bank if necessary and feeding the rest of the system. In case of an AC power supply outage for a long time, the battery discharges to a minimum voltage limit; at this moment, the LVD process begins, explained in Section 6.4 LVD - DISCONNECTION DUE TO LOW BATTERY VOLTAGE on page 6-9. In models without the LVD function and with Direct Output or DDU, the consumer will continue discharging the batteries until the AC power supply is restored. Figure 3.1 on page 3-2, Figure 3.2 on page 3-2 and Figure 3.3 on page 3-3 show the operation of the rectifier when using DCU, DDU, and direct output respectively.

The digital rectifier has a dedicated circuit that detects occasional leakage currents from the equipment positive and negative terminals or from the loads to the earth, generating events and alarms in case of fault.

Note: This circuit is disabled in RTDW models that have positive or negative terminals grounded.

The RTDW has electronics with dual power supply and a supervisory system that operate redundantly, providing even greater protection to the consumer's power supply in case of failure.

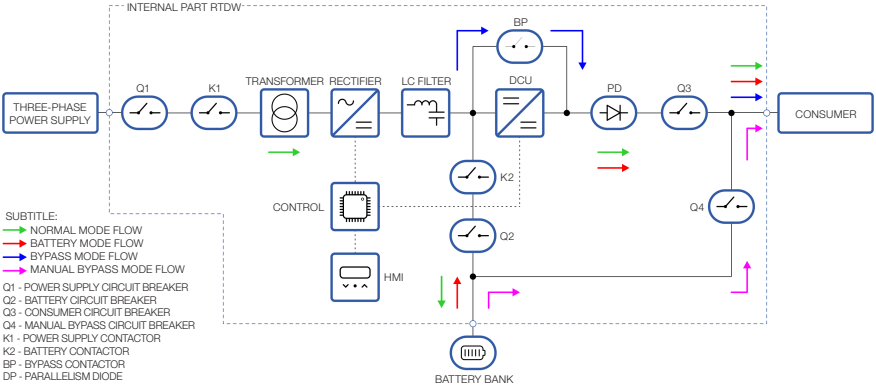

Figure 3.1: *General diagram of the Rectifier in the DCU model*

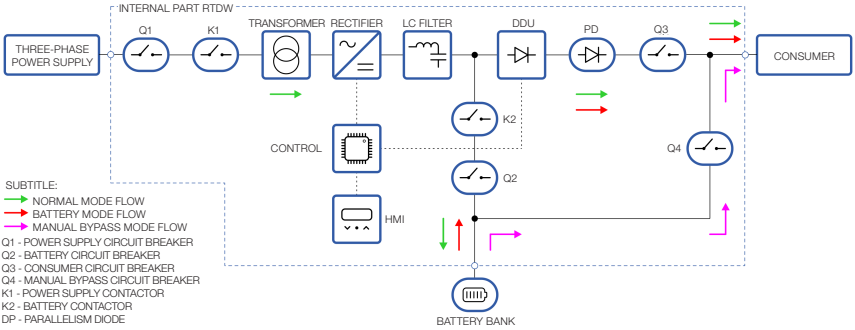

Figure 3.2: *General diagram of the Rectifier in the DDU model*

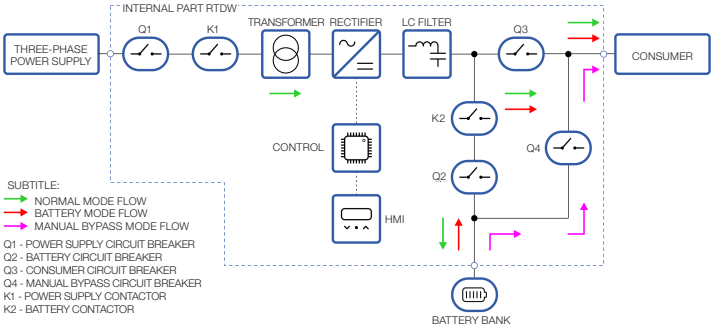

Figure 3.3: *General diagram of the Rectifier in the model with Direct Output*

3.2.4 Output Parallelism

By default, the RTDW with DCU output has an internal parallelism diode that allows connecting the consumer outputs of two or more rectifiers, so that all of them can supply the load.

If it is desirable to determine how each rectifier will operate: taking full load or remaining in standby, it is possible to adjust the output voltage of the individual DCU in each RTDW. To do that, it is necessary to maintain a voltage difference greater than three volts in relation to the other rectifiers in parallel. The RTDW with the highest voltage will take all the load connected to the bus and the others will remain in standby.

If this rectifier with a higher voltage presents a deviation that compromises the correct control of the output voltage, the other rectifiers will automatically supply the load.

ATTENTION!
Models with DDU or Direct Output can only operate in parallelism if the project includes the parallelism diode in its output. In these two output models, it is not possible to determine which of the RTDW will take charge. This will occur according to the variation of the output voltage and the dynamics between them.

3.3 LABEL DATA

The RTDW identification label is located inside the product door. The identification label follows the model shown in Figure 3.4 on page 3-4.

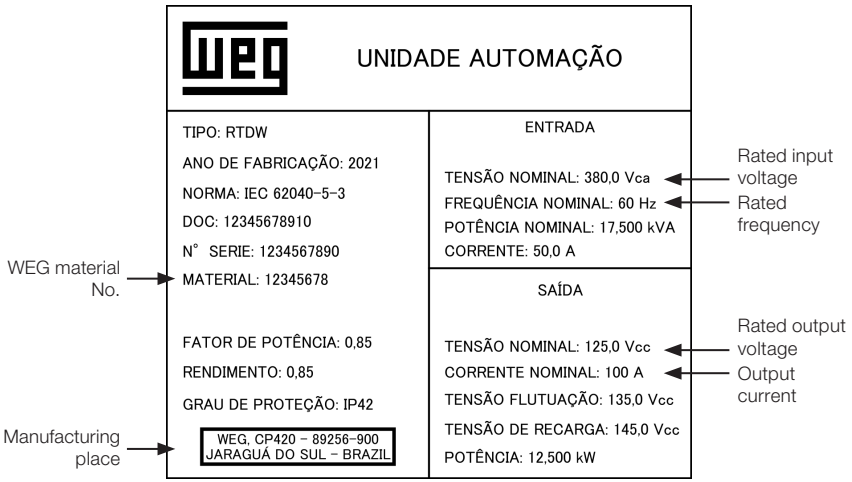

Figure 3.4: *Identification label*

3.4 CONNECTING THE MODULE

3.5 CONTROL MODULE (A4)

The signal information for the control module connections is shown in Table 3.1 on page 3-5, and Figure 3.5 on page 3-9 shows the position of each connector on the front of the module.

Table 3.1: *Control module signal table*

Conector	Pino	Descrição
XC1	1	Rectifier 1 Input AC voltage sample - Phase T
	2	Rectifier 1 Input AC voltage sample - Phase S
	3	Rectifier 1 Input AC voltage sample - Phase R
	4	Unassigned pins
	5	
	6	
	7	
	8	Source 1 AC power supply - Phase S
	9	Source 1 AC power supply - Phase R
	10	Source 2 AC power supply - Phase S
XC2	11	Source 2 AC power supply - Phase R
	12	DCU output voltage sample - Positive
	13	Pre-contactor battery voltage sample - Positive
	14	Rectifier 1 output voltage sample - Positive
	15	PGND voltage sample - Negative
	16	Voltage sample after parallelism diode - Positive
	17	Rectifier 2 output voltage sample - Positive
	18	Panel's roof fan drive - NO
	19	Panel's roof fan drive - C
	20	Redundant panel door fan drive - NO
XC3	21	Redundant panel door fan drive - C
	22	Redundant panel's roof fan drive - NO
	23	Redundant panel's roof fan drive - C
	24	Dehumidifier's module drive - NC
	25	Dehumidifier's module drive - C
	26	Rectifier 2 Input AC voltage sample - Phase T
	27	Rectifier 2 Input AC voltage sample - Phase S
	28	Rectifier 2 Input AC voltage sample - Phase R
	29	Unassigned pin
XC4	1	Spare AC power supply voltage sample - Phase R
	3	Spare AC power supply voltage sample - Phase S
	5	Spare AC power supply voltage sample - Phase T
XC5	1	Grounding (Electronics)
	2	Grounding (Earth Leakage)
XC6	1	Main AC power supply voltage sample - Phase R
	3	Main AC power supply voltage sample - Phase S
	5	Main AC power supply voltage sample - Phase T

Conector	Pino	Descrição
XC14	1	Door fan status drives GND
	2	Door fan status return
	3	Panel's roof fan drives GND
	4	Panel's roof fan status return
	5	Redundant door fan status drives GND
	6	Redundant door fan status return
	7	Redundant panel's roof fan drives GND
	8	Redundant panel's roof fan status return
	9	Dehumidifier's module status drives GND
	10	Dehumidifier's module status return
	21	Bimetallic 1 status drives GND
	22	Bimetallic 1 status return
	23	Bimetallic 2 status drives GND
	24	Bimetallic 2 status return
	25	Programmable Digital Input 1 drives GND
	26	Programmable Digital Input 1 Return
	27	Programmable Digital Input 2 drives GND
	28	Programmable Digital Input 2 Return
	29	Programmable Digital Input 3 drives GND
	30	Programmable Digital Input 3 Return
XC15	1	Battery circuit breaker status drives GND
	2	Battery circuit breaker status return
	3	Bypass circuit breaker status drives GND
	4	Bypass circuit breaker status return
	5	Consumer circuit breaker status drives GND
	6	Consumer circuit breaker status return
	7	Spare AC power supply circuit breaker status drives GND
	8	Spare AC power supply circuit breaker status return
	9	Main AC power supply circuit breaker status drives GND
	10	Main AC power supply circuit breaker status return
	21	Dry contact output 1 - NC
	22	Dry contact output 1 - C
	23	Dry contact output 1 - NO
	24	Dry contact output 2 - NC
	25	Dry contact output 2 - C
	26	Dry contact output 2 - NO
	27	Dry contact output 3 - C
	28	Dry contact output 3 - NO
	29	Supervisory - feedback output - C
	30	Supervisory - feedback output - NO

Conector	Pino	Descrição
XC16	1	Battery contactor drive status
	2	Battery contactor drive GND
	3	Battery contactor drive +24 V
	4	AC power supply contactor drive GND
	5	AC power supply contactor drive +24 V
	6	AC power supply contactor drive status
	7	Consumer contactor drive GND
	8	Consumer contactor drive +24 V
	10	Panel door fan drive - NO
	21	Spare AC power supply circuit breaker driver status
	22	Spare AC power supply contactor drive GND
	23	Spare AC power supply contactor drive +24 V
	24	Pre-charge contactor drive status
	25	Pre-charge contactor drive GND
	26	Pre-charge contactor drive +24 V
	27	Consumer contactor drive status
	30	Panel door fan drive - C
XC17	1	CT power supply current signal Phase R -
	2	CT power supply current signal Phase R +
	3	CT power supply current signal Phase S -
	4	CT power supply current signal Phase S +
	5	CT power supply current signal Phase T -
	6	CT power supply current signal phase T +
	7	NTC+ battery temperature measurement signal
	8	NTC- battery temperature measurement signal
	9	NTC+ ambient temperature measurement signal
	10	NTC- ambient temperature measurement signal
	25	Analog GND Power Supply - Electronics
	26	Analog 12 V Power Supply - Electronics
	27	Digital GND Power Supply - Electronics
	28	Digital 12 V Power Supply - Electronics
	29	Drives GND Power Supply
	30	Drives 24 V Power Supply

Conector	Pino	Descrição
XC18	1	Drives 24 V Power Supply
	2	Drives GND Power Supply
	3	Gate Drive 24 V Power Supply
	4	Gate Drive GND Power Supply
	5	Analog 12 V Power Supply - Electronics
	6	Analog GND Power Supply - Electronics
	7	Digital 12 V Power Supply - Electronics
	8	Digital GND Power Supply - Electronics
	9	Bypass Contactor Command
	10	Consumer current sensor OCD signal
	21	Consumer overcurrent protection
	22	Bypass Thyristor Command
	23	Bypass contactor status
	24	Analog 12 V Power Supply - Electronics
	25	Analog GND Power Supply - Electronics
	26	Digital GND Power Supply - Electronics
	27	Digital 12 V Power Supply - Electronics
	28	Drives GND Power Supply
	29	Drives 24 V Power Supply
XC19	1	Source Seal Command (Start-on-Battery/Source Off)
	2	Source Seal Command (Start-on-Battery/Source Off)
	3	Digital - Electronics 12 V Power Supply
	4	Digital - Electronics GND Power Supply
	5	Control/HMI - Communication Signal A
	6	Control/HMI - Communication Signal B
	8	External RS485 Communication 1 - Signal A
	9	External RS485 Communication 1 - Signal B
	10	External 1 - RS485 Communication GNDSERIAL
	23	External RS422/485 Communication 2 - GNDSERIAL2
	24	External RS422/485 Communication 2 - Signal Y
	25	External RS422/485 Communication 2 - Signal Z
	26	External RS422/485 Communication 2 - Signal B
	27	External RS422/485 Communication 2 - Signal A
	28	External RS485 Communication 3 - Signal A
	29	External RS485 Communication 3 - Signal B
	30	External RS485 Communication 3 - GNDSERIAL3
S6	1	Termination resistors - External RS422/485 Communication 2
	2	Termination resistors - External RS485 Communication 1
S7	1	Selection between 422 and 485 - External RS422/485 Communication 2
	2	
DB9 UCQ		Signals for command and communication with the DCU module
DB9 RELÉ		Signals for command and communication with the Relays module
DB25 RET1		Signals for command and communication with the Rectifier 1 module
DB25 RET2		Signals for command and communication with the Rectifier 2 module

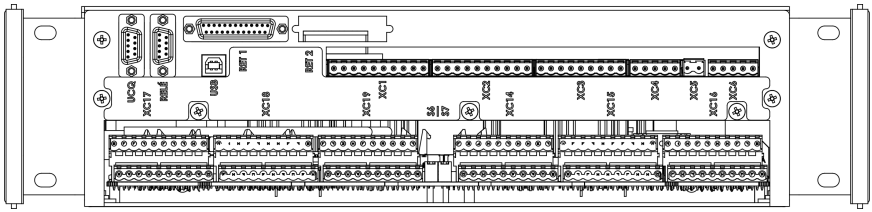

Figure 3.5: Identification of the control module connections

3.6 RELAY MODULE (A5)

The signal information for the relay module connections is shown in Table 3.2 on page 3-9, and Figure 3.6 on page 3-10 shows the position of each connector on the front of the module. To expand the relay module from 8 to 16 outputs, connect connector XC3 of relay module 1 (A5) to connector XC2 of relay module 2 (A6).

Table 3.2: Relay module signals

Connector	Pin	Description	
XC2	DB9	Command and communication signals	
XC3	DB9	Expansion connection	
XC4	1	Relay 1	NC
	2		Common
	3		NO
XC5	1	Relay 2	NC
	2		Common
	3		NO
XC6	1	Relay 3	NC
	2		Common
	3		NO
XC7	1	Relay 4	NC
	2		Common
	3		NO
XC8	1	Relay 5	NC
	2		Common
	3		NO
XC9	1	Relay 6	NC
	2		Common
	3		NO
XC10	1	Relay 7	NC
	2		Common
	3		NO
XC11	1	Relay 8	NC
	2		Common
	3		NO

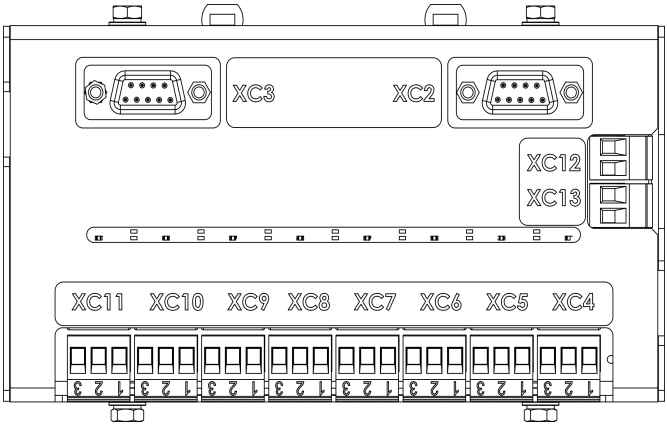

Figure 3.6: Identification of the relay module connections

3.7 RECTIFIER MODULE (A1)

Table 3.3 on page 3-10 shows the signal information for the rectifier module connections, and Figure 3.7 on page 3-11 shows the position of each connector on the front of the modules.

Table 3.3: Rectifier module signals

Connector	Pin	Description
XC3	1	Power Supply 1 18 Vac - FAN - Phase
	2	Power Supply 1 18 Vac - FAN - Neutral
	21	Power Supply 2 18 Vac - FAN - Phase
	22	Power Supply 2 18 Vac - FAN - Neutral
	23	Analog 12 V Power Supply - Electronics
	24	Analog GND Power Supply - Electronics
	25	Digital GND Power Supply - Electronics
	26	Digital 12 V Power Supply - Electronics
	27	Drives 24 V Power Supply
	28	Drives GND Power Supply
DB25		Command and communication signals
Bar R		AC Input - Phase R
Bar S		AC Input - Phase S
Bar T		AC Input - Phase T
Bar S.R.		Rectifier output (Positive)
Bar N		Negative
+BAT E		DC Link Input
+BAT S		DC Link Output to Battery

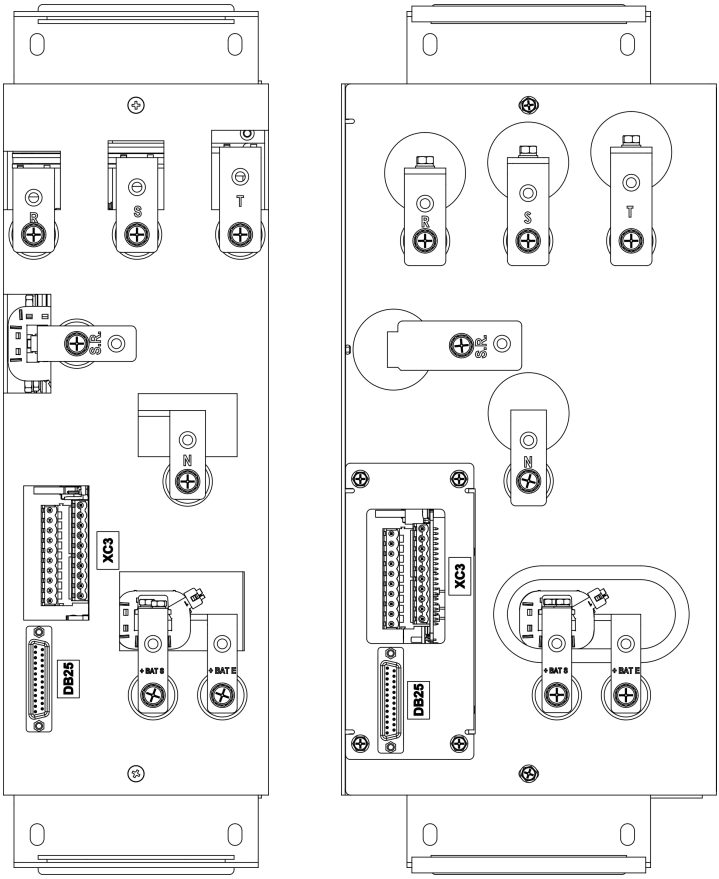

Figure 3.7: *Identification of rectifier module connections*

3.8 LC FILTER MODULE (A2)

Table 3.4 on page 3-12 shows the signal information for the LC and C filter module connections, and Figure 3.8 on page 3-12 shows the position of each connector on the front of the modules.

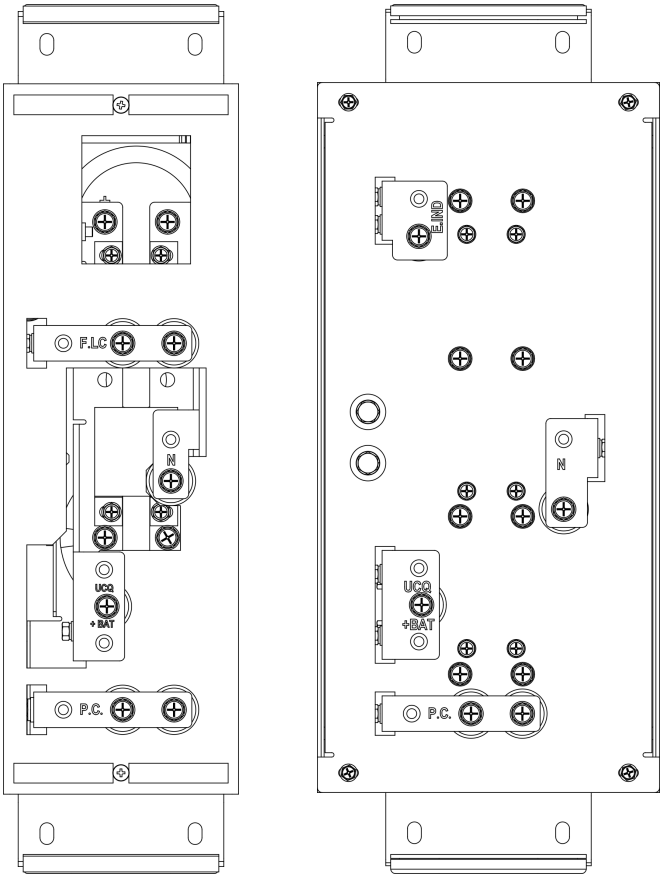

Figure 3.8: *Identification of the Filter LC and C module connections*

Table 3.4: *Table of the LC and C Filter module signal*

Connector	Description
Bar F.LC	LC filter input
Bar E.IND	C filter input
Bar P.C.	DC Link pre-charge input
Bar N	Negative
Bar DCU/+BAT	DC Link Output

3.9 DCU MODULE (A3)

Table 3.5 on page 3-14 shows the signal information for the DCU module connections, and Figure 3.9 on page 3-13 shows the position of each connector on the front of the module.

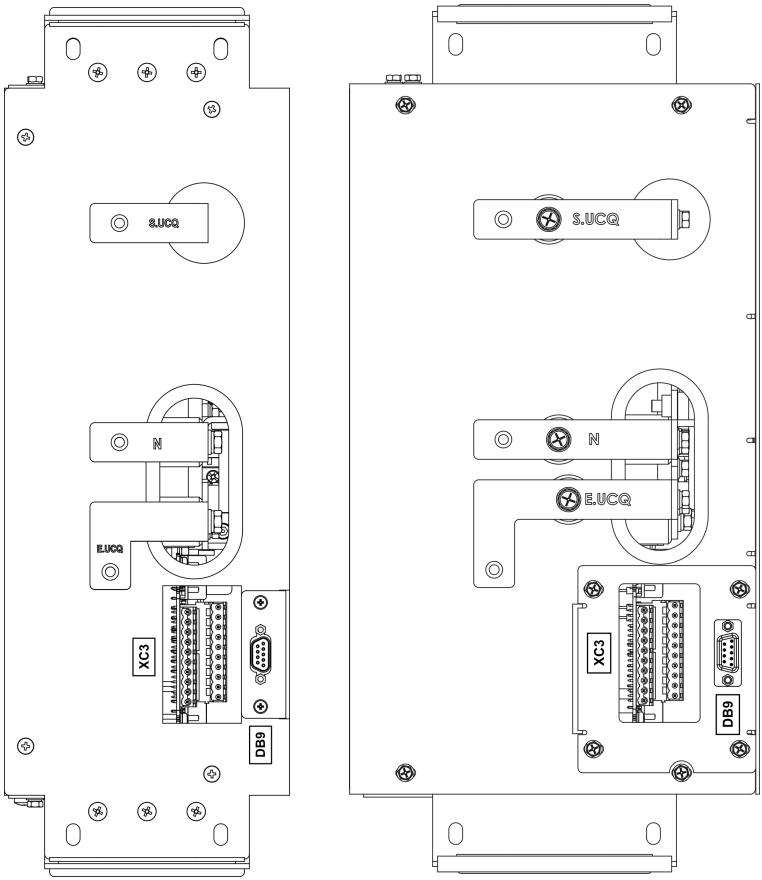

Figure 3.9: *Identification of the DCU module connections*

Table 3.5: DCU module signals

Connector	Pin	Description
XC3	1	Consumer overcurrent protection
	2	Bypass contactor status
	3	Bypass Contactor Command
	4	Bypass Thyristor Command
	9	Consumer overcurrent protection
	21	Drives 24 V Power Supply
	22	Drives GND Power Supply
	23	Gate Drive GND Power Supply
	24	Gate Drive 24 V Power Supply
	25	Digital 12 V Power Supply - Electronics
	26	Analog 12 V Power Supply - Electronics
	27	Digital GND Power Supply - Electronics
	28	Analog GND Power Supply - Electronics
	30	DCU Output Voltage Sample
DB9		Command and communication signals
Bar S.UCQ		Stabilized DCU output
Bar E.UCQ		DCU DC Link input
Bar N		Negative

3.10 HMI MODULE

The signal information for the HMI module connections is shown in Table 3.6 on page 3-14 and Figure 3.10 on page 3-14 shows the position of the connector on the bottom face of the module.

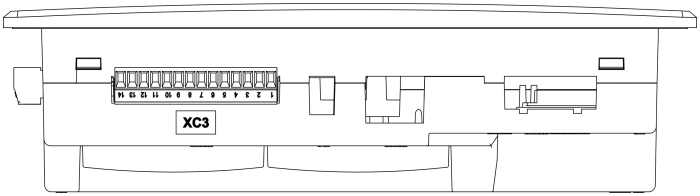

Figure 3.10: *Identification of HMI module connections*

Table 3.6: HMI module signals

Connector	Pin	Description
XC3	8	Control/HMI Communication - Signal A
	9	Control/HMI Communication - Signal B
	10	Digital 12 V Power Supply - Electronics
	11	Digital GND Power Supply - Electronics
	13	DC-Start button signal/command
	14	DC-Start button signal/command

NOTE!
The connections and signal tables described above are directly applicable to the standard modules. For special modules, applied to special products, please refer to the design.

4 RECEIVING AND STORING THE PRODUCT

4.1 TRANSPORTATION

The panels are prepared at the factory for transportation. Any component or bus that is prone to swing or vibrate during transportation must be secured. For the safety of the equipment, the transportation must be done on asphalt roads.

4.2 HANDLING

All the panel doors must be locked during shipment. The transported units must only be moved in an upright position. The loading is done by means of lifting eyebolts placed on top of the panels with the aid of a lifting rod with the cables at its ends connected to each eyebolt. The panels must be lifted by the lifting eyebolts with lifting equipment of capacity above 2000 kg. Always observe the signs on the package so as to place it in the right position. The vertical movement must be smooth without jolts, following the panel handling procedure attached to the external part of the panels; otherwise, internal component parts or doors may be damaged.

4.3 UNPACKING

The product must be unpacked with the panels on the floor and the aid of appropriate tools. Unload the box, loosen the bolts and nuts and remove the plastic and cardboard protections. Be careful not to damage the panels or equipment located on the doors during unpacking.

4.4 RECEIVEMENT

When opening the package, visually check for signs of violation or points that may indicate any damages to the equipment during transportation.

If a problem is detected, contact the carrier immediately. If the equipment will not be installed after the delivery, some safety measures should be taken in order to ensure the integrity and warranty of your product during storage:

- The air must be free of corrosive chemicals.
- The place must not present water infiltration or dripping.
- Good ventilation.
- The panel must be kept on the wooden base (pallet).
- The packages must not be removed.
- Vermin must not be present.
- The air relative humidity must be low.

5 INSTALLING AND CONNECTING

This chapter describes the procedures for the electric and mechanical installation of the RTDW. The directions and suggestions must be observed in order to ensure the safety of people and equipment and the proper operation of the rectifier.

5.1 ASSEMBLING THE DEVICES

- Assemble and connect all the devices sent separately for shipment reasons, carefully checking their position and connection in the respective drawings.
- Remove from the component parts all the anchorage or locking devices installed for shipment.
- Check the mechanical operation of all manual operating devices, such as switch-disconnectors, circuit breakers, limit switches, mechanical interlockings, auxiliary contactors and their actuators.

5.2 MECHANICAL INSTALLATION

The panels must be installed in the electric room according to the layout of the project. The panels must be fastened to concrete floor properly leveled.

Each shipment unit must be placed on the floor and fastened (anchored) to the floor with at least two bolts.

A cable channel must be provided below the floor or above the panels in the room where they will be installed (for cable entry/exit by the bottom or top door).

After fixing the panels, make the coupling between them.

When the panels are definitely fastened to the base, remove the internal shipment brackets, if applicable.

5.3 ELECTRICAL CONNECTIONS

DANGER!
The following information is a guide for the proper installation. Comply with applicable regulations for electrical installations.

DANGER!
Make sure the power supply is disconnected before starting the installation.

ATTENTION!
Check the tightening of all screws and electrical connections of the internal components, according to the existing identifications and with the aid of the electrical diagram of the project that comes with the RTDW.

5.3.1 Power Connections

The following precautions must be observed:

- Make sure the AC power and battery cables have no power and will not be inadvertently energized.
- Make sure the AC input, batteries and consumer circuit breakers are open.
- Start by connecting the grounding cable that must be fastened to the corresponding terminal or bar.
- Then, connect the AC power cables, located at the bottom of the panel according to the design diagram. It is necessary to observe the correct phase sequence of the three-phase AC power supply (R, S and T), and connect each phase to the indicated terminal.
- The battery cables must be connected to the corresponding terminal, observing the polarity.
- Finally, the consumer cables must be connected to the terminal indicated on the electrical diagram. For AC power supply, battery and consumer, use the minimum gauges indicated in Table 5.1 on page 5-2.

Table 5.1: *Table with the minimum gauge to be used in each model*

Conductor Cross Section (mm²)			
RTDW Model	**AC Power Supply**		**DC Power Supply**
	220 V	**380 / 440 / 480 V**	**Consumer / Battery**
15	2.5	2.5	4.0
25			
35	4.0		6.0
50	6.0		10.0
75	10.0	4.0	16.0
100	16.0	6.0	25.0
125		10.0	35.0
150	25.0		50.0
200	35.0	16.0	70.0

5.3.2 Battery Temperature Sensor

Install one end of the temperature sensor cable close to the batteries, at a spot that reflects the ambient temperature of the installation place. It is recommended to install it in a midpoint of the battery bank – it is not necessary that the sensor touch the battery.

5.3.3 Connecting the RS485 Communication

External RS485 communication is provided at the terminals according to the design diagram. Note the correct connection of the signals.

5.3.4 Connecting the USB Communication

In addition to RS485 communication, USB communication is also provided. Check the location of the USB connector in the design.

5.3.5 Dry Contact Outputs and Expansion of Dry Contact Outputs

The default configuration of the RTDW rectifier has eight dry contact outputs, which can be expanded to sixteen outputs.

Those outputs are set as indicated in Section 6.2.2 Alarm and Dry Contact Output Settings on page 6-2.

The Figure 3.6 on page 3-10 shows the connection diagram for the dry contact outputs.

The relay contact configurations can be seen in Table 3.2 on page 3-9.

5.3.6 Dehumidifier's Module Power Supply

The digital rectifier has an internal heating system to keep the equipment properly warm and free of humidity. This circuit is designed to be used during the equipment storage, installation or maintenance. Make the connection of the dehumidifier power supply as indicated in the electrical connections of the design.

NOTE!
The RTDW automatically manages the operation of the dehumidification module, allowing it to run only when the equipment is turned off and thus it avoids: overtemperature, output voltage drop (consumer), operation above the recommended temperature with damage to internal components, among others.

6 OPERATION

This chapter describes how to:

- Start up the product and make the first settings.
- Commission the product.

6.1 STARTING UP THE PRODUCT

The Rectifier must be installed according to the recommendations listed in Chapter 3 PRODUCT DESCRIPTION on page 3-1. Before the next steps, make sure that all connections are correct.

DANGER!
Always disconnect the main AC power supply before performing any connections.

There are two ways to start up the product, that is, two ways to power the product control electronics:

- **AC power supply**: In this option, the electronics are powered by the AC power supply. To enable that, circuit breaker Q1, Q5 and Q6 must be closed; (check the function of each breaker in the equipment project).
- **The battery DC power supply**: This function is called "DC-Start"; with it, the product electronics are powered by the battery DC voltage. For this startup, the battery power cables must be connected to the product, the battery circuit breaker Q2 must be closed and the battery bank voltage must meet the minimum values shown in Table 6.1 on page 6-1. On the HMI, press and hold the **On** key for a few seconds, until the startup bar is fully loaded, as shown in Figure 6.1 on page 6-1.

Table 6.1: *Minimum voltage of the battery bank to perform the DC-Start*

Model RTDW	Minimum Battery Bank Voltage
110 V	77 Vdc
125 V	86 Vdc

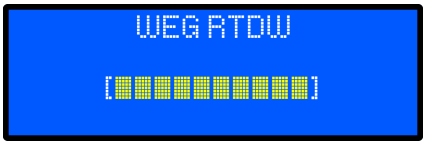

Figure 6.1: *Product electronics startup bar*

6.2 FIRST SETTINGS

6.2.1 Date and Time Settings

To set the product date and time, use the "down", "up" and "enter" keys to navigate through the HMI main menu (Figure 6.2 on page 6-2), select "[4] SETTINGS" and then "[4] DATE AND TIME". The HMI will display the date and time setting menu (Figure 6.3 on page 6-2), so select the year, month and day, and then set the time as shown in Figure 6.4 on page 6-2.

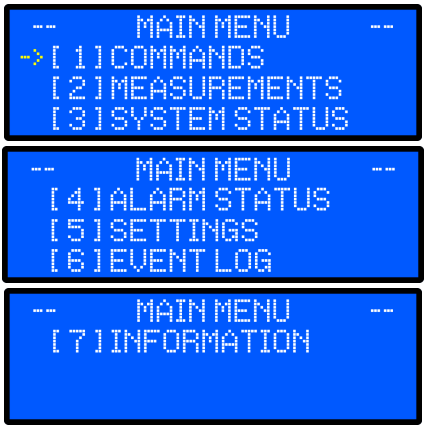

Figure 6.2: *Main menu screen*

Figure 6.3: *Date setting menu*

Figure 6.4: *Time setting menu*

6.2.2 Alarm and Dry Contact Output Settings

Table 6.15 on page 6-24 contains the descriptions of the 18 critical alarms of the RTDW, which generate a short beep when active. The user can also configure 50 additional alarms according to the events presented in Table 6.2 on page 6-3.

As default, the RTDW has 8 dry contact outputs, expandable to 16 (on request). The outputs are activated according to the events configured in Table 6.2 on page 6-3.

NOTE!
For special products, check the design for the settings adopted for each dry contact.

Table 6.2: Standard settings of dry contact relays

Event	Up to 100 A - DCU		125A to 200 A - DCU		DDU / Direct	
	Relay Connector	Alarm	Relay Connector	Alarm	Relay Connector	Alarm
AVG Overvoltage - Consumer's Output	Relay 1 XC4	1	Relay 1 XC4	1	Relay 1 XC4	1
AVG Undervoltage - Consumer's Output		2		2		2
AVG Overcurrent - Consumer		3		3		3
AVG Overvoltage - Battery Output	Relay 2 XC5	4	Relay 2 XC5	4	Relay 2 XC5	4
AVG Undervoltage - Battery Output		5		5		5
Battery Charging Overcurrent		6		6		6
AC power supply outage	Relay 3 XC6	7	Relay 3 XC6	7	Relay 3 XC6	7
RMS Overvoltage - Input		8		8		8
RMS Undervoltage - Input		9		9		9
Overfrequency - Input		10		10		10
Underfrequency - Input		11		11		11
AC power supply phase loss		12		12		12
Rectifier 1 phase sequence fault		13		13		13
AC Power Supply Circuit Breaker Open	Relay 4 XC7	14	Relay 4 XC7	14	Relay 4 XC7	14
Battery Circuit Breaker Open		15		15		15
Consumer's Circuit Breaker Open		16		16		16
Bypass Circuit Breaker Closed		17		17		17
Panel Door Ventilation Circuit Breaker Open		18		18		18
Positive Earth Leakage Current	Relay 5 XC8	19	Relay 5 XC8	19	Relay 5 XC8	19
Negative Earth Leakage Current		20		20	Relay 6 XC9	20
Fan Fault 1 - Rectifier	Relay 6 XC9	21		21	Relay 7 XC10	21
Fan Fault 2 - Rectifier		22		22		22
Fan 1 Fault - DCU		23		23	Not applicable	
Fan 2 Fault - DCU		24		24		
Fan 3 Fault - DCU	Not applicable			25		
AVG Overtemperature - Panel	Relay 7 XC10	25		26	Relay 8 XC11	23
AVG Overtemperature - DCU		26		27		Not applicable
AVG Overtemperature - Rectifier		27		28		24
AVG Overtemperature - Battery		28		29		25
Bypass via supervisory system	Relay 8 XC11	29		30	Not applicable	

Alarms and relays can be set via WPS software (WEG Programming Suite), available at **www.weg.net**. To set an alarm, select the "Alarms" tab.

Then follow the steps below:

- Click on (1) "Select Alarm" and define an available alarm number to set.
- Click on (2) "Associate an Event" and select the desired event.
- In (3) "Associate Outputs", select the dry contact output that should actuate when the selected event occurs.
- Click (4) "Save" to save the settings.
- At the end of the setting process, click on (5) "Update"; thus, the settings are shown in the "Current Alarm Settings" area.

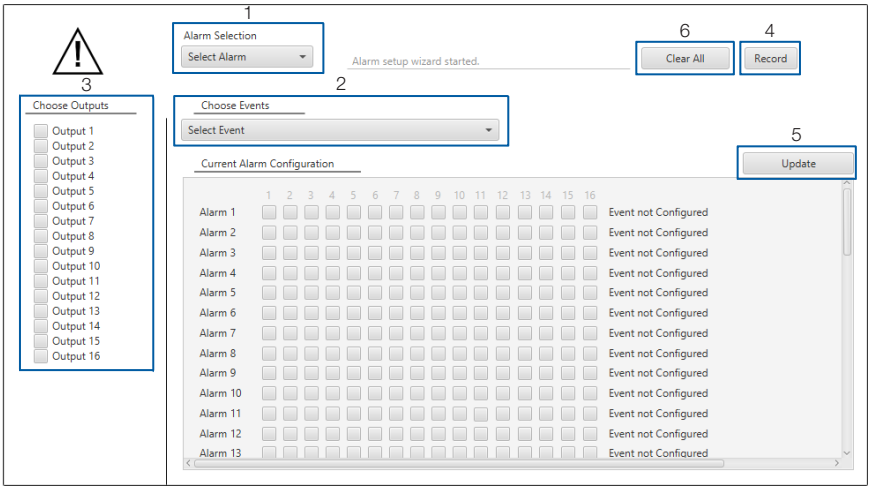

Figure 6.5: *Alarm settings screen via WPS software*

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To clear the alarm settings:

- Select the alarm, click (6) "Clear All" and then (4) "Save".

6.3 RTDW´S OPERATION

This topic describes the necessary steps start the rectifier and the product consumer.

NOTE!
For the correct operation of the product described below, the setup procedure described in Chapter 5 INSTALLING AND CONNECTING on page 5-1 is essential.

6.3.1 Turning the System On and Off Via the Commands Menu

The entire system can be started via HMI through a command menu (Figure 6.2 on page 6-2).

In the HMI main menu, select the "[1] COMMANDS" option, and then select the "[1] SYSTEM" option Figure 6.7 on page 6-7. The screen shown on Figure 6.8 on page 6-7 is displayed on the HMI. Use the "down" or "up" keys and press the "Enter" key in the "ON" option. The setting confirmation menu screen is displayed (Figure 6.9 on page 6-7). Select the "YES" option and press the "Enter" key to confirm.

In this way, the rectifier, the battery and the consumer are activated, and the product starts operating.

To turn off the entire system, select the "OFF" option and confirm the command. The synoptic panel starts operating according to the status described in Table 6.9 on page 6-14.

6.3.2 System Turning On Via On Switch

It is possible to start the entire system (rectifier, battery and consumer) via HMI **On** Key.

In this option, the starting of the modules that make up the system will start automatically.

To performing this operation, with the product already initialized (ver Section 6.1 STARTING UP THE PRODUCT on page 6-1), press and hold the **On** of the HMI for a few seconds.

6.3.3 Turning the Rectifier On and Off

The rectifier is turned on via the HMI through a command menu (Figure 6.2 on page 6-2).

In the main menu, select the "[1] COMMANDS" option, and then select the "[2] RECTIFIER" option (Figure 6.7 on page 6-7). The screen shown on Figure 6.8 on page 6-7 is displayed on the HMI. Use the "down" or "up" keys and press the "Enter" key in the "ON" option. The setting confirmation menu screen is displayed (Figure 6.9 on page 6-7). Use the "down" or "up" keys and press the "Enter" key on the "YES" option.

To turn off the rectifier, select the "OFF" option and confirm the command. The product synoptic panel starts operating according to the status described in Table 6.9 on page 6-14.

6.3.4 Turning the Consumer On and Off

The consumer can be turned on via HMI through a command menu (Figure 6.2 on page 6-2).

In the main menu select the "[1] COMMANDS" option, and then select the "[3] CONSUMER" option (Figure 6.7 on page 6-7). The screen shown on Figure 6.8 on page 6-7 is displayed on the HMI. Use the "down" or "up" keys and press the "Enter" key in the "ON" option. The setting confirmation menu screen is displayed (Figure 6.9 on page 6-7). Use the "down" or "up" keys and press the "Enter" key in the "YES" option.

To turn off the consumer, follow the steps mentioned above, select the "OFF" option and confirm the command. The product synoptic panel starts operating according to the status described in Table 6.9 on page 6-14.

6.3.5 Turning the Bypass On and Off

The bypass can be turned on via HMI through a command menu (Figure 6.2 on page 6-2).

In the main menu select the "[1] COMMANDS" option, and then select the "[5] BYPASS" option (Figure 6.7 on page 6-7). The screen shown on Figure 6.8 on page 6-7 is displayed on the HMI. Use the "down" or "up" keys and press the "Enter" key in the "ON" option. The setting confirmation menu screen is displayed (Figure 6.9 on page 6-7). Use the "down" or "up" keys and press the "Enter" key in the "YES" option. The bypass contactor is activated, and the product synoptic panel starts operating according to the status described in Table 6.9 on page 6-14.

To disable the bypass, follow the steps mentioned above, select the "OFF" option and confirm the command.

NOTE!
The "Turn off" bypass command can also be used when the DCU is in automatic bypass, and it restores the equipment to normal operating conditions.

NOTE!
The turning on and off the battery function via HMI is only valid for products that have a battery contactor (K2).

NOTE!
The enable the bypass function via HMI is only possible on products with DCU.

6.3.6 Battery Charger's Operating Modes

The operating mode of the battery charger is selected in the command menu (Figure 6.2 on page 6-2). In the HMI main menu, select the "[1] COMMANDS" option, and then select the "[4] BATTERY" option (Figure 6.7 on page 6-7). Choose the charger operating mode from:

- "**FAST CHARGE":** This mode will perform a recharge cycle on the battery bank with its own configurable current limit (Table 7.2 on page 7-1). After the end of the cycle, the equipment will return to the previous operating mode (manual or automatic float).
- "**MAN. FLOAT":** The charger will keep the battery bank in float indefinitely, until the operating mode is manually changed.
- "**MAN. EQUALIZATION":** This mode will execute an equalization cycle on the battery bank. After the end of the cycle, the equipment will return to the previous operating mode (manual or automatic float).
- "**MAN. RECHARGE":** When selected, this mode will execute a recharge cycle on the battery bank. Then, the equipment will go into manual or automatic float mode, as it was before the manual charging command.
- "**AUTOMATIC**" (factory default)**:** The equipment will keep the battery bank in floating mode, and, whenever a relevant discharge of the batteries is detected, a charging cycle will be performed right after the normalization of the situation that caused the battery bank to discharge.

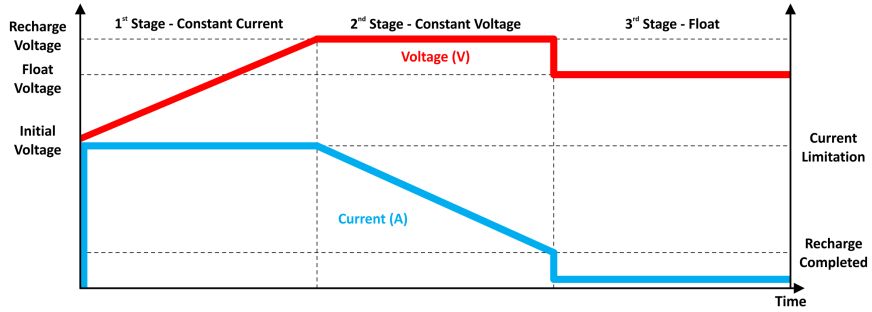

Figure 6.6: *Battery charging cycle*

After selecting the operating mode, the setting confirmation menu screen is displayed (Figure 6.9 on page 6-7). Use the "down" or "up" keys and press the "Enter" key in the "YES" option.

Settings such as recharging current, voltages and time in each mode can be set via WPS. It is recommended to set these parameters according to the manual of the battery used.

Figure 6.7: *Command menu - DCU Mode and DDU/Direct Output Mode*

Figure 6.8: *Menu for choosing the operation*

Figure 6.9: *Operation confirmation menu*

The RTDW has a dedicated temperature sensor that must be installed at the battery bank. This sensor signals to the system control the proper levels of *thermal compensation* to be applied to the float voltage of the battery bank, according to the design/manufactures' parameters, configurable via Modbus and that can be viewed in Table 6.3 on page 6-8.

Table 6.3: *Thermal Compensation Parameters*

	110 V	125 V
Operating Temperature	25 °C (77 °F)	
Negative Coefficient	-0.16 V/°C	-0.18 V/°C
Positive Coefficient	0.16 V/°C	0.18 V/°C
Minimum Temperature	10 °C (50 °F)	
Maximum Temperature	38 °C (100.4 °F)	
Minimum Voltage	108 Vdc	120 Vdc
Maximum Voltage	126 Vdc	140 Vdc

As a way to guarantee efficiency, integrity and service life, preventing overheating and degradation of the battery bank, the system uses the parameters to establish a characteristic curve in the behavior of the rectifier voltage (Figure 6.10 on page 6-8).

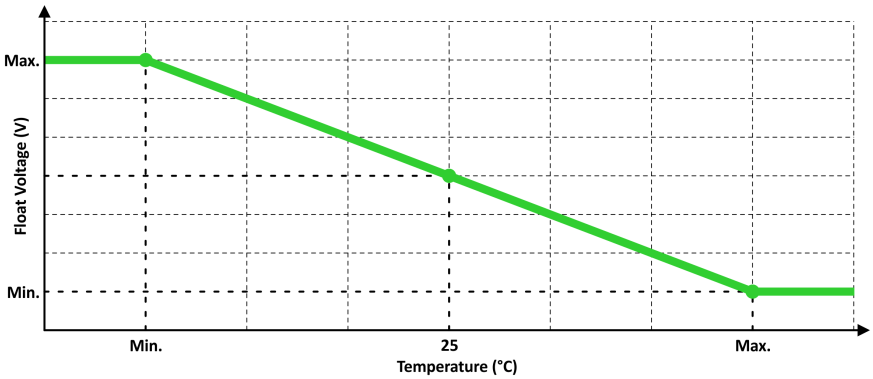

Figure 6.10: *Thermal Compensation actuation curve*

Starting from a central point of Operating Temperature and the adjusted value for Float Voltage, the Control applies the Negative or Positive Coefficients until the first of the minimum or maximum limits of Temperature or Voltage are reached.

If desired, Thermal Compensation can be activated/deactivated from the product's HMI. In the main menu, select the option "[5] SETTINGS" and then the option "[7] THERMAL COMP." (Figure 6.24 on page 6-37). The screen shown in Figure 6.11 on page 6-9 is shown on the HMI. Use the "down" or "up" keys and press the "ENTER" key at the desired option [ON] or [OFF]. The confirmation menu screen appears (Figure 6.9 on page 6-7). Use the "down" or "up" keys and press the "ENTER" key at the desired option [NO] or [YES].

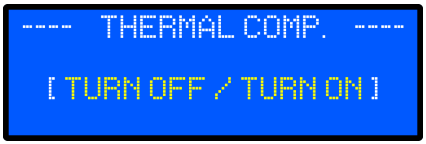

Figure 6.11: *Settings menu*

NOTE!
Thermal Compensation is applied only when the Rectifier is in **"Manual Float"** or **"Automatic"** operating modes.

6.4 LVD - DISCONNECTION DUE TO LOW BATTERY VOLTAGE

LVD is a protection system that, aiming at extending the service life of the battery bank, prevents deep discharges, avoiding irreversible damage. It consists of a contactor that connects/disconnects the batteries according to pre-established and configurable parameters.

Once the Rectifier is turned on (see Item 6.3.3 Turning the Rectifier On and Off on page 6-5) and, the battery circuit breaker is closed, the operating limits of the AC power supply (Table 7.1 on page 7-1) and the battery bank voltage limits between 94.5 V and 133.2 V on 110 V models and between 105 V and 148 V on 125 V models (default values, may vary according to what is specified/adjusted in the project), the system will activate the contactor connecting the batteries to the DC Link of the product, and the charging process will begin as described in Item 6.3.6 Battery Charger's Operating Modes on page 6-6.

This connection also occurs automatically whenever the product is started through the "DC-Start" function, explained in Section 6.1 STARTING UP THE PRODUCT on page 6-1, as long as the Consumer is turned on, as described in Item 6.3.4 Turning the Consumer On and Off on page 6-5.

After going into operation and regardless of the operating mode, whenever the RTDW detects that the batteries are in the process of being discharged, when the minimum voltage limit established in Table 6.4 on page 6-9 is reached, the low battery shutdown process will start, according to signaling and event seen in Table 6.9 on page 6-14 and Table 6.14 on page 6-21.

Once the disconnection time is over, the contactor will immediately open and if the product has no power supply, the RTDW will be completely turned off (including all electronics) and will remain in this condition until the AC power supply is reestablished for a new charging process of the battery bank or when the system is restarted using the "**DC-Start**" function.

Table 6.4: *LVD parameters*

	110 V	125 V
Disconnection voltage (1)	96 V	107 V
Disconnection time (1)	5 min	

(1) Configurable via Modbus (see Table 6.35 on page 6-34)

6.5 SUPERVISORY SYSTEM

It is a redundant protection system that monitors the battery and consumer voltages, ensuring the correct voltage on the loads connected to the RTDW.

Note: The Supervisory System is only available on models with DCU.

Operation

When an event that compromises the specified output voltage occurs, the RTDW activates the bypass and connects the rectifier/battery to the consumer's output. The Supervisory System is composed of two output voltage protection levels: the first one by means of the control itself, and the second one via dedicated circuit, ensuring even more robustness to the RTDW.

1st Level - Bypass via control: the firmware activates the system bypass, operating according to the events shown in Table 6.5 on page 6-10. After the event that activated the bypass is solved, the equipment returns to the normal operating mode at the end of the return time countdown.

Note: in case the batteries discharge in the process, they will go into the charging

2nd Level - Bypass via dedicated circuit: likewise, this circuit monitors the battery and consumer voltages, activating the bypass when necessary.

Table 6.5: *Bypass conditions*

<table>
<tr><th rowspan="2">Level</th><th rowspan="2">Event</th><th colspan="2">Levels</th><th rowspan="2">Actuation Time</th><th rowspan="2">Return Time</th></tr>
<tr><th>110 V</th><th>125 V</th></tr>
<tr><td rowspan="5">1st</td><td>Phase Failure</td><td colspan="2" rowspan="3">See technical data</td><td>5 s (1)</td><td rowspan="2">5 s (2)</td></tr>
<tr><td>Output overcurrent</td><td rowspan="2">3 s</td></tr>
<tr><td>Output overvoltage</td></tr>
<tr><td>Overtemperature</td><td>1 min</td><td>30 s</td></tr>
<tr><td rowspan="2">2nd</td><td rowspan="2">Output failure</td><td>< 99 V</td><td>< 110 V</td><td rowspan="2">Immediate</td><td>5 s (3)</td></tr>
<tr><td>< 94.5 V</td><td>< 105 V</td><td>Follow the instructions: operation to return Bypass by 2nd level</td></tr>
</table>

(1) The bypass actuates in case of an AC power supply outage five seconds after the battery bank voltage drops.
(2) The Bypass returns five seconds after the battery voltage reaches a level above the consumer voltage reference.
(3) Two attempts to return in 30 seconds. After that, only via the Bypass reset/shut down command.

6

Table 6.6: *Output voltages in Bypass mode*

<table>
<tr><th rowspan="2">Protection</th><th colspan="2">Minimum Tension</th><th colspan="2">Maximum Tension</th></tr>
<tr><th>110 V</th><th>125 V</th><th>110 V</th><th>125 V</th></tr>
<tr><td>1st Nivel - Control</td><td rowspan="2">94.5 V</td><td rowspan="2">105 V</td><td rowspan="2">115 V</td><td rowspan="2">128 V</td></tr>
<tr><td>2nd Nivel - Dedicated circuit</td></tr>
</table>

Minimum voltage: below this value, the equipment will shut down to ensure the integrity of the batteries.

Maximum voltage: in case the equipment is in overload, this voltage value will be proportionally equal to the battery voltage.

Indications and working voltages of the dedicated circuit

The dedicated circuit works with different levels of battery and consumer voltages, indicating the operating conditions through the HMI synoptic panel, the System Status menu and an available dry contact.

For the dedicated circuit to start operating, the RTDW must be turned on, in normal operation, and the battery and consumer voltages must be higher than the value indicated in Table 6.7 on page 6-11. Once the voltages exceed the aforementioned values, the circuit is activated and starts to supervise the output voltage, enabling the bypass system when the voltage reaches the minimum tripping value, as shown in the table below.

Table 6.7: *Reference voltages - Dedicated circuit*

Reference	Minimum Tension		Condition
	110 V	125 V	
$V_{battery}$	< 94.5 V	< 105 V	OFF
$V_{consumer}$	> 99 V	> 110 V	SUPERVISED
	< 94.5 V	< 105 V	TRIP VOLTAGE

Operation to RETURN bypass by 2nd level - Dedicated circuit

This instruction describes the correct and safe way to return to the normal operating mode after a possible activation of the supervisory system via dedicated circuit:

1. Open the AC POWER SUPPLY circuit breaker (Q1).
2. Close the MANUAL bypass circuit breaker (Q4).
3. Open the BATTERY circuit breaker (Q2) and the CONSUMER circuit breaker (Q3).
4. Execute the necessary repair or inspection.
5. Close the AC POWER SUPPLY circuit breaker (Q1).
6. Wait for the system verification and initialization.
7. Navigate through the display menus to set the configurations if necessary.
8. Navigate through the COMMANDS menu and start the SYSTEM.
9. Check the Rectifier voltage; it must be equal to the setting of the float parameter.
10. Check the Consumer voltage; it must be equal to the reference parameter setting.
11. Close the BATTERY circuit breaker (Q2) and check the battery charging.
12. Close the CONSUMER circuit breaker (Q3).
13. Navigate through the SYSTEM STATUS menu and check the active Rectifier, Consumer and Supervisor.
14. Open the bypass circuit breaker (Q4).

6.6 HMI

This chapter contains the following information:

- HMI keys and functions.
- Display indications.
- Illuminated indications on the HMI.

Figure 6.12: *Rectifier HMI front view*

6.6.1 Control Keys

The HMI of the RTDW rectifier has four keys to navigate between the screens and an additional **On** key, in addition to an internal buzzer for audible alarms. The keys have the functions shown in Table 6.8 on page 6-13.

Table 6.8: *Navigation keys description*

Key	Description
	**Menu/ESC:** can assume two distinct functions: **ESC:** used to return in the menu levels **MENU:** allows you to enter the main menu, starting from the home screen
	**Up:** allows you to advance or move the cursor upwards on the menu screens. It is also possible to toggle between "YES" and "NO" in the action and setting confirmation screens
	**Down:** allows you to return or move the cursor downwards on the menu screens. It is also possible to toggle between "YES" and "NO" in the action and setting confirmation screens
	**Enter:** allows you to enter the menu sub-levels selected by the UP and DOWN keys, allows you to confirm selected commands
	**On:** turns the product on and executes the start-on-battery function (DC-Start), energizing the equipment electronics power supply

6.6.2 Synoptic Panel

It is located in the central part of the front panel and which displays in real time the status of the main blocks of the product. Table 6.9 on page 6-14 describes the main indications displayed by the Synoptic Panel. In addition to the colors of the icons (Red, Green or Orange), the flashing rate of the icons must also be considered, as described below.

Icon flashing rate:

- **Constant.**
- **Slow:** flashes once per second.
- **Normal:** flashes 2.5 times per second.
- **Fast:** flashes 5 times per second.

Table 6.9: Status displayed on the Synoptic Panel

Signaling	Color/Flashing Rate	Status
 Input AC power supply	Off	AC power supply not available
	Green/Constant	AC power supply available and within the operating range
	Orange/Constant	AC power supply voltage in range but out of frequency of operation
	Red/Constant	AC power supply voltage out of the operating range
	Green/Normal	Wait for AC power supply return (10 s)
	Green/Red	Phase Sequence Failure
 Rectifier	Off	Rectifier turned off
	Green/Constant	Rectifier operating
	Red/Constant	Overload/Current Limitation
	Green/Slow	Rectifier in Standby
	Green/Normal	Ramp start
	Red/Normal	Rectifier fault
 DC/DC converter	Off	Converter turned off
	Green/Constant	Converter operating normally
	Red/Constant	Overload/Current Limitation
	Green/Normal	Converter in bypass mode
	Red/Normal	Converter fault
 Battery	Green/Constant	Battery with normal voltage
	Orange/Constant	Battery with partial voltage
	Red/Constant	Battery with tension on alert
	Green/Fast	DC Link Preload
	Red/Slow	Battery disconnected
	Red/Normal	In the process of LVD (1)
	Red/Fast	Overvoltage on batteries
	Alternates between Green and Red	Battery connected with wrong polarity
 Bypass	Off	Bypass turned off
	Red/Constant	Automatic bypass on
	Red/Normal	Manual bypass on
	Red/Fast	Automatic Bypass Supervisor
 Consumer	Off	Consumer output off
	Green/Constant	Voltage within operating range and load < 80 %
	Orange/Constant	Voltage within operating range and load > 80 % and < 100 %
	Red/ Constant	Voltage outside operating range or load > 100 %
	Green/Normal	Voltage within operating range and load < 80 % (operating by bypass) (2)
	Red/Normal	Voltage within operating range or load > 100 % (operating by bypass) (2)
	Orange/Normal	Voltage within operating range and load between 80 % and 100 % (operating by bypass) (2)
 Earth Leakage	Off	Without earth leakage
	Red/Normal	With earth leakage

Signaling	Color/Flashing Rate	Status
 Alarm	Off	Without alarms
	Red/ Constant	Active/present alarms
	Red/Slow	Alarm occurred (3)

(1) If you have the LVD function.
(2) For standard equipment with DCU.
(3) To view it, it is necessary to access the Events Menu Item 6.6.5 Event Log on page 6-21.

6.6.3 Display Menus

This chapter presents the RTDW operation, view and settings menus with their functions and information. It is also possible to see the structure of the HMI menu screens in Figure 6.13 on page 6-18.

6.6.3.1 Commands Menu

In this menu, it is possible to execute commands for the product operation. It contains the functions to turn on the entire system, the rectifier, the consumer, the battery and the function to activate the manual bypass. The steps that describe the commands on this menu are in Section 6.3 RTDW´S OPERATION on page 6-4 of this manual.

6.6.3.2 Measurements Menu

The main measurements of the product are displayed in this menu. The variables presented on this screen are those described in Item 6.6.4 Measurements on page 6-19 in this document.

6.6.3.3 System Status Menu

The status of: rectifier, the consumer, supervisory, the HMI buzzer (sound alarm) and synoptic panel.

Table 6.10: *Supervisory Status*

HMI	Description
OFF	On/Off
ACTIVE	Supervising
BYPASS	Bypass activated
DISABLED	Inhibited by the Control

Table 6.11: Rectifier Status

HMI	Description
OFF	Off
RAMP	Voltage Ramp
FLOAT	Float
CHARGING	Charging
FL.MAN	Manual Float
RE.MAN	Manual Charging
EQ.MAN	Manual Equalization
C.RAP	Fast Charging
STANDBY	STANDBY
T. BYP.	Bypass Voltage
FAILURE	Fault

Table 6.12: Consumer Status

HMI	Description
OFF	Off
NORMAL	Normal
BYPASS	Bypass
BP.MAN.	Manual Bypass
FAULT	Fault

Table 6.13: Buzzer and Synoptic Panel Status

HMI	Description
[X]	On
[ ]	Off

6.6.3.4 Alarm Status Menu

The alarm status menu shows the status of the internal (fixed) alarms and the status of alarms that can be set by the users (Item 6.6.6 Internal and Configurable Alarm Status on page 6-23).

6.6.3.5 Settings Menu

Through this menu you can configure the functions listed below. The configuration steps of each function are presented in the items shown in parentheses:

- **Audible and Synoptic Alarm** (Item 6.8.1 Synoptic Panel and Sound Alarm Settings on page 6-35).
- **Modbus Communication** (Item 6.7.3.14 Modbus USB Communication Settings on page 6-32 and Item 6.7.3.15 Modbus RS485 Communication Settings on page 6-32).
- **Date and Time** (Item 6.2.1 Date and Time Settings on page 6-2).
- **Consumer** (Item 6.8.2 Consumer Settings on page 6-38).
- **Battery** (Item 6.8.3 Battery Charger Settings on page 6-38).
- **Thermal Compensation** (Item 6.3.6 Battery Charger's Operating Modes on page 6-6).
- **Input** (Item 6.8.4 Input AC Power Supply Settings on page 6-39).
- **Factory Default** (Section 8.1 RESET TO FACTORY DEFAULT PARAMETERS on page 8-1).
- **Language** (Item 6.8.6 Language Settings on page 6-40).

6.6.3.6 Event Log Menu

It presents the list of events generated during the product operation. The conditions and reasons are described in Item 6.6.5 Event Log on page 6-21.

6.6.3.7 Information Menu

Firmware versions, model and product capacity are shown in this menu.

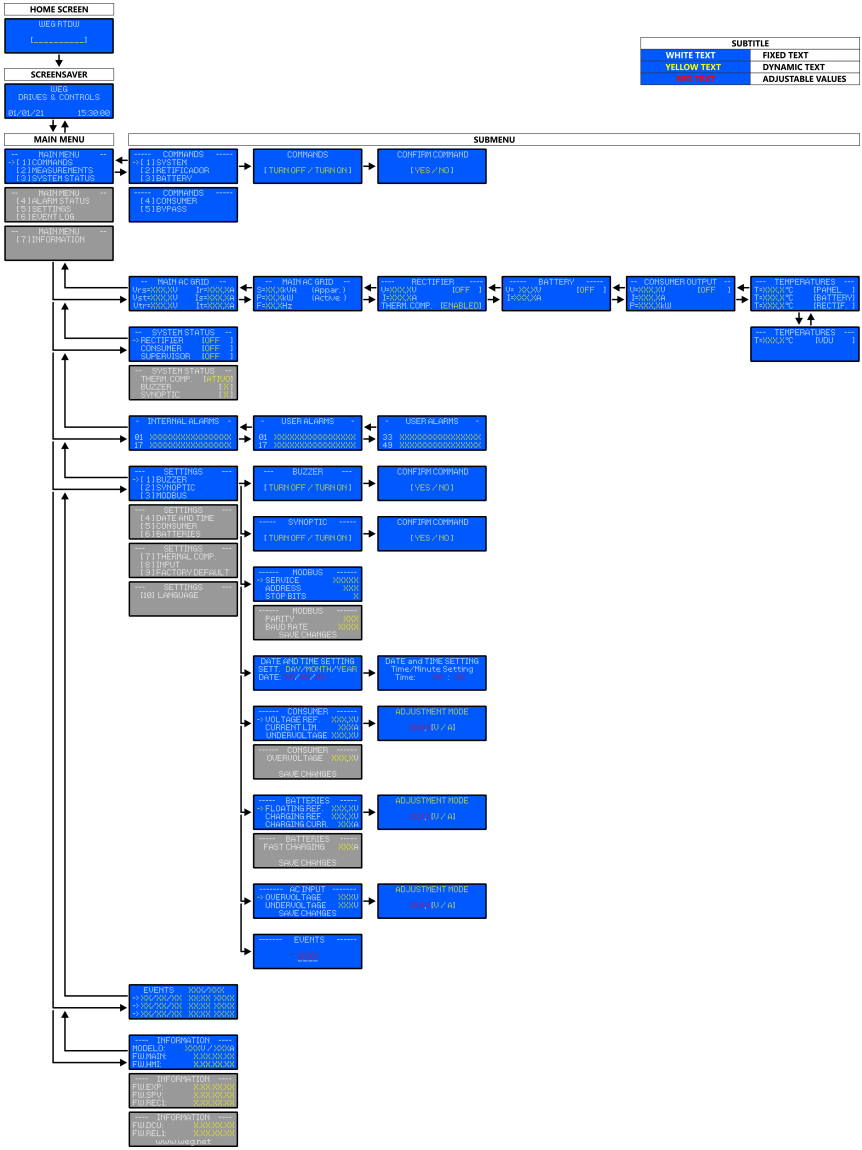

Figure 6.13: *Display menus*

6.6.4 Measurements

To access the measurements menu, select "[2] MEASUREMENTS" from the main menu. To navigate between the screens of the variables shown, use the "down" and "up" keys.

The measurements shown on the RTDW HMI are the following:

AC Power Supply (Figure 6.14 on page 6-20):

- True rms AC Power Supply voltage of the three phases (V).
- True rms AC Power Supply current of the three phases (A).
- AC Power Supply Frequency (Hz).
- AC Power Supply Apparent Power (kVA).
- AC Power Supply Active Power (kW).

Consumer DC output (Figure 6.15 on page 6-20):

- Output DC voltage (V).
- Output DC current (A).
- Output Active power (kW).

Batteries (Figure 6.16 on page 6-20):

- Battery DC voltage (V).
- Battery charging (+ sign) and discharging (- sign) DC current (A).

Temperature (Figure 6.17 on page 6-20):

- Panel internal temperature (°C).
- Battery temperature (°C).
- Rectifier Temperature.
- DCU Temperature.

Rectifier (Figure 6.18 on page 6-20)

- Rectifier DC voltage (V).
- Rectifier DC current (A).
- Rectifier status.
- Thermal compensation status.

NOTE!
Due to the tolerance of the transducers and other parts used in the measurement system, the readings may show a deviation in comparison to measurements made with other devices.

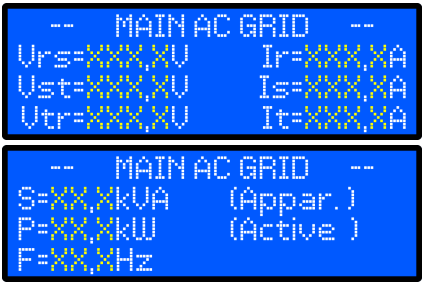

Figure 6.14: *AC power supply measurement menus*

Figure 6.15: *Consumer measurement menu*

Figure 6.16: *Battery measurement menu*

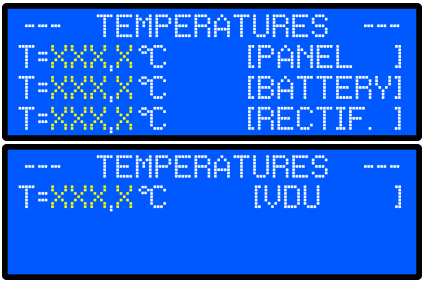

Figure 6.17: *Temperature measurement menu*

Figure 6.18: *Rectifier measurement menu*

6.6.5 Event Log

To view the event log list, select the option "[5] EVENT LOG" from the main menu and press "ENTER" to confirm. Use the "down" and "up" keys to navigate through the menu. The date and time the event was generated, and the event number are displayed. Table 6.14 on page 6-21 shows what each event represents.

To search for older events more quickly, press and hold one of the keys ("down" and "up") for a few seconds. A submenu screen is shown (Figure 6.20 on page 6-21), and you can select old events more quickly.

Figure 6.19: *Event menu*

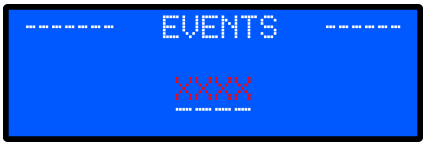

Figure 6.20: *Quick event selection menu*

Table 6.14: *Events identification*

ID	Event Description
301	RMS Overvoltage - Main Input
302	RMS Overvoltage - Auxiliary input
303	RMS Overvoltage - Rectifier Input
311	AVG Overvoltage - Consumer's Output
312	AVG Overvoltage - Battery Output
313	AVG Overvoltage - Rectifier Output
341	Instant Overvoltage - Input
342	Instant Overvoltage - Auxiliary input
343	Instant Overvoltage - Rectifier Input
344	Instant Overvoltage - Rectifier Output
345	Instant Overvoltage - Battery
346	Instant Overvoltage - Consumer
391	Overfrequency - Main Input
392	Overfrequency - Auxiliary input
393	Overfrequency - Rectifier Input
701	RMS Undervoltage - Main Input
702	RMS Undervoltage - Auxiliary input
703	RMS Undervoltage - Rectifier Input
711	AVG Undervoltage - Consumer's Output
712	AVG Undervoltage - Battery Output
713	AVG Undervoltage - Rectifier Output
741	Instant Undervoltage - Input

ID	Event Description
742	Instant Undervoltage - Auxiliary input
743	Instant Undervoltage - Rectifier Input
744	Instant Undervoltage - Rectifier Output
745	Instant Undervoltage - Battery Bank
746	Instant Undervoltage - Consumer
791	Underfrequency - Main Input
792	Underfrequency - Auxiliary input
793	Underfrequency - Rectifier Input
1101	RMS Overcurrent - Auxiliary input
1102	RMS Overcurrent - Main Input
1103	RMS Overcurrent - Rectifier Input
1111	AVG Overcurrent - Rectifier Output
1112	Battery Charging Overcurrent
1113	AVG Overcurrent - Consumer
1141	Instant Overcurrent - Input
1142	Instant Overcurrent - Auxiliary input
1143	Instant Overcurrent - Rectifier Input
1144	Instant Overcurrent - Battery Bank
1145	Instant Overcurrent - Consumer
1151	Hardware Overcurrent - Rectifier
1152	Hardware Overcurrent - Battery

ID	Event Description
1201	Positive Earth Leakage Current
1202	Negative Earth Leakage Current
1901	Consumer Overload
1902	Battery Overload
2011	AVG Overtemperature - Panel
2012	AVG Overtemperature - DCU
2013	AVG Overtemperature - DDU
2014	AVG Overtemperature - Rectifier
2015	AVG Overtemperature - Battery
3012	Battery Circuit Breaker Open
3013	AC Power Supply Circuit Breaker Open
3014	Consumer's Circuit Breaker Open
3015	Bypass Circuit Breaker Closed
3016	Panel Door Ventilation Circuit Breaker Open
3017	Panel Top Ventilation Circuit Breaker Open
3018	Redundant Panel Door Ventilation Circuit Breaker Open
3019	Redundant Panel Top Ventilation Circuit Breaker Open
3101	Main AC Power Supply Outage
3102	Main AC Power Supply Restoration
3103	Spare AC power Supply Outage
3104	Spare AC Power Supply Restoration
3201	DCU in Normal Mode
3202	DCU in Automatic Bypass
3203	DCU in Manual Bypass
3204	Replacement of bypass at DCU
3207	Bypass via supervisory system
3209	DCU Fault
3210	DCU On
3211	DCU Off
3250	Battery charger - Automatic float mode
3251	Battery charger - Automatic charging mode
3252	Battery charger - Manual float mode
3253	Battery charger - Manual recharging mode
3254	Battery charger - Manual equalization mode
3255	Battery charger - Quick recharging mode
3256	Battery charger - Reduced voltage to bypass mode
3259	Battery charger Fault
3260	Battery charger On
3261	Battery charger Off

ID	Event Description
3300	Change in the USB Modbus communication parameters
3301	Change in the COM Modbus communication parameters
3302	Change in Consumer parameters
3303	Change in the Battery parameters
3304	Change in the Input parameters
3310	General change in parameters
3410	Current Being Limited in the Rectifier
3411	Current Being Limited in the Battery
3412	Current Being Limited in the DCU
3510	Starting low battery shutdown process
3511	Low battery shutdown
3720	Ventilation Fault
3721	Fan Fault 1 - Rectifier
3722	Fan Fault 2 - Rectifier
3723	Redundant Fan 1 Fault - Rectifier
3724	Redundant Fan 2 Fault - Rectifier
3725	Fan 1 Fault - DCU
3726	Fan 2 Fault - DCU
3727	Inductor Fan Fault - DCU
3728	Redundant Fan 1 Fault - DCU
3729	Redundant Fan 2 Fault - DCU
3730	Redundant Inductor Fan Fault - DCU
3731	Fan 3 Fault - DCU
3732	Redundant Fan 3 Fault - DCU
3733	Fan Fault 3 - Rectifier
3734	Redundant Fan 3 Fault - Rectifier
3742	Rectifier 1 phase sequence fault
3743	Rectifier 2 phase sequence fault
3760	Failure to identify the power modules
3770	Failure to communicate with the power modules
3811	Main AC power supply phase loss
3821	Spare AC power supply phase loss
3851	Rectifier 1 thyristor pulse fault
3861	Rectifier 2 thyristor pulse fault
4001	System energized
4002	Communication buffers reset

6.6.6 Internal and Configurable Alarm Status

This menu shows the status of the fixed internal alarms (according to Table 6.15 on page 6-24) and the user-configurable alarms (see Section 6.2.2 Alarm and Dry Contact Output Settings on page 6-2). They can be viewed as shown in Figure 6.21 on page 6-23 and Figure 6.22 on page 6-23, respectively.

The system is composed of 18 fixed alarms generated by critical events plus 50 configurable alarms as defined in the project.

The alarm status is represented by the symbols:

- X: Alarm not set symbol.
- _: Alarm set and inactive symbol.
- ▮: Alarm set and active symbol.

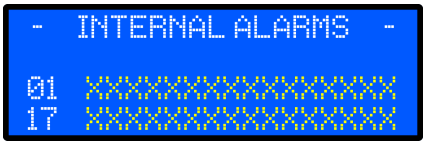

Figure 6.21: *Internal alarm status menu*

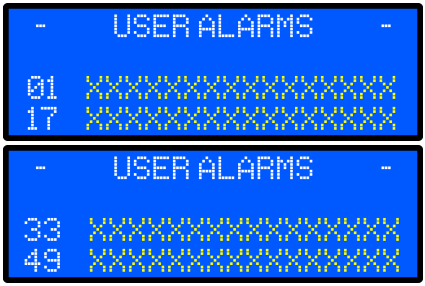

Figure 6.22: *User-set alarm status menu*

Table 6.15: Description of the critical events that generate alarms

ID	Alarm N°	Event Description
1	3259	Battery charger Faulty
2	3760	Failure to identify the Power Modules
3	3770	Failure to communicate with the Power Modules
4	3811	Phase Loss Fault
5	3742	Phase Sequence Fault
6	3851	Rectifier 1 Thyristor Pulse Fault
7	312	AVG Overvoltage - Battery Output
8	1112	Battery Charging Overcurrent
9	2012	AVG Overtemperature - DCU
10	2013	AVG Overtemperature - DDU
11	2014	AVG Overtemperature - Rectifier
12	2015	AVG Overtemperature - Battery
13	2011	AVG Overtemperature - Panel
14	3720	Ventilation Fault
15	3015	Bypass Circuit Breaker Closed
16	3012	Battery Circuit Breaker Open
17	3013	AC Power Supply Circuit Breaker Open
18	3014	Consumer Circuit Breaker Open
19	3016	Door Ventilation Circuit Breaker Open
20 to 22	Reserved	
23	3511	Low Battery Shutdown
24	3510	Initiating Process Low Battery Shutdown

6.7 MODBUS-RTU COMMUNICATION

The Modbus protocol was initially developed in 1979. Currently, it is an open protocol widely used by several manufacturers in different kinds of equipment. The Modbus-RTU communication of the RTDW was developed based on the following documents:

- MODBUS Application Protocol Specification.
- MODBUS over Serial Line.

Those documents define the formats of messages used by the elements that are part of the Modbus network, the services (or functions) that can be provided via network, and how those elements exchange data on the network. Those documents are available at: **www.modbus.org**.

The standard RTDW has two distinct physical interfaces: USB and RS485. The USB interface features a standard USB type B connector and is located inside the product, on the face of the control module (check Figure 3.5 on page 3-9). This interface allows local communication with the equipment. The RS485 interface is accessible via terminals according to the design. This interface allows a network communication with more devices compatible with the Modbus-RTU.

6.7.1 Setting the Communication Parameters

In the HMI main menu, select the "[4] SETTINGS" option (Figure 6.9 on page 6-7) and then select the "[3] MODBUS" option. The HMI shows the screen shown on Figure 6.23 on page 6-25. The RTDW Modbus-RTU communication operates at 9600, 19200, 38400, 57600 or 76800 bps rates, with parity (even, odd or without) and 1 or 2 stop bits. Use the "down" or "up" key and press the "Enter" key to select the desired parameters. Select the "SAVE CHANGES" option to save the changes.

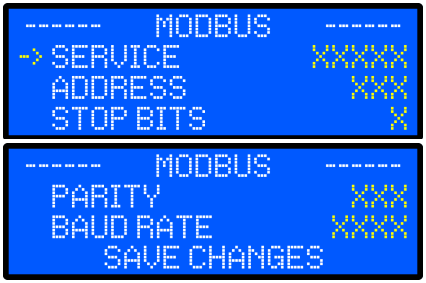

Figure 6.23: *Modbus communication parameter setting menu*

6.7.2 Termination Resistors

For each segment of the Modbus-RTU network that uses RS485, it is necessary to enable a termination resistor at the extreme points of the main bus. It is worth to mention that, in order to allow the disconnection of the element from the network without damaging the bus, it is interesting to put active terminations, which are elements that only play the role of the termination.

Thus, any device in the network can be disconnected from the bus without damaging the termination. The Digital Rectifier has termination resistors that can be turned on and off using switch S6, located in front of the control module (see Figure 3.5 on page 3-9). Resistors are added to the system when the switch is in the **on** position (downwards).

The standard RS485 communication termination resistor is connected to / disconnected from the circuit via pin 2 of switch S6, as shown in Table 6.16 on page 6-25.

Table 6.16: *Identification of termination resistors on switch S6*

Pin	Description
2	Termination resistors - Communication 1 RS485

6.7.3 Reading and Writing Parameters

For the Digital Rectifier, all the parameters were organized as Input Registers. Those registers can be read by the Read Input Registers function (code 04). In order to keep compatibility with legacy systems, those registers can be accessed as Holding Registers, via the Read Holding Registers function (code 03). The parameters can be written via the Write Single Register function (code 06).

The Digital Rectifier also supports the Read Device Identification function (code 43).

This function allows reading three strings, which represent the manufacturer's name, the product name and product software version. Table 6.17 on page 6-26 contains the parameters available on the Digital Rectifier. The "Access" column indicates if the parameter is reading/writing (RW), read only (R), write only (W).

6.7.3.1 Information on the RTDW Model

Table 6.17: Modbus parameters of the model information

Register	Access	Firmware or Description	Note
4127	R	Main	Bit 0: Identifier – beta or final version Bits 1 to 7: Identifier of the firmware version Bits 8 to 11: Identifier of the hardware generation Bits 12 to 15: Identifier of special firmware
4125	R	Expansion	
4164	R	Supervisory	
4128	R	Rectifier 1	
4167	R	Rectifier 2	
4129	R	DCU	
4165	R	Relays 1	
4166	R	Relays 2	
4126	R	HMI	
4132	R	Rated output voltage	Each unit is equivalent to 0.1 V
4133	R	Rated output current	Each unit is equivalent to 0.1 A
4135	R	Rated input frequency	Each unit is equivalent to 0.1 Hz

6.7.3.2 AC Input Voltage Measurements

Table 6.18: Modbus parameters of the AC input voltage measurements

Register	Access	Description	Note
1001	R	AC power supply effective voltage (R-S)	Each unit is equivalent to 0.1 V
1101	R	AC power supply effective voltage (S-T)	
1201	R	AC power supply effective voltage (T-R)	
1002	R	Spare AC power supply effective voltage (R-S)	
1102	R	Spare AC power supply effective voltage (S-T)	
1202	R	Spare AC power supply effective voltage (T-R)	
1004	R	Effective AC voltage at the rectifier input (R-S)	
1104	R	Effective AC voltage at the rectifier input (S-T)	
1204	R	Effective AC voltage at the rectifier input (T-R)	

6.7.3.3 DC Voltage Measurements

Table 6.19: Modbus parameters of the DC voltage measurements

Register	Access	Description	Note
54	R	Average DC voltage at the rectifier output	Each unit is equivalent to 0.1 V
56	R	Average DC voltage at the consumer output	
59	R	Average DC voltage at the battery bank	
66	R	Average DC voltage at the consumer output measured by the supervisor	
69	R	Average DC voltage on the battery bank measured by the supervisor	
89	R	Average DC voltage at the consumer output after the parallelism diode	

6.7.3.4 Electronics Supply Voltage Measurements

Table 6.20: Modbus parameters of the electronics supply voltage measurements

Register	Access	Description	Note
77	R	Main source average DC voltage (12 V) - Control	Each unit is equivalent to 0.1 V
76	R	Redundant source average DC voltage (12 V) - Control	
85	R	Main source average DC voltage (12 V) - Supervisory	
86	R	Redundant source average DC voltage (12 V) - Supervisory	
82	R	Average DC supply voltage (12 V) - Rectifier	
83	R	Hall sensor reference DC voltage (2.5 V) - Rectifier	
78	R	Average DC supply voltage (12 V) - DCU	
79	R	Average DC supply voltage (5 V) - DCU	
80	R	Hall sensor reference DC voltage (2.5 V) - DCU	
90	R	Average DC supply voltage (12 V) - Relays 1	Each unit is equivalent to 0.1 V
91	R	Average DC supply voltage (12 V) - Relays 2	

6.7.3.5 AC Input Current Measurements

Table 6.21: Modbus parameters of the AC input current measurements

Register	Access	Description	Note
301	R	AC power supply effective current (R)	Each unit is equivalent to 0.1 A
401	R	AC power supply effective current (S)	
501	R	AC power supply effective current (T)	
304	R	Effective AC current at the rectifier input (S)	
404	R	Effective AC current at the rectifier input (R)	
504	R	Effective AC current at the rectifier input (T)	

6.7.3.6 DC Current Measurements

Table 6.22: Modbus parameters of the DC current measurements

Register	Access	Description	Note
354	R	Average DC current at the rectifier output	Each unit is equivalent to 0.1 A
356	R	Average DC current at the consumer output	
357	R	Average earth leakage DC current	Each unit is equivalent to 0.1 mA
359	R	Average DC current at the battery bank	Each unit is equivalent to 0.1 A

6.7.3.7 Power Measurements

Table 6.23: Modbus parameters of the power measurements

Register	Access	Description	Note
1601	R	Main AC power supply VA power	Each unit is equivalent to 0.1 kVA
1602	R	Spare AC power supply VA power	
1604	R	Rectifier VA power	
1651	R	Main AC power supply W power	Each unit is equivalent to 0.1 kW
1652	R	Spare AC power supply W power	
1654	R	Rectifier W power	
656	R	Consumer W power	
1901	R	Charge percentage	Each unit is equivalent to 0.1 %

6.7.3.8 Temperature Measurements

Table 6.24: Modbus parameters of the temperature measurements

Register	Access	Description	Note
902	R	Panel temperature	Each unit is equivalent to 0.1 °C
901	R	Battery temperature	
903	R	Rectifier module - temperature	
904	R	Heat sink temperature - rectifier	
905	R	Module temperature - DCU	
906	R	DCU heat sink temperature 1 - output diode	
907	R	DCU heat sink temperature 2 - IBGT	
908	R	Inductor temperature - DCU	
910	R	Temperature Analog Input 1 relay module 1	
911	R	Temperature Analog Input 2 relay module 1	
912	R	Temperature Analog Input 1 relay module 2	
913	R	Temperature Analog Input 2 relay module 2	

6.7.3.9 Frequency Measurements

Table 6.25: Modbus parameters of the frequency measurements

Register	Access	Description	Note
951	R	AC power supply frequency	Each unit is equivalent to 0.1 Hz
952	R	Spare AC power supply frequency	
954	R	Rectifier input frequency	

6.7.3.10 Status of Measurement and Command Circuits

Table 6.26: Modbus parameters of the physical states

Register	Access	Description	Note
3200	R	Contactors state	Bit 0: AC power supply contactor Bit 1: Spare AC power supply contactor Bit 2: Battery contactor Bit 3: Pre-charge contactor Bit 4: Consumer contactor Bit 5: Bypass contactor
3201	R	Circuit breakers state	Bit 0: AC power supply contactor Bit 1: Spare AC power supply contactor Bit 2: Battery contactor Bit 3: Consumer contactor Bit 4: Bypass contactor
3202	R	Ventilation state	Bit 0: Door fan Bit 1: Roof fan Bit 2: Redundant door fan Bit 3: Redundant roof fan Bit 4: Rectifier fan 1 Bit 5: Rectifier fan 2 Bit 6: Redundant rectifier fan 1 Bit 7: Redundant rectifier fan 2 Bit 8: Rectifier 2 fan 1 Bit 9: Rectifier 2 fan 2 Bit 10: Redundant fan 1 of rectifier 2 Bit 11: Redundant fan 2 of rectifier 2 Bit 12: DCU fan 1 Bit 13: DCU fan 2 Bit 14: Redundant DCU fan 1 Bit 15: Redundant DCU fan 2
3212	R		Bit 0: DCU induction fan Bit 1: Redundant fan inductor DCU Bit 2: DCU fan 3 Bit 3: Redundant DCU fan 3 Bit 4: Rectifier fan 3 Bit 5: Redundant rectifier fan 3 Bit 6: Rectifier 2 fan 3 Bit 7: DCU fan 3 Bit 8: Redundant fan 3 of rectifier 2
3205	R	Bimetallic temperature measurements state	Bit 0: Bimetallic 1 temperature measurement of the MHL Bit 1: Bimetallic 2 temperature measurement of the MHL Bit 2: Bimetallic 1 temperature measurement of the rectifier Bit 3: Bimetallic 2 temperature measurement of the rectifier Bit 4: Not used Bit 5: Not used Bit 6: Bimetallic 1 temperature measurement of the DCU Bit 7: Bimetallic 2 temperature measurement of the DCU
3206	R	Dehumidifier's module state	0: On 1: Off

6.7.3.11 Operation States

Table 6.27: Modbus parameters of the operation states

Register	Access	Description	Note
3511	R	Rectifier operation mode	0: OFF 1: Voltage ramp 2: Float 3: Recharge 4: Manual float 5: Manual recharge 6: Manual equalization 7: Fast charge 8: Standby 9: Bypass voltage 10: Fault
3208	R	Rectifier state	0: OFF mode 1: ON mode 2: Standby mode 3: Fault mode
3611	R	DCU operation mode	0: OFF 1: Normal 2: Bypass 3: Manual bypass 4: Fault
3209	R	DCU state	0: OFF mode 1: ON mode 2: Standby mode 3: Fault mode

6.7.3.12 Measurement States

Table 6.28: Modbus parameters of the measurement states

Register	Access	Description	Note
2056	R	Consumer DC voltage state	Bit 0: Absent Bit 1: Average value above the maximum limit Bit 2: Average value below the minimum limit Bit 3: Value within the operating limits
2054	R	Rectifier DC voltage state	
2059	R	Battery bank DC voltage state	
2074	R	Pre-charge DC voltage status	
2356	R	Consumer DC current state	Bit 0: Absent Bit 1: Average current value above the maximum value Bit 2: Current limitation Bit 3: Current limitation via Hardware Bit 4: Value within the operating limits
2354	R	Rectifier DC current state	
2359	R	Battery bank DC current status - rectifier	
2854	R	Battery charging DC current state	Bit 0: Battery needs recharging Bit 1: Charge completed

Register	Access	Description	Note
12901	R	Main AC power supply voltage state	Bit 0: Absent Bit 1: Underfrequency Bit 2: Overfrequency Bit 3: RMS value above the maximum limit Bit 4: RMS value below the minimum limit Bit 5: Average DC voltage out of limits Bit 6: Value within the operating limits
12001	R	Main AC power supply voltage state (R-S)	
12011	R	Main AC power supply voltage state (S-T)	
12021	R	Main AC power supply voltage state (T-R)	
12902	R	Spare AC power supply voltage state	
12002	R	Spare AC power supply voltage state (R-S)	
12012	R	Spare AC power supply voltage state (S-T)	
12022	R	Spare AC power supply voltage state (T-R)	
12904	R	Rectifier AC voltage state	
12004	R	Rectifier AC voltage state (R-S)	
12014	R	Rectifier AC voltage state (S-T)	
12024	R	Rectifier AC voltage state (T-R)	
12931	R	AC power supply current state	Bit 0: Null current value Bit 1: RMS current value above the maximum value Bit 2: RMS current value below the minimum value Bit 3: DC current out of limits Bit 4: Value within the operating limits
2301	R	AC power supply current state (R)	
2401	R	AC power supply current state (S)	
2501	R	AC power supply current state (T)	
12934	R	Rectifier AC current state	
2304	R	AC current state at the rectifier input (R)	
2404	R	AC current state at the rectifier input (S)	
2505	R	AC current state at the rectifier input (T)	

6.7.3.13 Clock Settings

Table 6.29: *Modbus parameters of the clock settings*

Register	Access	Description	Note
4017	R / W	Date setting: year	
4016	R / W	Date setting: month	
4015	R / W	Date setting: day	
4014	R / W	Time setting: hour	
4013	R / W	Time setting: minute	
4007	R	Date: year	
4006	R	Date: month	
4005	R	Date: day	
4004	R	Time: hour	
4003	R	Time: minute	
4002	R	Time: second	

6.7.3.14 Modbus USB Communication Settings

Table 6.30: Modbus parameters of the Modbus USB communication settings

Register	Access	Description	Note
4900	R / W	Modbus - Address (USB serial)	
4901	R / W	Modbus - Baud Rate (USB serial)	0: 9600 bps 1: 19200 bps 2: 38400 bps 3: 57600 bps 4: 76800 bps
4902	R / W	Modbus - Parity (USB serial)	0: No parity 1: Even parity 2: Odd parity
4903	R / W	Modbus - Stop bits (USB serial)	

6.7.3.15 Modbus RS485 Communication Settings

Table 6.31: Modbus parameters of the Modbus RS485 communication settings

Register	Access	Description	Note
4910	R / W	Modbus - Address (RS485)	
4911	R / W	Modbus - Baud Rate (RS485)	0: 9600 bps 1: 19200 bps 2: 38400 bps 3: 57600 bps 4: 76800 bps
4912	R / W	Modbus - Parity (RS485)	0: No parity 1: Even parity 2: Odd parity
4913	R / W	Modbus - Stop bits (RS485)	

6.7.3.16 Memory Data

Table 6.32: Modbus parameters of the memory data

Register	Access	Description	Note
4150	R	Maximum number of events	
4151	R	Number of events in memory	
4152	R	Zero position in the event list	

6.7.3.17 Reference Settings

Table 6.33: Modbus parameters of the reference settings

Register	Access	Description	Note
6015	R/W	Maximum recharge time	Each unit is equivalent to 1.0 min
6016	R/W	Maximum equalization time	
6017	R/W	Constant current time to finish recharge	
6018	R/W	Constant current time to finish equalization	
6200	R/W	Float voltage reference	Each unit is equivalent to 0.1 V
6202	R/W	Equalization voltage reference	
6204 / 6205	R/W	Float voltage reference with thermal compensation	Value with floating point representation (32 bits). Both addresses must be read simultaneously to obtain the value. Via WPS the value is automatically converted
6206	R/W	Battery operating temperature	Each unit is equivalent to 0.1 °C
6207	R/W	Temperature compensation coefficient (+)	Each unit is equivalent to 0.01 V/°C
6208	R/W	Temperature compensation coefficient (-)	
6209	R/W	Maximum temperature for thermal compensation	Each unit is equivalent to 0.1 °C
6210	R/W	Minimum temperature for thermal compensation	
6211	R/W	Maximum voltage for thermal compensation	Each unit is equivalent to 0.1 V
6213	R/W	Minimum voltage for thermal compensation	
6300	R/W	Consumer voltage reference	

6.7.3.18 Limit Settings

Table 6.34: Modbus parameters of the limit settings

Register	Access	Description	Note
23301	R/W	Average current upper limit - input	Each unit is equivalent to 0.1 A
23304	R/W	Average current upper limit - rectifier	
23354	R/W	Average current upper limit - rectifier output	
23356	R/W	Average current upper limit - consumer	
23357	R/W	Upper limit of positive and negative earth leakage current	Each unit is equivalent to 0.1 mA
23359	R/W	Average current upper limit - battery	Each unit is equivalent to 0.1 A
23459	R/W	Upper limit of medium current - fast recharge	
23859	R/W	Battery recharge current upper limit	
24054	R/W	Average voltage lower limit - rectifier	Each unit is equivalent to 0.1 V
24056	R/W	Average voltage lower limit - consumer	
24059	R/W	Average voltage lower limit - battery	
24301	R/W	Average current lower limit - input	Each unit is equivalent to 0.1 A
24304	R/W	Average current lower limit - rectifier	
24859	R/W	Current to return to floating mode (recharge completed)	
26054	R/W	Average voltage upper limit - rectifier	Each unit is equivalent to 0.1 V
26056	R/W	Average voltage upper limit - consumer	
26059	R/W	Average voltage upper limit - battery	
33001	R/W	Upper limit of the AC power supply effective voltage - MPS	
33002	R/W	Upper limit of the AC power supply effective voltage - BPS	
33004	R/W	Upper limit of the AC power supply effective voltage - rectifier	
34001	R/W	Lower limit of the AC power supply effective voltage - MPS	
34002	R/W	Lower limit of the AC power supply effective voltage - BPS	
34004	R/W	Lower limit of the AC power supply effective voltage - rectifier	

6.7.3.19 LVD Limit Settings

Table 6.35: Modbus Parameters of the LVD limit settings measurements

Register	Access	Description	Note
4147	R/W	Setting of the system shutdown time due to low battery voltage	Each unit is equivalent to 1 min
22059	R/W	Battery disconnection voltage Low Voltage Disconnect (LVD)	Each unit is equivalent to 0.1 V

6.7.3.20 Commands

Table 6.36: Modbus parameters of the commands

Register	Access	Description	Note
5000	R / W	Command request	11. Turn on the RTDW in general (rectifier and output converter) 255: Turn off the RTDW in general (rectifier and output converter) 21: Turn on the rectifier 22: Turn off the rectifier 31: Turn on DCU 32: Turn off DCU 35: Enable manual bypass 36: Disable manual bypass 37: Reset of bypass at DCU 50: Battery charge: automatic mode 51: Battery charge: manual float 52: Battery charge: manual recharge 53: Battery charge: manual equalization 54: Battery charge: fast charging 57: Enable thermal compensation 58: Disable thermal compensation 128: Enable sound signaling 129: Disable sound signaling 130: Enable synoptic panel on the HMI 131: Disable synoptic panel on the HMI 150: Update leakage current configuration 160: Update Modbus settings (serial USB) 161: Update Modbus settings (RS485) 170: Update consumer settings 180: Update battery settings 190: Update input settings 200: Activate supervisor system 210: Deactivate supervisor system 240: Restore factory default

6.8 ADDITIONAL SETTINGS

6.8.1 Synoptic Panel and Sound Alarm Settings

In the RTDW settings menu, you can enable or disable the synoptic panel and the buzzer. Both parameters come enabled from the factory. To change this status, in the HMI main menu (Figure 6.2 on page 6-2), select "[4] SETTINGS" (Figure 6.24 on page 6-37) and then the "[1] BUZZER" or "[2] SYNOPTIC".

In the alarm or synoptic panel settings, the HMI displays the screen of Figure 6.25 on page 6-37 or Figure 6.26 on page 6-37, respectively, where you can use the "down," "up" and "Enter" keys to select the desired option. Then use the navigation keys to confirm the command (Figure 6.27 on page 6-37).

The intermittence of the audible alarm defines the criticality of the event, as follows:

Serious: continuous.

Attention required: 1 beep per second or 2 and 3 beeps every 30 seconds.

Warnings: one or three beeps.

Table 6.37: *Audible alarm description*

Beeps (1)	Events
1	AC Power Supply Circuit Breaker Open
	Bypass Circuit Breaker Closed
	Battery Circuit Breaker Open
	Consumer's Circuit Breaker Open
	DCU in Manual Bypass
	DCU in Automatic Bypass
	DCU in Bypass by the Supervisor
	Panel Ventilation Circuit Breaker Open
3	AVG Overtemperature - DCU
	AVG Overtemperature - DDU
	AVG Overtemperature - Rectifier
	AVG Overtemperature - Battery
	AVG Overtemperature - Panel
	Ventilation Fault
2 every 30 seconds	AVG Overvoltage - Consumer's Output
	AVG Undervoltage - Consumer's Output
	AVG Overvoltage - Battery
	Battery Charging Overcurrent
3 every 30 seconds	DCU Fault
	Phase Loss Fault
	Phase Sequence Fault
	Thyristor Pulse Fault
	Low Battery Shutdown
	Starting Low Battery Shutdown Process
1 per second	Failure to identify the Power Modules
	Failure to communicate with the Power Modules
Continuous	Battery Charger Failure

(1) By pressing the MENU/ESC key, the alarm will be silenced until a new event occurs.

NOTE!
The Buzzer is characterized by beeps with intervals as shown in Table 6.37 on page 6-36. To check and determine the fault, see the status indicated on the Synoptic Panel.

NOTE!
The Synoptic Panel, even if disabled, will light up temporarily when any key is pressed, turning off again after 35 seconds.

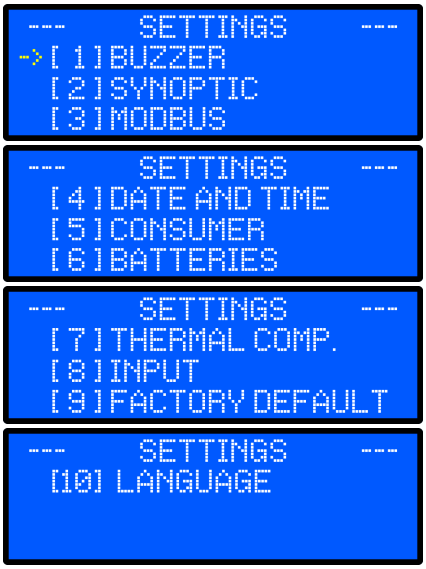

Figure 6.24: *Settings menu*

Figure 6.25: *Sound alarm settings menu*

Figure 6.26: *Synoptic panel settings menu*

Figure 6.27: *Command confirmation menu*

6.8.2 Consumer Settings

In this menu, you can set the output voltage value, the current limit value in the consumer, and the under and overvoltage values for alarms and bypass.

By default, these variables have the values already set, meeting the design specifications.

In the HMI main menu, select the "[4] SETTINGS" option (Figure 6.24 on page 6-37) and then select the "[5] CONSUMER" option. The HMI displays the screen shown in Figure 6.28 on page 6-39.

To set the consumer voltage value, use the "down" or "up" keys to navigate and choose "REF. VOLTAGE". The setting mode screen is displayed (Figure 6.29 on page 6-39). Select the desired voltage and press "Enter". To save the changes, press the "Menu/ESC" key, returning to the "[5] CONSUMER" setting screen (Figure 6.28 on page 6-39) Select the "SAVE CHANGES" option to save the changes.

To set the consumer current limit value, use the "down", "up" and "Enter" keys to navigate and choose "CURRENT LIM". The setting mode screen is displayed (Figure 6.29 on page 6-39). Select the desired current and press "Enter". To save the changes, press the "Menu/ESC" key, returning to the "[5] CONSUMER" setting screen (Figure 6.28 on page 6-39). Select the "SAVE CHANGES" option to save the changes.

To change the consumer undervoltage value, use the "down", "up" and "Enter" key to navigate, and choose "UNDERVOLTAGE". The setting mode screen is displayed (Figure 6.29 on page 6-39). Select the desired voltage and press "Enter". To save the changes, press the "Menu/ESC" key, returning to the "[5] CONSUMER" setting screen (Figure 6.28 on page 6-39) Select the "SAVE CHANGES" option to save the changes.

To change the consumer overvoltage value, use the "down", "up" and "Enter" keys to navigate and choose "OVERVOLTAGE". The setting mode screen is displayed (Figure 6.29 on page 6-39). Select the desired voltage and press "Enter". To save the changes, press the "Menu/ESC" key, returning to the "[5] CONSUMER" setting screen (Figure 6.28 on page 6-39). Select the "SAVE CHANGES" option to save the changes.

6.8.3 Battery Charger Settings

The adjustable parameters of the battery charger are: the floating voltage, battery charging voltage and battery charging current. To view the values, access the main menu of the HMI, select the "[4] SETTINGS" option (Figure 6.24 on page 6-37) and then select the "[6] BATTERIES" option. The HMI displays the screen shown in Figure 6.30 on page 6-40.

To change the battery floating voltage value, use the "down", "up" and "Enter" keys to navigate and choose "FLOAT.REF.". The setting mode screen is displayed (Figure 6.29 on page 6-39). Select the desired voltage and press "Enter". To save the changes, press the "Menu/ESC" key, returning to the "[6] BATTERIES" setting screen (Figure 6.30 on page 6-40) Select the "SAVE CHANGES" option to save the changes.

To change the battery charging voltage value, use the "down", "up" and "Enter" keys to navigate and select "CHARG.REF.". The setting mode screen is displayed (Figure 6.29 on page 6-39). Select the desired voltage and press "Enter". To save the changes, press the "Menu/ESC" key, returning to the "[6] BATTERIES" setting screen (Figure 6.30 on page 6-40). Select the "SAVE CHANGES" option to save the changes.

To change the battery charging current value, use the "down", "up" and "Enter" keys to navigate and choose "CURR.CHARG.". The adjustment mode screen is displayed (Figure 6.29 on page 6-39). Select the desired charging current and confirm with "Enter". For save the changes made, press the "Menu/ESC" key returning to the configuration screen "[6] BATTERIES" (Figure 6.30 on page 6-40) and select the "SAVE CHANGES" option.

NOTE!
It is recommended to set the charging current according to the manual of the battery used. For example, for 100 Ah batteries, the recommended charging current is 10 A. (Table 7.2 on page 7-1).

6.8.4 Input AC Power Supply Settings

The adjustable parameters of the AC power supply are the undervoltage and overvoltage values used in the alarms. To view the values, access the main menu of the HMI, select the "[4] SETTINGS" option (Figure 6.24 on page 6-37) and then select the "[7] INPUT" option. The HMI displays the screen shown in Figure 6.31 on page 6-40.

To change the AC input undervoltage value, use the "down", "up" and "Enter" keys to navigate and choose "UNDERVOLTAGE". The setting mode screen is displayed (Figure 6.29 on page 6-39). Select the desired voltage and press "Enter". To save the changes, press the "Menu/ESC" key, returning to the "[7] INPUT" setting screen (Figure 6.31 on page 6-40). Select the "SAVE CHANGES" option to save the changes.

To change the AC input overvoltage value, use the "down", "up" and "Enter" keys to navigate and choose "OVERVOLTAGE". The setting mode screen is displayed (Figure 6.29 on page 6-39). Select the desired voltage and press "Enter". To save the changes, press the "Menu/ESC" key, returning to the "[7] INPUT" setting screen (Figure 6.31 on page 6-40). Select the "SAVE CHANGES" option to save the changes.

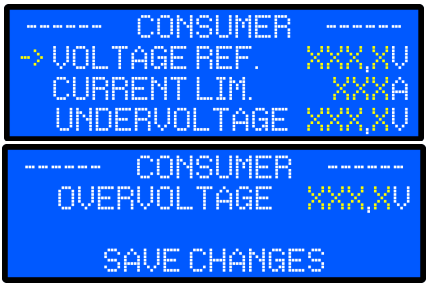

Figure 6.28: *Consumer parameter setting menu*

Figure 6.29: *Voltage/current setting menu*

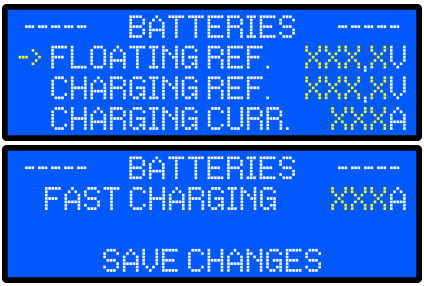

Figure 6.30: *Battery charger parameter setting menu*

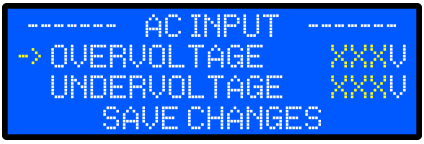

Figure 6.31: *Input AC power supply parameter setting menu*

6.8.5 Setting the Earth Leakage Current Alarm

The RTDW has an earth leakage current reading system, which has a visual indication in the synoptic panel. By default, the product is set to signal when the earth leakage current exceeds 10 mA.

This value can be set via Modbus communication (Section 6.7.3.18 Limit Settings on page 6-34), at address 23357. At this address, you can "write" the desired earth leakage current value, multiplied by 10.

For example, if the desired value is 25 mA, the value that must be "written" is 250. The minimum and maximum values that can be set are shown in Table 6.38 on page 6-40.

Table 6.38: *Minimum and maximum values of the earth leakage current reading*

RTDW Model	Minimum Value	Maximum Value
110 V	5 mA	75 mA
125 V		

6.8.6 Language Settings

The RTDW HMI has full translation into three languages (Portuguese, Spanish and English), which can be switched during product use at any time through the settings menu.

To change the language, in the HMI main menu, select the option "[4] SETTINGS" (Figure 6.24 on page 6-37) and then select the option "[10] LANGUAGE". The screen shown in Figure 6.32 on page 6-41 is displayed on the HMI. To select one of the languages, use the "Down", "Up" and "Enter" keys to navigate and choose the desired option.

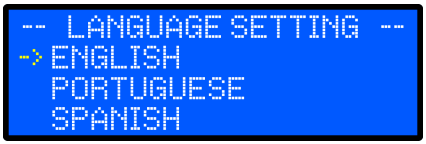

Figure 6.32: Language Menu

6.9 MONITORING VIA WPS SOFTWARE - WEG PROGRAMMING SUITE

The RTDW uses the WPS software for local parameter setting and monitoring via the product standard serial communication(1). The software configuration for monitoring the equipment is presented in the following sections.

NOTE!
The WPS Software is available for download from the website: **www.weg.net**.

(1) Modbus-RTU protocol in RS485 standard.

6.9.1 WPS Configuration

After downloading and installing the WPS software, it is necessary to configure the RTDW monitoring. When you start the WPS software, it displays the home screen shown in Figure 6.33 on page 6-41.

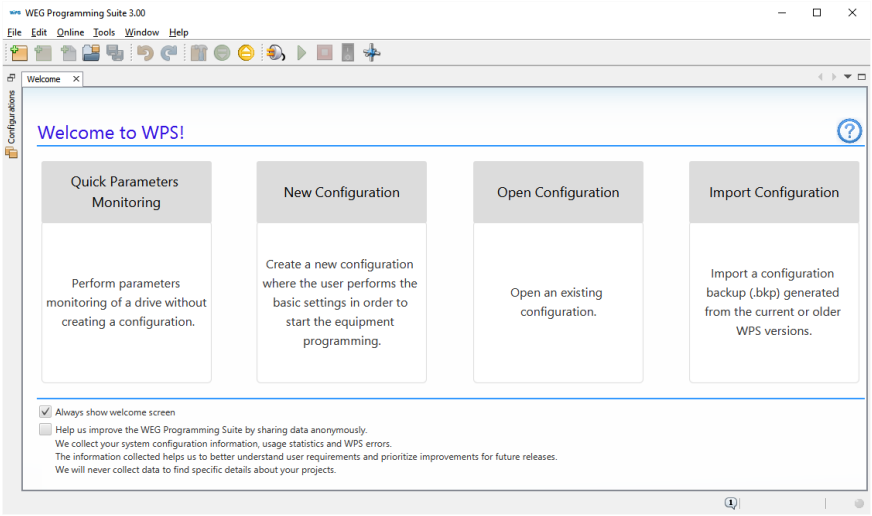

Figure 6.33: WPS software home screen

The procedures for setting the RTDW are described below.

- In the "File" tab, select "New Settings".
- Figure 6.34 on page 6-42 shows the fields to be filled in for the first step of the settings.

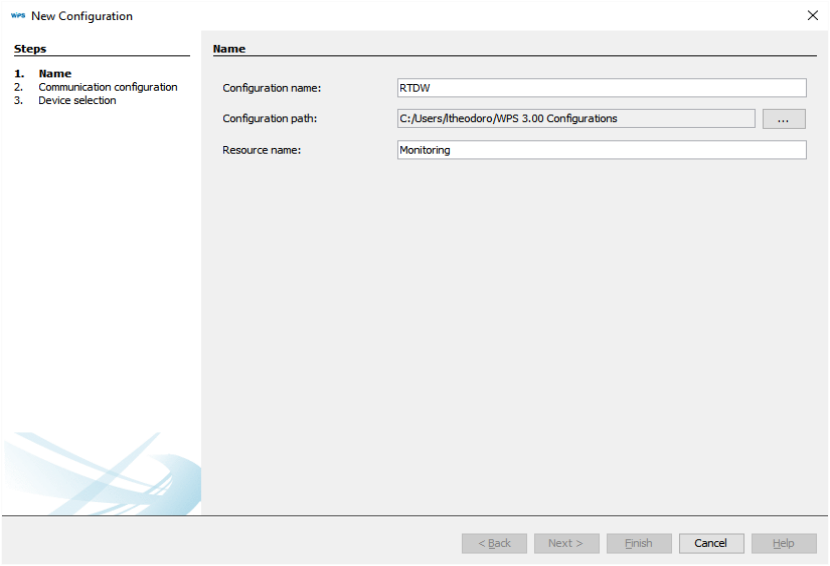

Figure 6.34: *Setting the initial parameters*

- Fill in the "Configuration name" and "Resource name" fields, define the location where the information will be saved and proceed to the next step, as shown in Figure 6.35 on page 6-42.

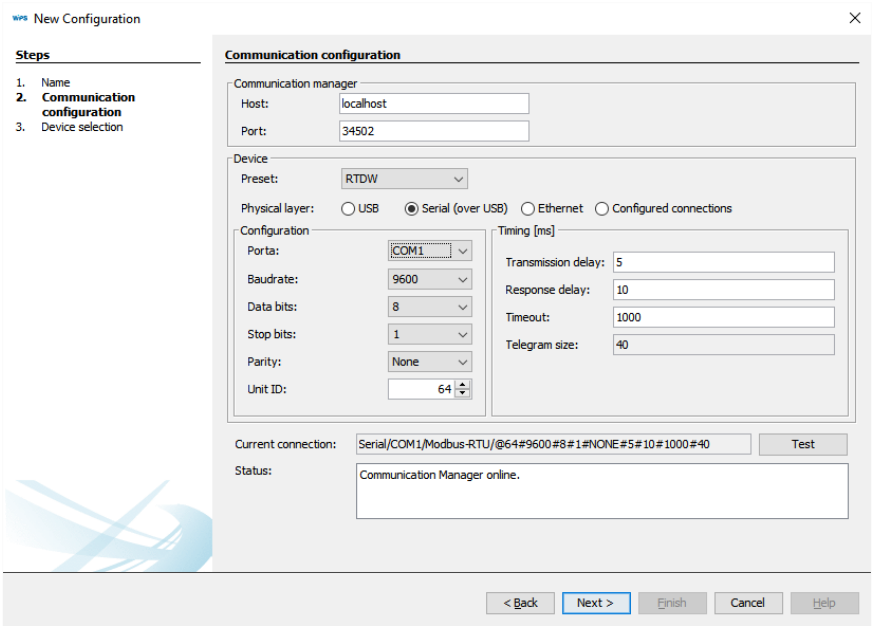

Figure 6.35: *Communication settings*

- In the "Device / Preset" list, look for the "RTDW" option.
- The initial settings will be filled with preset values.
- Check the unit ID and COM Port address according to your application.
- In "Times [ms]", the following parameters must be used:
- Transmission delay: 5.
- Response delay: 10.
- Timeout: 1000.
- Connect the RTDW to the PC (2).
- Check the communication with the product by pressing the "Test" button.
- Proceed to the next screen (device selection) as shown in Figure 6.36 on page 6-43.

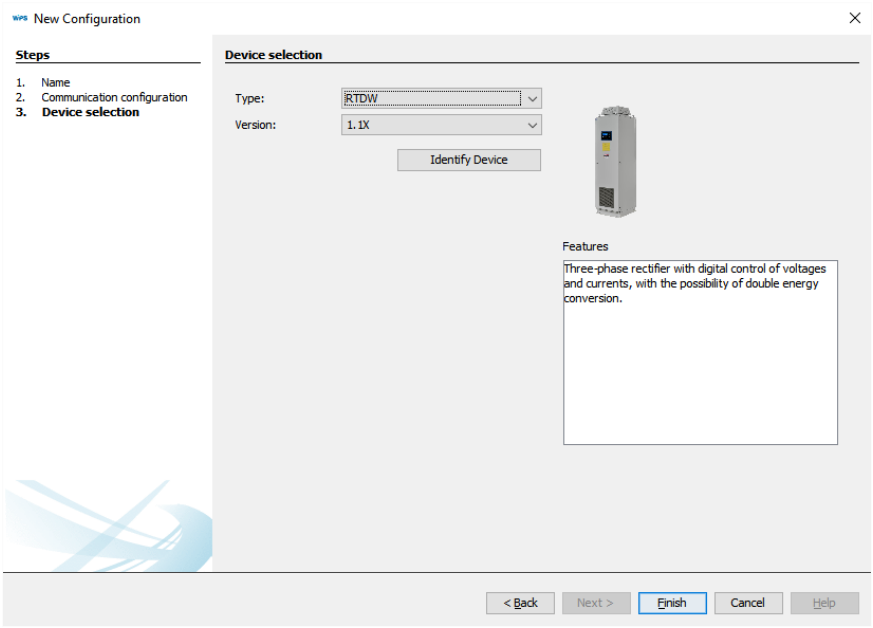

Figure 6.36: *Device settings*

(2) For further information, see Item 5.3.3 Connecting the RS485 Communication on page 5-2 or Item 5.3.4 Connecting the USB Communication on page 5-2.

- In the "Type" list, look for the "RTDW" option.
- The "Identify Device" button can be pressed to check the device name and its respective firmware version.
- Press "Finish" to complete the monitoring system configuration process.

6.9.2 Calibration of Readings

After completing the system configuration, if necessary, it is possible to calibrate all available voltage and current quantities.

- In the "Settings" tab, open on the left, as shown in Figure 6.37 on page 6-44, find the Wizards option and double click to open it.

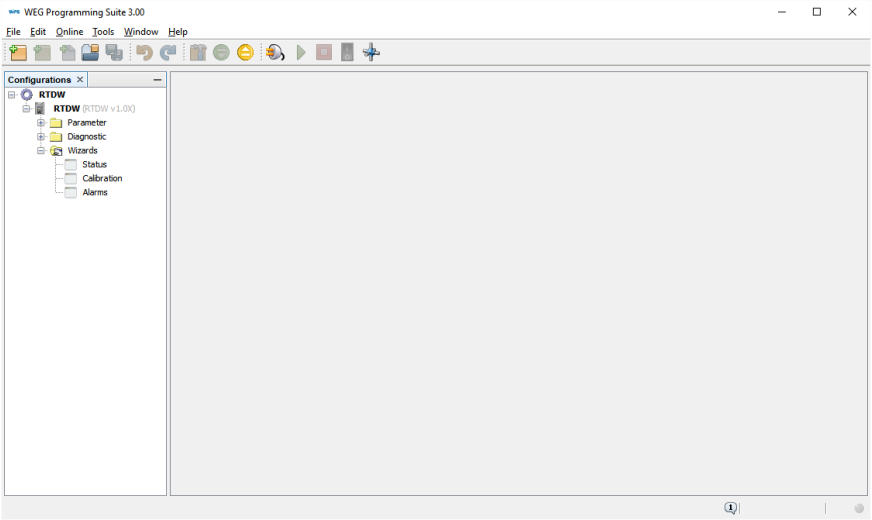

Figure 6.37: *Available wizards*

- With a double click, open the Calibration wizard, Figure 6.38 on page 6-45. Through this wizard, it is possible to calibrate the current and voltage gain and offset available in the RTDW, in addition to returning to the original values (Reset).

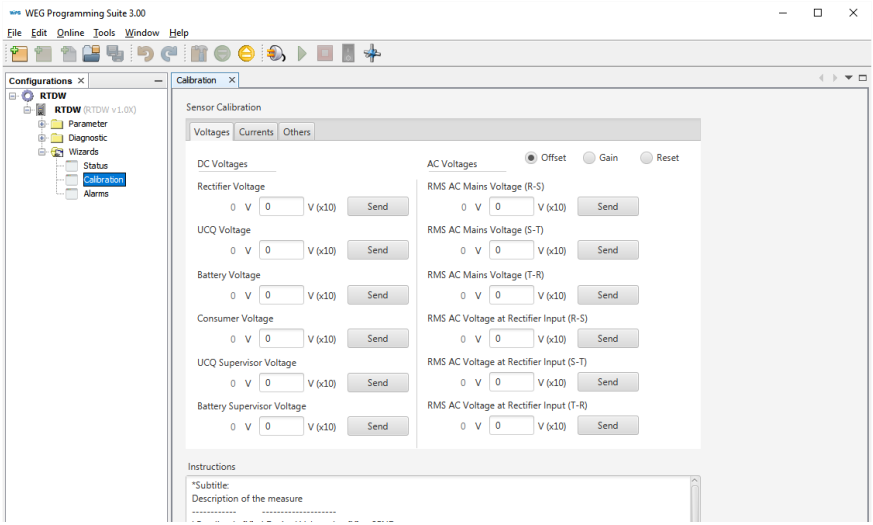

Figure 6.38: *Calibration wizard*

- To perform the calibration, select the tab of the electrical measurement to be adjusted (Voltage or Current), as shown in Figure 6.39 on page 6-46 and Figure 6.40 on page 6-46.

- The first field of each electrical measurement refers to the value read (online) by the RTDW, and the second field is the new calibration value **(1)** that will be sent.

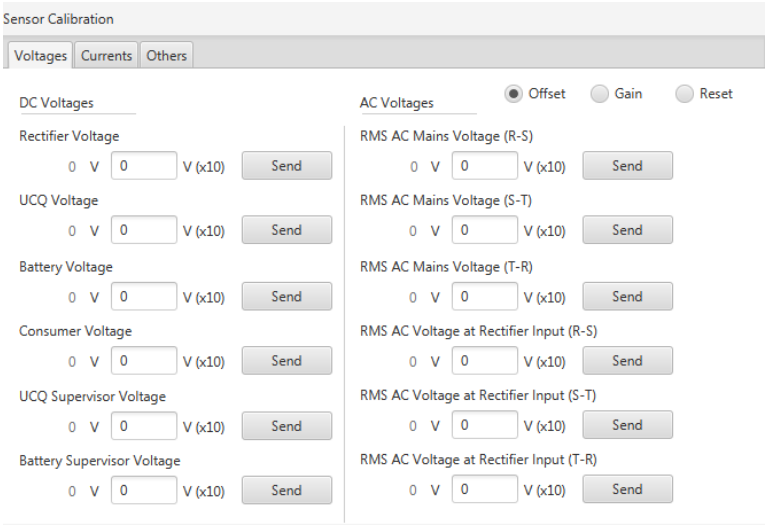

Figure 6.39: *Calibration of voltage readings*

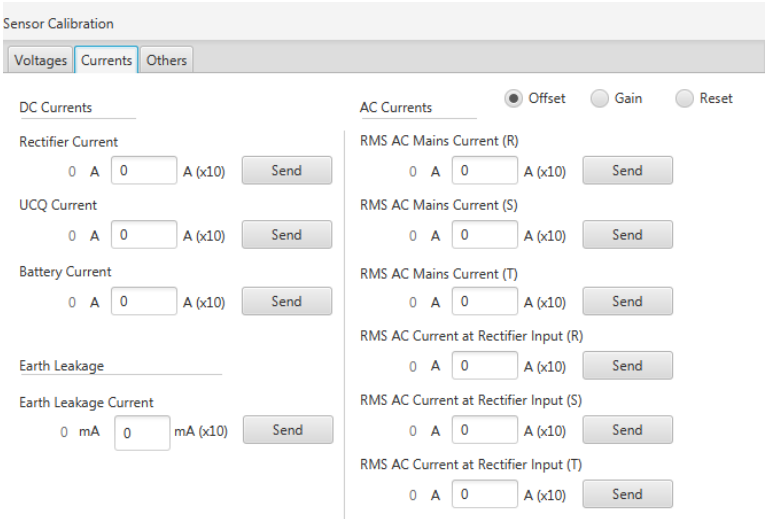

Figure 6.40: *Calibration of current readings*

Recommendations for Offset calibration:

- The RTDW must be powered by the AC power supply or battery.
- Rectifier and DCU must be in the Off state.
- Select the "Offset" marker.
- Enter the new offset (1) to be discounted/added.
- Click on the Send button.

Wait for the value to be updated.

Recommendations for Gain calibration:

- Switch on the RTDW in nominal operation (2) (entire system).
- Select the "Gain" marker.
- Enter the new value (1) to be recorded (multimeter reading).
- Click on the Send button. The gain is calculated automatically.
- Wait for the value to be updated.

Recommendations for resetting existing calibrations:

- Select the "Reset" marker.
- Enter value "0" and click on the Send button.
- Wait for the value to be updated.

(1) Values entered must be multiplied by 10 (e.g.: for -1.0 V enter -10 or for 0.3 V enter 3).
(2) For greater accuracy in calibration, it is imperative that the equipment be in rated operating conditions.

6.9.3 Monitoring the RTDW via WPS

The equipment can be monitored through its parameter table or Status wizard. This information can be accessed according to the procedure presented below.

6.9.3.1 Monitoring via Parameters

- In the "Settings" tab on the left side of the screen, click and open the "Parameters" folder as shown in Figure 6.41 on page 6-48.

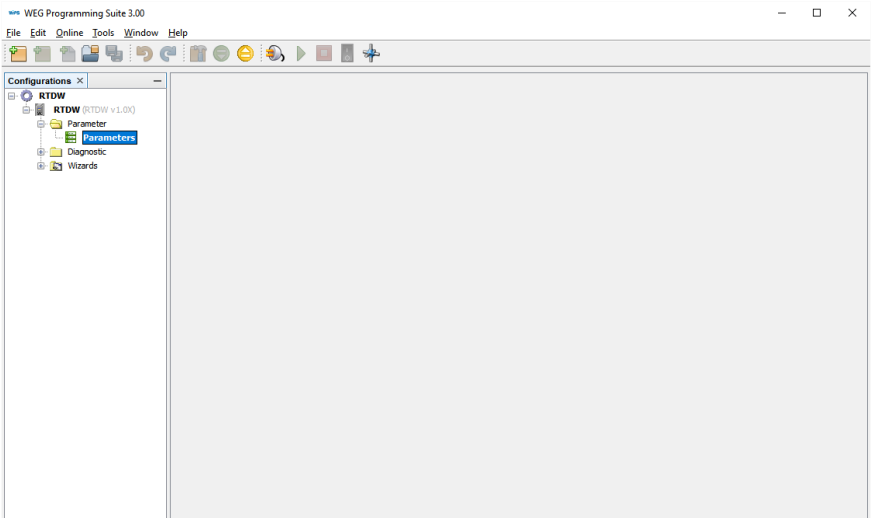

Figure 6.41: *Available settings*

- By double-clicking on "Parameters", see the parameter table available for monitoring the RTDW, as shown in Figure 6.42 on page 6-48.

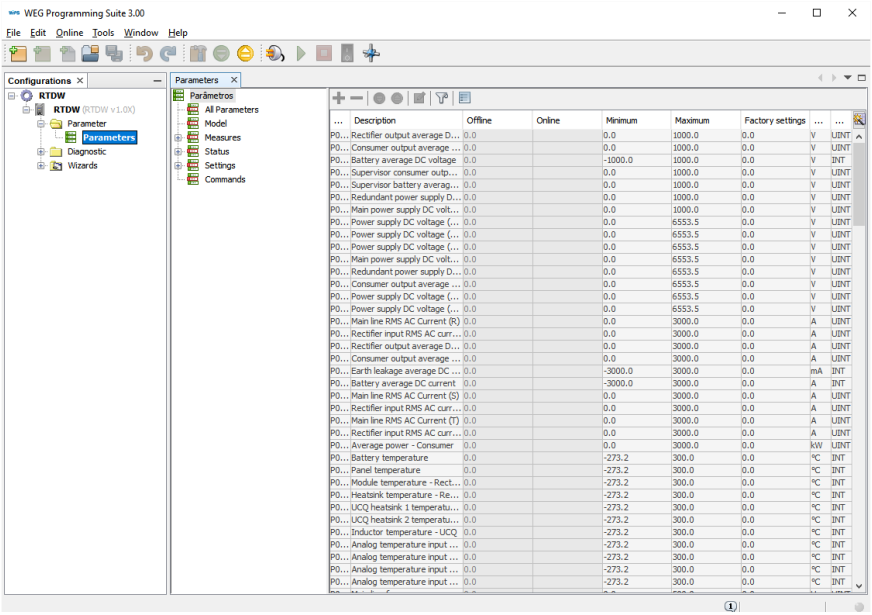

Figure 6.42: *Parameter table*

- To update the values, on the "Online" tab, access the "Connect Device" option or press the F9 key.
- At this point, all parameters available to monitor the RTDW start to be constantly updated.

6.9.3.2 Monitoring via Status Wizard

- In the "Settings" tab opened on the left side, as shown in Figure 6.37 on page 6-44, find and double-click to open the Wizards option.

- With a double click, open the Status wizard. Through this wizard, it is possible to monitor and command the entire RTDW operation, as shown in Figure 6.43 on page 6-49.

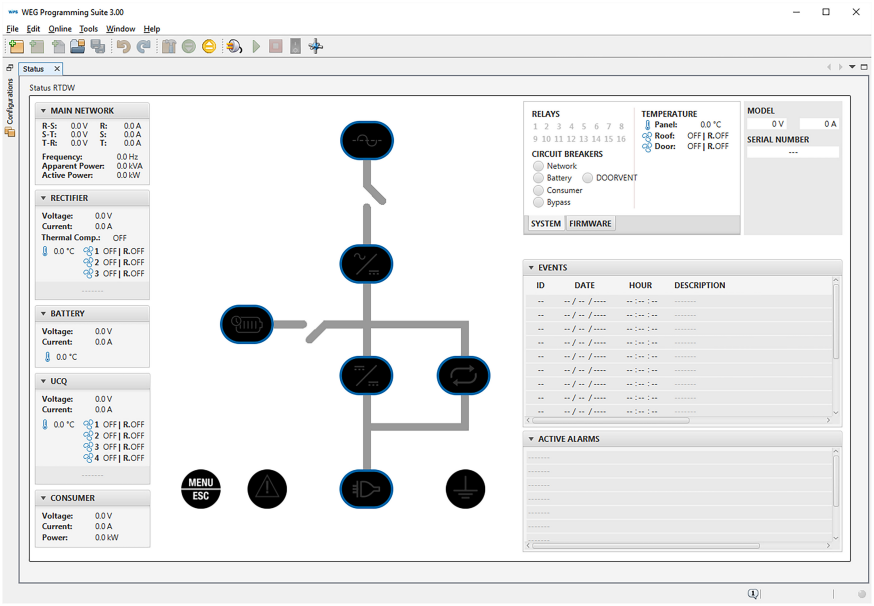

Figure 6.43: *Status Assistant - Synoptic Panel*

NOTE!
For additional information regarding the settings, operation and features available on the WPS, refer to the software manual available on the website: **www.weg.net**.

7 TECHNICAL DATA

This chapter contains the technical data (electrical and mechanical) of the RTDW.

7.1 POWER DATA

Table 7.1: *AC Input Data*

Supply Voltage	220 / 380 / 440 / 480 V ± 10 % **(1)** (Other on request)
Frequency	60 Hz or 50 Hz ± 5 %
Power Supply System	Three-phase
Current Imbalance	< 5 %
Power Factor	> 0.85 (Standard) or > 0,92 (On request)
Filter	Harmonic Filter **(2)**
Protection/Disconnection	Circuit Breaker/Contactor

(1) Rectifier in float.
(2) Element responsible for filtering the harmonics generated by the RTDW.

Table 7.2: *Rectifier output data*

	110 V	**125 V**
Floating Voltage	122.5 V	136 V
Ripple	≤ 2 % without battery and ≤ 1 % with battery	
Recharging Voltage	130.5 V	145 V
Discharging Voltage	108 V	120 V
Battery Charge (1)	C10 (Ah/10 h) or as recommended by the manufacturer **Current:** adjustable from 1 % (minimum 1 A) to 50 % of In **Fast Charge:** adjustable from 1 % (minimum 1 A) to 75 % of In	

(1) The defined value does not limit the consumer output, which continues as a priority in the operation (without reservations).

Table 7.3: *Consumer output data*

Rated Voltage	**110 V**	**125 V**
Rated Current	15 A to 200 A	
Ripple (1)	≤ 2 % without battery and ≤ 1 % with battery	
Efficiency	≥ 85 %	
Output current Limitation (1)	Adjustable between 50 % and 100 % of In	
Static Regulation (1)	≤ ± 1 % for variations from 10 % to 105 % In	
Dynamic Regulation (2)	2 % in 50 ms and 1 % in 100 ms @ ± 15 % overshoot for load step of 10 % to 100 % In	
Insulation	> 5 Mega ohms	

(1) Specification for standard equipment with DCU.
(2) With battery.

7.2 GENERAL DATA

Table 7.4: Operating conditions

Operating Duty	Continuous
Temperature Range	0 to 40 °C (32 to 104 °F)
Relative Humidity	0 to 95 % non-condensing
Altitude	Up to 1000 m above sea level (1)
Ventilation	Forced with fan
	Natural (On request)
Redundant Ventilation	Forced with fan (On request)
Noise Level	< 75 dB
Earth Leakage	5 to 75 mA

(1) From 1000 m to 4000 m (3.300 ft to 13.200 ft), consider 1 % derating in the consumer current for each 100 m above 1000 m of altitude.

Table 7.5: Temperature setpoints

Battery Overtemperature	45 °C [113 °F]
Panel Overtemperature	80 °C [176 °F]
Rectifier Overtemperature	95 °C [203 °F]
DCU Overtemperature	100 °C [212 °F]
Temperature to Turn on the Panel Fan	40 °C [104 °F]
Temperature to Turn on the Rectifier Fans	55 °C [131 °F]
Temperature to Turn on the DCU Fans	60 °C [140 °F]

Table 7.6: Available protections

Circuit Breakers	AC Power Supply, Battery, Consumer, Manual Bypass, Sources and Panel Ventilation
Contactor (Standard)	AC Power Supply, Pre-charge and Battery
Contactor (on Request)	Spare AC Power Supply and Consumer
Limitations (1) (2)	Rectifier output current, consumer current, charging current and battery discharge
Others	Hardware protection against overcurrent and overvoltage at the consumer and at the rectifier output

(1) When the Bypass is enabled, only the battery and circuit breaker limitations remain.
(2) Current limitation for the consumer is only available on equipment with DCU.

Table 7.7: Remote Interface

Standard	USB communication with Modbus-RTU protocol
	RS485 interface with Modbus-RTU protocol
	8 NO and NC dry contacts Capacity: 10 A to 277 Vac or 7 A to 30 Vdc Connection: maximum gauge 2.5 mm²
Optional	8 extra dry contacts. (same as above)

7.3 MECHANICAL DATA

Table 7.8: Construction data

Panel	Stand-alone with structure for fastening it to the floor and lifting handles
Painting	Epoxy resin with electrostatic powder application
Color	RAL 7035
Protection Rating	IP42
Plate Thickness	12 USG (2.65 mm) Base
	14 USG (1.90 mm) Frame, body, side and frame bracket, mounting plate and front plate
	16 USG (1.50 mm) Frame, side, top, vertical reinforcement of the door and cable tie bracket
	20 USG (0.90 mm) Rear Wall and Bottom

Table 7.9: Product dimensions

Model (A)	**15**	**25**	**35**	**50**	**75**	**100**	**125**	**150**	**200**
Dimensions - H x A x P (mm)	1718 x 600 x 650			2118 x 600 x 650			2118 x 800 x 650		

Note: The dimensions shown above are for standard products with DCU. For special projects, refer to the design.

Table 7.10: Thermal Dissipation

	Thermal Dissipation (W)								
Model (A)	**15**	**25**	**35**	**50**	**75**	**100**	**125**	**150**	**200**
Thermal Dissipation (W)	331	551	772	1103	1654	2206	2757	3309	4412

NOTE!
Indicated Dimensions, Weight and Thermal Dissipation values are only applicable to standard models with DCU. For models with DDU, the values tend to be higher, as specified in the project.

7.4 STANDARDS

Table 7.11: Applicable standards

IEC 62040-1 **IEC 62040-3** **IEC 62040-5-3**	Uninterruptible power systems (UPS)

8 PREVENTIVE MAINTENANCE

To ensure the equipment operation and extend its useful life, it is recommended to carry out periodic preventive maintenance every 6 months. The procedures for the maintenance jobs described below must be performed by a trained and authorized technician:

- Clear the product air inlets.
- Check the ventilation system.
- Check the mechanical connections.
- Measure the battery bank.
- Check the input, output and grounding connections.
- Check the event log and other parameters of the equipment.

NOTE!
The "Start-up and preventive maintenance checklist" is available in the Download Center, at the end of the product page on the WEG website (**www.weg.net**), which serves as a guide during the RTDW preventive maintenance.

ATTENTION!
Before beginning the maintenance jobs, check if voltage is not present on the terminals.

8.1 RESET TO FACTORY DEFAULT PARAMETERS

The RTDW has a functionality which resets all the settings to their factory values. To perform the reset, use the "down", "up" and "enter" keys to navigate through the HMI main menu (Figure 6.2 on page 6-2), select "[5] SETTINGS" and then "[9] FACTORY DEFAULT". The setting confirmation menu screen is displayed (Figure 6.8 on page 6-7). Use the "down" or "up" keys and press the "Enter" key in the "YES" option.

Factory reset can also be performed remotely via ModBus communication. Via the communication interface, send the "password" 7139 to address 5550, then send command 240 to address 5001.

8.2 PROCEDURE TO ENTER THE MAINTENANCE MODE (MANUAL BYPASS)

ATTENTION!
During this operation, the consumer will be supplied by the batteries; therefore, check the battery conditions.

To service the equipment and keep the consumer powered, follow the instructions below:

1. Open the AC POWER SUPPLY circuit breaker (Q1).
2. Close the MANUAL BYPASS circuit breaker (Q4).
3. Open the BATTERY circuit breaker (Q2) and the CONSUMER circuit breaker (Q3).
4. Check the bus voltage and discharge it properly if the capacitors are charged.
5. Perform the maintenance.

DANGER!
Measure the voltage on the bus before servicing the equipment. If the capacitors are still charged, discharge them correctly.

8.3 PROCEDURE TO EXIT THE MAINTENANCE MODE (MANUAL BYPASS)

After the maintenance is performed, check that all connectors and bars are correctly attached. To restart the product:

1. CLOSE the AC POWER SUPPLY circuit breaker (Q1).
2. Set the clock as described in the Item 6.2.1 Date and Time Settings on page 6-2.
3. Check and make the additional settings if necessary (Section 6.8 ADDITIONAL SETTINGS on page 6-35).
4. TURN ON the rectifier using the commands described in Item 6.3.3 Turning the Rectifier On and Off on page 6-5.
5. Check that the voltage at the rectifier output is correct.
6. CLOSE the BATTERY circuit breaker (Q2). If the product has a BATTERY contactor (K2), follow the procedure described in Item 6.3.6 Battery Charger's Operating Modes on page 6-6.
7. Check the battery charge (current and voltage) using the HMI measurements menu.
8. TURN ON the consumer using the commands described in Section 6.3 RTDW´S OPERATION on page 6-4. e Item 6.3.4 Turning the Consumer On and Off on page 6-5.

9. Check on the HMI if the consumer voltage is correct.

10. CLOSE the CONSUMER circuit breaker (Q3).

11. OPEN the BYPASS circuit breaker (Q4).

8.4 BATTERY MAINTENANCE

The battery bank is a vital component for the correct operation of the equipment. It is recommended to carefully follow the maintenance directions according to the manufacturer's manual of the purchased battery.

ATTENTION!
In addition to the equipment, the batteries also require periodic maintenance. Refer to the battery manufacturer's manual for details on procedures and maintenance periods.

Whenever the equipment undergoes preventive/corrective maintenance, it is important:

- Check the terminal torque of all batteries.
- Check the integrity of the battery pack.
- Check the voltage of each battery.
- Check the total voltage of the battery bank.

ATTENTION!
To safeguard the performance and warranty of the batteries, do not keep the equipment turned off for a period of more than 4 months. If it is necessary to keep the equipment turned off for a long period without use, at most every 4 months, turn on the equipment with the batteries connected. Thus, they will be recharged, without compromising their useful life.

DANGER!
Immediately disconnect the battery bank from the equipment when a failure or abnormal behavior is detected, such as: voltage variations, batteries with very low or very high voltage (10 % above or below the general average of the other elements of the bank), puffed batteries, smoke or flames, repetitive/constant low or high battery alarms, or repeated battery bank test failures.

To disconnect the battery bank, follow the procedure below:

- TURN OFF the entire system using the On/Off Key (Item 6.3.1 Turning the System On and Off Via the Commands Menu on page 6-5) or via the commands menu.
- OPEN the BATTERY circuit breaker (Q2).
- OPEN the BYPASS circuit breaker (Q4).
- OPEN the circuit breaker located on the battery bank.
- Disconnect the cables that connect the RTDW to the battery bank.

Even if the fault has ceased, do not turn the product back on and contact the authorized service center.

ATTENTION!
BATTERY DISPOSAL.
At the end of its service life, do not dispose of the battery in household, commercial or industrial waste. The batteries contain toxic electrolyte harmful to human beings and to the environment. Dispose of the batteries according to CONAMA Resolution 401/08. Refer to the battery manual for their proper disposal at the end of their service life. If you have any questions, forward them to our authorized service center or contact WEG.

APPENDIX

Views

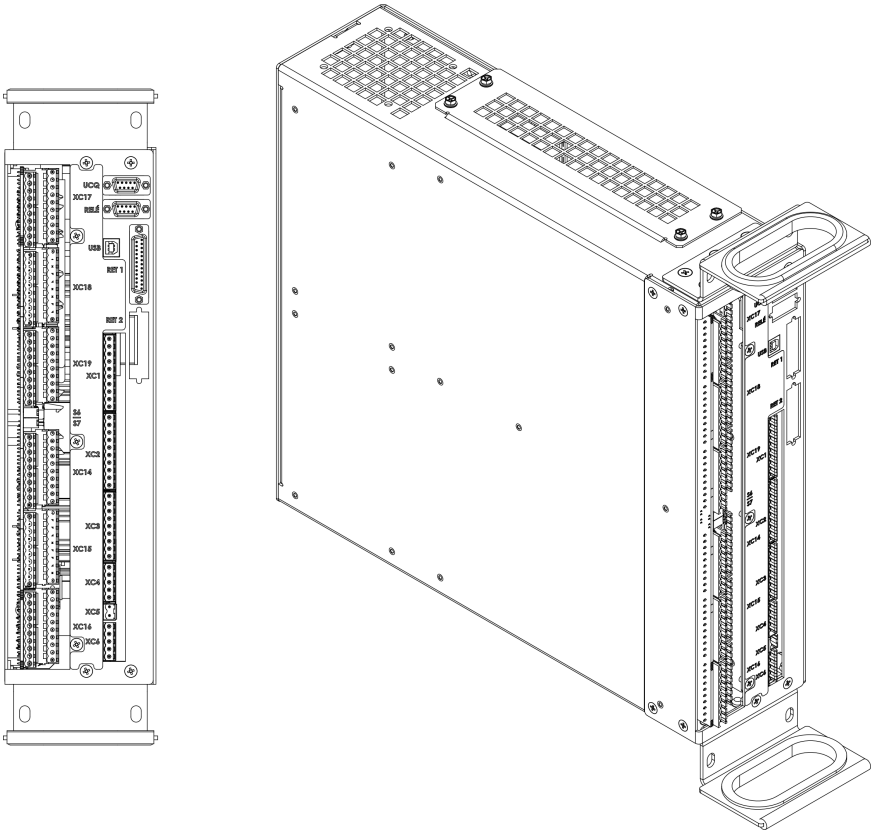

Figure A.1: *Control module (A4)*

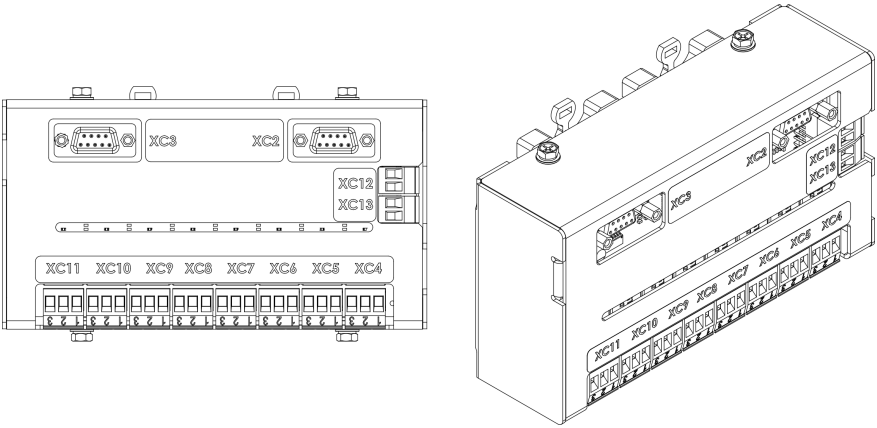

Figure A.2: *Relay module (A5)*

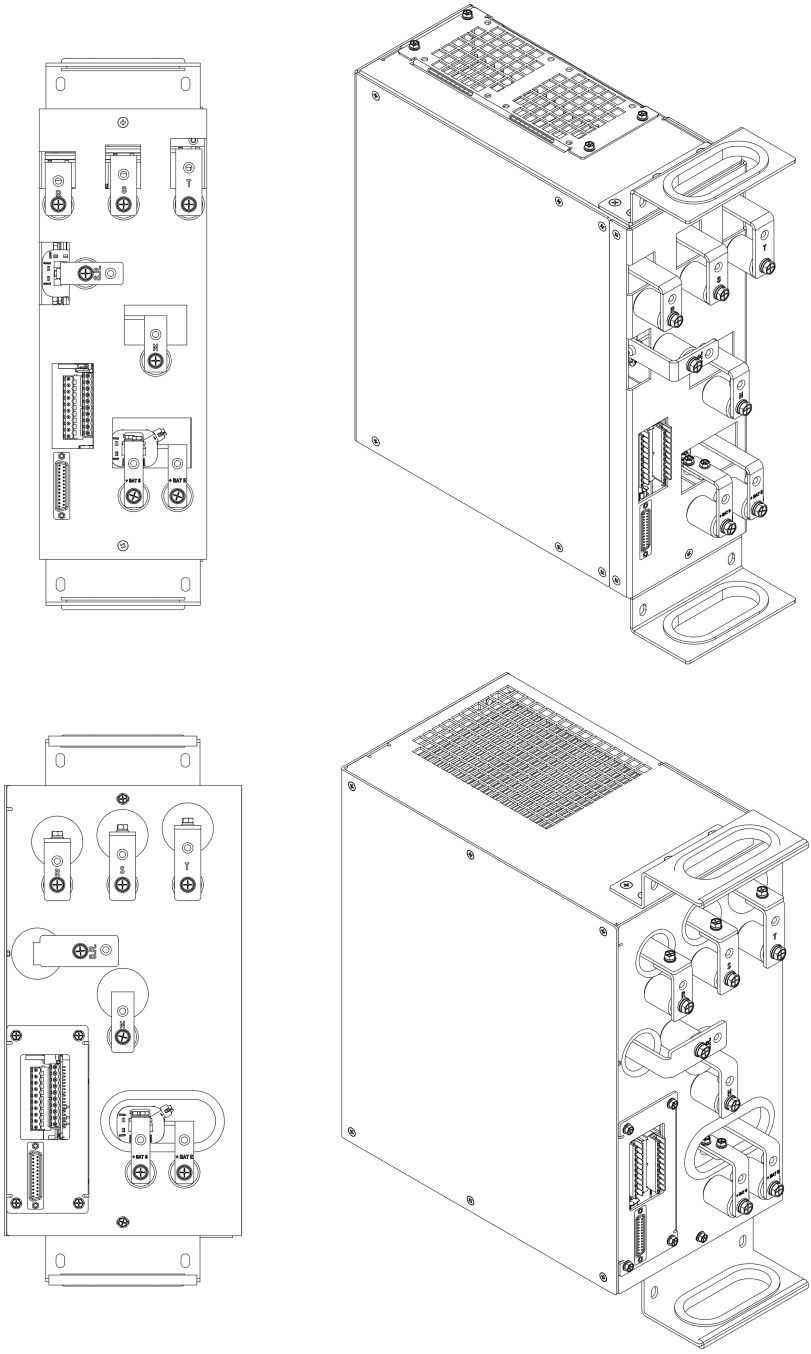

Figure A.3: *Rectifier module (A1)*

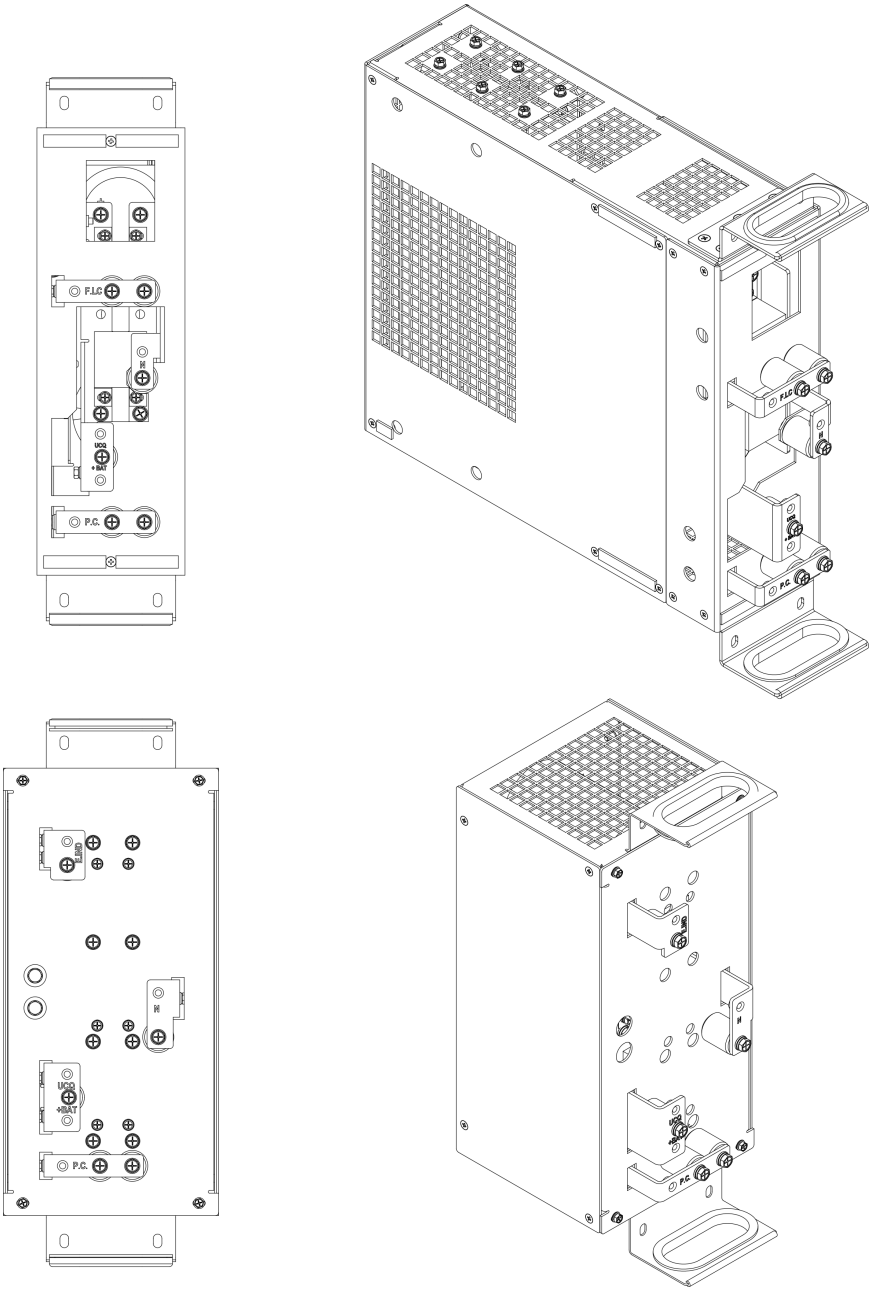

Figure A.4: *LC and C filter module (A2)*

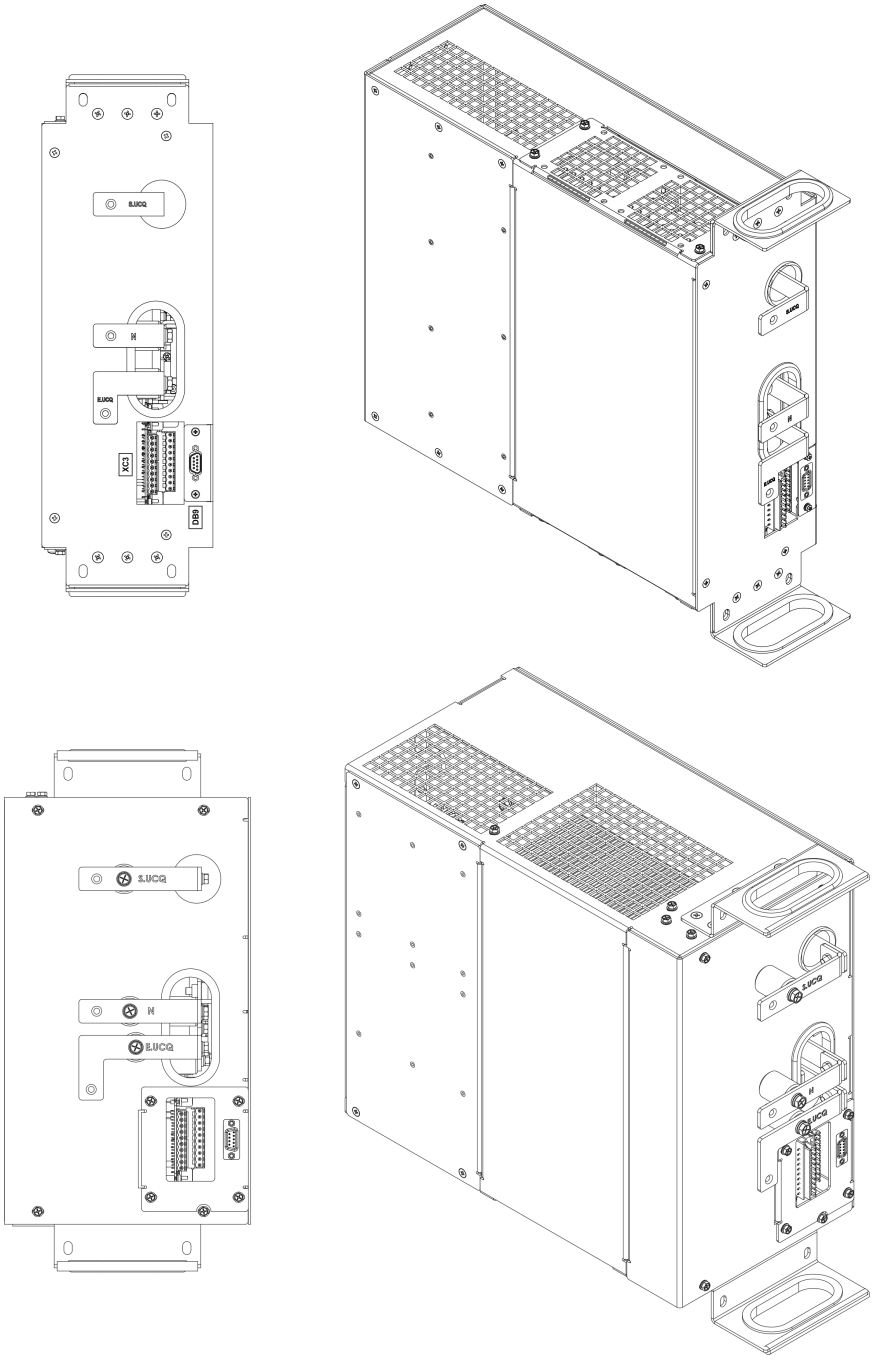

Figure A.5: *DCU module (A3)*

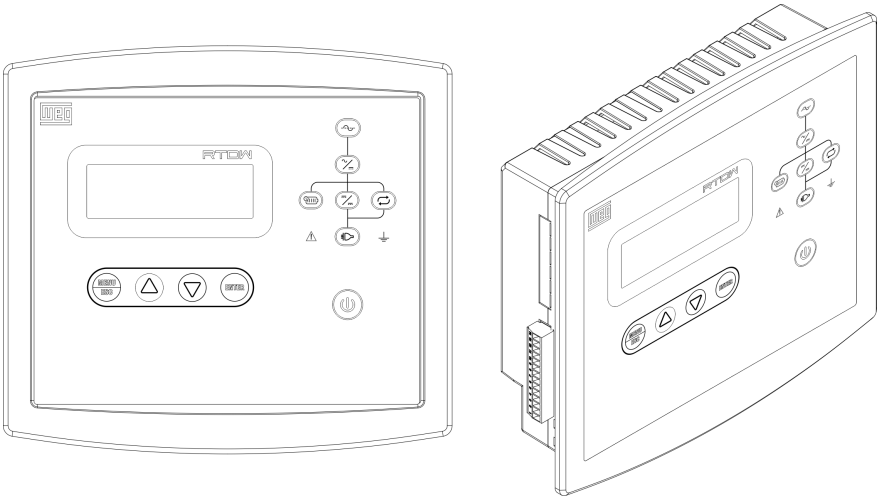

Figure A.6: *HMI module*