CLEANISLAND 100 AU/NZ
Multiple Mode Inverter – Energy Storage

DB 200
Interface Protection Distribution Board

INSTALLATION MANUAL

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IMPORTANT SAFETY INSTRUCTIONS

SAVE THESE INSTRUCTIONS

This manual contains important instructions for DB 200 and CLEANISLAND 100 AU/NZ that shall be followed during installation and maintenance of the converter.
Keep this document in a place that will keep it safe and easily accessible during installation or maintenance.
This manual must be read in conjunction with the user manual for further information about the connection of the whole system and the functionalities.

CAUTION: To reduce the risk of fire, connect only to a circuit provided with 630A maximum branch-circuit overcurrent protection.

For the grid side connection following the minimum wire size according to the following table:

Rated voltage	**CLEANISLAND 100 AU/NZ**
400V or 415V with transformer tap	use 90°C wire 2/0 AWG (67.4 mm2) copper

Rated voltage	**DB 200**
400V or 415V with transformer tap	use 90°C wire, either 400 AWG (203 mm2) copper or 600 AWG (304 mm2) aluminum

WARNING

These instructions must be carefully read before proceeding with the installation, start up and use of the converter. The installation must be performed by qualified personnel only.
Safety instructions have to be strictly observed to avoid serious injuries, loss of life, damage to the converter and the connected equipment.
The words “converter”, “inverter”, “PCS” (Power Conditioning System), “multiple mode inverter” refer to the CLEANISLAND 100 AU/NZ cabinet and its power converter bridges.
The words “distribution board”, “interface distribution board”, “interface protection distribution board” refer to the DB 200 cabinet.

Table of contents

1 SAFETY INSTRUCTIONS

- The following safety symbols are used in the manual:

Symbol	Word and Meaning
	**WARNING:** indicates a hazardous situation which, if not avoided, will result in death or serious injury.
	**DANGEROUS VOLTAGE**: the highlighted information regards parts of the converter that may operate or may be still at high voltages, also for a time after stopping operations. COMPLY with codes and regulations related to high voltages
	**NOTICE**: the information highlighted is important to avoid hazardous situations for the operator or the converter. DO NOT proceed without fully understanding
	**HOT TEMPERATURE**: some surfaces may become hot; wear appropriate personal protective equipment (PPE) when working with this product.

- The following symbols are used in the manual or/and in the label markings in the cabinet:

	GROUNDING: identifies a grounding terminal
	DIRECT CURRENT SUPPLY: indicates a DC circuit
	ALTERNATING CURRENT SUPPLY: indicates that a circuit shall be AC
	ON: indicates that a control device in this position is in on
	OFF: indicates that a control device in this position is in off
	PHASE SYMBOL: this symbol is equivalent to the word “phase”
	CAUTION, HOT SURFACE
	WAITING TIME: wait a prescribed amount of time before engaging in the indicated action
	SINGLE-PHASE
	THREE PHASE

1.1 General installation warnings

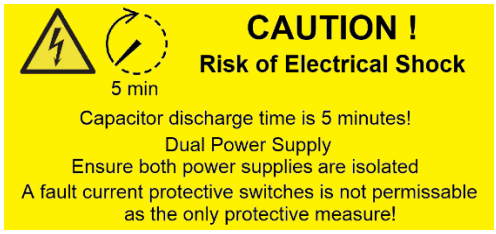
- **PRIOR** to installation, inspect the unit to ensure absence of any transport or handling damage, which could affect insulation integrity or safety clearances; the failure to do so could result in safety hazards.
- **USE** care when choosing the installation location and adhere to specified cooling requirements. Care must be taken to provide adequate ventilation if installed indoors.
- **UNAUTHORIZED** removal of necessary protection features, improper use, incorrect installation or operation may lead to serious safety and shock hazards and/or equipment damage.
- **READ** all chapters of this manual before installing or commissioning the converter.
- **GROUND** the metallic cabinet.
- **DO NOT TOUCH** the electrical parts of the converter while the power is on and wait at least 5 minutes after the power is switched off before touching any electrical components
- **CAUTION** wait at least 5 minutes after the power is switched off before open any internal panels (to remove internal panels are required proper tools)
- **DO NOT CARRY OUT** any operations on the converter when the power is on.
- **DO NOT INSTALL** in environments at risk of explosion and fire.
- **DO NOT CONNECT** the converter to batteries with voltages other than rated to prevent damage and malfunction.
- **DO NOT PERFORM** insulation tests between the power terminals or between the control terminals.
- **TIGHTEN** the screws of the terminal blocks properly.
- **COMPLY** with environmental installation conditions.
- **DO NOT TOUCH** the circuit boards unless absolutely necessary, since they contain components sensitive to static electricity. In that case, use precautions to prevent damage caused by electrostatic discharge.
- **DO NOT TOUCH** internal parts soon after or while the inverter is working, it could be dangerous due to risks of electric shock and of burnings for high temperatures.
- **DO NOT OPERATE** the inverter over the maximum ambient temperature of 50°C
- **CAUTION** the unit should be installed so that it is not expected to be in contact with not authorized personnel
- **CAUTION** the system grounding is responsibility of the installer.
- In case of alarm, see the chapter of this manual about diagnostics and follow the instructions

WARNING

before working on the cabinet, installer/operator must work under safety conditions: the battery must be disconnected.

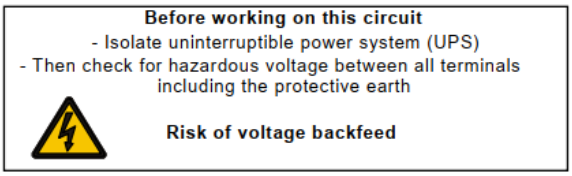
Be aware that even when the converter is not powered by the grid, the battery is a power source. Therefore, for servicing operations, OPEN the circuit breaker between the battery and the converter.

High leakage current, earth connection essential before connecting supply. The leakage current exceeds 3.5mA and is less than 1000mA (measured leakage current 7.1mA).



Wait 5 minutes after the removal of the power from the PCS, for the capacitors to discharge before working on the cabinet.

A label is required for the purpose of warning the electrical service person, which shall be a skilled person, against backfeed situations not caused by the converter. A backfeed situation can arise when a particular load fault is present while the converter operates in stored energy mode.
It is required the placement of a warning label by the installer, that shall be a skilled person, on all primary power isolators installed remote from the converter area and on external access points, if any, between such isolators and the converter.
The warning label shall carry the wording showed in the figure below, or equivalent:



CAUTION:
The system is equipped with auxiliary batteries:
• Do not dispose of batteries in a fire. The batteries may explode.
• Do not open or mutilate batteries. Released electrolyte is harmful to the skin and eyes. It may be toxic.
• A battery can present a risk of electric shock and burns by high short-circuit current.
• Failed batteries can reach temperatures that exceed the burn thresholds for touchable surfaces

CAUTION: A battery can present a risk of electrical shock and high short-circuit current. The following precautions should be observed when working on batteries:
a) Remove watches, rings, or other metal objects.
b) Use tools with insulated handles.
c) Wear rubber gloves and boots.
d) Do not lay tools or metal parts on top of batteries.
e) Disconnect charging source prior to connecting or disconnecting battery terminals.
f) Determine if battery is inadvertently grounded. If inadvertently grounded, remove source from ground. Contact with any part of a grounded battery can result in electrical shock. The likelihood of

such shock can be reduced if such grounds are removed during installation and maintenance (applicable to equipment and remote battery supplies not having a grounded supply circuit).

1.2 Liability limits

- The present manual is part of the product and gives important information relating to safe use and maintenance.
- The product should be used only for the purpose it has been designed and sold. Any other use is considered inappropriate and potentially dangerous; therefore, in this case, ELPOWER cannot be considered responsible for causing any damage.
- ELPOWER will be held responsible for the product in its original configuration.
- Any hardware and/or software change must be performed by ELPOWER technicians or authorized by ELPOWER Technical Department.
- ELPOWER is not responsible for any consequence arising from the use of non-original parts.
- ELPOWER reserves the right to update both this manual and the product without prior notice.
- ELPOWER is responsible for the contents mentioned in the original Italian version of this manual.
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2 GENERAL PRODUCT OVERVIEW

CLEANISLAND series is a line of converters designed for energy storage sources. It is designed to ensure:

- High performance
- Silent operation
- Reliability
- Durability
- Use in harsh environments

To achieve the higher efficiency a single AC/DC power converter bridge has been implemented, this is possible with a limited battery voltage range.

Alternatively to achieve a wide operating battery voltage range, a totally digital converter system has been implemented with 2 inverters: 1 inverter to manage the grid side AC/DC, and 1 inverter as DC/DC converter to start operation from zero volts on energy storage source (charging battery from 0V).

The most significant choices, concerning reliability and durability, are the elimination of electrolytic capacitors from both power and control sides in favour of film capacitors, and the use of industrial extended temperature grade components for the electronic boards.

Careful consideration has been given to the choice of materials and manufacturing solutions: e.g. tinned cables for the auxiliary circuits, tropicalized electronic boards.

The converter comes with a remote control kit (embedded PC + modem/router) that provide real operating information and alarms. There are not external monitoring portals or apps.

The cooling fans are controlled by a temperature sensor in order to minimize self-consumption and maximize life expectancy; their function is continuously monitored to prevent damage due to failures.

CLEANISLAND converters combine a high degree of standardization with the possibility of implementing elements of customization necessary to meet the needs of the different types of energy storage sources that exist on the market.

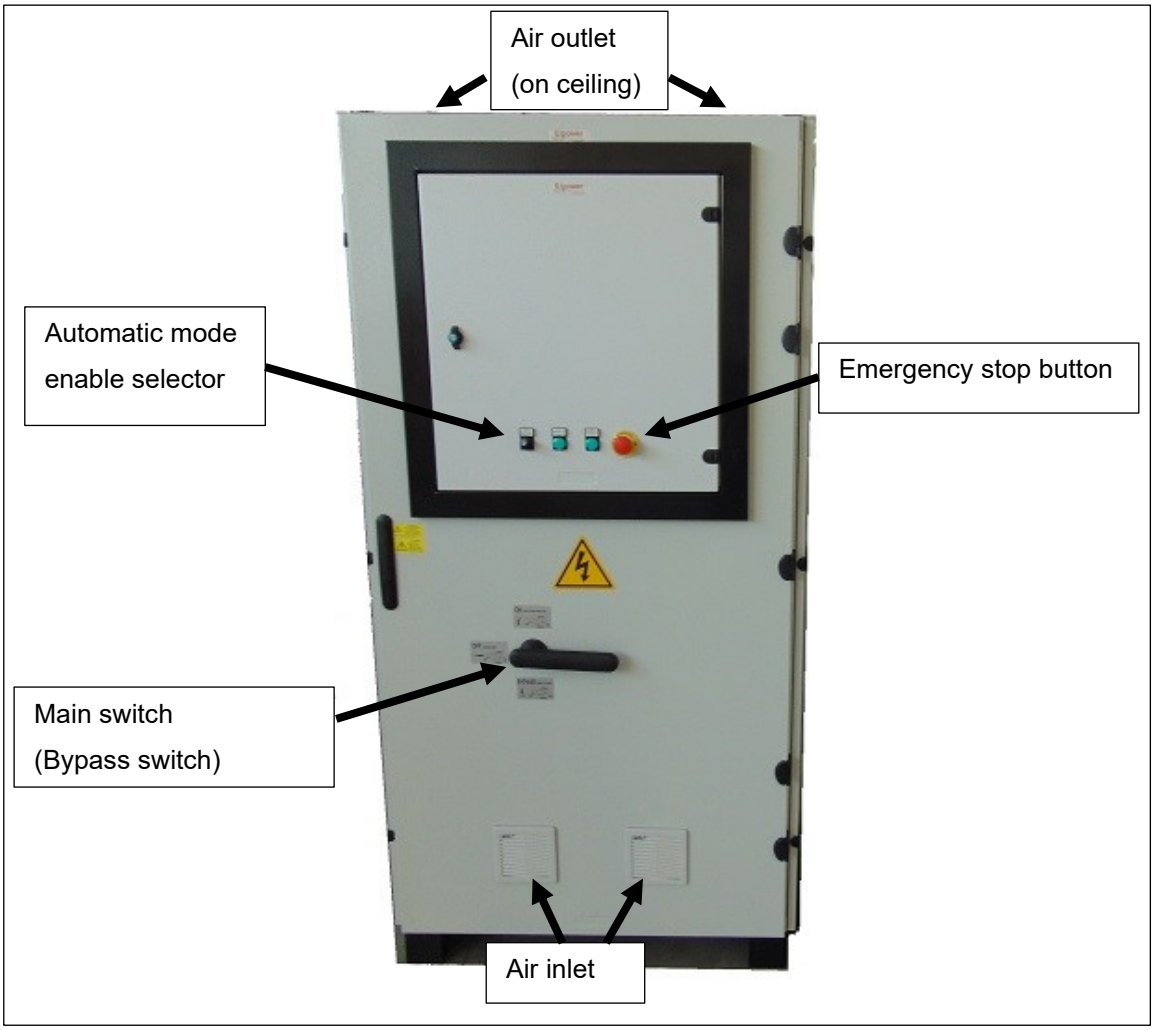
2.1 Regulatory nameplate

Technical data in this manual does not supersede the data on the labels affixed to the electrical cabinet. The product nameplate is affixed to the inverter chassis and provides the following information:

1) Product origin
2) Certification (where applicable)
3) Model type and number
4) AC output ratings
5) DC input ratings

2.2 Electrical cabinet overview – DB 200

The DB 200 is available in indoor version. In the following picture is shown the front door and are pointed the air inlet and outlet.

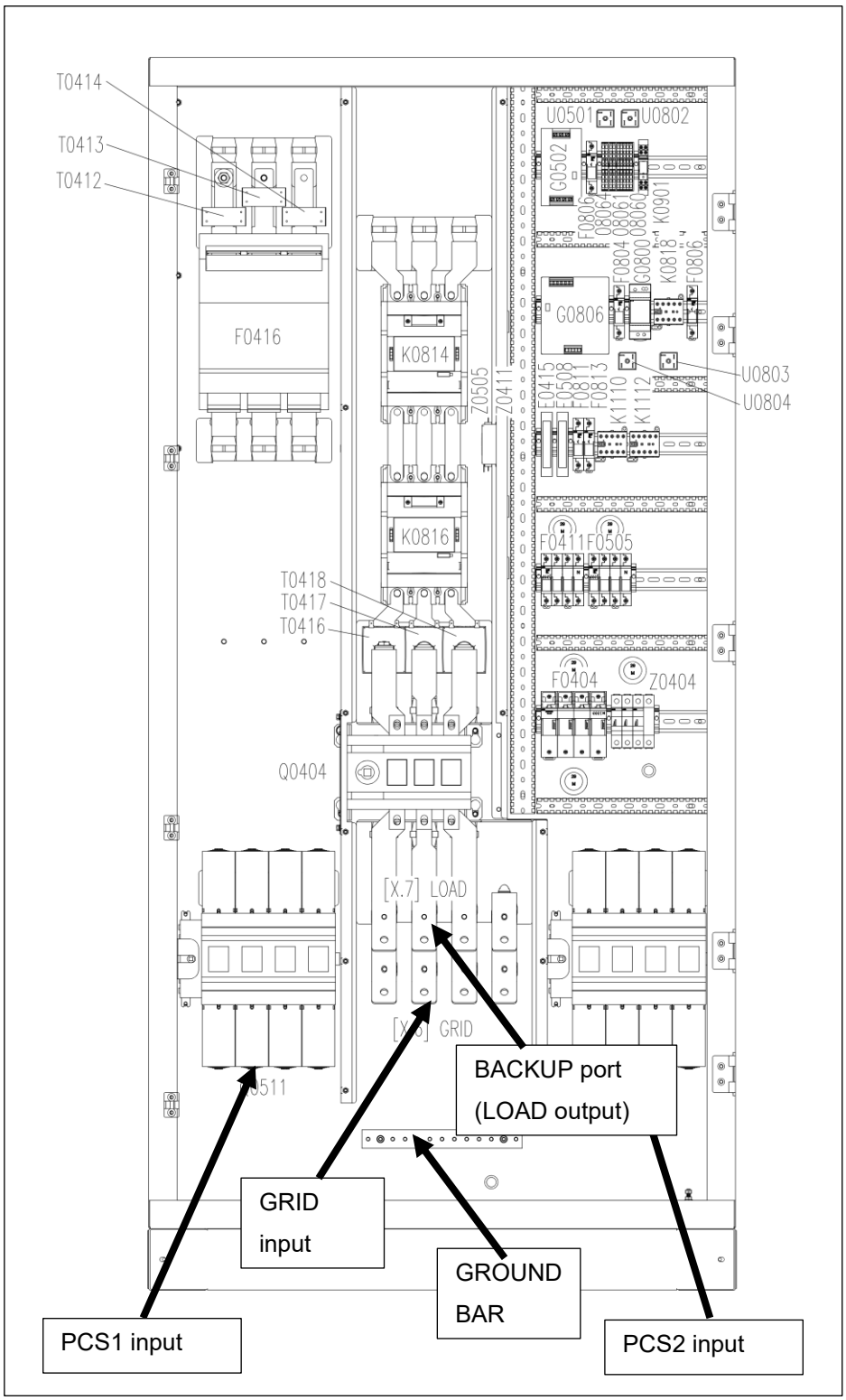


Picture 1

Inside the cabinet there are this components:

- The front compartment (Picture 2) can be reached by opening the main door and contains:
  - Electromechanical components
  - Electronic boards
  - AC GRID terminal blocks
  - AC LOAD terminal blocks
  - AC PCS1 terminal blocks
  - AC PCS2 terminal blocks

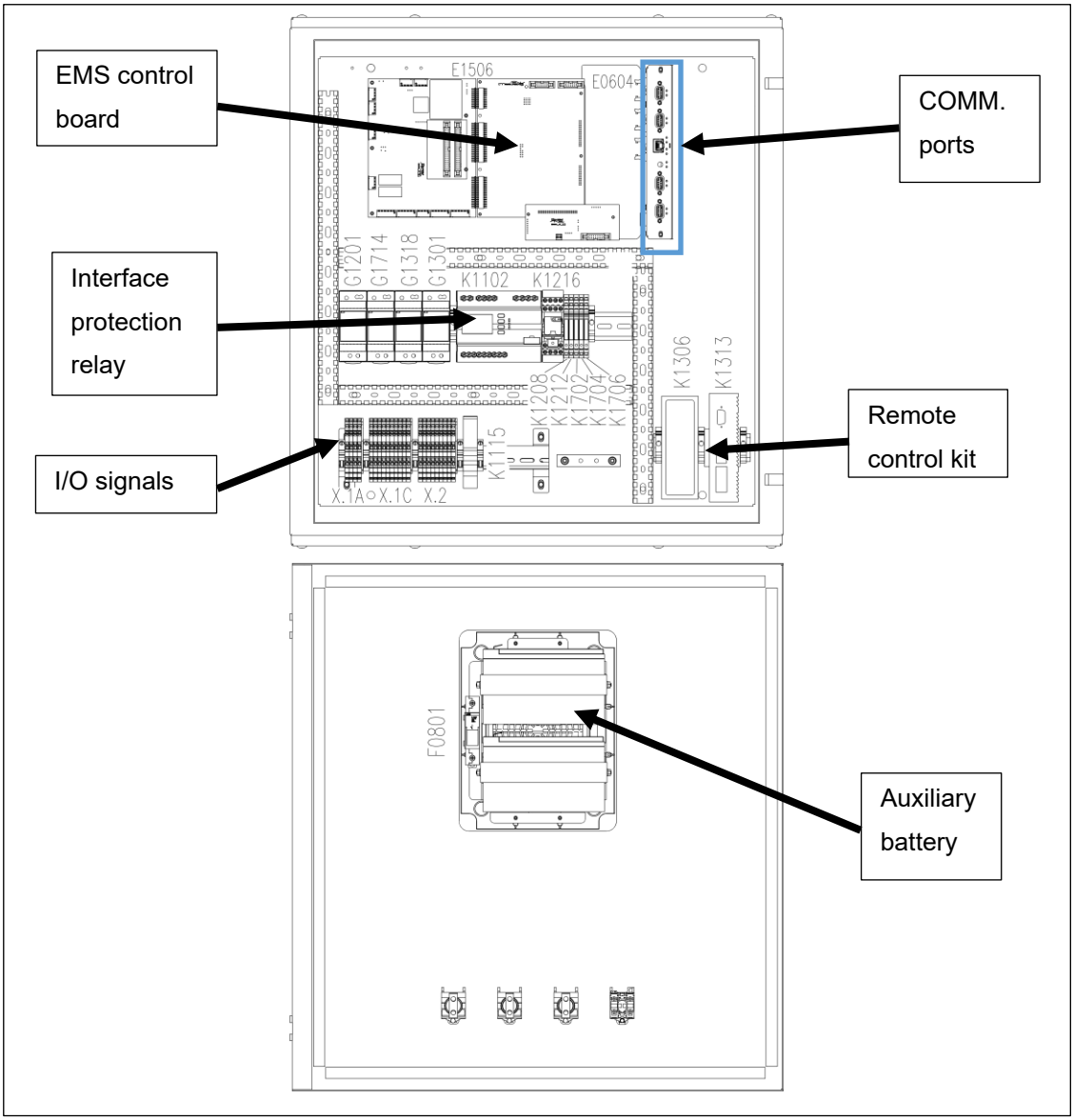
The following picture shows the internal layout of the front compartment:



Picture 2

- The EMS (Energy Management System) compartment (Picture 3) can be reached by opening the EMS door and contains:
  - Electromechanical components
  - Electronic boards
  - Communication gateway
  - Remote control kit
  - I/O terminal blocks

The following picture shows the internal layout of the EMS compartment and the auxiliary battery box on the door:



Picture 3

Referring to the DB 200 schematic, there is a list of electromechanical devices, to be checked and operated on for the first start up. For each fuse holder check the fuse rating. They will be referred with the device label written in the first column.

Device Label	Description	Remarks
F0404	Surge arrester fuses	50A aM 14x51 with signalling
Q0404	Main switch (Bypass switch)	-
F0416	AC main fuse	400A gG NH2
F0411	AC power supply auxiliary circuitry protection fuses	6A aM 10x38
F0505	AC power supply auxiliary circuitry protection fuses	2A aM 10x38
Q0511	Switch fuse disconnector PCS1	250A gG NH1
Q0512	Switch fuse disconnector PCS2	250A gG NH1
F0801	Auxiliary battery protection fuse	10A gG 10x38
F0804	Battery charger protection fuse	2A gG 10x38
F0805	Emergency stop circuitry protection fuse	4A gG 10x38
F0806	24VDC distribution protection fuse	4A gG 10x38
F0811	24VDC distribution protection fuse	6A aM 10x38
F0813	24VDC distribution protection fuse	6A aM 10x38

Table 1

2.3 Electrical cabinet overview – CLEANISLAND 100 AU/NZ

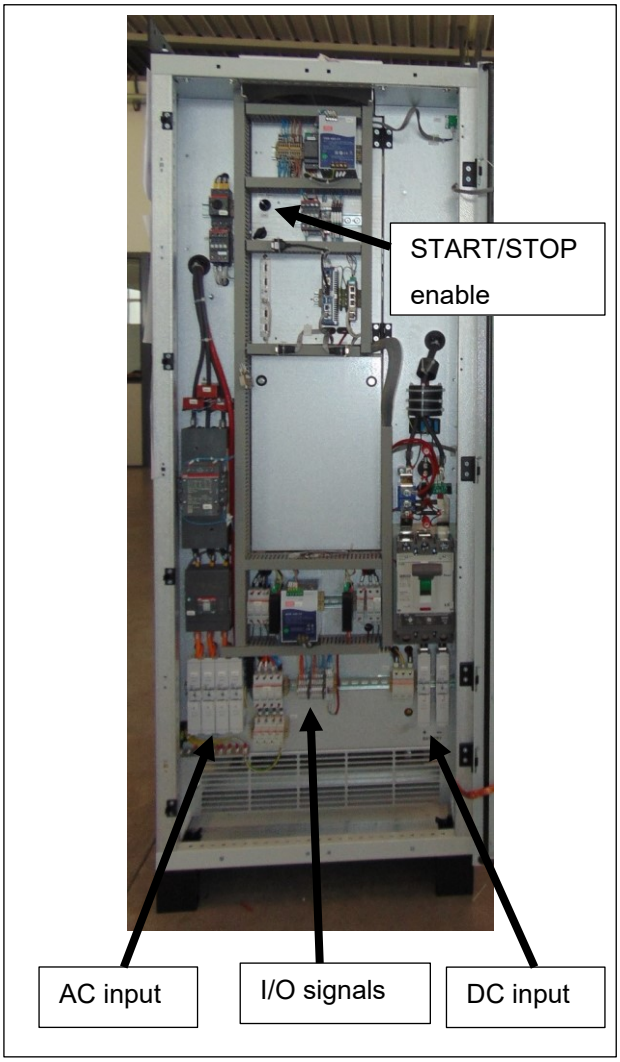
The CLEANISLAND 100 AU/NZ is available in indoor version. In the following picture is shown the front door and are pointed the air inlet and outlet.

Picture 4

Inside the cabinet there are this components:

- The front compartment (Picture 5) can be reached by opening the door and contains:
  - Electromechanical components
  - Electronic boards
  - AC terminal blocks
  - DC terminal blocks
  - I/O signal terminal blocks

The following picture shows the internal layout of the front compartment:

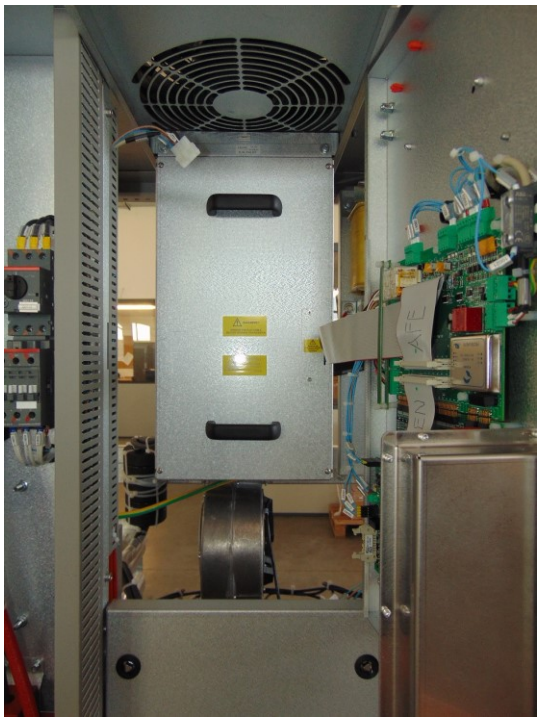


Picture 5

The following picture shows the access to the converter bridge and the components on the rear compartment:

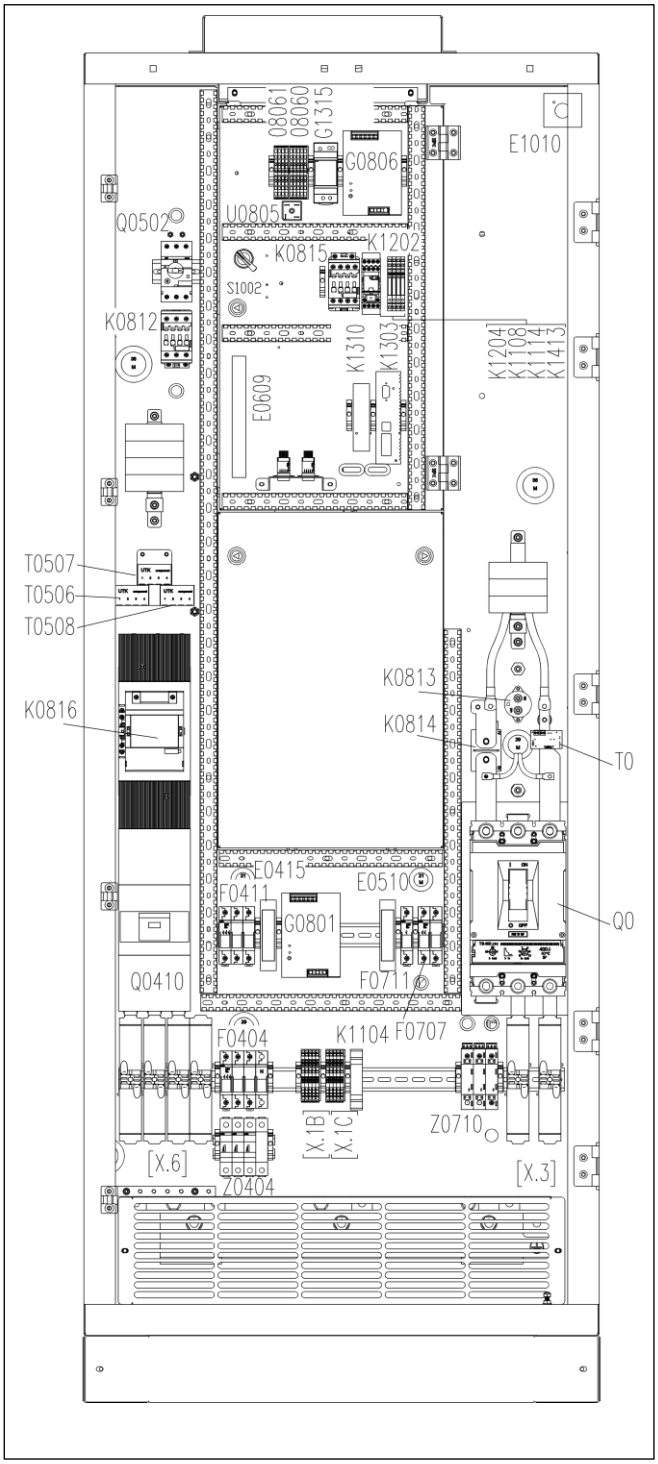
Open the internal door panel

Converter bridge



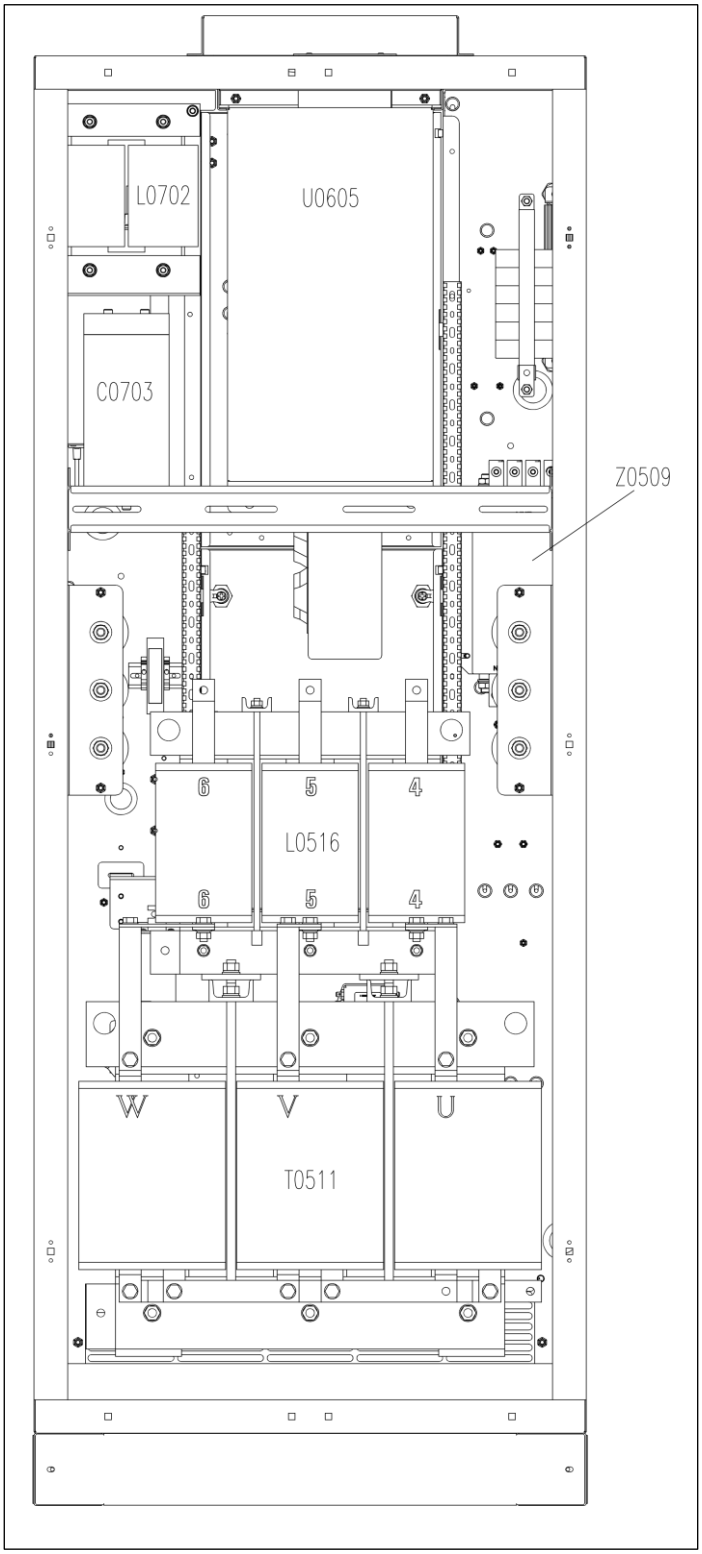
Picture 6

The following picture shows the front enclosure and the internal layout of the cabinet:



Picture 7

The following picture shows the rear enclosure and the internal layout of the cabinet:



Picture 8

Referring to the CLEANISLAND 100 AU/NZ schematic, there is a list of electromechanical devices, to be checked and operated on for the first start up. They will be referred with the device label written in the first column.

Device Label	Description	Remarks
F0404	Surge arrester fuses	32A aM 10x38
Q0410	Input/output grid switch disconnector	-
F0411	AC power supply auxiliary circuitry protection fuses	2A aM 10x38
Q0502	AC pre-charge circuit breaker	-
F0707	Battery DC input measurement protection fuses	10A gPV 10x38
F0711	DC pre-charge circuit protection fuses	10A gPV 10x38
Q0714	DC input circuit breaker	-

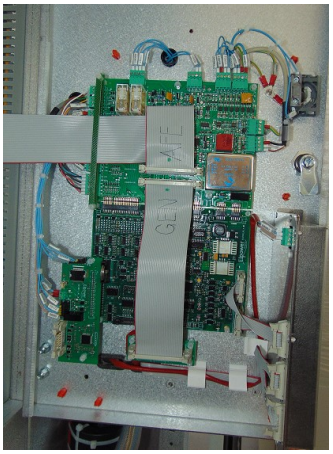
Table 2

2.3.1 Converter bridge

The converter bridge is shown in Picture 9.

Converter bridge external view

Control board



Picture 9

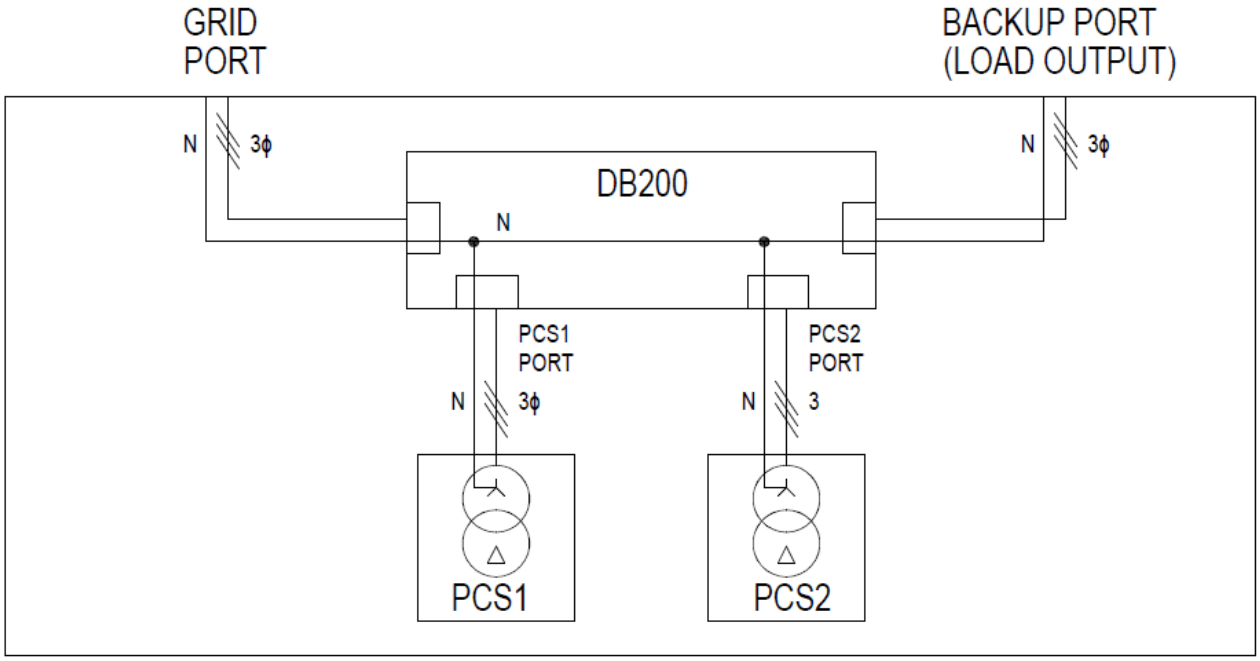
The converter cover can be removed to get access to the IGBT driver board and IGBT power modules (before opening the converter cover the flat cable must be disconnected).

2.4 Technical data

Configuration 1: 1 DB200 + 2 PCS 100 (see scheme below)	
AC electrical data	
Overvoltage category	OVC III (for all ports)
Grid port	
Rated voltage	400Vac ±10% (or 415Vac ±10%) (range according to AS/NZS 4777)
Rated frequency	50Hz +5% -5% (range according to AS/NZS 4777)
Rated current	321A
Rated output power	200kW
Rated apparent power	222.4kVA
Backup port (Load output)	
Rated voltage	400Vac ±10% (or 415Vac ±10%) (range according to AS/NZS 4777)
Rated current	321A
Rated output power	222.4kVA
General data	
Protective class	I
Operating temperature	From -20 to +45 °C
Storage temperature	From -25 to +70 °C
Relative humidity	From 0 to 95% max (no condensing)
Degree of cabinet mechanical protection	IP20
Overall dimensions	H 2000 x W 1020 x D 820(80) ±10mm
Weight	500 kg

Table 3a

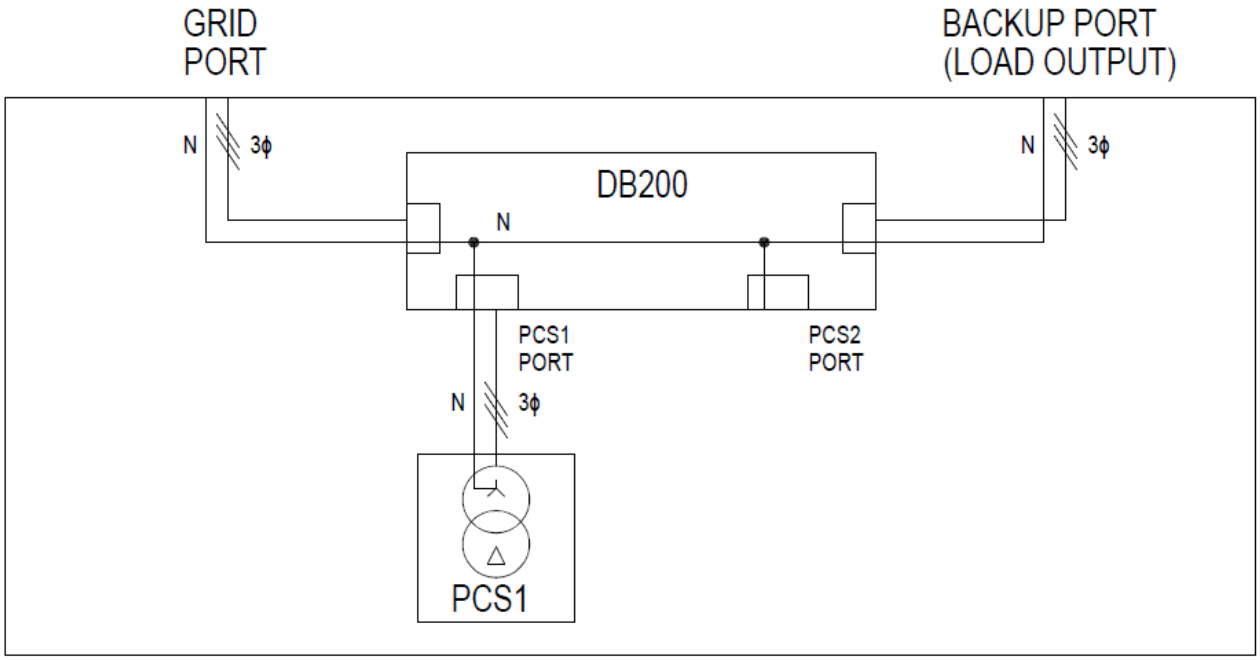
N.B: Internal neutral passthrough connection as depicted.



Configuration 2: 1 DB200 + 1 PCS 100 (see scheme below)	
AC electrical data	
Overvoltage category	OVC III (for all ports)
Grid port	
Rated voltage	400Vac ±10% (or 415Vac ±10%) (range according to AS/NZS 4777)
Rated frequency	50Hz +5% -5% (range according to AS/NZS 4777)
Rated current	160.5 A
Rated output power	100 kW
Rated apparent power	111.2 kVA
Backup port (Load output)	
Rated voltage	400Vac ±10% (or 415Vac ±10%) (range according to AS/NZS 4777)
Rated current	160.5 A
Rated output power	111.2kVA
General data	
Protective class	I
Operating temperature	From -20 to +45 °C
Storage temperature	From -25 to +70 °C
Relative humidity	From 0 to 95% max (no condensing)
Degree of cabinet mechanical protection	IP20
Overall dimensions	H 2000 x W 1020 x D 820(80) ±10mm
Weight	500 kg

Table 4b

N.B: Internal neutral passthrough connection as depicted.



CLEANISLAND 100 AU/NZ	
AC port electrical data	
Overvoltage category	OVC III
Grid following mode	
Rated voltage	400Vac +10% -10% (415Vac with transformer tap) (range according to AS/NZS 4777)
Rated current	160.5A
Current (inrush)	200A peak, duration 3ms
Rated frequency	50Hz +5% -5% (range according to AS/NZS 4777)
Rated output power	100kW
Rated apparent power	111.2kVA
Power factor	From 0.8 to 1 (lagging/leading)
Maximum output fault current	1.5kA peak, duration 0.1ms - 90Arms
Max overcurrent protection	250A
Harmonic distortion of current	<3% @ rated power
Stand-alone mode (Grid forming)	
Rated voltage	400Vac +5% -5% (415Vac with transformer tap)
Rated current	160.5A
Rated apparent power	111.2kVA
Rated frequency	50Hz +1% -1%
Power factor	From 0.8 to 1 (lagging/leading)
Max overcurrent protection	250A
Harmonic distortion of voltage	<3% @ resistive load
Max load unbalance	15%
DC port electrical data	
Overvoltage category	OVC II
Rated voltage	From 540 to 756Vdc
Min working voltage	540Vdc
Max workingvoltage	800 Vdc
Nominal battery voltage	580Vdc
Rated current	185A
General data	
Inverter topology	Isolated
Active anti-islanding method	Frequency shift
Protective class	I
Efficiency at 100% Pn AC side, charging (auxiliary included) – 100kW, PF 1, 750Vdc	95.6%
Efficiency at 100% Pn AC side, discharging (auxiliary included) – 100kW, PF 1, 750Vdc	94.9%
Cooling	Fans starting with a temperature threshold
Operating temperature	From -20 to +45 °C
Storage temperature	From -25 to +70 °C
Relative humidity	From 0 to 95% max (no condensing)
Degree of cabinet mechanical protection	IP20
Overall dimensions	H 2080 x W 820 x D 820(+20) ±10mm
Weight	800kg

Table 5

2.5 Input ports short circuit withstand strength

DB 200		
Input port	Maximum short circuit current	Minimum short circuit current
Grid port	10kA	3kA
Backup port	10kA	-kA

Table 6

CLEANISLAND 100 AU/NZ		
Input port	Maximum short circuit current	Minimum short circuit current
Grid port	10kA	3kA
Battery port	15kA	3kA

Table 7

2.6 Compatible batteries types

The CLEANISLAND 100 AU/NZ is compatible with this type of batteries:

- Lithium

The CLEANISLAND 100 AU/NZ does not include a connection terminal for a remote battery temperature sensor. CLEANISLAND 100 AU/NZ reads battery temperature data from the battery BMS using the CAN comms connection.

The CLEANISLAND 100 AU/NZ doesn't include the battery energy storage system, refer to the battery installation manual for safety instructions and relevant information.

2.7 Supported power quality response modes

2.7.1 Volt response modes

This mode responds to voltage changes at the inverter terminals and helps to increase the number of systems that can be connected at a point on the grid without affecting the voltage within an electrical

installation. Each of the voltage response modes may be programmed for different response values from the other modes, thus allowing for different response curves in different modes to suit local distributor requirements.

Reference	Australian default value (V)	NZ default value (V)	Range (V)
V_1	207	207	Not applicable
V_2	215	220	216 to 230
V_3	253	244	235 to 255
V_4	260	255	244 to 265

2.7.1.1 *Volt–watt response mode*

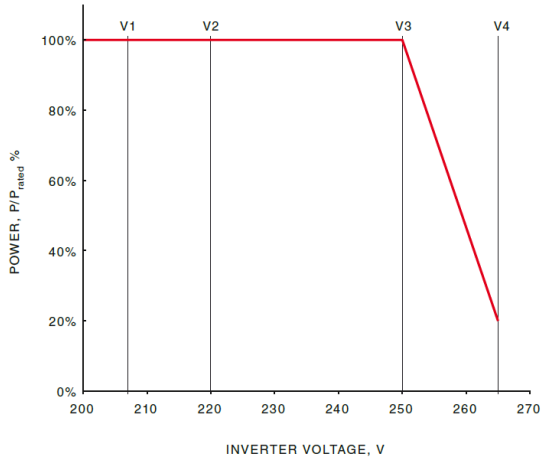
In this mode, the output power of the inverter is varied in response to terminal voltage. This method is enabled by default. The table below shows the maximum set point values for reference voltages.

Reference	Maximum value (P/P_{rated}), %
V_1	100%
V_2	100%
V_3	100%
V_4	20%

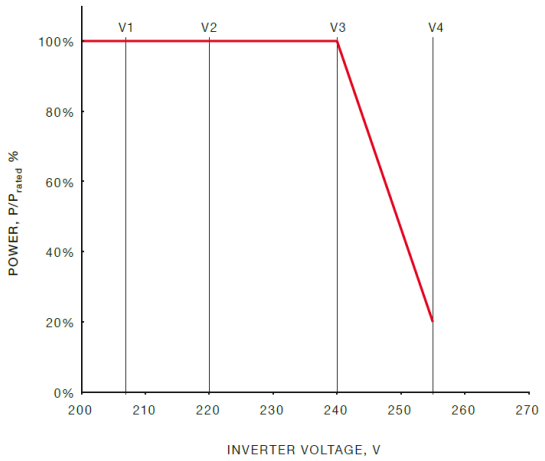
The table below shows the default parameters:

Parameters	Range	Unit	Description	Default Value
ENABLE_VOLT_WATT_OVR	0 = disabled 1 = enabled	bit	Enable/disable Volt-Watt mode when output power is positive	Enabled
V1_GRID_CODE_VX10	2000 - 2700	Vx10	Grid voltage at which the output power is limited to 100 %	2070
V2_GRID_CODE_VX10	2000 - 2700	Vx10	Grid voltage at which the output power is limited to 100 %	2150
V3_GRID_CODE_VX10	2000 - 2700	Vx10	Grid voltage at which the output power is limited to 100 %	2530
V4_GRID_CODE_VX10	2000 - 2700	Vx10	Grid voltage at which the output power is limited to 20 %	2600
P1_GRID_CODE_Px100	0 - 100	%	Percent of output power when V grid = V1_GRID_CODE_VX10	100
P2_GRID_CODE_Px100	0 - 100	%	Percent of output power when V grid = V2_GRID_CODE_VX10	100
P3_GRID_CODE_Px100	0 - 100	%	Percent of output power when V grid = V3_GRID_CODE_VX10	100
P4_GRID_CODE_Px100	0 - 100	%	Percent of output power when V grid = V4_GRID_CODE_VX10	20

The figure below shows the curve (default Australia):



The figure below shows an example curve for New Zealand:

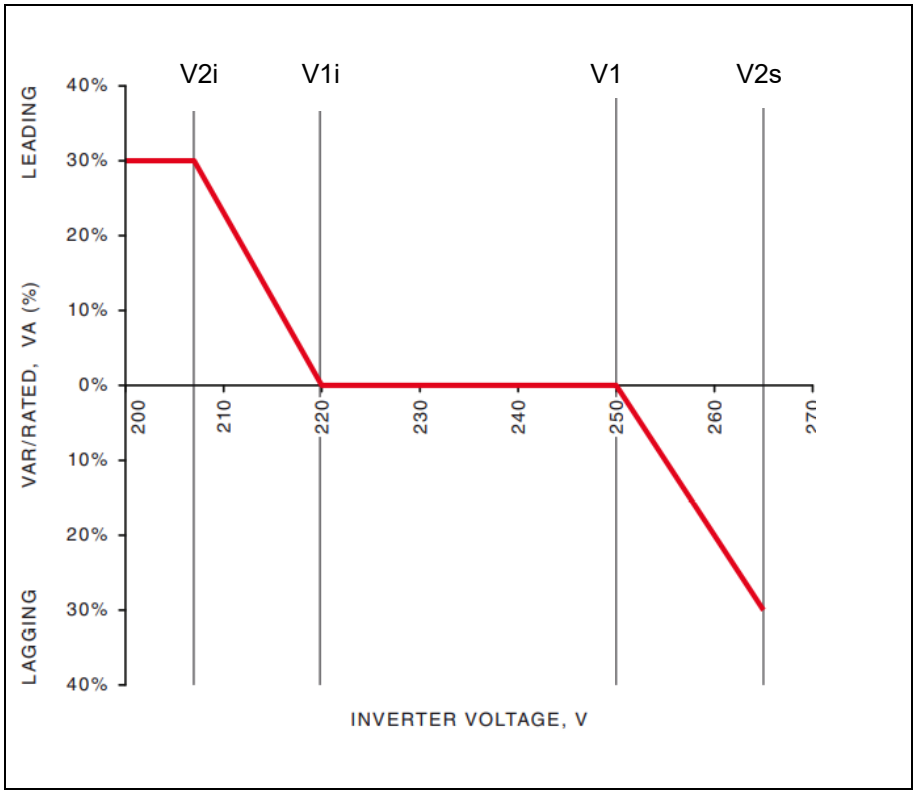


2.7.1.2 *Volt-var Response Mode*

In this mode, the reactive power output of the inverter is varied in response to the voltage at its grid interactive port. This mode is disabled by default. The table below shows the default values for reference voltages.

Reference	Default values for var level (var % rated VA)	Minimum range
V_1	45% leading	0 to 60% leading
V_2	0%	0%
V_3	0%	0%
V_4	60% lagging	0 to 60% lagging

The figure below shows the default curve:



The table below shows the default parameters:

Parameters	Range	Unit	Description	Default Value
ENABLE_VOLT_VAR	0 = disabled 1 = enabled	bit	Enable/disable volt Var mode	Disabled
V2i_QfV_tab	2000 - 2700	Vx10	Voltage corresponding to maximum reactive power output (LEAD)	2070
V1i_QfV_tab	2000 - 2700	Vx10	Threshold under whitch inverter starts to inject reactive power (LEAD)	2200
V1s_QfV_tab	2000 - 2700	Vx10	Threshold over whitch inverter starts to inject reactive power (LAG)	2400
V2s_QfV_tab	2000 - 2700	Vx10	Voltage corresponding to maximum reactive power output (LAG)	2600
QMAX_VOLT_VAR	0 - 6672	kVAR x 100	Maximum reactive power leading	4500
QMIN_VOLT_VAR	0 - 6672	kVAR x 100	Maximum reactive power lagging	-6000

2.7.1.3 *Voltage balance modes*

This mode is not available.

2.7.2 Fixed power factor or reactive power mode

The fixed power factor mode and the reactive power mode may be required in some situations by the electrical distributor to meet local grid requirements. Fixed reactive power mode is not available. Fixed power factor mode is disabled by default.

The fixed power factor mode is for control of the displacement power factor over the range of inverter power output. The range of settings is 0.8 leading to 0.8 lagging.

Parameters	Range	Description	Default value
ENABLE_FIXED_POWER_ FACTOR_MODE	0 = disabled 1 = enabled	Enable/disable volt Fixed power factor mode	0
COS_PHI_SET_TAB	80<=value<= 99	Leading power factor from 0.8 to 0.99 - Over excited	100
	-99<=value<= -80	Lagging power factor from 0.8 to 0.99 - Under excited	
	100	Unit power factor	

2.7.3 Characteristic power factor curve for cos φ (P) (Power response)

The characteristic power factor curve for cos φ (P) (Power response) mode varies the displacement power factor of the output of the inverter in response to changes in the output power of the inverter. The inverter provides cos φ (P) mode defined within displacement power factor range of 0.9 leading to 0.9 lagging. This mode is disable by default.

Parameters	Range	Description	Default value
ENABLE_COS_PHI_P	1 = enabled 0 = disabled	Enable/disable cos φ (P) mode	0
P_LOCK_IN	0 - 100	% of nominal power	50
COS_PHI_MIN_COSPHI_P	-90, 90	Leading power factor from 0.8 to 0.99 - Over excited Lagging power factor from 0.8 to 0.99 - Under excited	90

2.7.4 Power rate limit

The power rate limit for an inverter is a power quality response mode which states that inverter shall have the capability to rate limit changes in power generation through grid interactive mode. The power rate limit does not apply when the inverter disconnection device is required to operate. The power rate limit causes the inverter power output to either ramp up or ramp down smoothly as it transitions from one power output level to another power output level. These changes in power output level are constrained by several factors such as energy storage and operating state of the inverter. Ramp rates are adjustable between 5% and 100% of rated power per minute and may be different for ramp up to that for ramp down.

2.7.4.1 *Soft ramp up after connect or reconnect*

This mode limit the power gradient after connect or reconnect.

Parameters	Description	Unit	Default value
TMP_POW_RST	Time to restore 100% of nominal power. Soft ramp up	s	300

2.7.4.2 *Gradient power rate limit*

The inverter has an adjustable power rate limit (W_{GRA}) which limits the change in power output to the set power rate limit.

Parameters	Range	Unit	Description	Default value
P_KWx100_S	1 to 10000	kWx100/s (e.g. 1000 = 10kW/s)	Output power gradient in kWx100/s	28 (i.e. 16.67 kW/min)

The inverter will use the lower power rate limit between soft ramp up and gradient power rate limit response.

2.7.4.3 *Response to a decrease in frequency (4.5.3.2.2)*

The response to an increase in frequency for multiple mode inverters with energy storage is a two stage response. The initial stage is a reduction in the power output level if the inverter is generating, the second stage requires the inverter to increase its power input level through the grid-interactive port as the frequency continues to increase.

	Default value	Parameter
Decrease in frequency response lower limit	47 Hz	
Frequency where power outoput level is maximum	48 Hz	`FreqLimP2UF`
Frequency where discharging power level is zero	49 Hz	`FreqLimP1UF`
lower limit of continuos operation	49.75 Hz	`FreqLimP0UF`

2.7.4.4 Response to an increase in frequency for multiple mode inverters with energy storage

The response to an increase in frequency for multiple mode inverters with energy storage is a two stage response. The initial stage is a reduction in the power output level if the inverter is generating, the second stage requires the inverter to increase its power input level through the grid-interactive port as the frequency continues to increase.

	Default value	Parameter
Upper limit of continuos operation	50.25 Hz	`FreqLimP0`
Frequency where discharging power level is zero	50.75 Hz	`FreqLimP1`
frequency where power level is minimum	52 Hz	`FreqLimP2`

2.8 PV arrays requirements - Earth Fault Detection and Alarm

The CLEANISLAND 100 AU/NZ doesn't have a PV port and it cannot work with PV arrays.
The requirements related to earth fault detection and notification, in AS 4777.2:2020 Clause 5.3. IEC 62109-2 Clause 13, and AS 5033:2014 Clause 3.4.3, are not applicable, so the CLEANISLAND 100 AU/NZ doesn't have an earth fault detection and alarm.
An external earth fault detection and alarm have to be installed in the system by the installer. It is recommended the adoption of a Bender Isometer IsoPV425+AGH420 (see 3.4.7.3 for further information).

3 INSTALLATION

3.1 Storage and transport

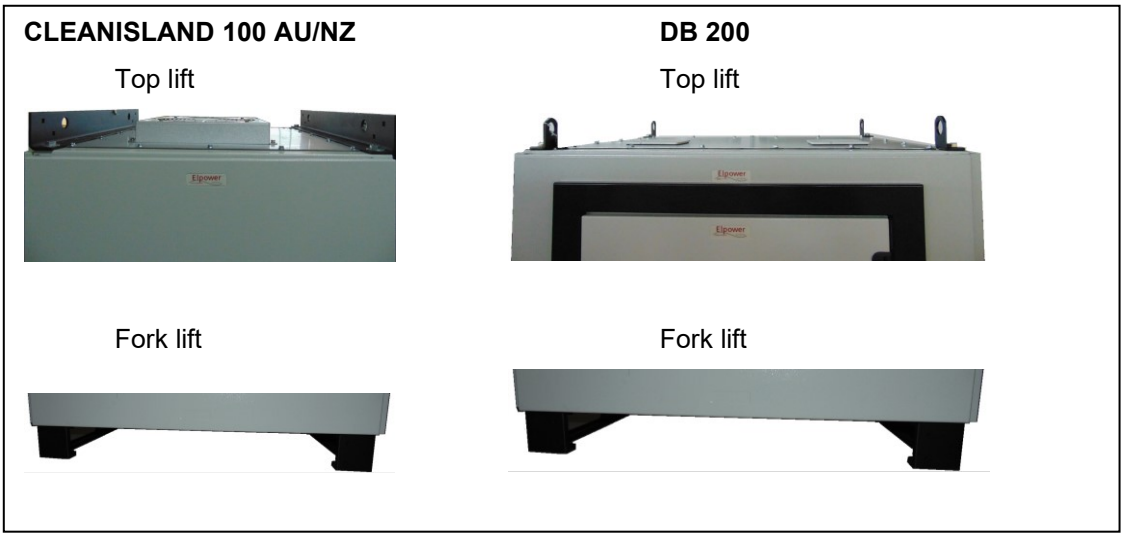
Since the electronic boards are tropicalized, there are no particular rules to follow for storage, with the exception of the respect of the values for temperature and humidity as in Table 3.

Temperature for storage and transport	From -25°C to 70°C
Environmental humidity during storage	From 5% to 95%, from 1g/m³ to 29 g/m³ , without condensation or ice formation (class 1K3 according to EN 50178)
Environmental humidity during transport	Max 95%, up to 60 g/m³, a little condensation can be developed when the machine is not working (class 2K3 according to EN 50178)
Overvoltage category	III

Table 8

3.2 Checks at cabinet delivery

Usually, the cabinet is sent bent on a pallet and protected with air pack. Usually top lift accessories are mounted or sent, so that loading and unloading is possible both with fork lift and top lift (Picture 10):



Picture 10

Inside the cabinet, there are the closing panels for the cable entries and the retaining screws. Outside there are proper keys to open the door cabinet, and internal removable panels.
Once the cabinet has arrived on the installation location, open the wrapping of the cabinet and check the above-mentioned components.
Inspect the unit for any transportation or handling damage (since these could cause loss of insulation or reducing safety clearances).

3.3 Installation

WARNING: these instructions must be carefully read before proceeding with the installation, start up and use of the converter. The installation must be performed by qualified personnel only.

To install:

- Place the cabinet by using the top lift (Picture 10), or a forklift by using the room available at the base (by opening the base)
- Mount the cable glands on the closing panels of the cable entry plate according to the cables types (Picture 11)

CLEANISLAND 100 AU/NZ

Cable entry

DB 200

Cable entry

Picture 11

If the closing panel is not placed to close properly the cable entry, the converter is suitable for mounting on concrete or other non-combustible surfaces only.

The installation site must be compatible with the conditions listed in Table 9

Condition	Indoor conditioned
Temperature of working site	-20°C ÷ +45 °C
Installation site	Pollution degree 2 (PD2) or better (EN 62477-1)
Altitude	Up to 2000 meters above sea level For higher altitudes, derating the output current of 2% per 100 meters beyond 2000 m (max 4000 m)
Humidity of working site	From 5% to 85% R.H. / non-condensing (class 3K3 according to IEC 60721-3-3)
Overvoltage category	III

Table 9

The cabinet must not be placed with the top not less than 50 cm from the ceiling, and with the front not less than 1mt from walls or other equipment; furthermore, since the cabinet dissipates heat in the surrounding environment, it is necessary to bear this in mind when sizing the cooling system for that room.

3.4 Wirings

After placing the panel, it is necessary to check the tightness of all the power, signal and auxiliary connections in order to prevent malfunctions and/or damage resulting from terminals that have come loose due to vibration during transport.

3.4.1 Preliminary operations

Before starting the connections, **make sure that**:

- the mains circuit breaker, placed to protect the connection line between the point of delivery of energy and the cabinet, is open

Furthermore, **check:**

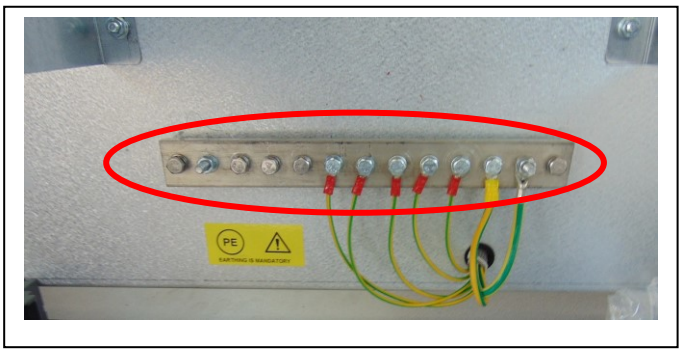
- that the mains input matches the inverter input configuration and that the rated voltage is compatible with the one indicated on the identification plate affixed on the cabinet.

After all the steps described above, the converter can be connected to the grid and the DC energy source. Pass the cables through the cable duct and relevant panel. Lastly, close the base with the relevant panels.

3.4.2 Grounding

CLEANISLAND 100 AU/NZ and DB 200 cabinets are equipped with a ground terminal (CLEANISLAND 100AU/NZ-> Picture 12, DB 200->Picture 13): it constitutes the collector for all connections to system's ground.

Picture 12



Picture 13

Therefore, before powering the cabinet, make sure the ground is correctly connected; use a minimum size of 1 AWG (or 42.4 mm^2) copper wire for CLEANISLAND 100 AU/NZ and use a minimum size of 4/0 AWG (or 107 mm^2) copper wire for DB 200. It is the user's responsibility to ensure that the ground system complies with current standards.

High leakage current, earth connection essential before connecting supply!

A 10mm hexagonal socket with the proper torque tool is required to tighten the 10mm hexagonal bolt (M6 hole): the tightening torque is 5 to 6Nm (44 to 53 lb.in).
Do not connect any AC phase wire to ground. Input and output circuits are isolated from the enclosure, which is connected to the system ground.

3.4.3 Type of electrical supply system and stand-alone output circuit bonding

The type of electrical supply systems permitted for multiple mode configuration are TN-S (no switch on neutral conductor) and TN-C. IT system is not permitted.
AS/NZS4777.2:2020 Clause 7.3.6 “Multiple mode inverters shall be arranged to ensure that the continuity of the neutral conductor to the load from the electrical installation is not interrupted when the inverter disconnects from the grid and supplies a load via the stand-alone port.”

AS4777.2 states the requirement of continuity of grid neutral-earth connection (MEN connection) must be maintained at all times. In case of multiple mode inverter it is critical for the installer to ensure that the load neutral to MEN connection is maintained during all operating modes of the inverter, including stand-alone mode.

The DB 200 has a pass-through neutral connection to all ports, this avoid the switching of the neutral conductor in any operational mode on both DB 200 and CLEANISLAND 100 AU/NZ. The mandatory stand-alone output circuit bonding requires the connection of DB 200 grid port neutral terminal (see chapter [X.6] terminal block: Input/Output Grid) to the grid neutral point. The minimum cross section for this connection must be at least 400 AWG (203 mm2) copper or 600 AWG (304 mm2) aluminium.

Furthermore it is mandatory connect the neutral connection between DB200 and CLEANISLAND 100 AU/NZ (see chapter [X.6] AC GRID Input/Output) with the minimum cross section of 2/0 AWG (67.4 mm2) copper.
TT is permitted with modification of values and/or safety levels which shall be quantified, because in any case the neutral to MEN connection must be maintained to the inverter during all operating modes.
In case the inverter is set in grid mode only (stand-alone mode is not possible) TT is permitted.

3.4.4 Compatibility with RCD

The DB200 and CLEANISLAND 100 AU/NZ don't have any built-in RCMU (residual current monitoring unit). The inverter is equipped with built-in isolation power transformer so it is compatible with external RCD type A.

External RCDs rating is depending on the number of installed CLEANISLAND 100 AU/NZ:

1) In case of one unit use 1A rating
2) In case of two units use 2A rating

These RCDs rating refer to the inverter branch.

The external RCDs to the loads (on the output of the DB 200), must be rated according local standards and load types.

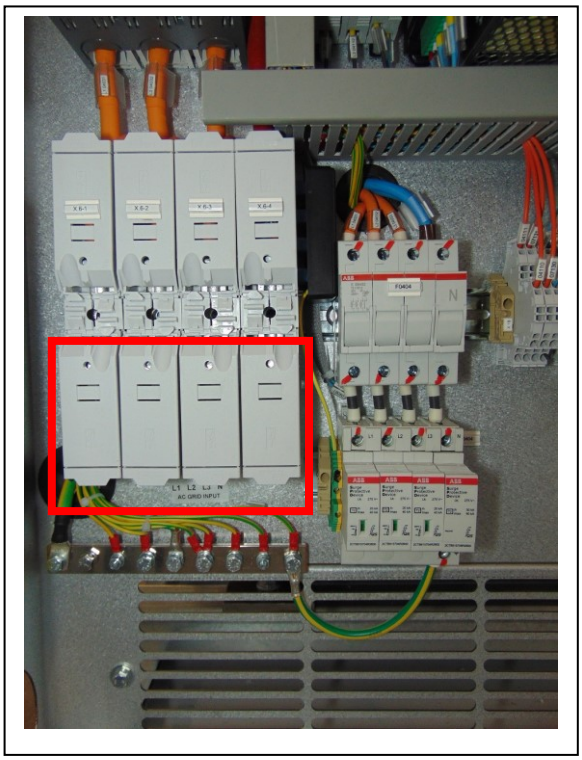
AS4777.2 states the requirement of continuity of grid neutral-earth connection (MEN connection) must be maintained at all times. In case of multiple mode inverter it is critical for the installer to ensure that the load neutral to MEN connection is maintained during all operating modes of the inverter, including stand-alone mode.
It is mandatory connect the DB 200 grid port neutral terminal (see chapter [X.6] terminal block: Input/Output Grid) to the grid neutral point, and connect the neutral connection between DB200 and CLEANISLAND 100 AU/NZ (see chapter [X.6] AC GRID Input/Output).

3.4.5 Automatic restart

The system can be configured to operate automatic restart after the removal of power.
To stop all operations follow the instructions in section "4 MAINTENANCE". Open all isolators from the sources and to the loads.

3.4.6 CLEANISLAND 100 AU/NZ terminal blocks

3.4.6.1 *[X.6] AC GRID Input/Output*



Picture 14

400V (415V) 3 phase + neutral grid to PCS, it is connected to the cabinet through the terminal blocks [X.6], where there is the label “AC GRID INPUT/OUTPUT“ (see Picture 14).

Number terminal	Category	Description
01	Grid	Phase (L1)
02	Grid	Phase (L2)
03	Grid	Phase (L3)
04	Grid	Neutral (N)

Table 10

Following the minimum wire size according to Table 11:

Rated voltage	**CLEANISLAND 100 AU/NZ**
400V or 415V with transformer tap	use 90°C wire 2/0 AWG (67.4 mm2) copper

Table 11

After attaching the wire to the M8 lug terminal, this should be tightened to the [X.6] terminal. It is required a 13mm hexagonal socket with the proper torque tool to tighten the M8 nut/bolt with a torque between 6 to 12 Nm (52 to 104 lb.in) see Picture 15.

Requirements for wiring:

- 4 x M8 lug terminals (size accordingly to the chosen wire)
- Hydraulic crimping clamp for lug terminals

Picture 15

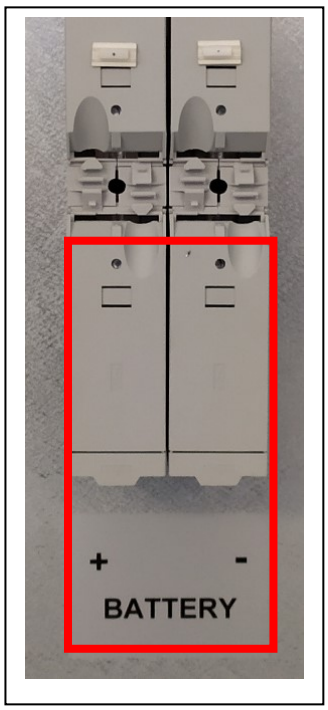
After the connections are ready it is mandatory mount all phase barriers (protections) of the terminal blocks [X.6].

3.4.6.2 *[X.3] terminal block: DC battery input*

The terminal block [X.3] has the terminals for the connection to the battery. In Table 12 the standard position of the terminals is shown, to be verified on the schematic.

Number terminal	Category	Description
01	Battery	Positive pole
02	Battery	Negative pole

Table 12



Picture 16

The battery has to be connected in the terminal block [X.3]. The rated cross-section of the cables for connections are 3/0 AWG (85 mm2) copper for 90°C wire.

After attaching the wire to the M8 lug terminal, this should be tightened to the [X.3] terminal. It is required a 13mm hexagonal socket with the proper torque tool to tighten the M8 nut/bolt with a torque between 6 to 12 Nm (52 to 104 lb.in) see Picture 15.

Requirements for wiring:

- 2 x M8 lug terminals (size accordingly to the chosen wire)
- Hydraulic crimping clamp for lug terminals

After the connections are ready it is mandatory mount all phase barriers (protections) of the terminal blocks [X.3].

3.4.6.3 *[X.1B] terminal block*

Terminal block [X.1B], is located at the front-bottom part of the front side compartment (Picture 17).

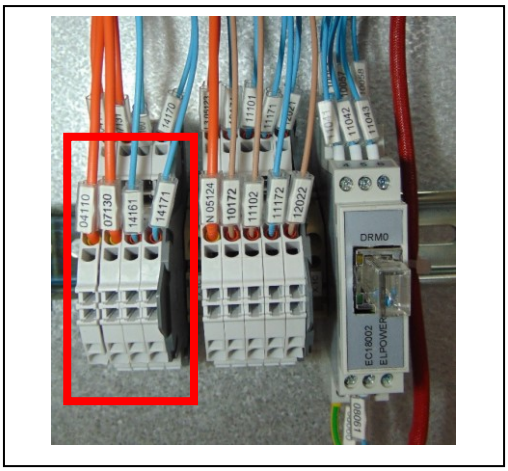
In [X.1B] there are input/output signals. The terminal block is a spring clamp double deck type with these rating:

Characteristics			
Wire size			
		IEC NFC DIN	**UL/CSA**
	Rigid	0,12-4 * mm²	26-12 AWG
	Flexible	0,12-2,5 mm²	26-12 AWG
	Rigid	0,5-2,5 mm²	
	Flexible		
Voltage			
Rated		500 V	300 V
Impulse withstand		6 kV	
Pollution degree		3	
Current			
Rated		20 A	20 A
Wire size			
Rated / Gauge		2,5 mm² / A2	12 AWG
Wire stripping length	Recommended screwdriver	Weight	Protection
9,5 mm	3,5 mm	15 g	IP 20
.37 "	*.14"*	*.53 oz*	*NEMA 1*

* **entrelec**® *spring connection terminal blocks comply with IEC 947-1 standard for 2.5 mm² rated wire size. Never the less, our spring terminal blocks can be connected to 4 mm² rigid wires.*

The maximum cable cross-section for each terminal is 2.5 mm² (12 AWG max).

Alternatively in case of screw clamp terminal, the clamping screw is M2.5 and tightening torque is 0.4 to 0.8 Nm (3.5 to 7.0 in-lbs) for copper wire or 0.4 Nm (3.5 in-lbs) for aluminium wire.



Picture 17

In Table 13 it is possible to see the position of the terminals, which anyway has to be checked in the electrical schematic. Where necessary it is required an external 24VDC power supply to feed the external circuitry and converter inputs and outputs.

Terminal number	Category	Description	Note
01	Input	"AC CB EMERGENCY OFF"	+24VDC from output of DB 200
02	Input		0VDC from output of DB 200
03	Input	"BATTERY CB EMERGENCY OFF"	+24VDC from output of DB 200
04	Input		0VDC from output of DB 200
05	Output	"AC SUPPLY CONTACTOR STATUS"	K0816 AC side contactor status: NO dry contact (K0816 open)
06	Output		
07	Output	"DC SUPPLY CONTACTOR STATUS"	K0814 DC side contactor status: NO dry contact (K0814 open)
08	Output		

Table 13

3.4.6.4 *[X.1C] terminal block*

Terminal block [X.1C], is located at the front-bottom part of the front side compartment (Picture 18).

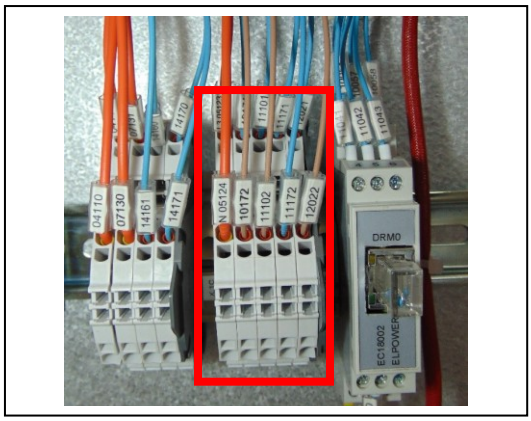
In [X.1C] there are input/output signals. The terminal block is a spring clamp double deck type with these rating:

Characteristics			
Wire size			
	IEC NFC DIN		UL/CSA
Rigid	0,12-4 * mm²		26-12 AWG
Flexible	0,12-2,5 mm²		26-12 AWG
Rigid	0,5-2,5 mm²		
Flexible			
Voltage			
Rated	500 V		300 V
Impulse withstand	6 kV		
Pollution degree	3		
Current			
Rated	20 A		20 A
Wire size			
Rated / Gauge	2,5 mm² / A2		12 AWG
Wire stripping length	Recommended screwdriver	Weight	Protection
9,5 mm	3,5 mm	15 g	IP 20
.37 "	.14"	.53 oz	NEMA 1

**entrelec® spring connection terminal blocks comply with IEC 947-1 standard for 2.5 mm² rated wire size. Never the less, our spring terminal blocks can be connected to 4 mm² rigid wires.*

The maximum cable cross-section for each terminal is 2.5 mm² (12 AWG max).

Alternatively in case of screw clamp terminal, the clamping screw is M2.5 and tightening torque is 0.4 to 0.8 Nm (3.5 to 7.0 in-lbs) for copper wire or 0.4 Nm (3.5 in-lbs) for aluminium wire.



Picture 18

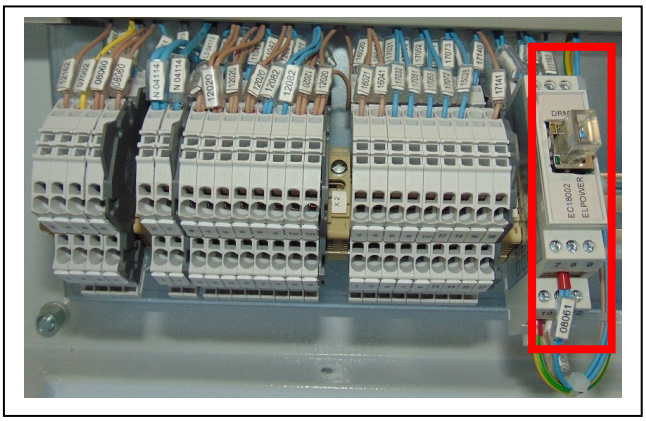
In Table 14 it is possible to see the standard position of the terminals, which anyway has to be checked in the electrical schematic. Where necessary it is required an external 24VDC power supply to feed the external circuitry and converter inputs and outputs.

Terminal number	Category	Description	Note
01	Input	"L3-N VOLTAGE SYNC. FROM INT. DB."	L3 voltage from DB 200
02	Input		N voltage from DB 200
03	Input	"INTERFACE DB CONTACTORS STATUS"	+24VDC from DB 200 contactors K0814 and K0816 status
04	Input		+0VDC from DB 200 contactors K0814 and K0816 status
05	Input	"INTERFACE PROTECTION STATUS"	+24VDC from DB 200 interface protection status
06	Input		+0VDC from DB 200 interface protection status
07	Output	REMOTE TRIP COMMAND	NO dry contact: connect to DB 200 input. When this contact closes the DB 200 opens grid contactors
08	Output		
09	Input	ENABLE FROM PLC OR EMS	+24VDC from DB 200 enable command
10	Input		+0VDC from DB 200 enable command

Table 14

3.4.6.1 *DRM0 terminal block*

Terminal block DRM0, is located at the front-bottom part of the EMS compartment (Picture 19). It is a RJ45 connector. The terminal block is supplied with a RJ45 male connector that simulate enable command on the pin 5 and 6. To connect a cable for the remote DRM0 command remove the RJ45 male connector.



Picture 19

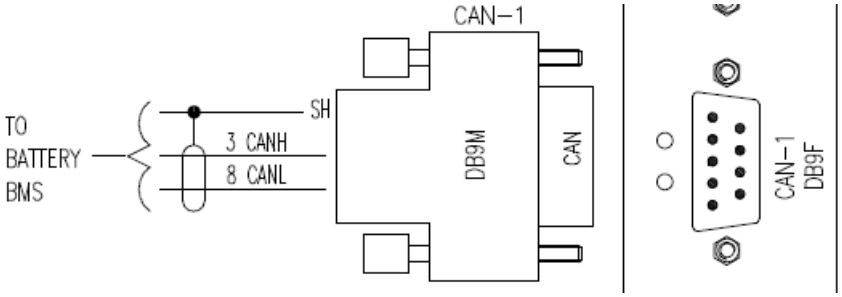
3.4.6.2 *Gateway - communication connectors*

The communication gateway is located on the internal door of the front compartment, see Picture 20. There are five communication ports:

- CAN-1: female DB9 connector (not terminated) for communication with BMS
  1. Pin configuration BMS side

Pin	Signal
1	Sync1 - reserved
2	CAN_GND
3	SYNC_H
4	CAN_H
5	CAN_L
6	SYNC_L
7	Sync7 - reserved
8	Sync8 - reserved

Pin configuration PCS side



- CAN-2: female DB9 connector (not terminated)
- TCP/IP: female RJ45 connector
- RS485-1: female DB9 connector (not terminated)
- RS485-2: female DB9 connector (not terminated)

To connect the RS485 and CANBUS cable it is necessary a DB9 male connector: if necessary terminate with a resistor inside the DB9 male connector according to the system configuration. To connect the TCP/IP cable it is necessary a LAN cable with RJ45 connector.

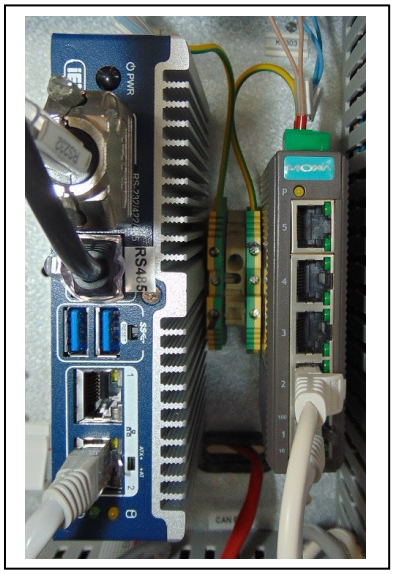
Picture 20

3.4.6.3 *Remote kit connection*

The CLEANISLAND 100 AU/NZ is equipped with a remote control kit to connect with a LAN cable to the modem inside the DB 200. It is located on the internal panel of the front compartment (see Picture 21).
The remote control kit is composed of:

- Embedded PC: ITG-100-AL-E1/S
- LAN switch: EDS-205

Please refer to the CLEANISLAND supervisor software manual to have further information about the functionality and setup.



Picture 21

3.4.6.4 *Remote monitoring of Inverter*

To remotely supervise CLEANISLAND, Teamviewer's remote access software is used. Through this software it is possible to access the embedded PC to view the supervisor, see the data in real time, download the files of the stored logs, ecc.
In order to connect, it is necessary to install Teamviewer's remote access software in your PC and enter the Partner ID that is shown on the side of the embedded PC itself. After entering the password, the desktop of the pc embedded will appear. The refresh rate depends on the quality of the internet connection.
Once Teamviewer's connection is established,, the monitoring is done by the Elpower Monitor app installed on the embedded PCs.

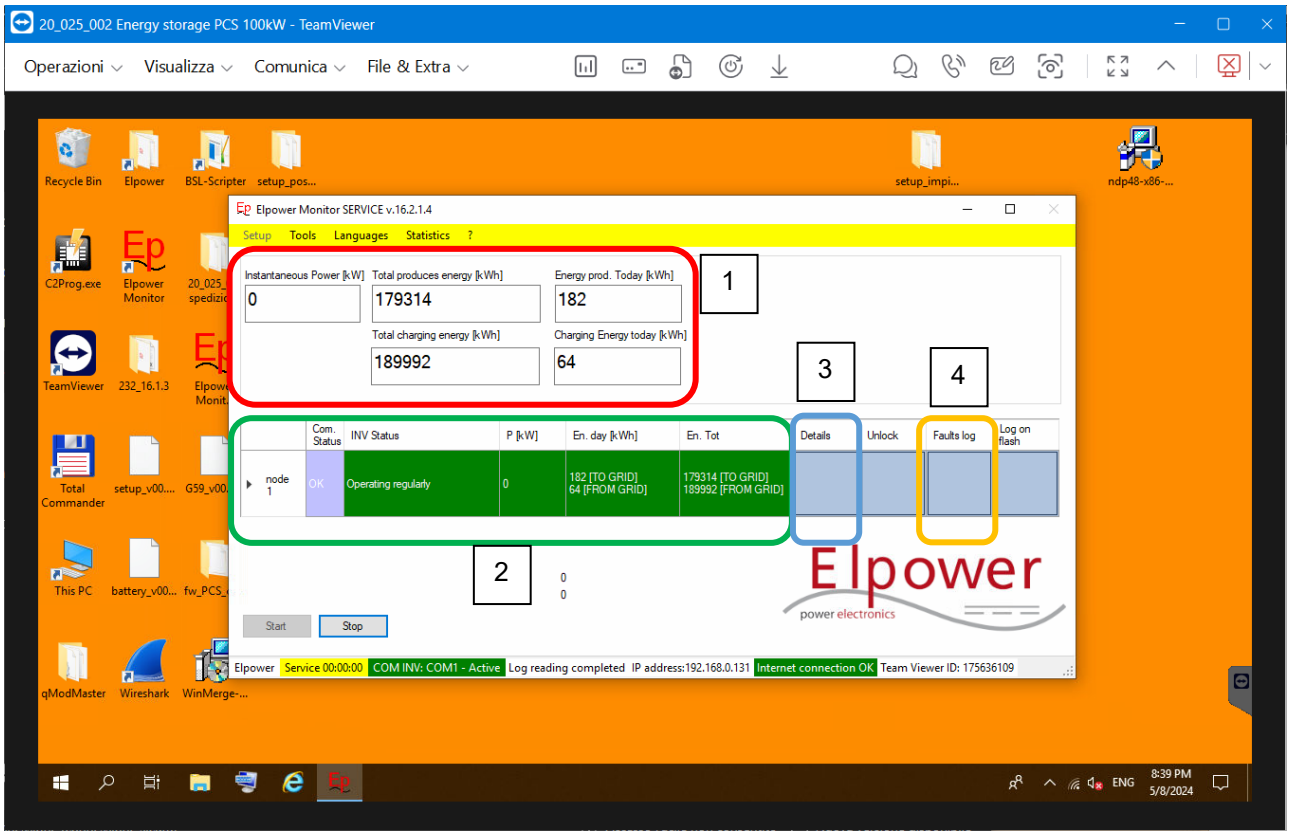
Here it is a quick guide to the Elpower Monitor, also know as supervisor software.

3.4.6.4.1 Structure of the supervisor

The supervision software is meant to work during all the activity period of the inverter in order to detect data and sampling it in real time. In order to start the supervisor, please run ElpowerMonitor.exe file; this file is activated automatically in pc embedded installed in the machine.

3.4.6.4.2 Supervisor Start-up

Then, push *Start* button and check if the communication is present. If the communication is active, the bar related to the inverter data has to be green otherwise there is no communication. If after pushing start button the communication is not active, check the set up of COM port both on inverter and pc side.



1 - *Display of working data in real time*

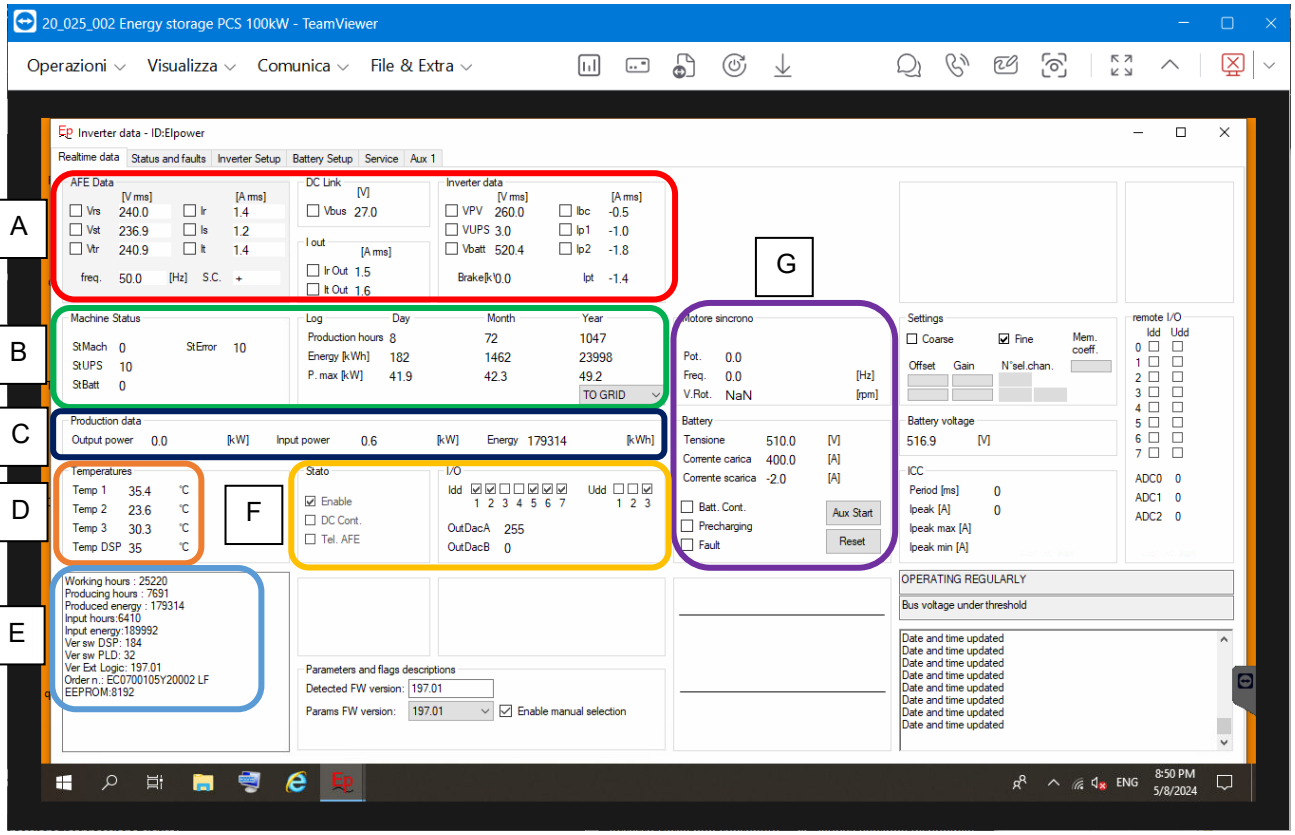
2 - *Display the inverter status*

3 - *Button to access details*

4 - *Button to access list of the alarms and faults stored by the inverter.*

3.4.6.4.3 Inverter data

By clicking on *details* the data regarding generator and grid are displayed in real time.



A - *Phase to phase voltages, current phases, frequency on the generator side and grid side. Output current and voltages on DC link.*

B - *It displays state machine management of logic and errors, and it displays statistical data of production.*

C - *Supply data: power supplied and power entering.*

D - *Inverter temperature.*

E - *Summary hours and logic version of the firmware installed (Ver sw DSP).*

F - *I/O status*

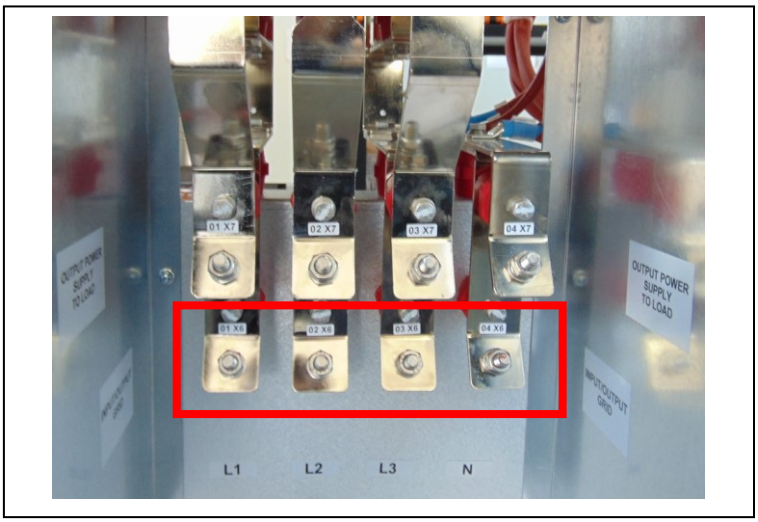
G - *Data related to battery and motor.*

3.4.6.4.4 Closing the supervisor software

In order to switch off the supervisor software it is sufficient to push the *Stop* button and then *Close*, which is enabled after pushing the first one.

3.4.7 DB 200 terminal blocks

3.4.7.1 *[X.6] terminal block: Input/Output Grid*



Picture 22

400V (415V) 3 phase + neutral grid to the distribution board, it is connected to the cabinet through the terminal blocks [X.6], where there is the label “INPUT/OUTPUT GRID” (see Picture 22).

Number terminal	Category	Description
01	Grid	Phase (L1)
02	Grid	Phase (L2)
03	Grid	Phase (L3)
04	Grid	Neutral (N)

Table 15

Following the minimum wire size according to Table 16:

Rated voltage	**DB 200**
400V or 415V with transformer tap	use 90°C wire, either 400 AWG (203 mm2) copper or 600 AWG (304 mm2) aluminum

Table 16

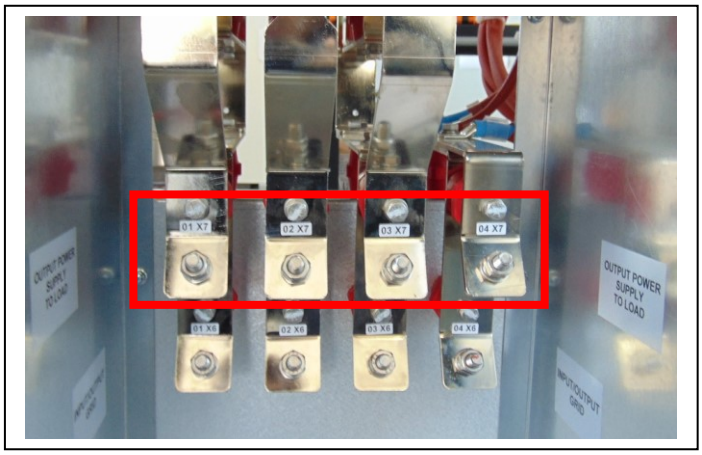
The terminal block hole size is 15mm diameter, the minimum suggested bolts size is M10. After attaching the wire to the lug terminal, this should be tightened to the [X.6] terminal.
In case of M10 lug terminal it is required a 17mm hexagonal socket with the proper torque tool to tighten the M10 nut/bolt with a torque between 10 to 20 Nm (87 to 174 lb.in) or according to the chosen bolt and lug terminal.

Requirements for wiring:

- 4 x M10 to M14 lug terminals (size accordingly to the chosen wire)
- Hydraulic crimping clamp for lug terminals

After the connections are ready it is mandatory mount the protection of the terminal blocks [X.6].

3.4.7.2 *[X.7] terminal block: Output power supply to LOAD*



Picture 23

400V (415V) 3 phase + neutral grid to PCS, it is connected to the cabinet through the terminal blocks [X.7], where there is the label “OUTPUT POWER SUPPLY TO LOAD” (see Picture 23).

Number terminal	Category	Description
01	Load	Phase (L1)
02	Load	Phase (L2)
03	Load	Phase (L3)
04	Load	Neutral (N)

Table 17

Following the minimum wire size according to Table 11:
The terminal block hole size is 15mm diameter, the minimum suggested bolts size is M10. After attaching the wire to the lug terminal, this should be tightened to the [X.7] terminal.
In case of M10 lug terminal it is required a 17mm hexagonal socket with the proper torque tool to tighten the M10 nut/bolt with a torque between 10 to 20 Nm (87 to 174 lb.in) or according to the chosen bolt and lug terminal.

Requirements for wiring:

- 4 x M10 to M14 lug terminals (size accordingly to the chosen wire)
- Hydraulic crimping clamp for lug terminals

After the connections are ready it is mandatory mount the protection of the terminal blocks [X.7].

3.4.7.3 *[X.1A] terminal block*

Terminal block [X.1A], is located at the front-bottom part of the EMS compartment (Picture 24).

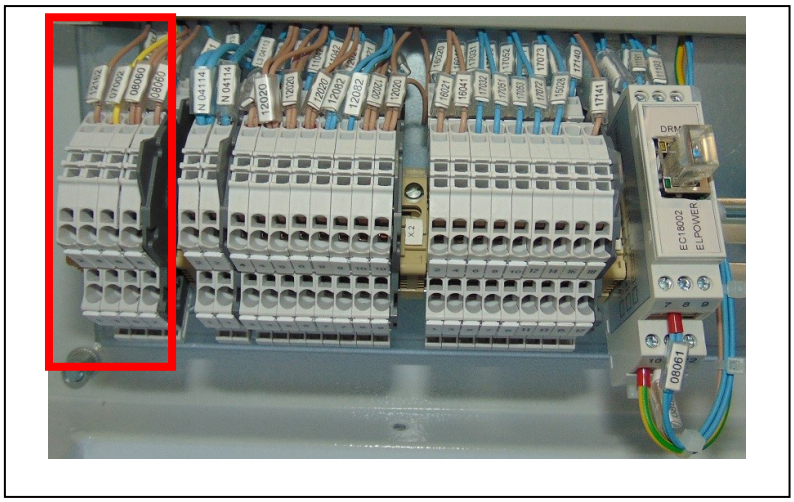
In [X.1A] there are input/output signals. The terminal block is a spring clamp double deck type with these rating:

Characteristics			
Wire size			
	IEC NFC DIN		**UL/CSA**
Rigid	0,12-4 * mm²		26-12 AWG
Flexible	0,12-2,5 mm²		26-12 AWG
Rigid	0,5-2,5 mm²		
Flexible			
Voltage			
Rated	500 V		300 V
Impulse withstand	6 kV		
Pollution degree	3		
Current			
Rated	20 A		20 A
Wire size			
Rated / Gauge	2,5 mm² / A2		12 AWG
Wire stripping length	Recommended screwdriver	Weight	Protection
9,5 mm	3,5 mm	15 g	IP 20
.37 "	*.14"*	*.53 oz*	*NEMA 1*

* **entrelec**® *spring connection terminal blocks comply with IEC 947-1 standard for 2.5 mm² rated wire size. Never the less, our spring terminal blocks can be connected to 4 mm² rigid wires.*

The maximum cable cross-section for each terminal is 2.5 mm² (12 AWG max).

Alternatively in case of screw clamp terminal, the clamping screw is M2.5 and tightening torque is 0.4 to 0.8 Nm (3.5 to 7.0 in-lbs) for copper wire or 0.4 Nm (3.5 in-lbs) for aluminium wire.



Picture 24

In Table 18 it is possible to see the standard position of terminals, which anyway has to be checked in the electrical schematic. Where necessary it is required an external 24VDC power supply to feed the external circuitry and converter inputs and outputs.

Terminal number	Category	Description	Note
01	Input	"AUTOMATIC MODE ENABLE FROM PLC"	+24VDC from PLC (*)
02	Input		0VDC from PLC (*)
03	Output	"EMERGENCY STOP TO PLC""	NC dry contact. When the Emergency button is pushed this contact opens
04	Output		
05	Output	"EMERGENCY STOP TO PCS1"	+24VDC to PCS1 to open AC CB and BATTERY CB in case of emergency
06	Output		+24VDC to PCS1 to open AC CB and BATTERY CB in case of emergency
07	Output	"EMERGENCY STOP TO PCS2"	+24VDC to PCS2 to open AC CB and BATTERY CB in case of emergency
08	Output		+24VDC to PCS2 to open AC CB and BATTERY CB in case of emergency

Table 18

(*) this input could be not used and it is possible bypass the relay status. The relay is equipped with a little lever, in case the lever is rotated anti clockwise the status of the relay is equivalent to supply the coil.

3.4.7.4 *[X.1C] terminal block*

Terminal block [X.1C], is located at the front-bottom part of the EMS compartment (Picture 25).

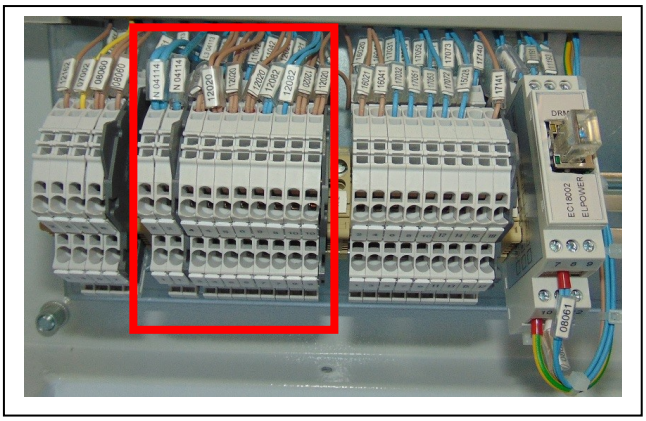
In [X.1C] there are input/output signals, each signal has a double terminal because it is possible wire 1 or 2 PCS. The terminal block is a spring clamp double deck type with these rating:

Characteristics			
Wire size			
	IEC NFC DIN		**UL/CSA**
Rigid	0,12-4 * mm²		26-12 AWG
Flexible	0,12-2,5 mm²		26-12 AWG
Rigid	0,5-2,5 mm²		
Flexible			
Voltage			
Rated	500 V		300 V
Impulse withstand	6 kV		
Pollution degree	3		
Current			
Rated	20 A		20 A
Wire size			
Rated / Gauge	2,5 mm² / A2		12 AWG
Wire stripping length	Recommended screwdriver	Weight	Protection
9,5 mm	3,5 mm	15 g	IP 20
.37 "	.14"	.53 oz	NEMA 1

* **entrelec**® *spring connection terminal blocks comply with IEC 947-1 standard for 2.5 mm² rated wire size. Never the less, our spring terminal blocks can be connected to 4 mm² rigid wires.*

The maximum cable cross-section for each terminal is 2.5 mm² (12 AWG max).

Alternatively in case of screw clamp terminal, the clamping screw is M2.5 and tightening torque is 0.4 to 0.8 Nm (3.5 to 7.0 in-lbs) for copper wire or 0.4 Nm (3.5 in-lbs) for aluminium wire.



Picture 25

In Table 19 it is possible to see the standard position of terminals, which anyway has to be checked in the electrical schematic. Where necessary it is required an external 24VDC power supply to feed the external circuitry and converter inputs and outputs.

Terminal number	Category	Description	Note
01	Output	"L3 VOLTAGE SYNC TO PCS"	L3 synchronism voltage from DB 200 to CLEANISLAND 100 AU/NZ
02	Output	"N VOLTAGE SYNC TO PCS"	N synchronism voltage from DB 200 to CLEANISLAND 100 AU/NZ
03	Output	"INTERFACE DB CONTACTORS STATUS (+)"	+24VDC to PCS
04	Output	"INTERFACE DB CONTACTORS STATUS (-)"	0VDC to PCS
05	Output	"INTERFACE PROTECTION RELAY STATUS (+)"	+24VDC to PCS
06	Output	"INTERFACE PROTECTION RELAY STATUS (-)"	0VDC to PCS
07	Input	"REMOTE TRIP"	Dry contact from PCS. If any PCS close this contact the DB 200 opens the grid contactors
08	Input		
09	Output	"ENABLE COMMAND TO PCS (+)"	+24VDC to PCS
10	Output	"ENABLE COMMAND TO PCS (-)"	0VDC to PCS

Table 19

3.4.7.1 *[X.2] terminal block*

Terminal block [X.2], is located at the front-bottom part of the EMS compartment (Picture 25).

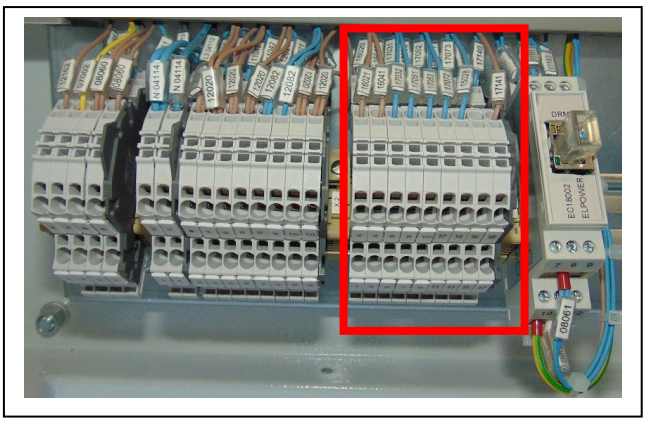
In [X.2] there are input/output signals. The terminal block is a spring clamp double deck type with these rating:

Characteristics			
Wire size			
		IEC NFC DIN	**UL/CSA**
	Rigid	0,12-4 * mm²	26-12 AWG
	Flexible	0,12-2,5 mm²	26-12 AWG
	Rigid	0,5-2,5 mm²	
	Flexible		
Voltage			
Rated		500 V	300 V
Impulse withstand		6 kV	
Pollution degree		3	
Current			
Rated		20 A	20 A
Wire size			
Rated / Gauge		2,5 mm² / A2	12 AWG
Wire stripping length	Recommended screwdriver	Weight	Protection
9,5 mm	3,5 mm	15 g	IP 20
.37 "	*.14"*	*.53 oz*	*NEMA 1*

* **entrelec**® *spring connection terminal blocks comply with IEC 947-1 standard for 2.5 mm² rated wire size. Never the less, our spring terminal blocks can be connected to 4 mm² rigid wires.*

The maximum cable cross-section for each terminal is 2.5 mm² (12 AWG max).

Alternatively in case of screw clamp terminal, the clamping screw is M2.5 and tightening torque is 0.4 to 0.8 Nm (3.5 to 7.0 in-lbs) for copper wire or 0.4 Nm (3.5 in-lbs) for aluminium wire.



Picture 26

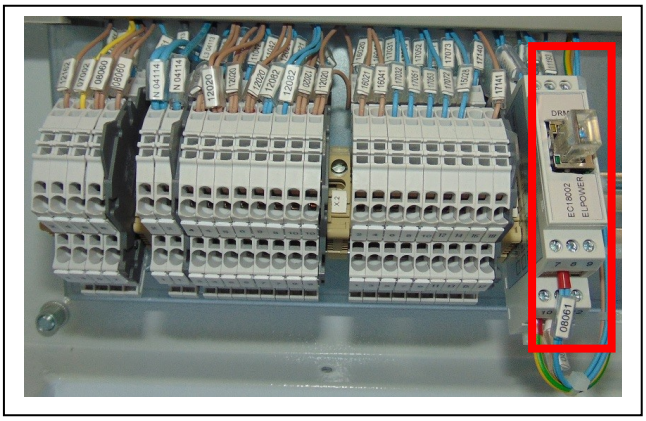
In Table 19 it is possible to see the standard position of terminals, which anyway has to be checked in the electrical schematic. Where necessary it is required an external 24VDC power supply to feed the external circuitry and converter inputs and outputs.

Terminal number	Category	Description	Note
01	Input	"EMS INPUT 1"	+24VDC from other site device
02	Input		0VDC from other site device
03	Input	"EMS INPUT 2"	+24VDC from other site device
04	Input		0VDC from other site device
05	Output	"EMS OUTPUT 1"	NO dry contact
06	Output		COM of the contact
07	Output		NC dry contact
08	Output	"EMS OUTPUT 2"	NO dry contact
09	Output		COM of the contact
10	Output		NC dry contact
11	Output	"EMS OUTPUT 3"	NO dry contact
12	Output		COM of the contact
13	Output		NC dry contact
14	Output	"EMS OUTPUT 4"	NO dry contact
15	Output		
16	Spare	-	
17	Output	"24VDC POWER SUPPLY TO EXT. LOGIC"	+24VDC to external logic
18	Output		0VDC to external logic

Table 20

3.4.7.2 *DRM0 terminal block*

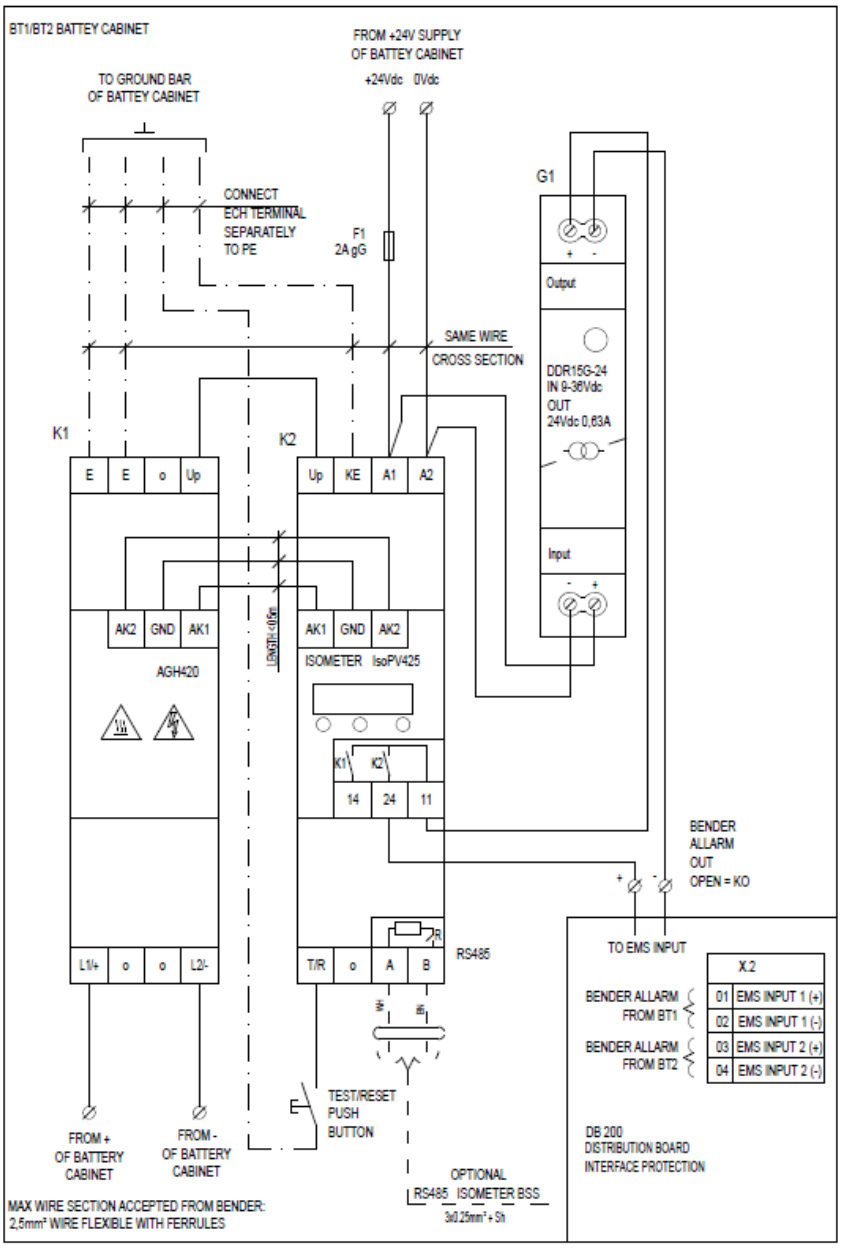
Terminal block DRM0, is located at the front-bottom part of the EMS compartment (Picture 27). It is a RJ45 connector. The terminal block is supplied with a RJ45 male connector that simulate enable command on the pin 5 and 6. To connect a cable for the remote DRM0 command remove the RJ45 male connector.



Picture 27

3.4.7.3 *Bender isometer alarm connections*

The figure below shows the connections scheme regarding the alarms' benders to detect the external earth fault in case these devices are installed. For the overall system connections check it with the electrical schematic provided.



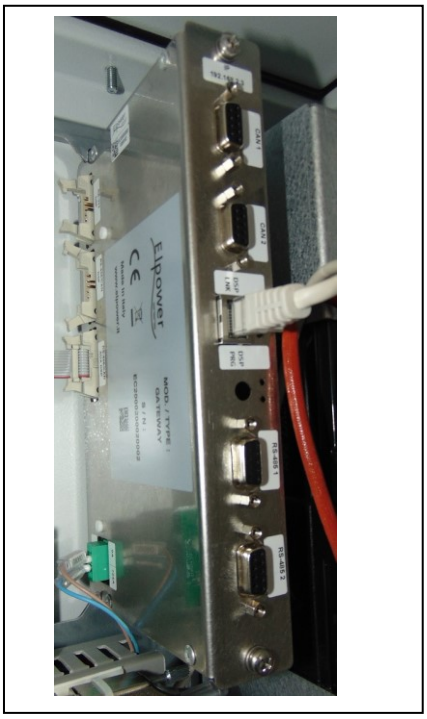
Note: Every system (PCS + battery bank) requires one dedicated bender isometer.

3.4.7.4 *Gateway - communication connectors*

The communication gateway is located in the right of the EMS compartment, see Picture 28. There are five communication ports:

- CAN-1: female DB9 connector (not terminated)
- CAN-2: female DB9 connector (not terminated)
- TCP/IP: female RJ45 connector
- RS485-1: female DB9 connector (not terminated)
- RS485-2: female DB9 connector (not terminated)

To connect the RS485 and CANBUS cable it is necessary a DB9 male connector: if necessary terminate with a resistor inside the DB9 male connector according to the system configuration. To connect the TCP/IP cable it is necessary a LAN cable with RJ45 connector.



Picture 28

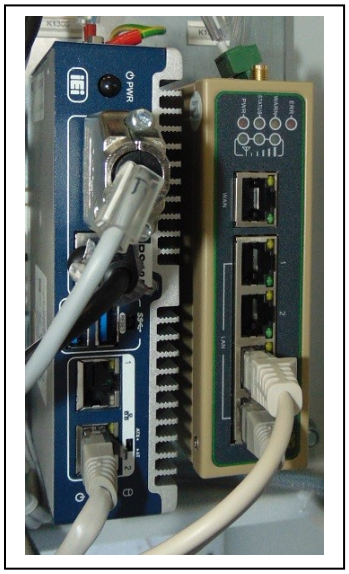
3.4.7.5 *Remote kit connection*

The DB 200 is equipped with a remote control kit to interact with the EMS (Energy Management System) it is located in the right of the EMS compartment (see Picture 29).

The remote control kit is composed of:

- Embedded PC: ITG-100-AL-E1/S
- 4G Modem/router: IR615S-L3

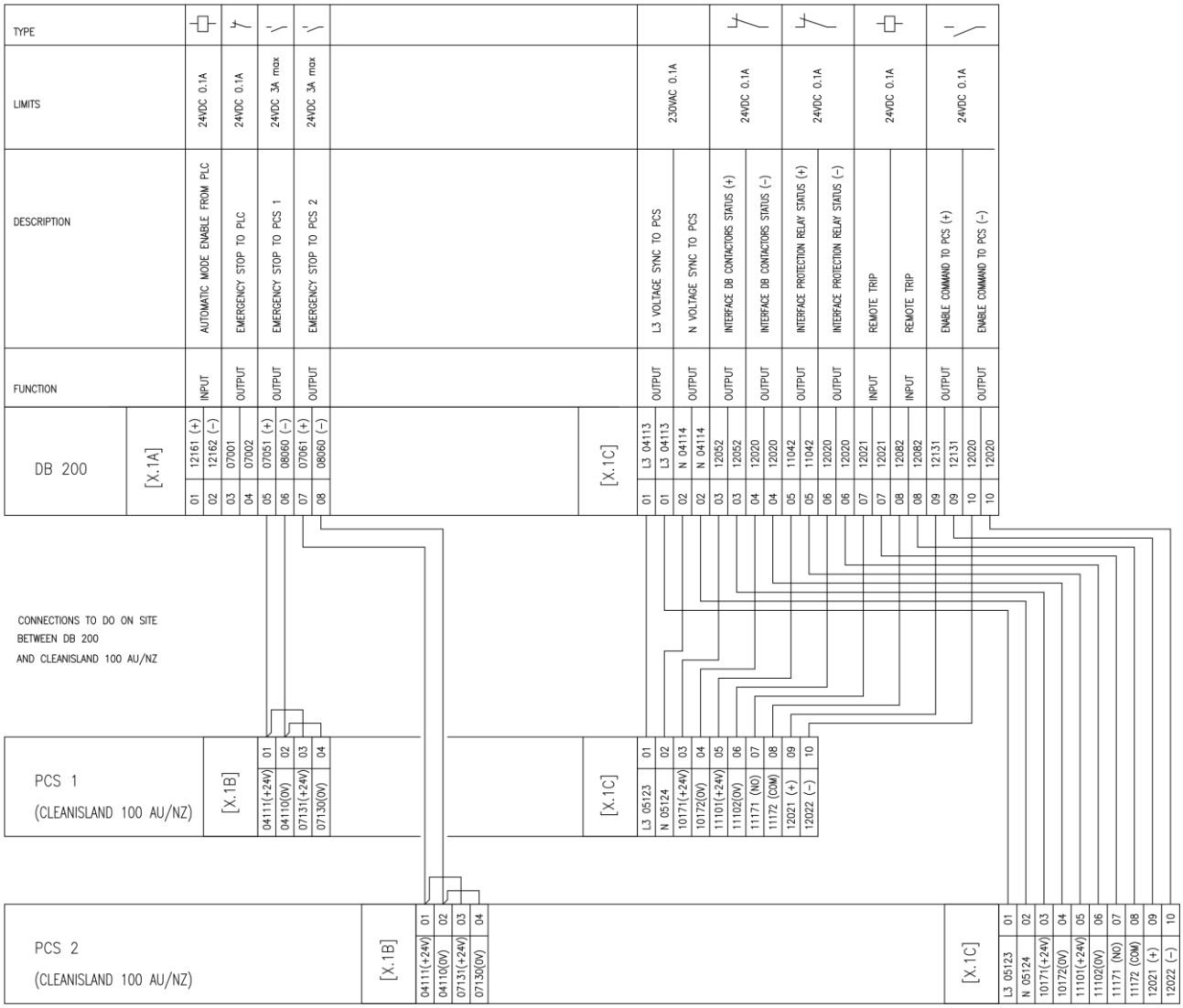
Please refer to the modem router documentation for further information about the communication setup. Please refer to the EMS supervisor software manual to have further information about the EMS functionality and setup.



Picture 29

3.4.8 Interconnections between DB 200 and CLEANISLAND 100 AU/NZ

In the previous sections regarding the terminal blocks there are the reference regarding the signals interconnected between the DB200 and one or two CLEANISLAND 100 AU/NZ. This section summarize those interconnections:



The minimum suggested wiring size is 0.5 mm^2 the maximum cable cross-section for each terminal is 2.5 mm^2 (12 AWG max). Cable type according local requirements.

3.5 Commissioning

The commissioning must be performed by qualified personnel only.
Safety instructions have to be strictly observed to avoid serious injuries, loss of life, damage to the converter and the connected equipment.

3.5.1 **Preliminary checks**

1. Check that the DB200 and CLEANISLAND 100 AU/NZ are installed correctly and securely
2. Check that the DB200 and CLEANISLAND 100 AU/NZ AC and DC main switches are open
3. Check that the upstream DC switches and upstream/downstream AC switches are OFF
4. Check that all grounding connection are done correctly and securely
5. Check that all AC output power cables are connected correctly and securely, without open circuits or short circuits
6. Check that all DC input power cables are connected correctly and securely, without open circuits or short circuits
7. Check that all connections between DB 200 and CLEANISLAND 100 AU/NZ are correctly and securely, without open circuits or short circuits
8. Check that the communications cable are connected correctly and securely
9. Check that all used cable glands at the bottom of the enclosure are sealed, and that the thread-lock sealing nut is tightened
10. Check that the terminal shrouds are reinstalled, and all protection panel are mounted
11. Check that inside the compartments is clean and tidy, without foreign matter
12. Check that the cabinets doors are closed

3.5.2 **Start-up**

The commissioning must be performed by qualified personnel only.
Safety instructions have to be strictly observed to avoid serious injuries, loss of life, damage to the converter and the connected equipment. Before switch on the AC power supply and DC power supply, use a multimeter to check that the AC voltage and DC voltage are within the specified range.

Refer to section “2.2 Electrical cabinet overview – DB 200” and “2.3 Electrical cabinet overview – CLEANISLAND 100 AU/NZ” to see the devices positions.

Referring to the DB 200 schematic, the following steps list the devices to operate during the start-up (in case of name mismatch refer to the schematic):

1. Close F0404 surge arrester fuse holder
2. Check F0416 AC main fuse holder is closed
3. Close F0411 and F0505 AC power supply auxiliary circuitry protection fuse holders
4. Close F0801 auxiliary battery protection fuse holder
5. Close F0804 battery charger protection fuse holder
6. Close F0805 emergency stop circuitry protection fuse holder
7. Close F0806, F0811 and F0813 24VDC distribution protection fuse holders
8. Close Q0511 and Q0512 switch fuse disconnector PCS1 and PCS2 when installed

Referring to the CLEANISLAND 100 AU/NZ schematic, the following steps list the devices to operate during the start-up (in case of name mismatch refer to the schematic):

9. Close F0404 surge arrester fuse holder
10. Close F0411 AC power supply auxiliary circuitry protection fuse holder
11. Close Q0502 AC pre-charge circuit breaker
12. Close F0707 Battery DC input measurement protection fuse holder
13. Close F0711 DC pre-charge circuit protection fuse holder
14. Check that the Emergency push button on DB 200 it is released, if needed rotate anticlockwise the button to release
15. Close Q0714 DC input circuit breaker
16. Close Q0410 switch disconnector
17. Rotate to position 1 the START/STOP enable selector

Then the system is ready to be power supplied:

18. Switch on upstream DC switches and upstream/downstream AC switches
19. Switch on Q0404 to position II “ON”
20. Select EMS operating mode with the “AUTOMATIC MODE ENABLE” selector on DB 200
21. The system will operate according to EMS set and external PLC commands

3.5.3 **Shut-down**

1. CLEANISLAND 100 AU/NZ must be stopped. START/STOP selector must be turned to STOP wait for the converter stop
2. Then follow the battery producer instruction to ensure safe stop (no voltage on DC input)
3. Then the CLEANISLAND 100 AU/NZ main AC circuit breaker and battery circuit breaker must be opened
4. To ensure this condition push the emergency stop button on the DB 200
5. Operate the DB 200 main AC switch handle to select the position 0 “OFF”
6. In case of maintenance open all isolators from the sources and to the loads

7. Before touching any electrical parts, wait 5 minutes for the filter capacitors to discharge

3.5.4 **Bypass**

1. Shut down the system (refer to section 3.5.3 Shut-down)
2. Open upstream AC switch (grid side)
3. Operate the DB 200 main AC switch handle to select the position I “BYPASS”
4. Close upstream AC switch (grid side) to power supply the loads in bypass mode

3.6 Country grid code set information

The CLEANISLAND 100 AU/NZ is set specifically for AS/NZS4777.2:2020 grid code standard according to region AUSTRALIA A requirements.
Inside the DB 200 is present an interface protection relay (ABB CM-UFD.M33M) already set with the proper setting for AS/NZS4777.2:2020 according to region AUSTRALIA A requirements.
To modify the setup of the interface protection relay and user has to be asked to Elpower or to Elpower's importer
In the following tables are listed the default setting of interface protection relay CM.UFD.M33M regarding voltage and frequency monitoring functions:

Menu			Configuration possibilities	Step size	Default
Monitoring functions	Overvoltage >U1	Monitoring	[disabled], [enabled]		enabled
		Threshold value	[0.100]-[1.300] xU_n	0.005 xU_n	1.155 xU_n (265.5 V)
		Hysteresis	[0.5]-[10.0] %	0.10%	1%
		Tripping delay	[0.06]-[600.00] s	0.01 s	1.0 s
	Overvoltage >U2	Monitoring	[disabled], [enabled]		enabled
		Threshold value	[0.100]-[1.300] xU_n	0.005 xU_n	1.195 xU_n (274.8 V)
		Hysteresis	[0.5]-[10.0] %	0.10%	1%
		Tripping delay	[0.00]-[600.00] s	0.01 s	0.01 s
	Undervoltage <U1	Monitoring	[disabled], [enabled]		enabled
		Threshold value	[0.100]-[1.300] xU_n	0,005 xU_n	0.785 xU_n (180.5 V)
		Hysteresis	[0.5]-[10.0] %	0.10%	1%
		Tripping delay	[0.00]-[600.00] s	0.01 s	10.0 s
	Undervoltage <U2	Monitoring	[disabled], [enabled]		enabled
		Threshold value	[0.100]-[1.300] xU_n	0,005 xU_n	0.305 xU_n (70.1 V)
		Hysteresis	[0.5]-[10.0] %	0.10%	1%
		Tripping delay	[0.00]-[600.00] s	0.01 s	1.0 s

Menu			Configuration possibilities	Step size	Default
Monitoring functions	Overfrequency >F1	Monitoring	[disabled], [enabled]		enabled
		Threshold value	[45.00]-[65.00] Hz	0.01 Hz	52.0 Hz
		Hysteresis	[0.05]-[4.00] Hz	0.01 Hz	0.1 Hz
		Tripping delay	[0.00]-[600.00] s	0.01 s	0.01 s
	Overfrequency >F2	Monitoring	[disabled], [enabled]		enabled
		Threshold value	[45.00]-[65.00] Hz	0.01 Hz	55.0 Hz
		Hysteresis	[0.05]-[4.00] Hz	0.01 Hz	0.1 Hz
		Tripping delay	[0.00]-[600.00] s	0.01 s	0.01 s
	Underfrequency <F1	Monitoring	[disabled], [enabled]		enabled
		Threshold value	[45.00]-[65.00] Hz	0.01 Hz	47.0 Hz
		Hysteresis	[0.05]-[4.00] Hz	0.01 Hz	0.1 Hz
		Tripping delay	[0.00]-[600.00] s	0.01 s	1.0 s
	Underfrequency <F2	Monitoring	[disabled], [enabled]		enabled
		Threshold value	[45.00]-[65.00] Hz	0.01 Hz	45.0 Hz
		Hysteresis	[0.05]-[4.00] Hz	0.01 Hz	0.1 Hz
		Tripping delay	[0.00]-[600.00] s	0.01 s	5.0 s

Elpower must be informed regarding any modification of the interface protection relay settings. In case the distribution and transmission company requires different settings, the CM-UFD.M33M can be set according to the datasheet instruction of the producer.

Software parameters are stored inside the CLEANISLAND 100 AU/NZ control board: the software parameters can be changed only by Elpower service, please ask to Elpower or Elpower's importer for any change of those settings.
The CLEANISLAND 100 AU/NZ hasn't a HMI panel to interface with, so there is no possibility to access to the system locally in a strictly way, but you can overcome this problem using the remote accessing (see 3.4.6.4).
The settings related to region AUSTRALIA A can be viewed browsing through: Details → Inverter Setup (tab) → Grid (tab). These are implicity protected by the access password required for the monitoring system (see 3.4.6.4)
Default settings are according to region AUSTRALIA A requirements:

Under frequency watt function

Parameter name	*Position*	*Format*	*Default*
FreqLimT1	[37]	Hz x 100	4985
FreqLimP0UF	[51]	Hz x 100	4975
FreqLimP1UF	[52]	Hz x 100	4900
FreqLimP2UF	[53]	Hz x 100	4800

Over frequency watt function

Parameter name	*Position*	*Format*	*Default*
FreqLimT2	[38]	Hz x 100	5015
FreqLimP0	[5]	Hz x 100	5025
FreqLimP1	[6]	Hz x 100	5075

FreqLimP2	[7]	Hz x 100	5200

Volt watt UnderV

Parameter name	*Position*	*Format*	*Default*
V1_GRID_CODE_VX10	[41]	Vx10	2070
V2_GRID_CODE_VX10	[42]	Vx10	2150
PMIN_UNDERVOLTAGE_x100	[58]	%	20

Volt watt OverV

Parameter name	*Position*	*Format*	*Default*
V3_GRID_CODE_VX10	[43]	Vx10	2530
V4_GRID_CODE_VX10	[44]	Vx10	2600
PMMAX_OVERVOLTAGE_x100	[59]	%	20

Volt-var

Parameter name	*Position*	*Format*	*Default*	*Reference note*
V2i_QfV_tab	[12]	V	207	Vv1
V1i_QfV_tab	[13]	V	220	Vv2
V1s_QfV_tab	[11]	V	240	Vv3
V2s_QfV_tab	[10]	V	258	Vv4

Ramp soft start

Parameter name	*Position*	*Format*	*Default*
tmpPotRip	[15]	s	360

Reconnect times

Parameter name	*Position*	*Format*	*Default*
tmpFreqReteOk	[16]	s	60

Please ask to Elpower for any further information.

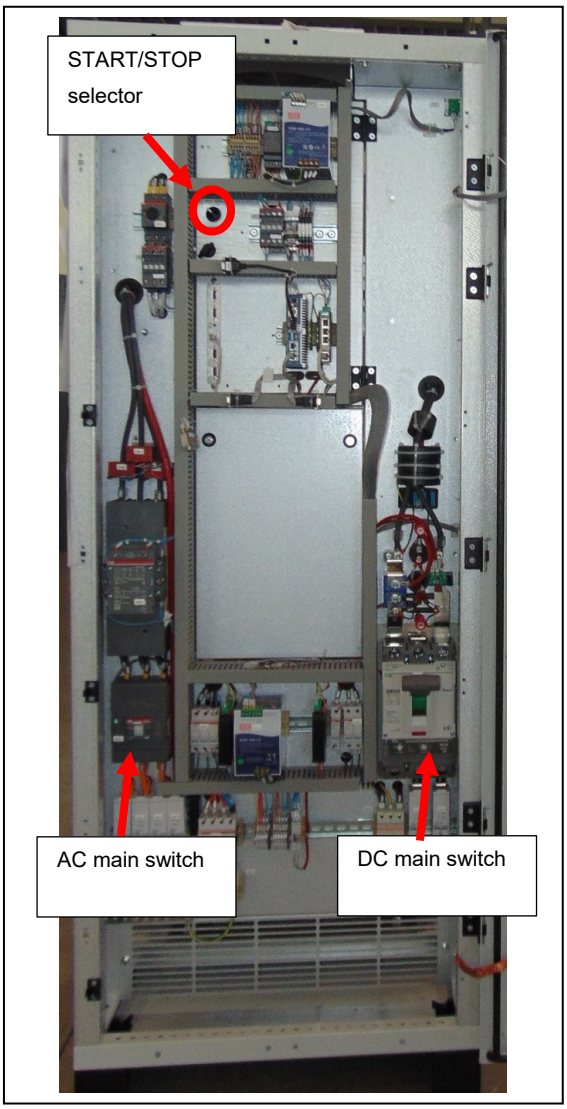
4 MAINTENANCE

To perform any maintenance operations it is mandatory to switch the system off. The CLEANISLAND 100 AU/NZ must be stopped. START/STOP selector must be turned to STOP wait for the converter stop, then follow the battery producer instruction to ensure safe stop (no voltage on DC input). Then the main circuit breaker and battery circuit breaker must be opened. To ensure this condition push the emergency stop button on the DB 200 and operate the main switch handle to select the position 0 “OFF” (refer to section “2.2 Electrical cabinet overview – DB 200” and “2.3 Electrical cabinet overview – CLEANISLAND 100 AU/NZ”). Open all isolators from the sources and to the loads. Before touching any electrical parts, wait 5 minutes for the filter capacitors to discharge.

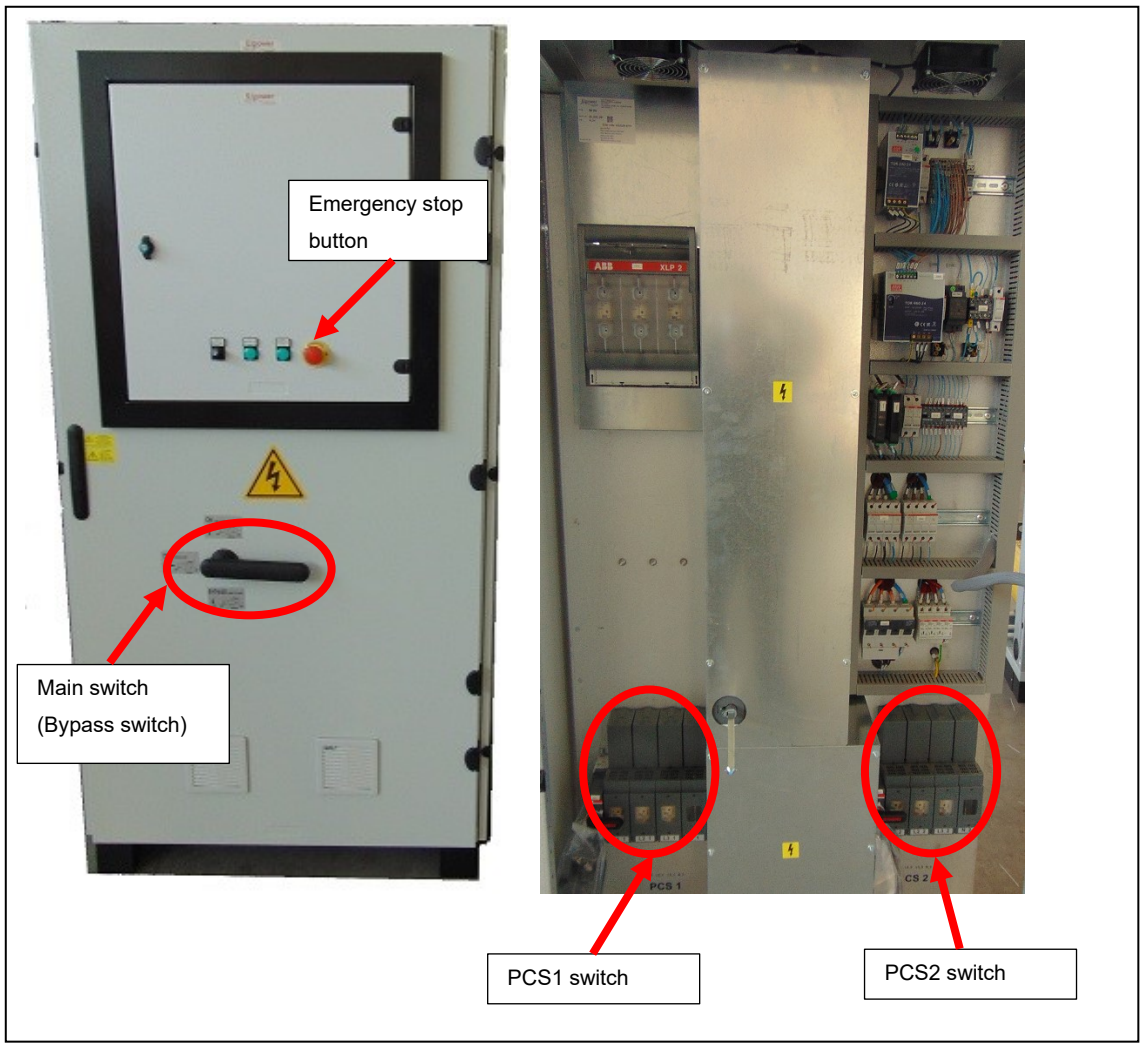
CAUTION:
The system is equipped with auxiliary batteries:
• Do not dispose of batteries in a fire. The batteries may explode.
• Do not open or mutilate batteries. Released electrolyte is harmful to the skin and eyes. It may be toxic.
• A battery can present a risk of electric shock and burns by high short-circuit current.
• Failed batteries can reach temperatures that exceed the burn thresholds for touchable surfaces

Dismantling and disposal operations may only be done by a qualified electrician. These instructions are to be considered indicative: in every country there are different regulations with regard to the disposal of electronic or hazardous waste such as batteries. It is necessary to strictly adhere to the standards in force in the country where the equipment is used.

Do not throw any component of the equipment in the ordinary rubbish.
Batteries must be disposed of in a site intended for the recovery of toxic waste. Disposal in the traditional rubbish is not allowed.
Apply to the competent agencies in your countries for the proper procedure.



Picture 30



Picture 31

The following safety rules must be observed generally when working on the inverter system:

• Watches, rings and other metal objects must be removed

• Use personal safety equipment (PPE)

• Use only insulated tools

• The inverter must not be dismantled

Although the system is generally maintenance free, there are consumable parts to replace.

The list of components subject to periodical replacement is:

CLEANISLAND 100 AU/NZ			
Device Label	Description	Type	Check interval/replacement
-	Front air inlet filter	Viledon P15/150S Dimensions L 525 x H 775 mm	1 years check and cleaning, replacement depending on environment pollution
-	DSP board RTC battery	CR2032	5 years

DB 200			
Device Label	Description	Type	Check interval/replacement
-	Front air inlet filter	Viledon P15/150S Dimensions L 120 x H 120 mm	1 years check and cleaning, replacement depending on environment pollution
-	Auxiliary battery	12V 7.2Ah H 94 x L 151 x W 65 mm faston 6.3mm	2 years
-	DSP board RTC battery	CR2032	5 years

The list of components subject to periodical check/replacement is:

CLEANISLAND 100 AU/NZ			
Device Label	Description	Type	Check interval/replacement
M0908	Converter Fan	G1G146-BA07-52	Expected life L10 70000h @ 40°C
M0911	Converter internal fan	3414-NH	Expected life L10 70000h @ 40°C
M0916	Cabinet Fan	W3G300-BV24-01	Expected life L10 40000h @ 40°C

DB 200			
Device Label	Description	Type	Check interval/replacement
M0902	Cabinet Fan	4715KL-05W-B40	Expected life L10 100000h @ 25°C
M0904	Cabinet Fan	4715KL-05W-B40	Expected life L10 100000h @ 25°C

Fan expected life is referred to full speed and rated temperature. Depending on operating condition the fan speed may be less than rated and/or the operating time is not continuous (fan controlled by temperature thresholds).

The list of components subject to check/replacement in case of protection trip is:

CLEANISLAND 100 AU/NZ			
Device Label	Description	Type	Check interval/replacement
F0404	Surge arrester fuses	32A aM 10x38	-
F0411	AC power supply auxiliary circuitry protection fuses	2A aM 10x38	-
F0707	Battery DC input measurement protection fuses	10A gPV 10x38	-
F0711	DC pre-charge circuit protection fuses	10A gPV 10x38	-

DB 200			
Device Label	Description	Type	Check interval/replacement
F0404	Surge arrester fuses	50A aM 14x51 with signalling	-
F0411	AC power supply auxiliary circuitry protection fuses	6A aM 10x38	-
F0505	AC power supply auxiliary circuitry protection fuses	2A aM 10x38	-
Q0511	Switch fuse disconnector PCS1	250A gG NH1	-
Q0512	Switch fuse disconnector PCS2	250A gG NH1	-
F0811	Auxiliary battery fuse	10A gG 10x38	-
F0811	Auxiliary battery protection fuse	10A gG 10x38	-
F0804	Battery charger protection fuse	2A gG 10x38	-
F0805	Emergency stop circuitry protection fuse	4A gG 10x38	-
F0806	24VDC distribution protection fuse	4A gG 10x38	-
F0811	24VDC distribution protection fuse	6A aM 10x38	-
F0813	24VDC distribution protection fuse	6A aM 10x38	-

In case of fuse protection trip it is mandatory a visual inspection and analysis to find out possible damages before restart the operation.

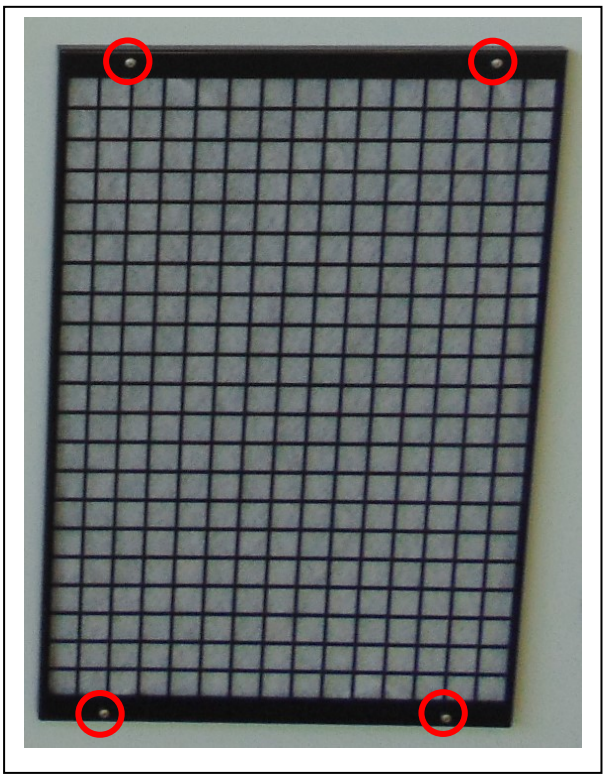
For further information about devices replacement please contact Elpower service.

4.1 Air filter periodical replacement

There is a front air inlet filter for CLEANISLAND 100 AU/NZ and 2 front air filters for DB 200. The filter type is Viledon P15/150S.

4.1.1 CLEANISLAND 100 AU/NZ Front air inlet filter replacement

The front air inlet filter dimension is L 525 x H 775 mm, to check and clean the filter it is possible open the front ventilation grid (see Picture 32) by unscrewing 4 screws. To replace the filter take off the old and insert the new filter. After the positioning of the ventilation grid screw the 4 screws to 2 to 3 Nm (17 to 26 lb.in).



Picture 32

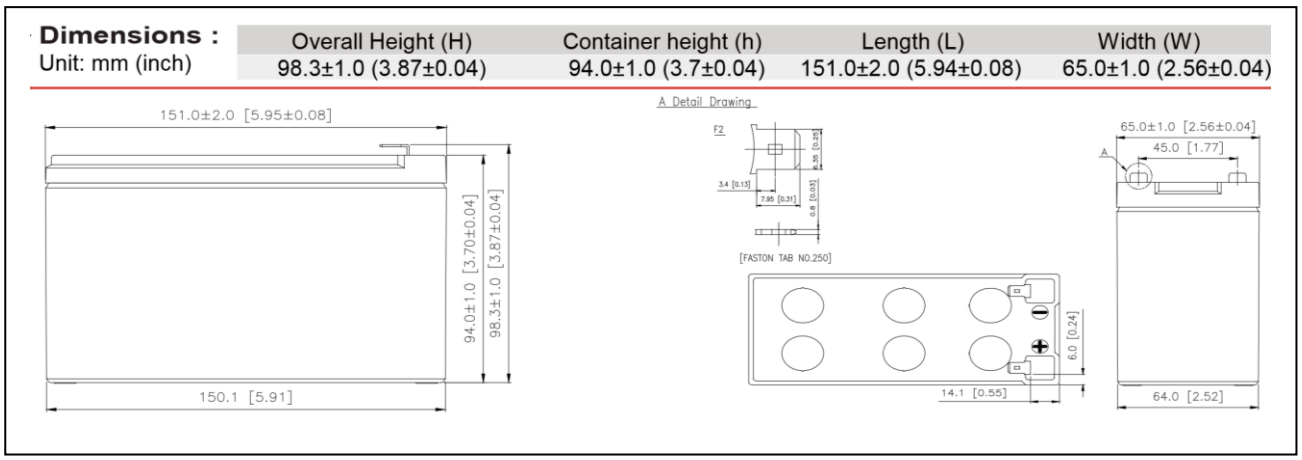
4.1.2 DB 200 Front air inlet filters replacement

The front air inlet filters dimension is L 120 x H 120 mm, to check and clean the filter it is possible open the front ventilation grid (see) by pulling the intake grille. To replace the filter take off the old and insert the new filter. After insert the intake grille in the original position.

Picture 33

4.2 DB 200 Auxiliary battery periodical replacement

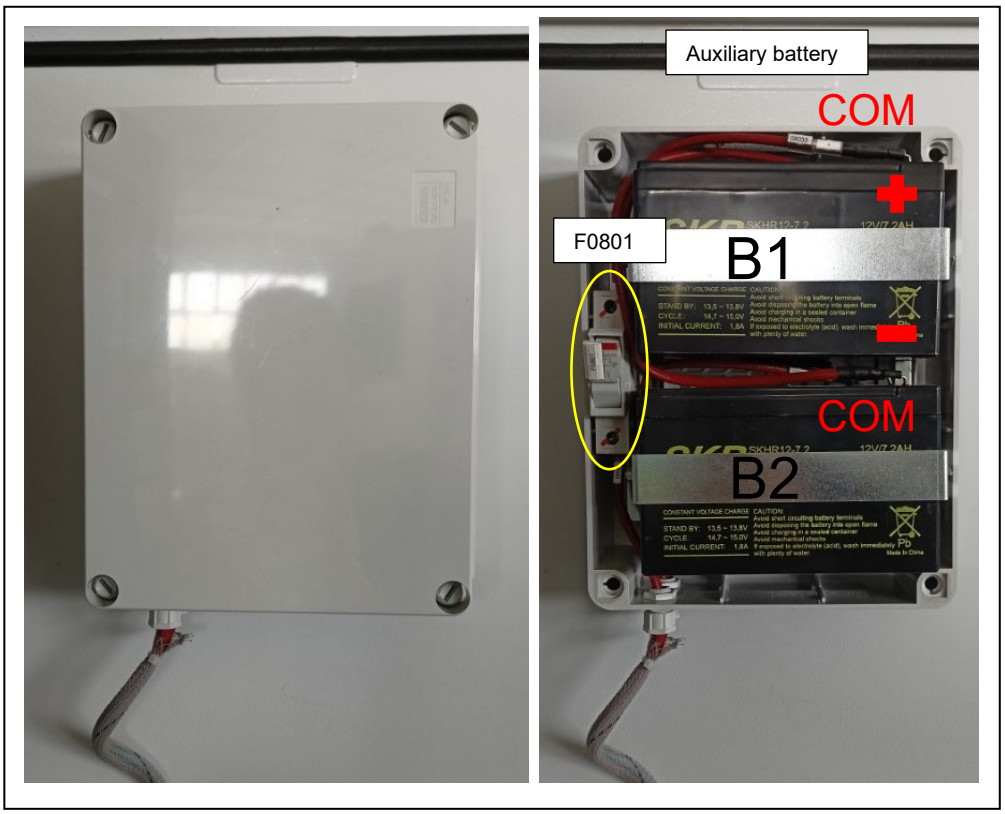
The battery rating is 12V 7.2Ah the dimension is H 94 x L 151 x W 65 mm faston 6.3mm (see Picture 34 for dimension). The auxiliary battery is composed of 2 batteries in series to have 24V total voltage (see Picture 35).



Picture 34

To replace the DB 200 auxiliary battery (see Picture 35):

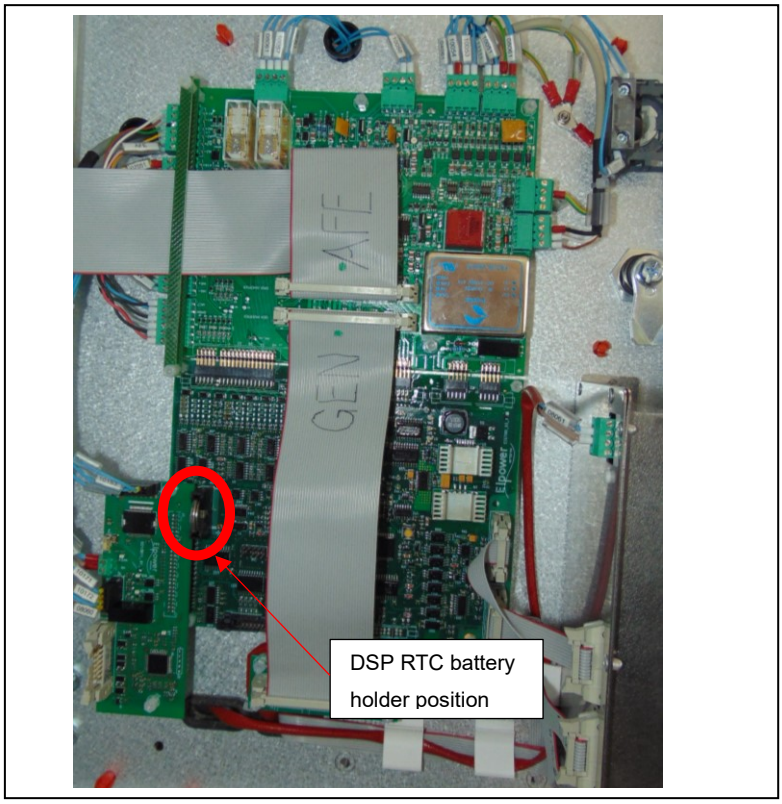
- open the battery's box
- open the fuse holder F0801
- disconnect the battery wire named 08033 (positive pole +)
- unscrew the 2 screws of the top battery holder
- take off the battery 1 (B1 in Picture 35): pay attention on the wiring between the two batteries
- disconnect the wire between the two batteries (COM)
- disconnect the battery wire named 08060 (negative pole -)
- unscrew few turns the 2 screws of the bottom battery holder
- take off the battery 2 (B2 in Picture 35)
- replace the battery 2 with the new one
- screw the 2 screws of the bottom battery holder
- check the voltage of the new battery is about 12V
- connect the wire named 08060 (negative pole) and the wire to the battery 1 as before
- replace the battery 1 with the new
- place the top battery holder and screw the 2 screws
- connect the black wire in the middle of the battery pack
- connect the battery wire named 08033 (positive pole)
- check the total battery voltage is about 24V (between 08033 and 08060)
- close the fuse holder F0801



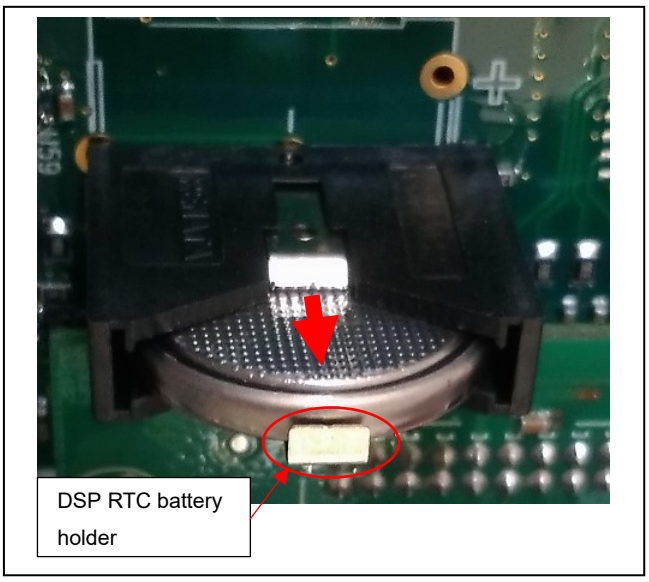
Picture 35

4.3 DSP board RTC battery replacement

The DSP board RTC battery is a type CR2032. To replace the battery it is necessary gain access to the DSP board (see Picture 36). Push gently the little battery holder and extract the old battery (see Picture 37). Insert the new battery: take care about the right polarity. After the battery is replaced, close the panels/doors.



Picture 36



Picture 37