



Leading Conversion Technology for Power Resilience

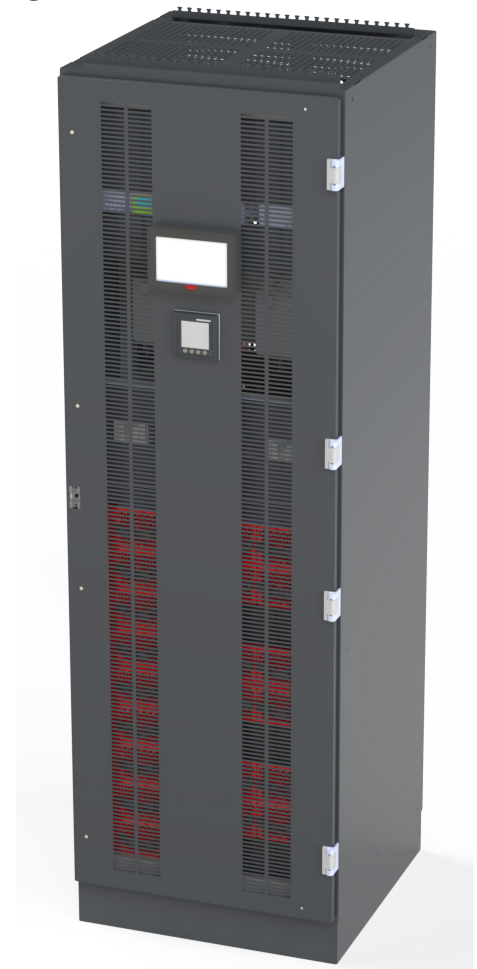
HYBRID SIERRA SYSTEM

GRID INTERACTIVE POWER CONVERSION

User Manual

THE NEW GENERATION OF POWER CONVERTERS

- **DUAL AC AND DC OUTPUT CONVERTER**
Commercial Power as default source
- **AC AND DC BACKUP IN A DC ENVIRONMENT**
Leverage your existing DC infrastructure
- **ONE STOP SHOP**
Wide output power range
- **HARSHEST AC INPUT CONDITIONS**
Without compromising the quality of the AC output



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Version 1.2

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Release Note:

Version	Release date (DD/MM/YYYY)	Modified page number	Modifications
1.0	12/06/2022	-	First release of the manual.
1.1	10/01/2025	-	Added 18 to 90 kVA details.
1.2	02/04/2026	-	Updated according to CEC comments Editorial formating Inview X screens updated

1. CE+T Power at a glance

CE+T Power is your trusted partner in **advanced power solutions** engineered to meet the demands of modern and dynamic industrial applications. With over 60 years of experience in power conversion technology, CE+T Power nurtures the industry with **innovative solutions designed for critical power backup and energy management**.

Our complete range of power solutions includes **modular inverters** (DC to AC), **UPS** (securing AC loads with batteries), and **multi-directional converters** (inverter, rectifier, and UPS all-in-one). Coupled with our state-of-the-art **monitoring solution**, you have a real energy blender to connect multiple sources of energy seamlessly!

Whether you require **robust backup power solutions**, **energy management solutions**, or a **combination of both**, CE+T Power delivers tailored solutions to meet your specific needs. Our products are **designed with integration in mind**, ensuring **seamless compatibility with other components of your system**. CE+T Power is committed to providing you with the expertise and resources needed to maximize the performance of your power systems.

Thank you for choosing CE+T Power as your partner in advanced power management. Let's power the future together.

2. Abbreviations

AC	Alternating current
CB	Circuit Breaker
DC	Direct current
DHCP	Dynamic Host Configuration Protocol
DSP	Digital Signal Processor
ECI	Enhanced Conversion Innovation
EMBS	External Maintenance Bypass Switch
EPC	Enhanced Power Conversion
ESD	Electro Static Discharge
ETH	Ethernet
G	Ground / Grounding
HTTP	HyperText Transfer Protocol
HTTPS	Secure HyperText Transfer Protocol
LAN	Local Access Network
MBB	Measure Box Battery
MBP	Manual By-pass
MCB	Miniature Circuit Breaker
MCCB	Molded Case Circuit Breaker
MET	Main Earth Terminal
MIB	Management Information Base
N	Neutral
NTP	Network Time Protocol
NUA	Non-Urgent Alarm
PCB	Printed Circuit Board
PE	Protective Earth (also called Main Protective Conductor)
PEK	Power Extension Kit
PPE	Personal Protective Equipment
PWR	Power
REG	Regular
SNMP	Simple Network Management Protocol
TCP/IP	Transmission Control Protocol/Internet Protocol
TRS	True Redundant Structure
UA	Urgent Alarm
USB	Universal Serial Bus

3. Warranty and Safety Conditions

WARNING:

The electronics in the power supply system are designed for an indoor, clean environment. When installed in a dusty and/or corrosive environment, indoors, it is important to:

- Install an appropriate filter on the enclosure door or on the room's air conditioning system. Installation of filters may result in de-rating of module.
- Keep the enclosure door closed during operation.
- Replace the filters on a regular basis.

Important Safety Instructions, Save These Instructions.

3.1 Disclaimer

- The manufacturer declines all responsibilities if equipment is not installed, used, or operated according to the instructions herein by factory certified technicians according to local regulations.
- Warranty does not apply if the product is not installed, used, or handled according to the instructions in the manual. Manufacturer may waive warranty if the system is not installed and commissioned by factory trained technician.

3.2 Technical care

- This electronic equipment can only be repaired or maintained by a “qualified employee” with adequate training. Even personnel who are in charge of simple repairs or maintenance are required to have knowledge or experience related to product maintenance.
- Please follow the procedures contained in this Manual, and note all the “DANGER”, “WARNING” AND “NOTICE” marks contained in this Manual. Warning labels must not be removed.
- Qualified employees are trained to recognize and avoid any dangers that might be present when working on or near exposed electrical parts.
- Qualified employees know how to lock out and tag out machinery, electrical equipment and circuits so these can not accidentally be turned on and injure employees working on them.
- Qualified employees are trained in OSHA and NFPA safety related work practices, and NFPA 70E Arc Flash Protection and PPE requirements.
- All operators are to be trained to perform the emergency shut-down procedure.
- Never wear metallic objects such as rings, watches, or bracelets during installation, service, and maintenance of the product.
- Insulated tools must be used at all times when working with live systems.
- **CAUTION** – Risk of electric shock. Capacitors store hazardous energy. Do not remove cover until 5 minutes after disconnecting all sources of supply.
- **CAUTION** – Risk of electric shock. This Converter / UPS receives power from more than one source. Disconnection of the AC source and DC source is required to de-energize this unit before servicing.
- **CAUTION** - For continued protection against risk of fire, replace parts only with same type and rating.
- When handling the system/units pay attention to sharp edges.

- This product is suitable for use in a computer room.

3.3 Installation precautions

- This product is intended to be installed only in restricted access areas.
- The user must observe the recommended IEC/ASZ listed upstream and downstream circuit breaker requirements as defined in this manual.
- Please use extreme caution when accessing circuits that may be at hazardous voltages or energy levels.
- The modular converter rack is a dual input power supply. The complete system shall be wired in a way that both input and output leads can be de-energised when necessary.
- AC and DC circuits shall be terminated with no voltage / power applied (de-energised).
- The safety standards IEC62109-1, IEC62109-2 and IEC62477 requires that, in the event of an output short circuit, the converter must disconnect in 5 seconds maximum. The parameter can be adjusted on Inview or equivalent device; however, if the parameter is set at a value > 5 seconds, an external protection must be provided so that the short circuit protection operates within 5 seconds.
- The system is designed for installation within an IP20 environment. When installed in a dusty or humid environment, appropriate measures (air filtering) must be taken. Installation of filters may result in de-rating of module.
- Environmental Conditions for UPS System (not including batteries)
 - Storage Conditions: -40 to 70°C
 - Battery Storage Conditions: Consult Battery Manufacturer
 - Relative Humidity: 95%, non-condensing, max occurrence 96 hours per year
 - Altitude above sea without de-rating: Less than 2000 m
Greater than 2000 m – de-rating at 0.8% per 100 m

3.3.1 Handling

- The cabinet shall not be lifted using lifting eyes.
- Remove weight from the cabinet by removing the converter modules. Mark converter modules clearly with shelf and position for correct rebuild. This is especially important in dual or three phase configurations.
- Empty module positions must not be left open. Replace with blank module or cover.

3.3.2 Surge and Transients Protection

The mains (AC) supply of the modular converter system shall be equipped with Lightning surge suppression and Transient voltage surge suppression suitable for the application. Follow manufacturer's recommendation for installation. Selecting a device with an alarm relay for function failure is advised.

All sites are considered to have a working lightning surge suppression device in service and installed close enough to ensure effective protection in accordance with best industry practice.

- Indoor sites Min Class II.
- Outdoor sites Min Class I + Class II or combined Class I+II. The modular converter system/rack can reach hazardous leakage currents. Grounding must be carried out prior to energizing the system. Grounding shall be made according to local regulations.

3.3.3 Other

- Insulation test (Hi-Pot) must not be performed without instructions from the manufacturer. Irreparable damage may occur.

3.4 Maintenance

- The modular converter system/rack can reach hazardous leakage currents. Grounding must be carried out prior to energizing the system. Grounding shall be made according to local regulations.
- Prior to accessing the system or modules, make sure all sources of supply are disconnected.
CAUTION – Risk of electric shock. Capacitors store hazardous energy. Do not remove cover until 5 minutes after disconnecting all sources of supply.
- Converter modules and shelves contain capacitors for filtering and energy storage. Prior to accessing the system/modules after power down, wait at least 5 minutes to allow capacitors to discharge.
- Some components and terminals carry high voltage during operation. Contact may result in fatal injury.

3.5 Disposal

- CE+T cannot be held responsible for disposal of the Converter system and therefore the customer must segregate and dispose of the materials which are potentially harmful to the environment, in accordance with the local regulations in force in the country of installation.
- If the equipment is dismantled, to dispose of its component products, you must comply with the local regulations in force in the country of destination and in any case avoid causing any kind of pollution.

3.6 Documentation

- The User Manual and Data Sheet can be downloaded from our website at www.cet-power.com.

We recommend accessing the latest versions directly from the site to ensure you have the most up-to-date information.

4. Introduction

4.1 Overview of Sierra Hybrid System

The Sierra hybrid system is a grid interactive inverter system. This system has 2 to 10 Sierra inverter module per phase.

The Sierra hybrid system combined with auxiliary hardware including grid protection relays, DRM interfacing components and a power meter (Optional) are required for grid interactive operation.

The block diagram below shows an overview of the major components of the Sierra Hybrid System:

1. The Sierra inverter modules is the major part of the Sierra hybrid system and the modules are available in 48 Vdc nominal DC bus version.
2. Grid and system protection relay (NA003) measures the voltage and frequency of the grid to protect the system.
3. Grid and system protection relay (NA003) controls the decoupling relay when there is grid failure.
4. A DRM interface circuit accepts the standard 8-pin DRM interface.
5. A power meter provides a reference point for measuring power flows in and out of the system.
6. The Inview controller controls the power flow of the Sierra modular inverter modules and the controller interfaces with peripheral devices resulting in the desired application behavior.

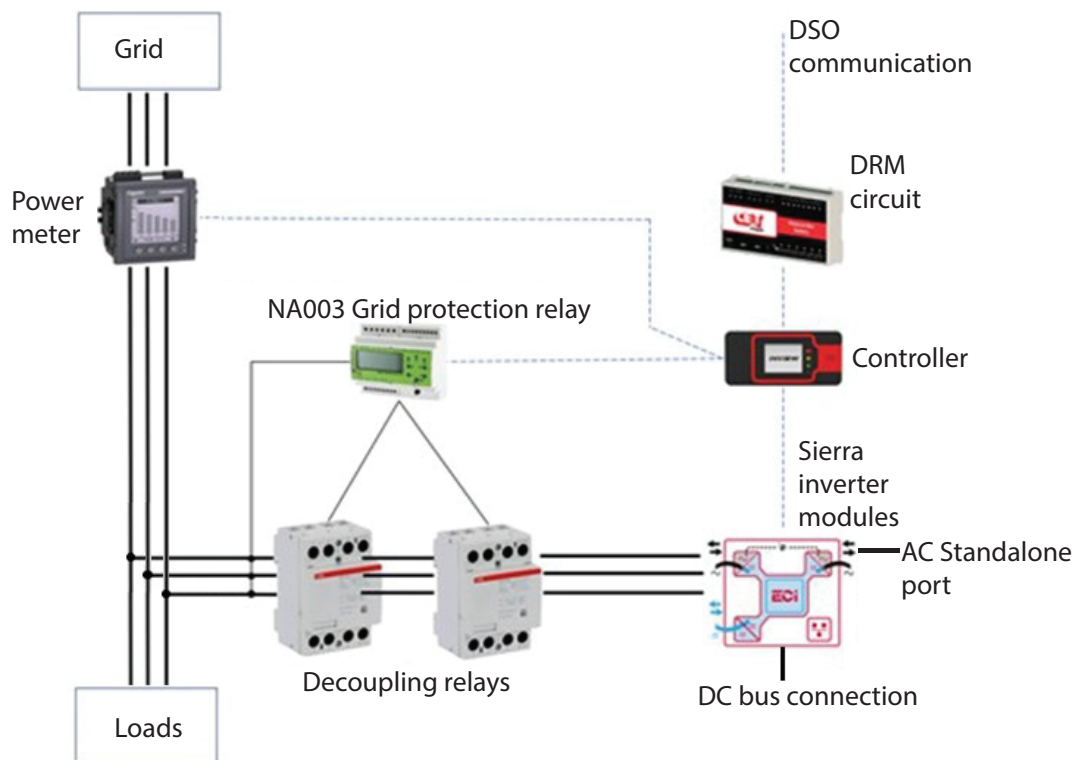


Figure 1. Sierra Hybrid System Block Diagram

5. Cabinet Layout

A Sierra Hybrid System is a modular converter with other components installed in cabinet. The system requires clean and temperature controlled environment.

The Sierra Hybrid System is designed in such a way that the cable routed through the top of the cabinet and all the protection circuit breaker is accessible from the front of the cabinet.

The system controller is mounted on the door. This controller uses user friendly interface shows the current status and operation of the system.

The Sierra 48 Vdc inverter modules are installed at the bottom half of the cabinet.

All other hardware do not require user access and are mounted behind the cover plate in the top half of the cabinet.

Important features of the cabinet are:

- Telecom grade design
- Fully modular
- Support redundant configurations
- Cabinet NEMA 1 (IP20)
- System designed for top cable entry
- Environmental category (Indoor – conditioned)
- OVC II (AC grid port, DC port & AC standalone port).



Figure 3. Hybrid Sierra System - Front View

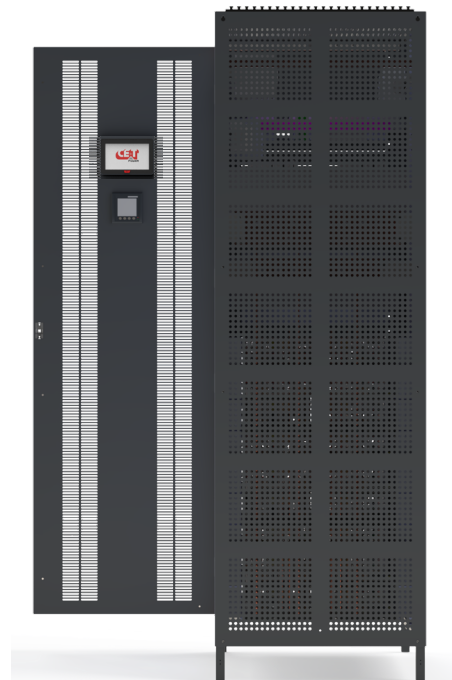


Figure 4. Hybrid Sierra System - Rear View

5.1 System Specifications - 48 Vdc

Specifications	Sierra Hybrid System 48 Vdc								
	18 kVA	27 kVA	36 kVA	45 kVA	54 kVA	63 kVA	72 kVA	81 kVA	90 kVA
General									
Efficiency (MAX) AC to AC (EPC) / DC to AC / AC to DC	96% / 93.7% / 93.7%								
Operating T° and relative humidity / Storage T°	-20 to 40°C and 95% non-condensing / -40 to 70 °C								
Cooling	Forced air (required 200 mm clearance from rear to wall)								
Altitude above sea without de-rating	Max. 2000 m / de-rating – 0.8 % per 100 m								
Cable entrance	Top cable entrance								
Cabinet / Ingress protection	RAL7024 powder coated steel / IP20								
Modules									
Model	Sierra 25 - 48/277								
Power converter type	Modular inverter (with AC and DC input)								
Nominal power	3 kVA / 2.4 kW								
Modules number	6	9	12	15	18	21	24	27	30
AC stand-alone port									
Nominal voltage (selectable)	3 x 230/400 + N								
Nominal power (kVA / kW)	18 / 14.4	27 / 21.6	36 / 28.8	45 / 36	54 / 43.2	63 / 50.4	72 / 57.6	81 / 64.8	90 / 72
Nominal current at 230VAC / 3x400VAC (A)	26.1	39.1	52.2	65.2	78.3	91.3	104.3	117.4	130.4
Inrush current (A)	Max 110 %								
Overload capacity	125% for 15 seconds								
Maximum output over current protection	150%								
Admissible load power factor	Full power rating from 0 inductive to 0 capacitive								
Frequency / Range	50 Hz / (45 - 55) Hz								
Total harmonic distortion (resistive load)	< 1.5 %								
Turn on delay	20 s to 40 s depending on the number of modules installed								
Crest factor at nominal power @ 0.7 Load PF (with short circuit management and protection)	3 : 1								
Short circuit capacity	8.2 x In during 20 ms. While mains is available at AC input port 2.1 x In during 15 s and 1.5 x In after 15 s while mains is not available.								

Specifications	Sierra Hybrid System 48 Vdc								
	18 kVA	27 kVA	36 kVA	45 kVA	54 kVA	63 kVA	72 kVA	81 kVA	90 kVA
Distribution (standard configuration / option)	Ready-to-install MCBs (MCB not included) / Bulk AC out on breaker or terminals								
AC Grid interactive port									
Nominal voltage (range)	3 x 230/400 Vac + N (150 Vac - 293 Vac L-N)								
Frequency (range)	50 Hz (45 – 55 Hz)								
Nominal power (kVA / kW)	14.4	21.6	28.8	36.0	43.2	50.4	57.6	64.8	72.0
Nominal current at 230Vac (A)	20.9	31.3	41.7	52.2	62.6	73.0	83.5	93.9	104.3
Inrush current (A)	Max 125 %								
Power factor	>0.99 (above 50% load)								
Short circuit capacity	Maximum 105% of nominal power								
Surge arrestor	Not included								
Energy storage port									
Voltage range	32 – 63 Vdc								
Nominal charging current at 48Vdc (A)	300	450	600	750	900	1050	1200	1350	1500
Maximum discharging current at 48Vdc (A)	326	490	653	816	979	1142	1306	1469	1632
Short circuit capacity	Maximum 105% of nominal power								
DC input connection	Single DC feed per cabinet								
Storage type	Batteries								
Compatible battery chemistries	Lead-Acid, Self managed Lithium, Lithium								
Source Transfer Performance									
Voltage deviation and duration	0 V, 0 s (no interruption)								
Performance (EN62040-3)	VFI-SS-111								
Monitoring (Communications)									
Monitoring	Synoptic LEDs on module and touchscreen with Inview X								
Alarms output	3 Dry contacts (Major, Minor, Auxiliary)								
Safety & EMC									
Safety	IEC62109-1, IEC62109-2, IEC62477-1								
Active anti-islanding method	Slip frequency method								
Protective class	I / OVC II								
Vibration	GR63 office vibration: 0 to 100 Hz - 0.1 g / transport vibration: 5 to 100 Hz - 0.5 g, 100 to 500 Hz -1.5 g								

Specifications	Sierra Hybrid System 48 Vdc								
	18 kVA	27 kVA	36 kVA	45 kVA	54 kVA	63 kVA	72 kVA	81 kVA	90 kVA
EMC immunity	EN 61000-4-2 / EN 61000-4-3 / EN 61000-4-4 / EN 61000-4-5 / EN 61000-4-6 / EN 61000-4-8								
EMC emission (class)	EN 55022 (A)								
Electrical isolation / Topology	Doubled isolation DC/AC 4,3 kV / Multi-mode type-Isolated								
RoHS	Compliant RoHS 6 / REACH								
System Dimensions (W x D x H mm)	600 x 600 x 1800 mm								
System weight without modules	210 kg								
System weight with modules (kg)	240	255	270	285	300	315	330	345	360

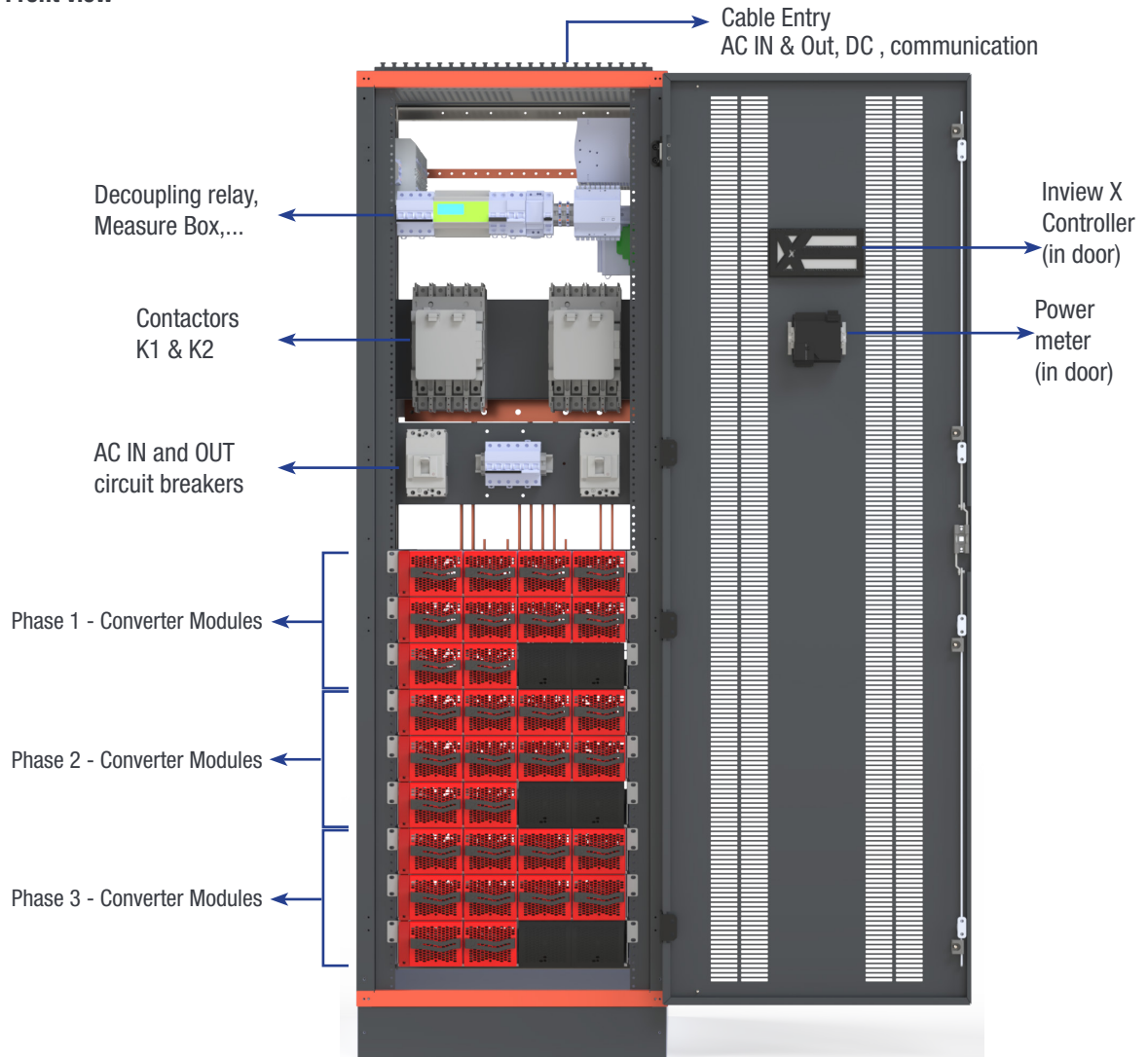
Table 1. System specifications - 48 Vdc

5.2 System Description

Hybrid Sierra System cabinet has three compartments:

- Top Compartment - Customer connections area
 - AC IN and OUT connections
 - DC Positive and Negative connections
 - Remote alarm contacts connections
 - Monitoring device - Inview X on the door
- Middle Section - K1 & K2 decoupling contactor Q1 and Q2 Breakers
- Bottom Compartment - Shelves with 4 slots for modules
- System weight: 360 kg (90 kVA system)

Front view



Top view of cable entries

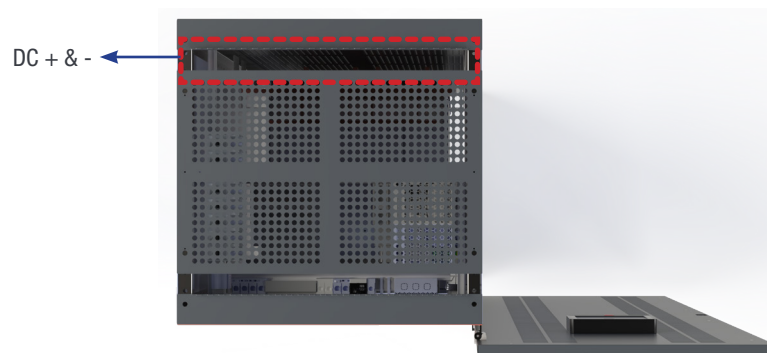
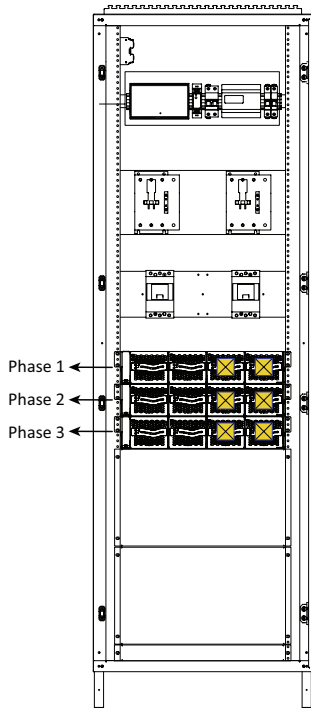
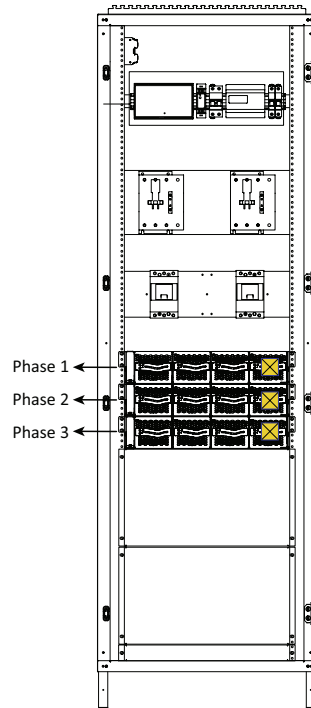


Figure 2. Hybrid Sierra System 90 kVA - General Arrangement

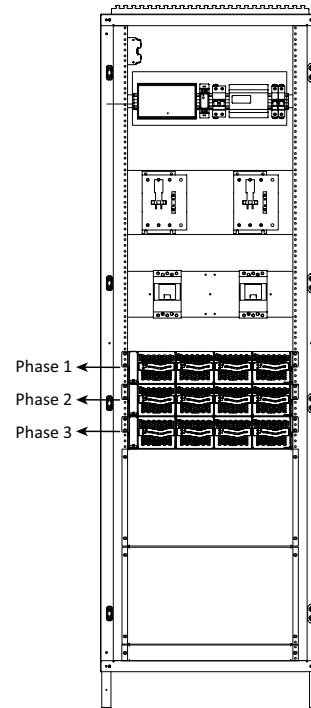
5.3 System General Arrangement - 18 to 90 kVA



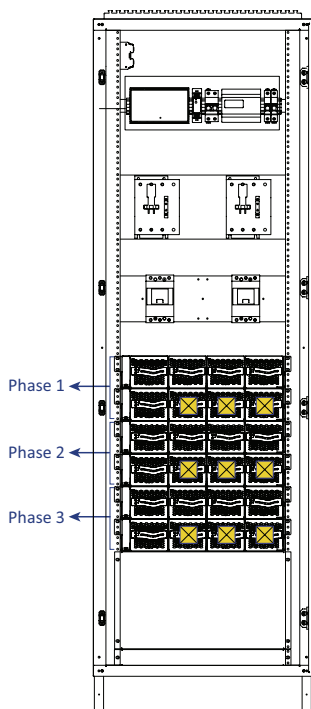
Hybrid Sierra System - 18 kVA



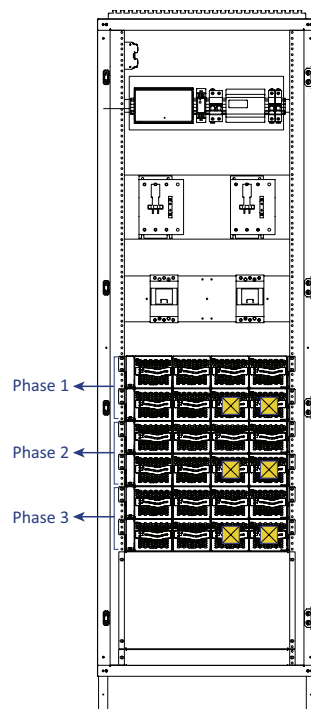
Hybrid Sierra System - 27 kVA



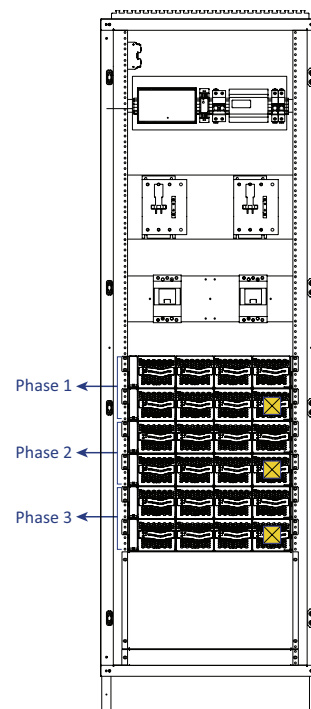
Hybrid Sierra System - 36 kVA



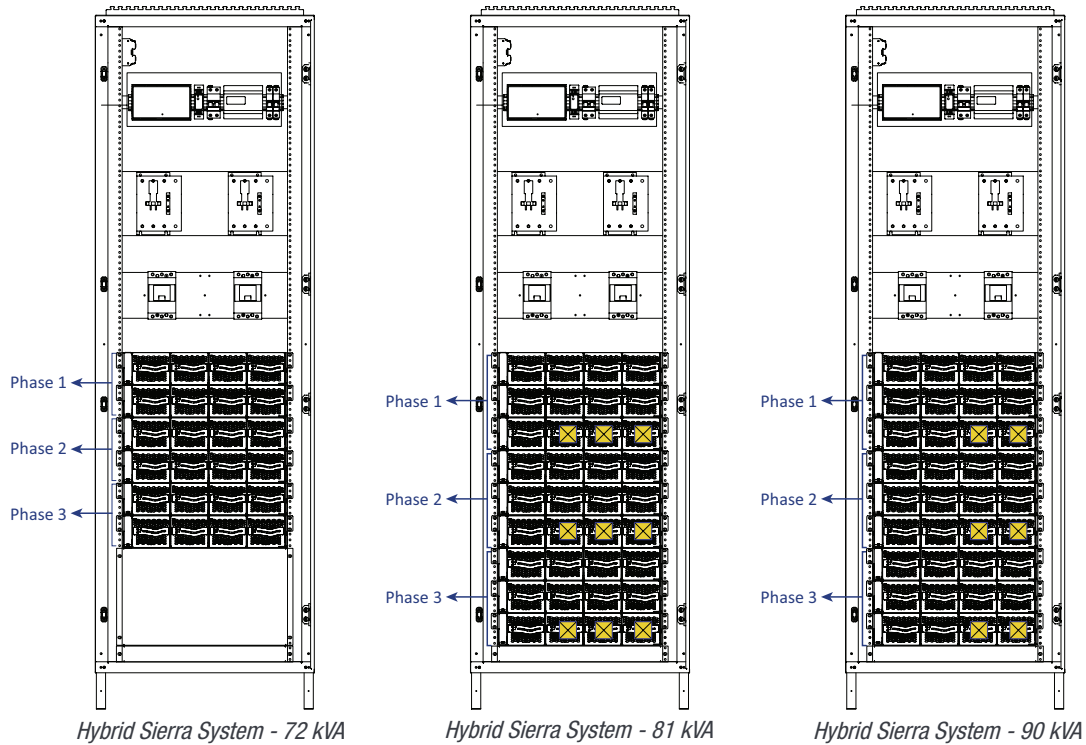
Hybrid Sierra System - 45 kVA



Hybrid Sierra System - 54 kVA



Hybrid Sierra System - 63 kVA



5.4 Battery Integration

The Sierra Hybrid System is compatible with Lead-Acid, self-managed lithium, and smart lithium batteries. Self-managed lithium batteries do not use Battery Management System (BMS) communication. Only smart lithium batteries use BMS communication. The system integrator is responsible for connecting the battery to the system. Consider the points in the following chapters.

5.4.1 Earth fault monitoring

- If the Sierra Hybrid System uses a Battery Energy Storage System (BESS) that operates at Decisive Voltage Classification (DVC) B or C, the system installer must choose an earth fault monitoring system with an alarm. The installer must select the monitoring system according to the battery manufacturer's specifications and follow AS/NZS 5139 requirements.
- CE+T does not supply the Earth monitoring device. The integrator must complete installation before system commissioning.

5.4.2 Lead acid batteries

Install a temperature sensor to monitor the battery temperature when the system uses Lead-Acid batteries. The Sierra Hybrid System provides a Temperature sensor (LM335) input on the Measure Box Battery (MBB). The system is able to apply temperature compensation. The system has built-in alarm and protection levels to prevent damage to the Lead-Acid batteries.

Refer to "6.4 Measure Box Battery (MBB)", page 21 for the temperature-sensor input location on the MBB.

5.4.3 Self-managed lithium batteries

Self-managed lithium batteries monitor their operational conditions. The battery monitor disconnects themselves from the DC busbar if these operational parameters are exceeded. They do not provide a communication interface with their internal BMS. The Sierra Hybrid System can be configured to operate with this type of battery.

5.4.4 Smart lithium batteries

Smart Lithium batteries have a communicating Battery Management System (BMS). The BMS provides operational information to the inverter that includes Required charge voltage, Maximum charge or Discharge current capabilities.

The Sierra Hybrid System integrates with a number of smart Lithium batteries using modbus or CAN communication. The BMS communication connects to the iso CAN or RS485 port on the Inview controller. Please visit our website for the latest list of integrated compatible batteries.

5.4.5 Type of compatible battery chemistry


- Lead-based - Lead-acid, Lead carbon, Pure lead
- Li-Ion - LFP & NMC are the most commonly used, but we're compatible with other such as NCA, LTO, LCO & LMO

6. Components

The Sierra Hybrid converter system consists of the components described below. All these components are part of the complete system and are fully integrated with each other.

6.1 Sierra Converters

Sierra 25 - 48/230-277		
Telecom / Datacom:	Input	48 Vdc 230, 240 & 277 Vac, 50/60 Hz
	Output	48 Vdc 230, 240 & 277 Vac, 50/60 Hz
	Power	3 kVA / 2.4 kW



- Each Sierra 25 - 48/230-277 converter can supply 2.4 kW on any DC, AC, or combination of both AC and DC output ports. AC output load has the highest priority. If the AC output is fully loaded (2.4 kW), 300 W is still available for the DC output.
- Hot swappable and hot pluggable.
- The front LED's indicate the converter status and output power.
- Module is equipped with soft start.
- Fan is equipped with alarm and run time meter. The fan is field replaceable.
- 435 mm (D) x 102 mm (W) x 88 mm (H).
- 5 Kg.

6.2 Sierra Inverter Shelf

- A Sierra inverter shelf can house up to maximum of four converter modules.
- The Sierra shelf is designed with individual DC input /output, Common AC input and Common AC output.
- Optional rear cover for IP 20 in open rack.
- Max 12 kVA per shelf.
- 480 mm (D) x 19" (W) x 2U (H).
- 6 Kg (Without modules).



6.3 User Interface - Inview X

Inview X is an advanced monitoring and controller unit for power systems. It allows the user to easily view, access, configure the system information through LCD screen display and web interface. The home screen of both LCD and web interface provides a summary of system power, modules, batteries, and events information.

The Ethernet ports in Inview X allow multiple communication points for remote communication, web interface, and connecting the accessories such as Measure Box Battery, DRM interface, Power Meter or a wide range of 3rd party products.

Inview X interface provides the user access to the configuration and setup files of the modules that are connected in the system. It is also a controller for DC regulation.

Inview X can monitor up to 32 modules and featured with:

- 7" LCD touch screen display
- Two Digital Inputs
- Two Output Relay contacts
- Records 5000 events as FIFO



6.3.1 Inview X Connections

Inview X composed of multiple network ports and inbuilt free potential contacts



- CE+T COM port is dedicated to establish connection between Inview X and converters.
- ETH ports are used for network connectivity, and user can access the system information through the web interface.
 - ETH Front: DHCP server, providing access to the configuration at URL <https://inview.local> or <https://10.250.252.1>
 - Intended for direct connection of a laptop computer. **Warning: Do not connect this port to the network, as it might interfere with other DHCP servers.**
 - ETH1: Main network interface
 - Default static IP address: 10.250.250.1/24
 - It can be configured to other static addresses or as a DHCP client in a web-based configuration interface
 - ETH2: Secondary network interface
 - It is dedicated to CE+T accessories like Inview Gateway and do not connect to the network

- CAN MB port shares the system information to the Measure Box Battery. It also provides +12 Vdc power to three MBB 60V or two MBB 500V which are connected in series.
- iso CAN is used for CAN communication.
- RS485 is used for Modbus communication.
- USB port is used for internal factory purpose.
- Digital Inputs (D1 and D2): Two potential free Digital Inputs are available for customer connections.
- Output Relays (K1 and K2): Two output relays are available for customer connections – relay modes can be configured and/or customized.
- Power:
 - +48V supply is required to power up the Inview X.
 - Two terminals are available for redundancy purposes. Note that an alarm (AL100) is monitoring the use of that dual source and should be disabled in case only one of those is used.

6.4 Measure Box Battery (MBB)

Measure Box Battery is a device that monitors the Battery. It is composed of multiple digital inputs and analog outputs. They are used for:

- Battery management
 - Voltage (V1 to V3)
 - Current (I1 to I3)
 - Temperature (T1 and T2)
 - Relay for LVD (option)
- 8 Digital Input (D1 to D8)
- 6 Output Relay (K1 to K6)

Note: Some digital inputs and relay outputs may be used for internal monitoring and may not be available for customer use.

Note: If an external battery temperature sensor is needed, connect an LM335 temperature sensor to T1 as illustrated.

6.5 Grid Protection Relay

The Grid Protection relay is a device for Grid and System protection. It can handle several monitoring functions simultaneously, depending on the configuration selected.

If a threshold value is exceeded, the device switches off after a turn-off delay. The delay time is defined for each threshold value. The device switches off immediately when the test function or the remote shutdown is activated. Once all monitored parameters are within the permissible limits, and the remote shutdown is deactivated. The device switches back ON after a defined turn-on time.

To know more about the connection details, refer to “[18.Electrical Diagrams](#)”.



6.6 Surge Arresters

Caution: Make sure to use the same type and rating of the fuse, to protect against the risk of fire.

Install suitable lightning surge suppression devices and transient voltage surge suppression devices on the mains (AC) supply of the modular converter system.

Follow the manufacturer's installation recommendations. We recommend that you select a device that has an alarm relay for function failure.

Indoor sites must have a functioning lightning surge suppression device in service. The minimum requirement for an indoor site is Class II protection.

Lightning surges in converter circuits can cause immediate and catastrophic equipment failure. Surges that result from induced lightning and power switching operations are smaller. These smaller surges occur more than once. They can cause equipment to operate incorrectly, stop responding, or be damaged.

Some places have frequent lightning than other places and also amount of lightning increases greatly at higher altitudes.

You must obey strict rules when you select and install surge arresters. If you do not obey the rules, the devices will not work. This document does not cover how to select a surge arrester or how to install it.

The installer must analyze the local site conditions. The installer must ask for a site inspection to protect their own liability.

CE+T product warranty does not cover damage to converters if the protection system is not correct.

6.7 Power Meter

The PowerLogic PM5000 series power meter is the new benchmark for precise metering at a low cost. It is the correct product for high-end cost management applications.

The powerlogic PM5000 can be used to allocate energy use, Perform tenant metering and sub-billing, Identify energy savings, make equipment efficient and use equipment correctly and perform a high level assessment of the power quality in electrical networks

All meters provide Modbus serial communications. PM5500 level meters can communicate simultaneously through Modbus TCP and BTL certified BACnet IP over ethernet.

- Panel instrumentation (OEMs)
- Sub-billing and cost allocation
- Remote monitoring of an electrical installation
- Harmonic monitoring (THD)

The power meter in the Sierra grid interactive system provides data about power exchange with the grid. The system uses this data to control the power injected into the grid. These are grid interactive grid-oriented functions.

When the power meter is in the system, you can use the measurements for other functions. Examples of these functions are peak shaving or auto-consumption.

Inverters have export control capabilities. These capabilities are not tested to AS/NZS 4777.2:2020.



[Icw] rated short-time withstand current	1.1 kA - 10 s, 0.64 kA - 30 s, 0.52 kA - 1 min, 0.4 kA - 3 min, 0.32 kA - 10 min
[U _i] rated insulation voltage	1000 V
Auxiliary contact composition	1 NO + 1 NC
Standards	EN/IEC 60947-4-1 EN/IEC 60947-5-1 UL 60947-4-1 CSA C22.2 No 60947-4-1 JIS C8201-4-1 JIS C8201-5-1
IP degree of protection	IP2X front face with shrouds conforming to IEC 60529 IP2X front face with shrouds conforming to VDE 0106

Note: External load-breaking switching device should be used according to the characteristics listed in the above table that confirms to the requirements AS/NZS 4777.1. The warning label is used to indicate the external load-breaking switching device, which should not be part of the inverter assembly.

7. Installation

The Sierra Hybrid Systems are for use only in commercial and industrial applications. Do not use these systems in households. Only qualified personnel must install and commission the systems.

7.1 Site Preparation

- The System must be installed in an indoor conditioned, dry environment and without condensation.
- All cables must be copper wire and rating should be min 90°C (194°F).
- All cables must be sized based on the rated current of the converter system and the customer terminal connection.
- All AC input, AC output, DC input, and signal cables must be routed properly.
- Use blank module covers for empty converters slots.
- **System Position**
 - Do not install the system very close to the wall at the rear side.
 - Make sure to **maintain a minimum of 50 cm clearance in and around of the system.**
 - The System is designed to operate in a temperature controlled (maximum operating ambient 40°C/104°F) and clean environment.
 - The system with front door should be installed with filter to avoid foreign particles from entering.

7.1.1 Transformer Sizing

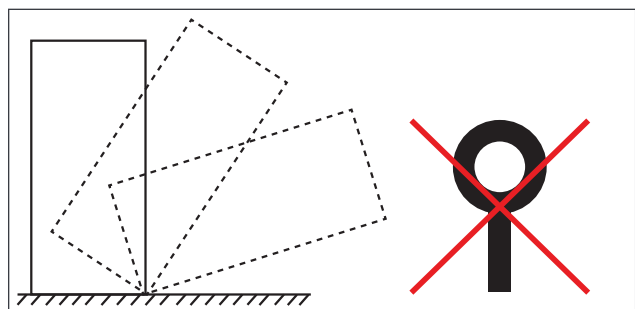
The converter can operate at 125% of its rated capacity for 15 seconds. Make sure any upstream transformers that supply AC to the converter are sized correctly. The minimum size required is 1.5 times the kVA rating of the converter.

7.2 Packaging Information

CE+T cabinets are always fixed on a pallet. Then, they are packed in a wooden crate. We usually deliver these crates in a flat, horizontal position.

To unpack your cabinet, we recommend the following method:

1. Make sure the crate is in flat surface and on the correct side. The side with double red arrow is the correct side to open the crate.
2. Remove the top cover in order to identify the top and bottom sides of the cabinet.
3. Raise the crate vertically with the top side of the cabinet up. Make sure that the cabinet does not fall forward out of the crate while you do so.
4. Remove the cabinet and its attached pallet from the crate.



Make sure to lift the cabinet from the wooden crate and secure it in safe place. Make sure to use the lifting eye bolt to lift the cabinet from the crate. Do not damage or cause dent on the cabinet while removing.

Warning: The top cover fixing bolts may NEVER be replaced with lifting eye bolts.

7.3 Removing the Cabinet Rear Protection

Make sure that the wooden wedges are fixed at the rear of the cabinet. So that no component can move or damage during transportation.

Remove the wooden wedges from the cabinet before installing and commissioning.

1. Remove the rear panel.
2. Identify the protection (Refer Figure 5).
3. Cut the tie wrap of the back wedges and remove them (Refer Figure 6).

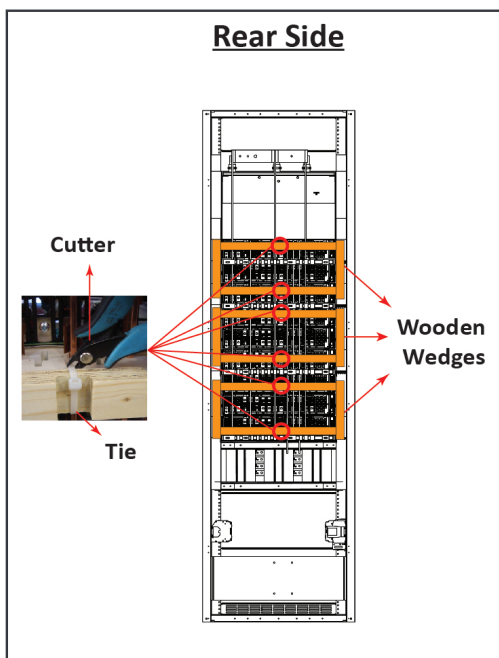
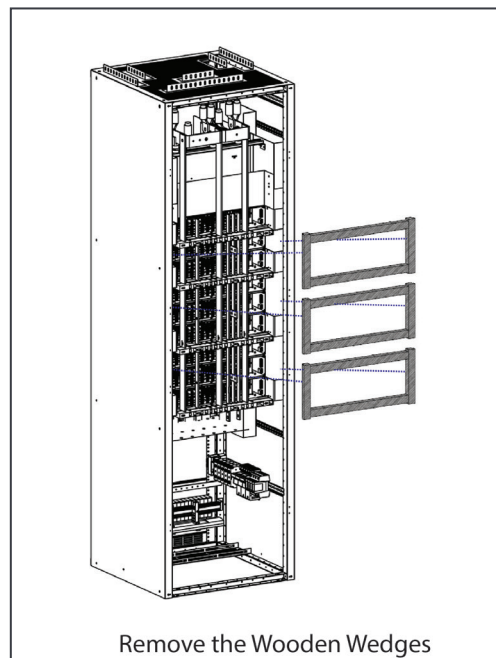


Figure 5. System rear view



Remove the Wooden Wedges

Figure 6. Remove the wedges

Note: The number of wooden wedges varies depend upon the system configuration.

4. Install the correct filter for protection from foreign particles.

7.3.1 Clearance and Ventilation

Make sure that the minimum clearance is maintained around the sierra hybrid system as mentioned:

- Side - 100 mm
- Top -500 mm
- Front -1000 mm
- Rear - 500 mm

Make sure adequate ventilated is provided for the sierra hybrid system when installed in enclosed room.

- For a 90 kVA system: Supply 60 cubic meters per minute (60m³/min) of airflow.
- Each module: Supply 2 cubic meters per minute (2m³/min) of airflow

7.4 Fix the Cabinet on the Floor

The Hybrid Sierra system cabinet contains 4 holes of each 9 mm diameter at bottom for floor fixing.

Place the system unit in the upright position on the floor. Secure the unit with four M8 ground anchoring bolts. Tighten each bolt to a torque value of 20 to 29 Nm.

Refer the following drawing layout for the holes marking

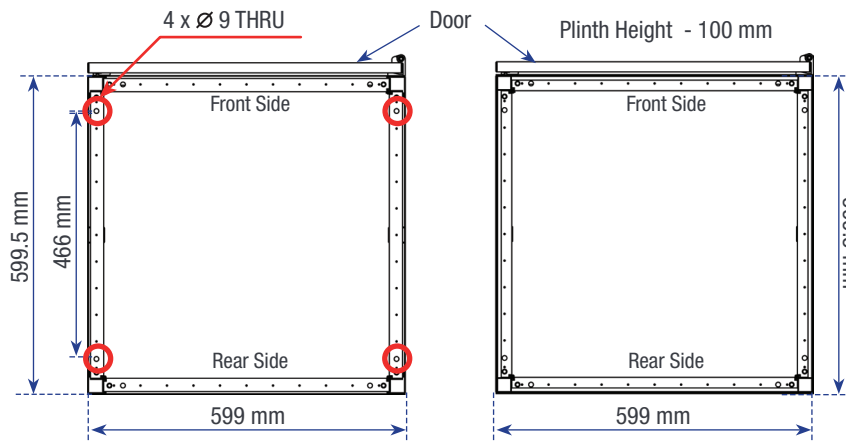


Figure 7. Frame Cabinet - Footprint

Figure 8. Frame Cabinet - Footprint with Plinth

7.5 Route the Cable

Route all cables through the top of the system unit. Use a suitable collar to attach the conduits to the cabinet roof panel. Remove the top panel to install conduit knockouts.

This can prevent foreign material from entering the system during installation.

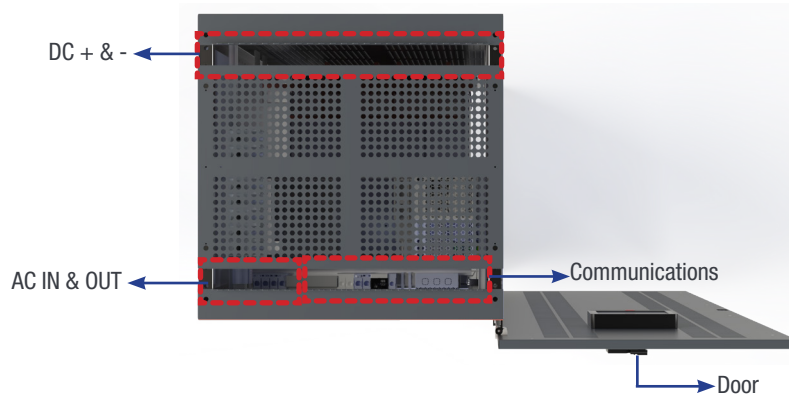


Figure 9. Cable entrance from System top

7.6 Grounding

The Protective Earthing (PE) bar position: The main PE bar is in the top-left side below AC terminal blocks (X1 & X4) of the system.

The PE bar can be identified by the symbol .

Always connect the PE bar to the building or main panel ground. This connection is necessary even if the main power is not available.

Connect the main earth cable at PE bus bar in the cabinet using a proper lug with hole size M6.

Connect the main earth cable to the PE bar inside the cabinet. Use a correct lug with a M6 hole size. Use an earth cable with the same cross-section size as the Neutral cable. Refer to section 1.1.

Connect the ground cable according to local safety regulations.

The cabinet is bounded to the PE bar from the manufacture.

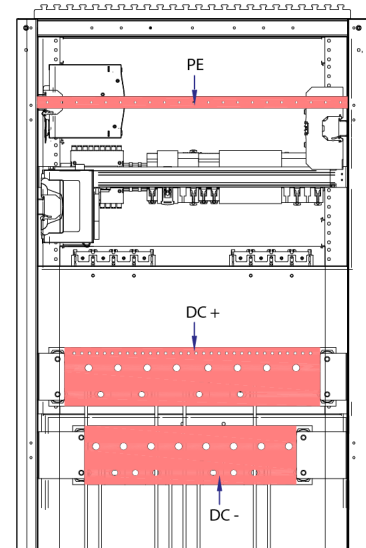


Figure 15. PE Bus bar

7.7 AC Input and Output

The AC input and output terminals are at the top of the system. The terminal blocks have this arrangement:

The AC Input terminal is the grid interactive port and must be connected to the grid supply.

The AC output is the stand-alone port. Connect all backed-up loads to this port.

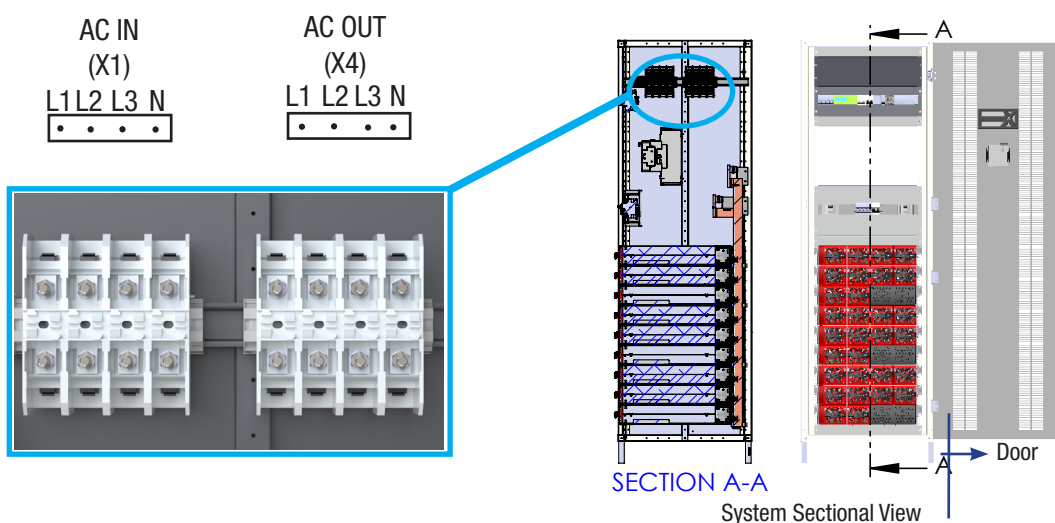


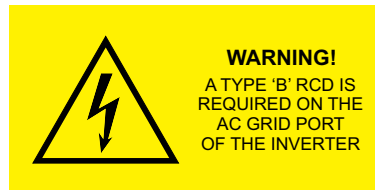
Figure 10. AC Input and Output terminals

Hybrid Sierra System Model	AC Input and Output			
	External Protection (Recommended Specs)	Connection Cable	Torque	Lug
18 kVA	32 A, 3 Poles	10 mm ²	3 Nm	terminal block with in build M8 screw
27 kVA	40 A, 3 Poles	10 mm ²	3 Nm	terminal block with in build M8 screw
36 kVA	63 A, 3 Poles	25 mm ²	3 Nm	terminal block with in build M8 screw
45 kVA	80 A, 3 Poles	25 mm ²	3 Nm	terminal block with in build M8 screw
54 kVA	80 A, 3 Poles	25 mm ²	3 Nm	terminal block with in build M8 screw
63 kVA	100 A, 3 Poles	35 mm ²	7 Nm	terminal block with in build M8 screw
72 kVA	125 A, 3 Poles	70 mm ²	7 Nm	terminal block with in build M8 screw
81 kVA	125 A, 3 Poles	70 mm ²	7 Nm	terminal block with in build M8 screw
90 kVA	160 A, 3 Poles	70 mm ²	7 Nm	Insulated bootlace

Table 2. AC Input and Output connections

7.7.1 Residual Current Detection (RCD)

The Residual Current Device (RCD) provides safety protection. If there is an earth fault or high leakage current, the RCD stops the flow of electricity to all live conductors (phase and neutral). The external RCD protection installed in this system is Type B. Follow the manufacturer's instructions for correct installation and operation of the residual current detection device.



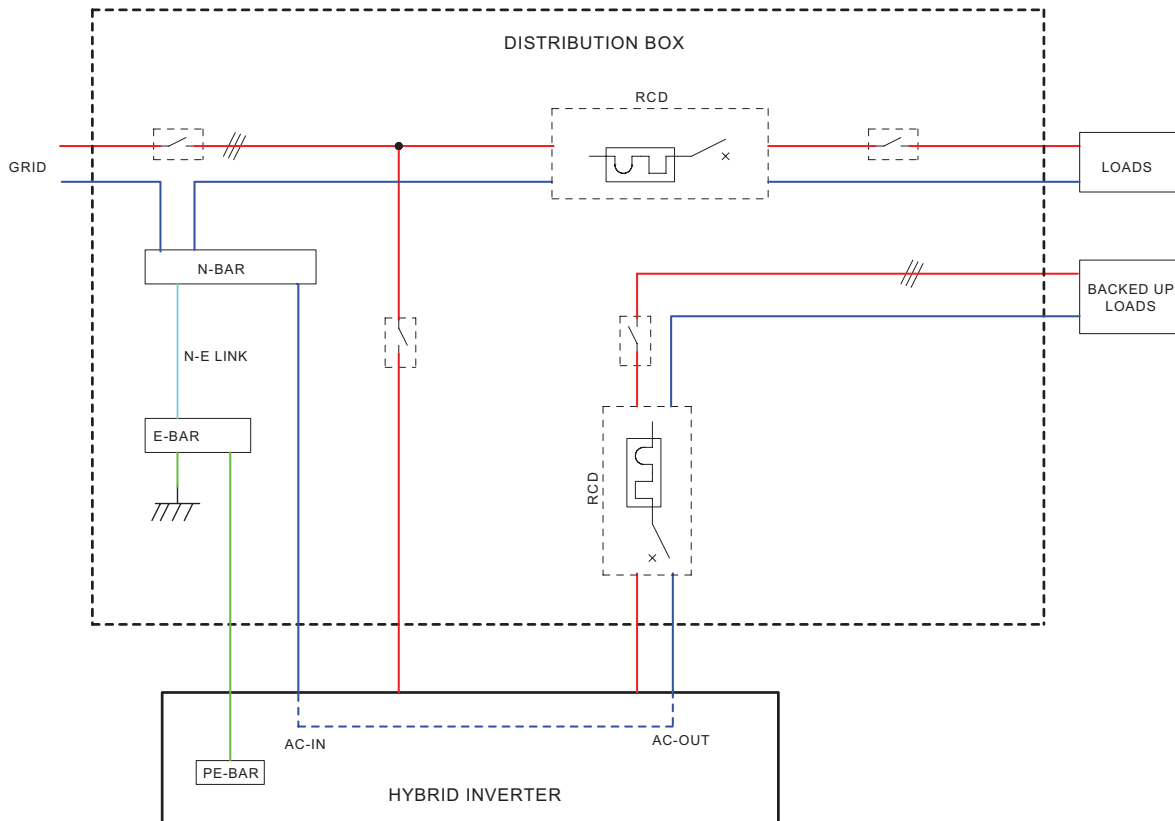
Recommended RCD values for AC Grid interactive port can be followed according to the following table.

Specifications	Hybrid Sierra System 48 Vdc								
	18 kVA	27 kVA	36 kVA	45 kVA	54 kVA	63 kVA	72 kVA	81 kVA	90 kVA
RCD - Type B, Max (mA)	180	270	360	450	540	630	720	810	900

7.7.2 Neutral and MEN

Caution: For Australian installations, make sure the NEM connection is made in the distribution box for installation.

The below diagram shows a typical installation.

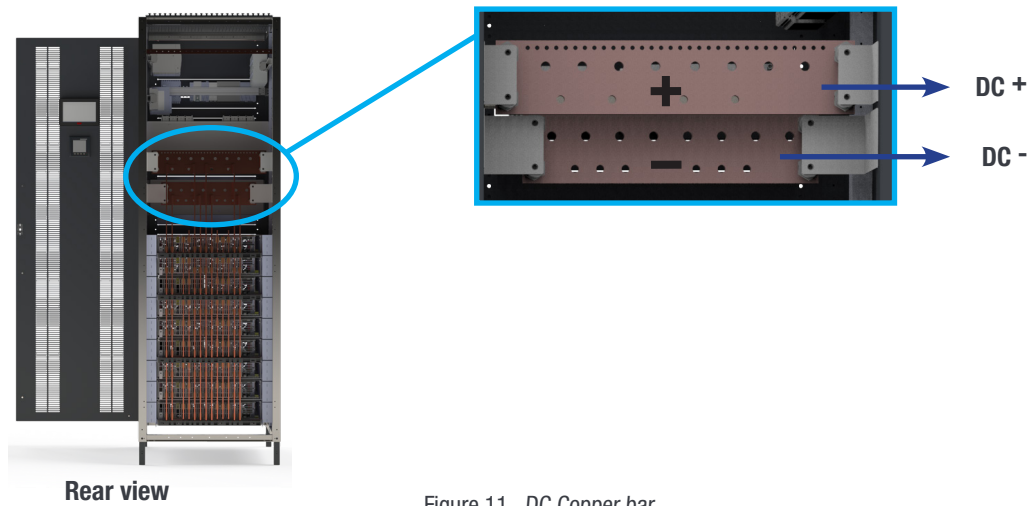


A Multiple Earth Neutral (MEN) connection can be made by linking the neutral terminal (N) of the AC input (X1) or AC output (X4) to the earthing point. Refer to “18.2 System Connections (TN-C-S)”, page 78.

The cable used for the Multiple Earth Neutral (MEN) connection must meet a minimum size requirement. Make sure that the MEN connection cable size is not smaller than the cable size mentioned in “Table 2. AC Input and Output connections”, page 29.

7.8 DC

DC connections are located at the top rear side of the system.



7.8.1 DC Connections

DC connections use separate bus bars for positive (+) and negative (-) cable terminations. The bus bar details as below,

Each bus bar has eight termination points. Each termination points has a hole diameter of 13 mm.

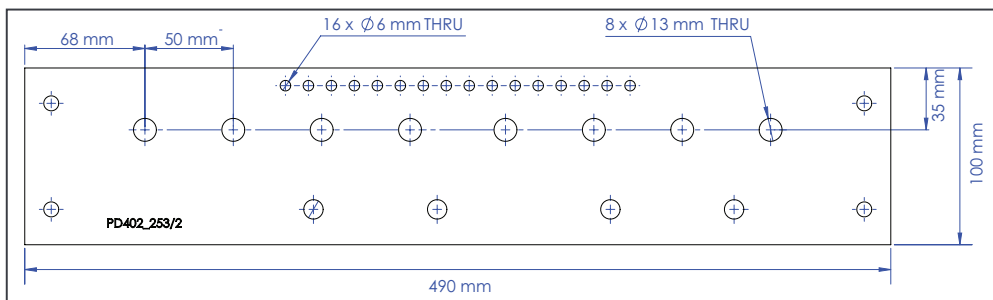


Figure 12. DC Positive bar

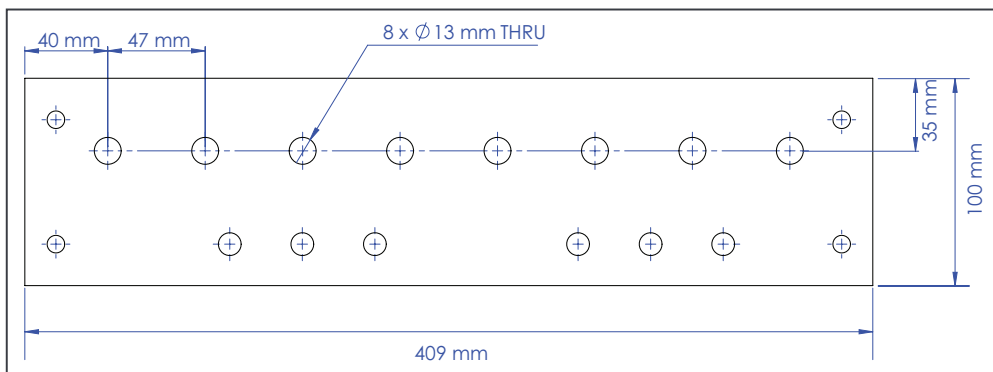


Figure 13. DC Negative bar

Hybrid Sierra System Model	Common DC Input - 48 Vdc			
	Maximum DC Current	Connection Cable	Torque	Lug Hole Size
18 kVA	321 A	150 mm ²	20 Nm	13 mm
27 kVA	482 A	2 x 95 mm ²	10 Nm	13 mm
36 kVA	653 A	2 x 150 mm ²	20 Nm	13 mm
45 kVA	816 A	2 x 180 mm ²	20 Nm	13 mm
54 kVA	979 A	2 x 240 mm ²	25 Nm	13 mm
63 kVA	1142 A	2 x 300 mm ²	25 Nm	13 mm
72 kVA	1306 A	3 x 180 mm ²	20 Nm	13 mm
81 kVA	1469 A	3 x 240 mm ²	25 Nm	13 mm
90 kVA	1632 A	3 x 300 mm ²	25 Nm	13 mm

Table 3. DC connections - 48 Vdc Systems

Note: Bolts, nuts and cable lugs are not included in the delivery.

The switching device used to isolate the energy source must adhere to specific standards:

- Voltage Rating: The device's voltage rating must equal or exceed the inverter's maximum DC voltage.
- Current Interruption: It must be capable of interrupting both the maximum rated normal and fault current of the inverter.
- Simultaneous Interruption: All live conductors must be interrupted at the same time.
- Lockout Capability: The device must be lockable in the open (off) position, and secured only when the main contacts are open.
- Device Type: It must be a switch disconnection or a circuit breaker.
- Sierra Hybrid Systems are designed for connection to external battery sources and must meet these specific standards:
 - Standard Compliance: The system must conform to AS 60947-3.
 - Polarization Type: It shall be a non-polarized type device.
 - Utilisation Category: It must have a utilisation category of at least DC-21B.

The DC circuit breaker is not built into the system. The customer must install the DC circuit breaker.

Select the correct breaker based on the required ratings listed in "Table 3. DC connections - 48 Vdc Systems", page 32.

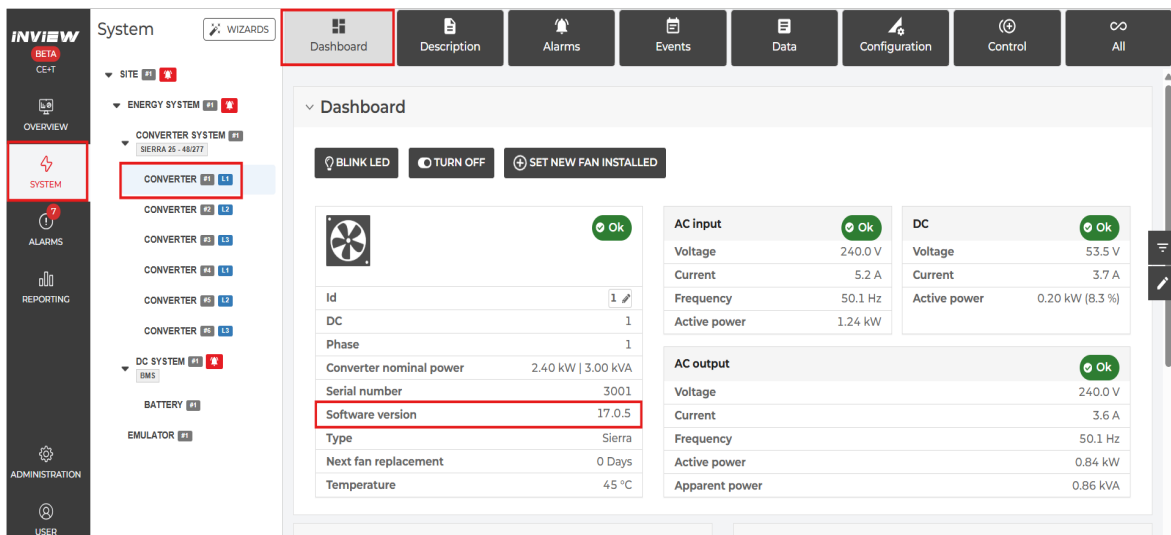
8. Operational modes

8.1 Grid Interactive Mode

8.1.1 Software required

- Module software : 17.0.5 version (minimum)
- Inview software : 7.0 version (minimum)

To know the module firmware and other details. Navigate to *Site > Converter System > Converter > Dashboard*.



The screenshot shows the Inview software interface. The left sidebar has 'SYSTEM' selected. The main area shows the 'Dashboard' for a 'CONVERTER #1'. The 'Software version' is 17.0.5. The dashboard also displays AC input, DC, and AC output parameters.

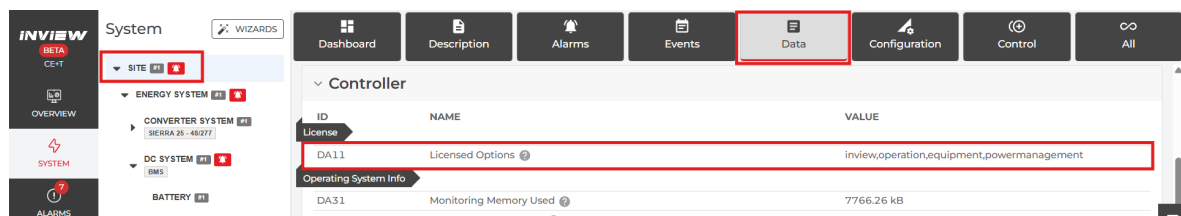
Parameter	Value
AC Input Voltage	240.0 V
AC Input Current	5.2 A
AC Input Frequency	50.1 Hz
AC Input Active power	1.24 kW
DC Voltage	53.5 V
DC Current	3.7 A
DC Active power	0.20 kW (8.3 %)
AC output Voltage	240.0 V
AC output Current	3.6 A
AC output Frequency	50.1 Hz
AC output Active power	0.84 kW
AC output Apparent power	0.86 kVA

8.1.2 Enable Grid Interactive Mode

Note: To change these settings, login as Admin (refer to “Login”, page 59) and the Power management software license must be installed on the Inview controller.

To enable Grid Interactive mode, follow the steps:

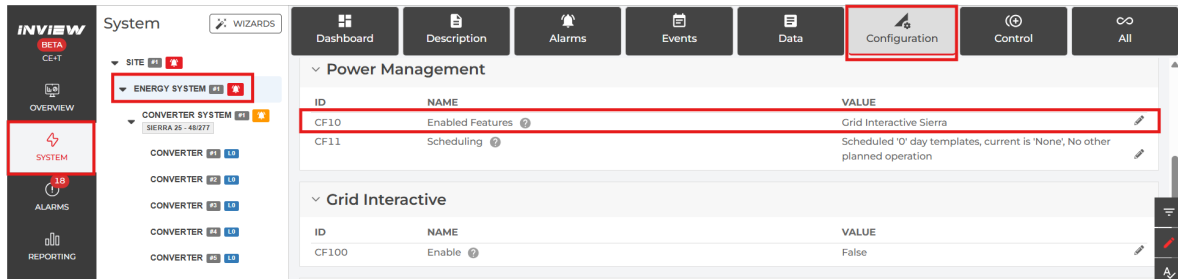
1. Navigate to *SITE > Data* and scroll down to controller section (DA11) to make sure the power management software license is loaded.



The screenshot shows the Inview software interface with the 'Data' section selected. The 'Controller' section is expanded, showing a table with license information.

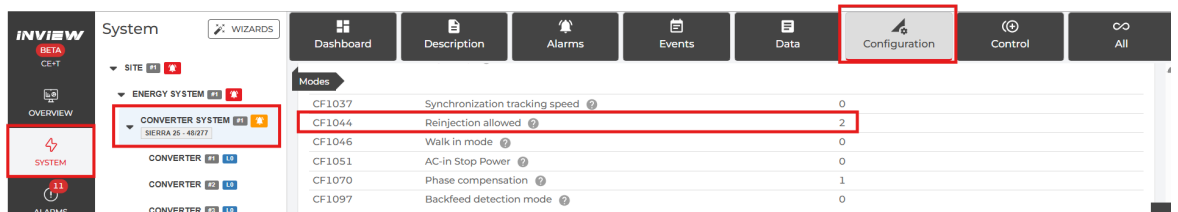
ID	NAME	VALUE
DA11	Licensed Options	inview.operation,equipment,powermanagement
DA31	Monitoring Memory Used	7766.26 kB
DA32	COI Dependent License	0.76 %

2. Navigate to **ENERGY SYSTEM > Configuration**, scroll down to power management system and enter the GridInteractiveSierra in CF10 to enable the Power Management – Grid interactive feature



ID	NAME	VALUE
CF10	Enabled Features	Grid Interactive Sierra
CF11	Scheduling	Scheduled '0' day templates, current is 'None', No other planned operation

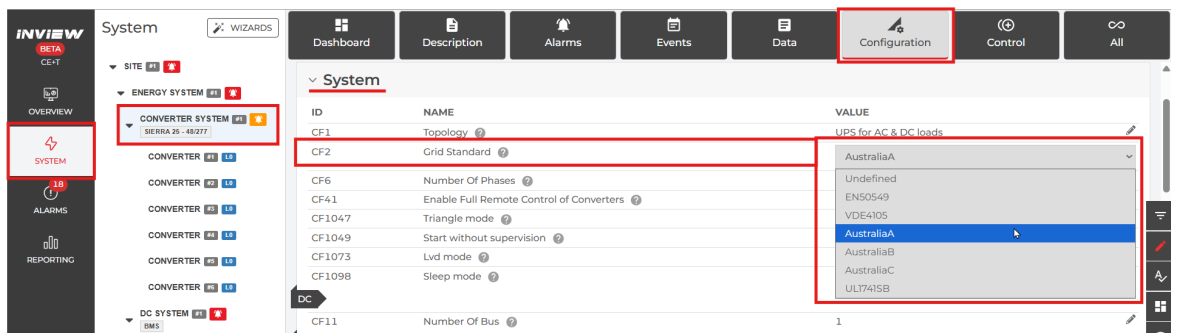
3. Navigate to **CONVERTER SYSTEM > Configuration**, scroll down to Grid interactive section and click Edit and set the ID CF1044 to 2 and Apply and Save.



ID	NAME	VALUE
CF1037	Synchronization tracking speed	0
CF1044	Reinjection allowed	2
CF1046	Walk in mode	0
CF1051	AC-in Stop Power	0
CF1070	Phase compensation	1
CF1097	Backfeed detection mode	0

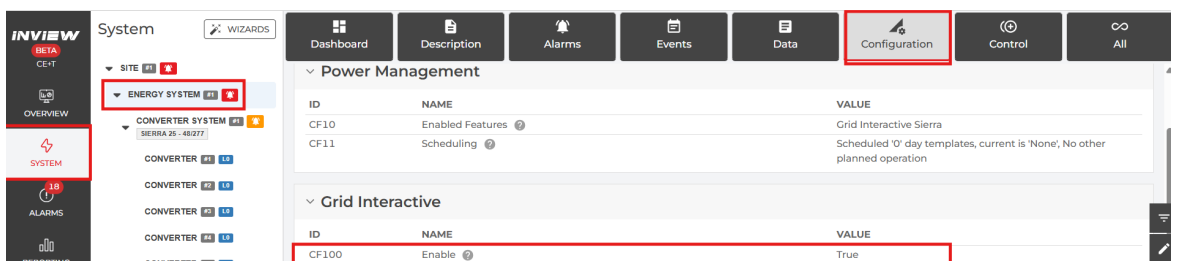
4. Scroll up to ID CF2 and set the grid code as AustraliaA or AustraliaB or AustraliaC from the drop down. Select the correct Grid code for region where the system is being installed.

Edit the *Grid Standard (CF2)* to *AustraliaA, AustraliaB* or *AustraliaC* which refer to different inverter settings within the AS4777 standard, based on regional grid configurations. Power quality response mode is automatically adjusted.



ID	NAME	VALUE
CF1	Topology	UPS for AC & DC loads
CF2	Grid Standard	AustraliaA
CF6	Number Of Phases	Undefined
CF41	Enable Full Remote Control of Converters	EN50549
CF1047	Triangle mode	VDE4105
CF1049	Start without supervision	AustraliaA
CF1073	Lvd mode	AustraliaB
CF1098	Sleep mode	AustraliaC
CF11	Number Of Bus	ULT74ISB

5. Navigate to **ENERGY SYSTEM > Configuration**, scroll down to Grid interactive section ID CF100 and click the edit icon to select True from the drop down.



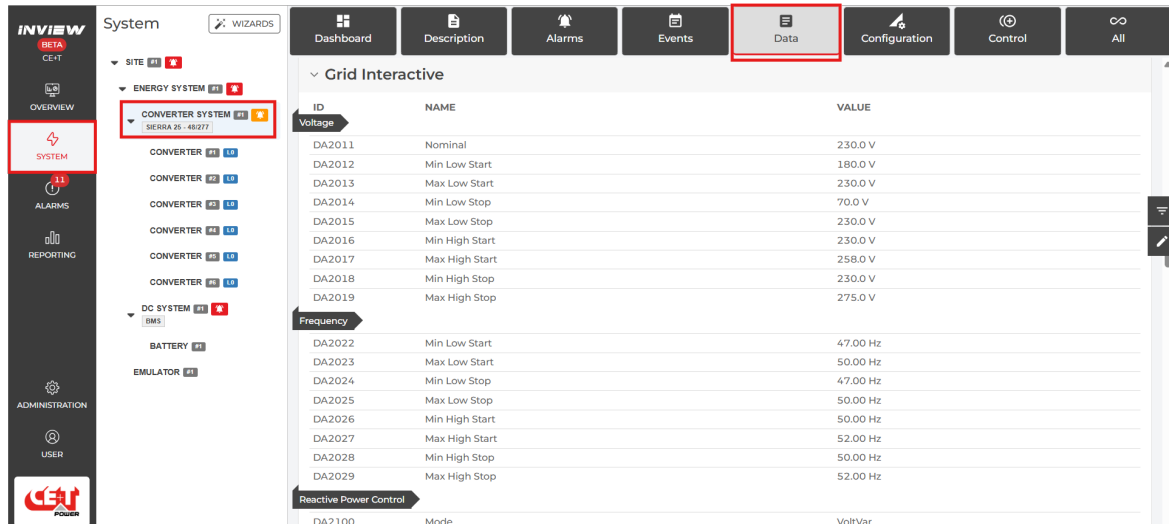
ID	NAME	VALUE
CF10	Enabled Features	Grid Interactive Sierra
CF11	Scheduling	Scheduled '0' day templates, current is 'None', No other planned operation

ID	NAME	VALUE
CF100	Enable	True

8.1.3 Verify the Active Grid Interactive Module Parameters

Once the grid code is selected, the module parameters are automatically adapted.

Navigate to *Converter system > Data*, scroll down to Grid Interactive to the parameters taken into account by the inverters.



The screenshot shows the INVIEW system interface. The 'Data' tab is selected, displaying a table of 'Grid Interactive' parameters. The table has columns for ID, NAME, and VALUE.

ID	NAME	VALUE
Voltage		
DA2011	Nominal	230.0 V
DA2012	Min Low Start	180.0 V
DA2013	Max Low Start	230.0 V
DA2014	Min Low Stop	70.0 V
DA2015	Max Low Stop	230.0 V
DA2016	Min High Start	230.0 V
DA2017	Max High Start	258.0 V
DA2018	Min High Stop	230.0 V
DA2019	Max High Stop	275.0 V
Frequency		
DA2022	Min Low Start	47.00 Hz
DA2023	Max Low Start	50.00 Hz
DA2024	Min Low Stop	47.00 Hz
DA2025	Max Low Stop	50.00 Hz
DA2026	Min High Start	50.00 Hz
DA2027	Max High Start	52.00 Hz
DA2028	Min High Stop	50.00 Hz
DA2029	Max High Stop	52.00 Hz
Reactive Power Control		
DA2100	Mode	VoltVar

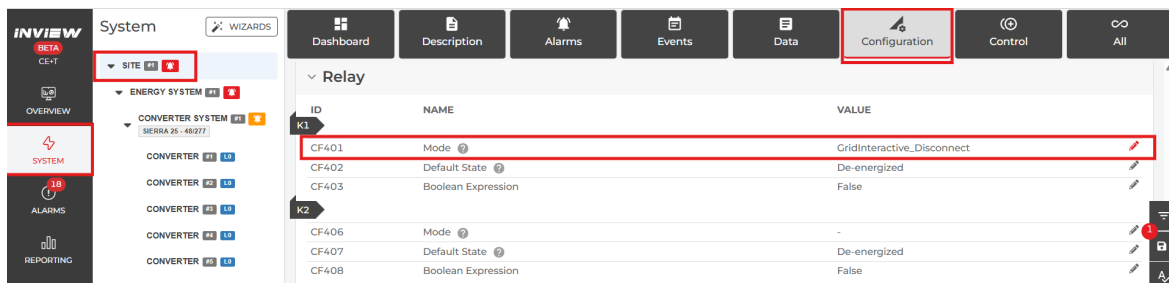
The inverters power quality response mode settings are secured. This prevents accidental or unauthorized changes.

To configure the Sierra systems grid parameters, please contact the CE+T team. They will discuss your requirements and how to meet them.

The secure parameters and modes described in following include Volt-watt response settings, Volt-var response settings, Fixed power factor mode, Reactive power mode, Power rate limits, and Volt-watt response mode when charging.

8.1.4 Configure the Grid Interactive Disconnect Relay

Navigate to *Site > Configuration* or *Site > Sensors and Actuators > Configuration*, scroll to Relay section. Edit the Mode (CF401) to GridInteractive_Disconnect and Save and apply the changes for grid protection.



The screenshot shows the INVIEW system interface. The 'Configuration' tab is selected, displaying a table of 'Relay' parameters. The table has columns for ID, NAME, and VALUE.

ID	NAME	VALUE
K1		
CF401	Mode	GridInteractive_Disconnect
CF402	Default State	De-energized
CF403	Boolean Expression	False
K2		
CF406	Mode	-
CF407	Default State	De-energized
CF408	Boolean Expression	False

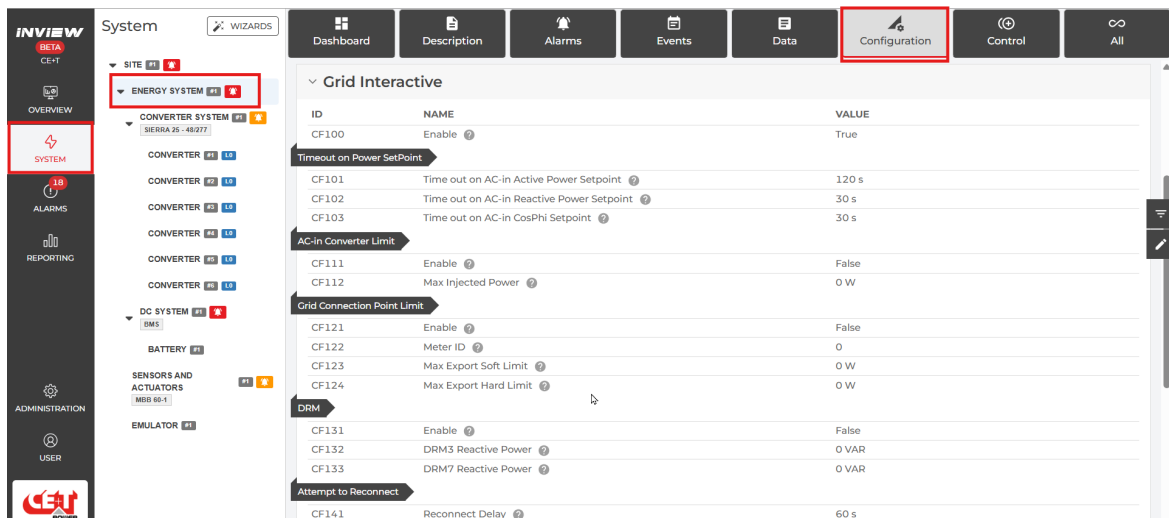
This relay will be energised (if Default State is De-energised) when features described in the next section require the system to get disconnected from the grid. Additionally to that, if there is a difference of more than 5% between phase currents on AC-in, the relay is energised as well.

The relay also activates if the difference between the AC-input phase currents is more than 5%.

The relay activates (closes the circuit) to disconnect the system from the grid for specific reasons described in the next section.

8.1.5 Verify the Grid Interactive Configuration

Navigate to *Site > Converter System > Configuration*, scroll to Grid Interactive section.



ID	NAME	VALUE
CF100	Enable	True
Timeout on Power SetPoint		
CF101	Time out on AC-in Active Power Setpoint	120 s
CF102	Time out on AC-in Reactive Power Setpoint	30 s
CF103	Time out on AC-in CosPhi Setpoint	30 s
AC-in Converter Limit		
CF111	Enable	False
CF112	Max Injected Power	0 W
Grid Connection Point Limit		
CF121	Enable	False
CF122	Meter ID	0
CF123	Max Export Soft Limit	0 W
CF124	Max Export Hard Limit	0 W
DRM		
CF131	Enable	False
CF132	DRM3 Reactive Power	0 VAR
CF133	DRM7 Reactive Power	0 VAR
Attempt to Reconnect		
CF141	Reconnect Delay	60 s

First configure all the parameters and now set the ID CF100 to True to activate the grid interactive feature.

a. Timeout on Power setpoints

CF101 to CF103 correspond to the duration during which the power setpoints that are sent to Inview (via Modbus, SNMP or directly via the web interface – under Control) are applied.

They are only taken into account if the grid code allows it.

b. AC-in Converter Limit

A maximum injected power at the AC-in converter level can be configured. To do so, edit the parameter CF112 and then enable this functionality by setting CF111 to True.

When enabled, if for some reason the CF112 threshold is trespassed for more than 15 seconds, the GridInteractive_Disconnect relay is energised.

c. Grid Connection Point Limit

A similar configuration is possible at power meter level. When the feature is enabled by setting CF121 to True, if the power measured at the power meter of ID CF122 trespasses the CF124 threshold for more than 15 seconds, the GridInteractive_Disconnect relay is energised.

Software limit CF123 controls the power at the grid connection point. This limit prevents the injected power from exceeding the maximum permitted value.

d. DRM

For Australian grid standards to be respected, it is mandatory to enable the DRM functionalities by setting CF131 to True.

DRM functionalities are managed by CE+T's DRED box and a DRM box. For DRM3 and DRM7, reactive power setpoints can be configured with CF132 and CF133.

If the DRM functionalities require a disconnection from the grid, the GridInteractive_Disconnect relay is energised.

Mode	Requirement
DRM 0	Operate the disconnection device
DRM 1	Do not consume power
DRM 2	Do not consume at more than 50% of rated power
DRM 3	Do not consume at more than 75% of rated power and source reactive power if capable
DRM 4	Increase power consumption (subject to constraints from other active DRMs)
DRM 5	Do not generate power
DRM 6	Do not generate at more than 50% of rated power
DRM 7	Do not generate at more than 75% of rated power and sink reactive power if capable
DRM 8	Increase power generation (subject to constraints from other active DRMs)

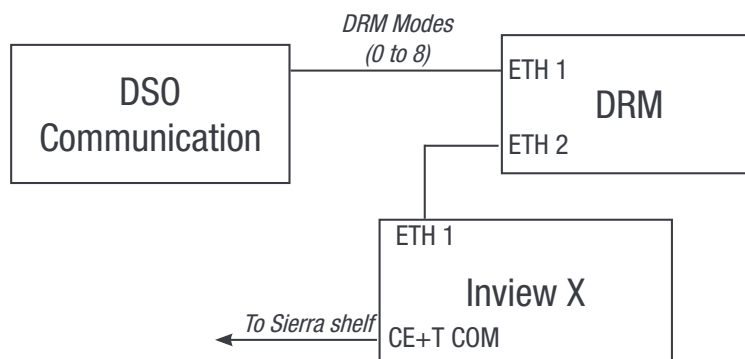
e. Attempt to Reconnect

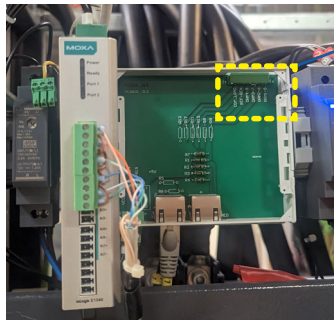
Once conditions are met to de-energize the GridInteractive_Disconnect relay, there is a reconnection delay defined by CF141.

8.2 Demand Responses Modes (DRMs)

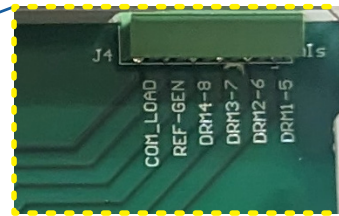
The system has DRED connections that are compatible with nine DRM codes. If DRM0 is not active, no other DRM functions can be enabled.

8.2.1 DRM Connections

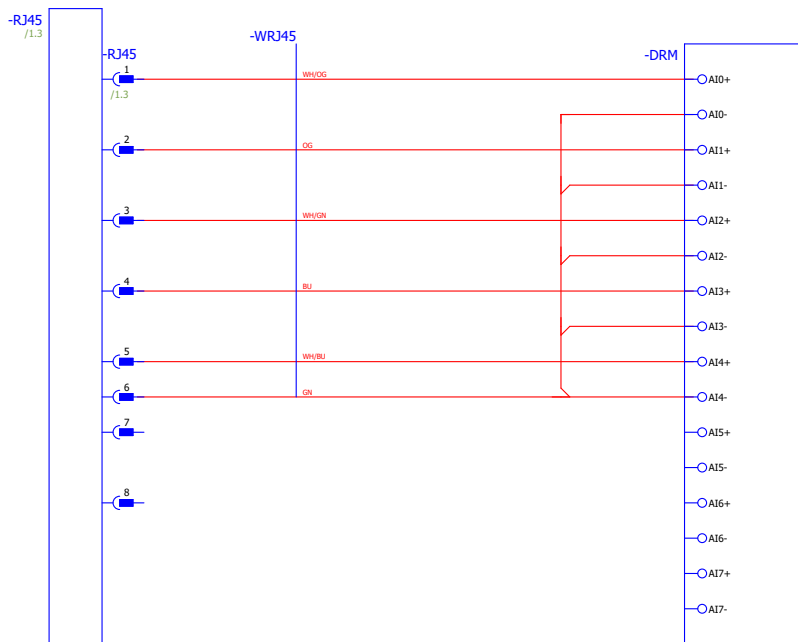




DRM Unit



DRM Connection details



PIN OUT
DRED TO DRM BOX

8.2.2 DRM Modes

DRM 0	✗	DRM 1	✗	DRM 2	✗
DRM 3	✗	DRM 4	✗	DRM 5	✗
DRM 6	✗	DRM 7	✗	DRM 8	✗

Note: All DRM modes can be enabled.

Note: To know more about each DRM mode, refer to the Grid standard [AS_NZS_4777_2](#).

8.2.3 DRM Enabling

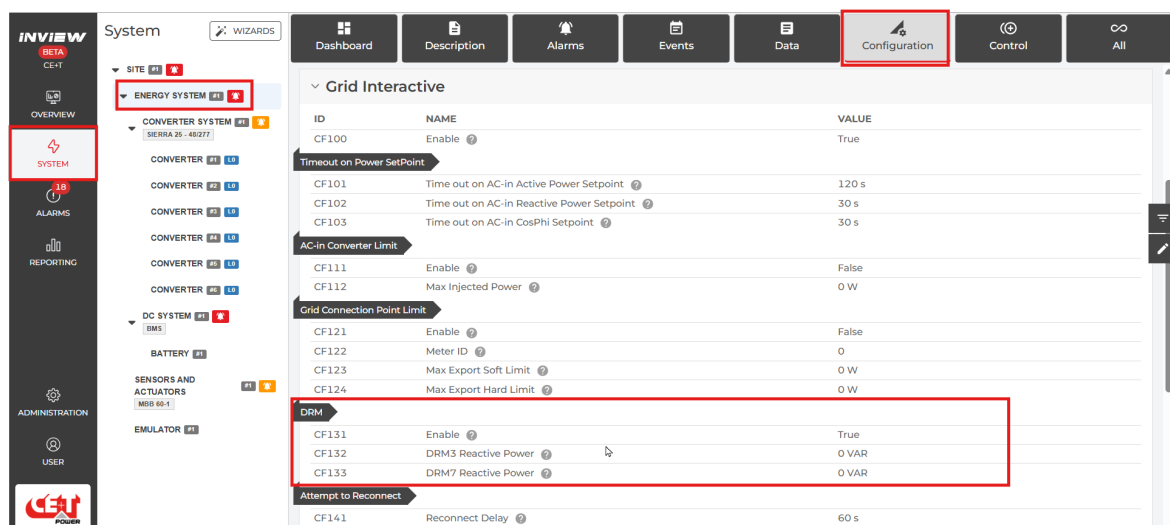
To enable DRM, navigate to Configuration and CF131 and select True.

Navigate to *Energy System > Configuration*, scroll down to *Grid Interactive* section.

In DRM section > **ID CF131** (Enabled), select the **True** from the drop-down list. And enable the corresponding DRMs.

For example, DRM3 and DRM7 modes will fix the reactive power set point. The respective ID is CF132 and CF133.

Note: DRM 0 - To operate the Disconnection device. DRMO should be always enable to comply with asz4777 standard.



8.3 Volt-Watt Response Mode

The Volt-watt response mode varies the maximum active power output level of the inverter in response to the voltage at its grid-interactive port.

Parameters name	Description	Units
XY1_POWER_RESPONSE_TO_OVER_VOLTAGE_CURVE	First point of overvoltage curve in power injection.	X should be given in dV and Y in %.
XY2_POWER_RESPONSE_TO_OVER_VOLTAGE_CURVE	Second point of overvoltage curve in power injection.	X should be given in dV and Y in %.
XY3_POWER_RESPONSE_TO_OVER_VOLTAGE_CURVE	Third point of overvoltage curve in power injection.	X should be given in dV and Y in %.
XY4_POWER_RESPONSE_TO_OVER_VOLTAGE_CURVE	Fourth point of overvoltage curve in power injection.	X should be given in dV and Y in %.

Because each parameter contains at the same time the X and Y value, a small computation is needed. Indeed, the parameter can be divided in two parts, the low part is the X value and the high part the Y value. To have the final value of the parameters, we have to use the following mathematical expression:

$$XY_{PowerResponseToOverVoltageCurve} = Round \left(200 * \frac{X}{V_{Nom}} \right) + 256 * IF (Y < 0; Y + 256; Y)$$

A small example is given in the following tabular:

65	RESPONSE TO FREQ SLOPE 2 pc_per_Hz	U16	25680	0	0	X (dV) (Voltage)	Y (%) (Active power)
66	XY1_POWER_RESPONSE_TO_OVER_VOLTAGE_CURVE	U16	25800	25800	25800	2300	100
67	XY2_POWER_RESPONSE_TO_OVER_VOLTAGE_CURVE	U16	25820	25820	25820	2530	100
68	XY3_POWER_RESPONSE_TO_OVER_VOLTAGE_CURVE	U16	5346	5346	5346	2600	20
69	XY4_POWER_RESPONSE_TO_OVER_VOLTAGE_CURVE	U16	5360	5360	5360	2760	20

These are the default value for Australian certification.

8.4 Volt-Var Response Mode

The Volt-var response mode varies the reactive power absorbed or supplied by the inverter in response to the voltage at its grid-interactive port

Where the inverter apparent power rating is reached, active power level shall be reduced to stay within the inverter apparent power rating while meeting the Volt- var mode reactive power requirements. This behavior is intended to provide reactive power priority.

The link between reactive power and voltage can be represented by four points. As the Volt-watt function. To each voltage point, there is a corresponding reactive power. As for Volt-watt function, there is four parameters used to configure the function inside the Sierra. However, because there exist several kind of reactive power function (Volt-var, constant Q, constant cosphi, . . .), there is also a parameter allowing to choose which kind of reactive power function is applied by the system.

Parameters name	Description	Units
VAR_MODE	Choice of reactive power mode	
XY1_VAR_MODE_CURVE	First point of reactive power curve	X should be given in dV and Y in %
XY2_VAR_MODE_CURVE	Second point of reactive power curve	X should be given in dV and Y in %
XY3_VAR_MODE_CURVE	Third point of reactive power curve	X should be given in dV and Y in %
XY4_VAR_MODE_CURVE	Fourth point of reactive power curve	X should be given in dV and Y in %

Because each parameter contain at the same time the X and Y value, a small computation is needed. Indeed, the parameter can be divided in two parts, the low part is the X value and the high part the Y value. To have the final value of the parameters, we have to use the following mathematical expression:

$$XY_{VarModeCurve} = Round \left(200 * \frac{X}{V_{Nom}} \right) + 256 * IF (Y < 0; Y + 256; Y)$$

A small example is given in the following tabular:

				X (%) (V or P)	Y (%) (Q or CosPhi)
XY1_VAR_MC U16	11444	11444	11444	2070	44
XY2_VAR_MC U16	191	191	191	2200	0
XY3_VAR_MC U16	209	209	209	2400	0
XY4_VAR_MC U16	50400	50400	50400	2580	-60

These are the default value for Australian certification.

8.5 Volt-Var and Volt-Watt Response Set Point Values

Volt-var response default set-point values					
Region	Setting (V) and Reactive power level Q of S_{rated}				Setting value checked
	V_{v1}	V_{v2}	V_{v3}	V_{v4}	
Australia A	207V	220V	240V	258V	<input checked="" type="checkbox"/> Pass <input type="checkbox"/> Fail <input type="checkbox"/> N/A
	44% sup.	0%	0%	60% abs.	
Australia B	205V	220V	235V	255V	<input checked="" type="checkbox"/> Pass <input type="checkbox"/> Fail <input type="checkbox"/> N/A
	30% sup.	0%	0%	40% abs.	
Australia C	215V	230V	240V	255V	<input checked="" type="checkbox"/> Pass <input type="checkbox"/> Fail <input type="checkbox"/> N/A
	44% sup.	0%	0%	60% abs.	
New Zealand	207V	220V	235V	244V	<input type="checkbox"/> Pass <input type="checkbox"/> Fail <input checked="" type="checkbox"/> N/A
	60% sup.	0%	0%	60% abs.	
Allowed range	180 to 230V	180 to 230V	230V to 265V	255V	<input checked="" type="checkbox"/> Pass <input type="checkbox"/> Fail
	30 to 60% sup.	0%	0%	30 to 60% abs.	
Volt-watt response default set-point values					
Region	Setting (V) and maximum output level (P) of S_{rated}				Setting value checked
	V_{w1}		V_{w2}		
Australia A	253V		260V		<input checked="" type="checkbox"/> Pass <input type="checkbox"/> Fail <input type="checkbox"/> N/A
	100%		20%		
Australia B	250V		260V		<input checked="" type="checkbox"/> Pass <input type="checkbox"/> Fail <input type="checkbox"/> N/A
	100%		20%		
Australia C	253V		260V		<input checked="" type="checkbox"/> Pass <input type="checkbox"/> Fail <input type="checkbox"/> N/A
	100%		20%		
New Zealand	242V		250V		<input type="checkbox"/> Pass <input type="checkbox"/> Fail <input checked="" type="checkbox"/> N/A
	100%		20%		
Allowed range	235 to 255V		240 to 265V		<input checked="" type="checkbox"/> Pass <input type="checkbox"/> Fail
	100%		0% to 20%		

Diagram Voltage, apparent power, active power and reactive power

The graph for Australia A shows the relationship between voltage set point and power levels. The y-axis represents Maximum Power Level, Q/P/S [% S_{rated}] from -80% to 120%. The x-axis represents Voltage set point [V] from 200 to 290. The Volt Watt response (red line) starts at 100% for voltages up to 258V, then drops to 20% at 260V. The Volt Var response (green line) starts at 44% for voltages up to 220V, then drops to 0% at 220V. Measured data points (blue circles for S, green crosses for P, purple crosses for Q) closely follow these setpoint curves.

Note:
The active power may be reduced due to the reactive power provision or current limit of the DUT. This was considered when calculating the minimum active power output. The requirement from the maximum

8.6 Fixed Power Factor Mode

The fixed power factor mode may be enabled in some situations by the electrical distributor to meet local grid requirements.

Once this mode is enabled, Volt-var mode will be disabled.

Volt-watt and fixed power factor CAN operate together.

The CE+T equipment can supply between 0.8 and 1.0 reactive power and can absorb between 0.8 and 1.0. The default PF is 1.0.

The parameter is the same for all reactive power function. This means, the parameter used for the fixed power factor are the same as the volt-var function. However, the value of the parameters are not the same. For fixed power factor, we need only one point, instead of 4, to characterize the function. So, the following table can be used to use the fixed power factor mode.

The XY1_VAR_MODE_CURVE give the power factor in percent. So, a value of 90 means "PF = 0.9.

8.7 Reactive Power Mode

The electrical distributor can enable the reactive power factor mode to obey local grid requirements. When you enable this mode, the Volt-var mode must be disabled.

The Volt-watt mode and the reactive power mode can operate at the same time.

The minimum range for the ratio of reactive power (Vars) to rated apparent power (VA) is 60% absorption to 60% supply. The default setting for reactive power is 0%.

If the inverter apparent power rating is reached, active power output level shall be reduced to meet the inverter apparent power rating while meeting the fixed power factor mode or reactive power requirements. This behavior is intended to provide reactive power priority.

All reactive power functions use the same parameters. The reactive power mode and the volt-var function use the same parameters. However, the parameter values are different.

The fixed reactive power mode uses only one point to define the function. In other modes, you use four points.

Use the table for the fixed reactive power mode. In this mode, the reactive power is constant at 500 Var.

VAR_MODE	3
XY1_VAR_MODE_CURVE	500
XY2_VAR_MODE_CURVE	0
XY3_VAR_MODE_CURVE	0
XY4 VAR MODE CURVE	0

8.8 Power Rate Limit

The inverter has the capability to rate limit changes in power generation through the grid-interactive port.

To control the ramp up of all configurations, four parameters are configurable allowing to handle each possible case.

Here are the four parameters:

Parameters name	Description	Units
LIMITE_INCREASE_INJECTED_POWER_TIME	Time to increase the injected active power from 0% to 100% of nominal power.	5 cs. So, a value of 20 = 1s.
LIMIT_DECREASE_INJECTED_POWER_TIME	Time to decrease the injected active power from 100% to 0% of nominal power.	5 cs. So, a value of 20 = 1s.
LIMIT_INCREASE_CONSUMED_POWER_TIME	Time to increase the consumed active power from 0% to 100% of nominal power.	5 cs. So, a value of 20 = 1s.

LIMIT_DECREASE_CONSUMED_POWER_TIME	Time to decrease the consumed active power from 100% to 0% of nominal power.	5 cs. So, a value of 20 = 1s.
------------------------------------	--	-------------------------------

Here is an example of the parameters for the Australian standard:

LIMIT_INCREASE_INJECTED_POWER_TIME_5cs	7200
LIMIT_DECREASE_INJECTED_POWER_TIME_5cs	7200
LIMIT_INCREASE_CONSUMED_POWER_TIME_5cs	7200
LIMIT_DECREASE_CONSUMED_POWER_TIME_5cs	7200

8.9 Volt-Watt Response Mode Inverter With Energy When Charging

The Volt-watt response mode for an inverter able to charge an energy storage device (battery) varies the maximum active power input of the inverter from the grid in response to the voltage at its grid-interactive port.

This Volt-watt response mode is only active when the inverter charges the battery through the grid-interactive port.

The Volt-watt response mode for charging of energy storage shall be enabled by default.

The curve is typically characterize by 4 points. At each point we can associate a voltage (%) and an active power (%). In the grid interactive parameter file, you will find 4 parameters you can choose allowing you the choose the Volt-watt curve you (or the DSO) want to see applied.

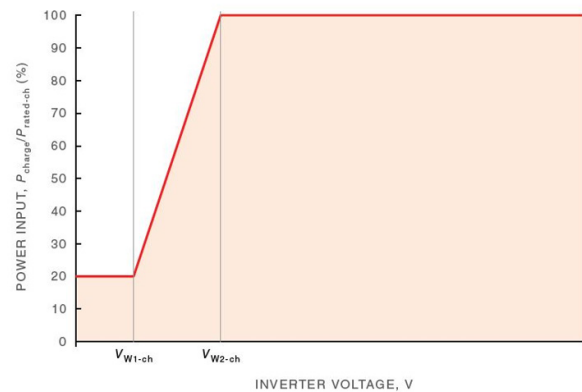


Figure 14. Example curve for the Volt-watt response mode for multiple mode inverters with energy storage when charging

Parameters name	Description	Units
XY1_POWER_RESPONSE_TO_UNDER_VOLTAGE_CURVE	First point of undervoltage curve in power injection.	X should be given in dV and Y in %.
XY2_POWER_RESPONSE_TO_UNDER_VOLTAGE_CURVE	Second point of undervoltage curve in power injection.	X should be given in dV and Y in %.
XY3_POWER_RESPONSE_TO_UNDER_VOLTAGE_CURVE	Third point of undervoltage curve in power injection.	X should be given in dV and Y in %.
XY4_POWER_RESPONSE_TO_UNDER_VOLTAGE_CURVE	Fourth point of undervoltage curve in power injection.	X should be given in dV and Y in %.

Because each parameter contains at the same time the X and Y value, a small computation is needed. Indeed, the parameter can be divided in two parts, the low part is the X value and the high part the Y value. To have the final value of the parameters, we have to use the following mathematical expression:

$$XY_{VarModeCurve} = Round \left(200 * \frac{X}{V_{Nom}} \right) + 256 * IF (Y < 0; Y + 256; Y)$$

A small example is given in the following table:

POWER RESP TO OVER VOLT RAMP UP TIME_Scs	U16	0	0	0	X (%) (Voltage)	Y (%) (Active power)
XY1_POWER_RESPONSE_TO_UNDER_VOLTAGE_CURVE	U16	5277	5277	5277	1800	20
XY2_POWER_RESPONSE_TO_UNDER_VOLTAGE_CURVE	U16	5300	5300	5300	2070	20
XY3_POWER_RESPONSE_TO_UNDER_VOLTAGE_CURVE	U16	25787	25787	25787	2150	100
XY4_POWER_RESPONSE_TO_UNDER_VOLTAGE_CURVE	U16	25800	25800	25800	2300	100

8.10 Security of Operation Settings

The settings of the demand response or power quality response modes of the inverter are secured against inadvertent or unauthorized change.

To change the grid interactive parameters of Sierra system, please contact CE+T team that will see with you the purpose and how to reach your goals.

8.11 Automatic Disconnection Device

The automatic disconnection device comprises the NS protection device and one decoupling relay.

The NS protection device (NA003) is used to control the decoupling relay connected to the Grid. Once the regional settings are enabled, it will energize the decoupling relay to supply the system. Otherwise, the disconnection switch stays open. To know more about the automatic disconnection switch, refer to the NA003 user manual.

The automatic disconnection device, in combination with Sierra system, can provide anti-islanding services such as:

- Active anti-islanding using method called 'Slip mode frequency shift.'
- Passive anti-islanding (Voltage and frequency limits)

The active anti-islanding function can be activated or deactivated but is activated by default.

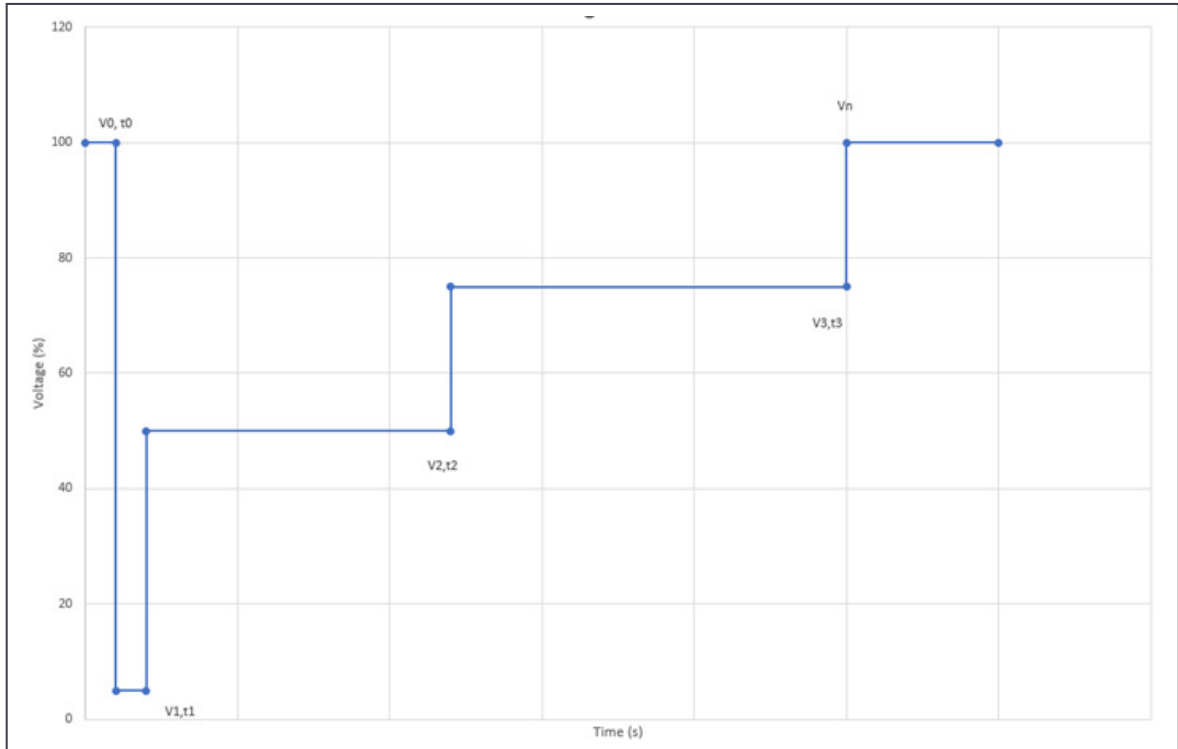
133	Other Parameters					
134	Balancing activation	Yes	Choice list	/	/	
135	Max imbalance (% I _{max})	1,66	%	0	10	
136	Offset reactive power (VAr)	0	Var	0	2880	
137	Walk In Mode Minimum Time (s)	0	s	0	6000	
138	Active anti-islanding	Activated				

All the parameters for passive anti-islanding are not easily changeable (voltage threshold, trip delay time,...). The default value are the ones of Australian certification:

For all the part explained until here, there is a set of parameters allowing to meet the goals of the previous points:

Parameters name	Description	Units
VAC_LOW_UVRT_dV	Low voltage value, under which the converters can disconnect immediately. In the figure, this correspond to V1.	dV. A value of 2300 = 230V
MAX_TIME_UVRT_5cs	Time associated to INDEX_VAC_LOW_UVRT_dV. This means, if the measured voltage remains between INDEX_VAC_LOW_UVRT_dV and INDEX_MIN_VAC_LOW_STOP_dV during this time, the system will disconnect. Other parameters can be used later to configure the UVRT and OVRT. This time needs to be considered as the longest time met in the UVRT curve (the longest time of an UVRT event all steps included). So, this correspond to t3.	5 cs. So, a value of 20 = 1s.
VAC_HIGH_OVRT_dV	High voltage value, above which the converters can disconnect immediately. This correspond to V1.	dV. A value of 2300 = 230V
MAX_TIME_OVRT_5cs	Time associated to INDEX_VAC_HIGH_OVRT_dV. This means, if the measured voltage remains between INDEX_VAC_HIGH_OVRT_dV and INDEX_MAX_VAC_HIGH_STOP_dV during this time, the system will disconnect. Other parameters can be used later to configure the UVRT and OVRT. This time needs to be considered as the longest time met in the UVRT curve (the longest time of an UVRT event all steps included). This correspond to t3.	5 cs. So, a value of 20 = 1s.

Parameters name	Description	Units
VAC_AVERAGE_HIGH_STOP_dV	At each time, the system measure the voltage at the input port and compute the mean voltage on the third phases for the 10 last minutes. If this mean goes above this parameters, the system will disconnect from the grid.	dV. A value of 2300 = 230V
VAC_UVRT_1_dV	According to the corresponding schematic, this is the first under voltage step. This correspond to V1	dV. A value of 2300 = 230V
TIME_UVRT_1_5cs	This is the time associated to the first under voltage step. This correspond to t1	5 cs. So, a value of 20 = 1s.
VAC_UVRT_2_dV	According to the corresponding schematic, this is the second under voltage step. This correspond to V2	dV. A value of 2300 = 230V
TIME_UVRT_2_5cs	This is the time associated to the second under voltage step. This correspond to t2.	5 cs. So, a value of 20 = 1s.
VAC_UVRT_3_dV	According to the corresponding schematic, this is the third under voltage step. This correspond to V3.	dV. A value of 2300 = 230V
TIME_UVRT_3_5cs	This is the time associated to the thrid under voltage step. This correspond to t3.	5 cs. So, a value of 20 = 1s.
VAC_OVRT_1_dV	According to the corresponding schematic, this is the first over voltage step. This correspond to V1.	dV. A value of 2300 = 230V
TIME_OVRT_1_5cs	This is the time associated to the first over voltage step. This correspond to t1.	5 cs. So, a value of 20 = 1s.
VAC_OVRT_2_dV	According to the corresponding schematic, this is the second over voltage step. This correspond to V2.	dV. A value of 2300 = 230V
TIME_OVRT_2_5cs	This is the time associated to the second over voltage step. This correspond to t2.	5 cs. So, a value of 20 = 1s.
VAC_OVRT_3_dV	According to the corresponding schematic, this is the third over voltage step. This correspond to V3.	dV. A value of 2300 = 230V
TIME_OVRT_3_5cs	This is the time associated to the third over voltage step. This correspond to t3.	5 cs. So, a value of 20 = 1s.
MAX_INSTANTANEOUS_VAC_dV	This is the maximum instantaneous voltage allowed on the AC input port. If the AC voltage goes above, the sierra module will open the connector immediately.	dV. A value of 2300 = 230V



Here is an example of parameters:

VAC_LOW_UVRT_dV	1
MAX_TIME_UVRT_5cs	200
VAC_HIGH_OVRT_dV	2750
VAC_UVRT_1_dV	700
TIME_UVRT_1_5cs	20
VAC_UVRT_2_dV	700
TIME_UVRT_2_5cs	20
VAC_UVRT_3_dV	700
TIME_UVRT_3_5cs	20
VAC_OVRT_1_dV	2650
TIME_OVRT_1_5cs	20
VAC_OVRT_2_dV	2650
TIME_OVRT_2_5cs	20
VAC_OVRT_3_dV	2650
TIME_OVRT_3_5cs	20

As you can see here, there is too much parameters, that explain they have sometimes the same value. However, in case you need more granularity for the frequency and voltage range, the supplementary parameters already exist.

8.12 Response to a Decrease in Frequency for Multiple Mode Inverters With Energy Storage

Every national code has different way to implement the freq-watt function, the correspondence between our parameters and grid codes parameters is not always the same depending of the grid code. The first below table give an explanation for each parameter existing in the Sierra allowing to implement freq-watt function. The second table gives the relation between these parameters and the one given in the different grid codes.

Parameters name	Description	Units
LSB_RESPONSE_TO_UNDER_FREQ_MODE	Choose how the change of power is calculated based on frequency measurement. More explanation in the following.	Need to choose between 0,1,2,3 or 4
MSB_RESPONSE_TO_UNDER_FREQ_SLOPE_pc_per_Hz	Slope value at which the system change its active power based on frequency measurement for under frequency events.	%/Hz. 100 means that the active power
RESPONSE_TO_UNDER_FREQ_F1_cHz	Frequency value under which the system begins to react and change its active power.	cHz. A value of 5000 = 50Hz
RESPONSE_TO_UNDER_FREQ_DELAY_START_5cs	Delay between the moment the frequency reach INDEX_RESPONSE_TO_UNDER_FREQ_F1_cHz and the moment the system begins to adapt its active power.	5 cs. So, a value of 20 = 1s.
RESPONSE_TO_UNDER_FREQ_F_STOP_cHz	Frequency value using for f_{stop} function. When the frequency goes back at a value below this parameters, the system goes back to the active power level before the frequency disturbance.	cHz. A value of 5000 = 50Hz
RESPONSE_TO_UNDER_FREQ_DELAY_STOP_5cs	Delay to return to pre frequency disturbance power setpoint after the under frequency goes back to the normal range of value.	5 cs. So, a value of 20 = 1s.
RESPONSE_TO_UNDER_FREQ_RAMP_UP_TIME_5cs	Ramp-up time of active power to reach new setpoint if a new setpoint, higher than the one before the disturbance, has been given during the under frequency event.	5 cs. So, a value of 20 = 1s.
MSB_RESPONSE_TO_UNDER_FREQ_SLOPE_2_pc_per_Hz	Second slope used during under frequency event. This slope is used for Australian certification. This slope is used after the power reach zero. It drives how the power goes from zero to maximum injection.	%/Hz. 100 means that the active power

The first parameter 'LSB_RESPONSE_TO_UNDER_FREQ_MODE' allow to choose how we want to adapt the power based on frequency measurements. Indeed, based on national grid code, there is several way to adapt active power. So, here are the different way:

LSB_RESPONSE_TO_UNDER_FREQ_MODE = 0 (P_MAX_RESPONSE_TO_UNDER_FREQ_MODE)

In this case, the active power modification is based on the nominal power of the system as in the following formula:

$$\Delta P = \frac{1}{s} \cdot \frac{(f_1 - f)}{f_n} \cdot P_{ref}$$

Where Pref is the nominal power of the system.

LSB_RESPONSE_TO_UNDER_FREQ_MODE = 1 (P_M_RESPONSE_TO_UNDER_FREQ_MODE)

In this case, the active power modification is based on the active power provided by the system at the moment the frequency reached the limit activating the freq-watt function. This means, in the previous formula, have a $P_{ref} = P_m$ where P_m is the actual AC output power at the instant when the frequency reaches the threshold.

LSB_RESPONSE_TO_UNDER_FREQ_MODE = 2 (P_CHARGER_RESPONSE_TO_UNDER_FREQ_MODE)

In this case, the adaptation of power is based on the active power provided by the DC port of the sierra converter at the instant when the frequency reaches the threshold.

LSB_RESPONSE_TO_UNDER_FREQ_MODE = 3 (P_MAX_PLUS_P_M_RESPONSE_TO_UNDER_FREQ_MODE)

The adaption of the active power is based on P_m and P_{nom} . For example, with a slope of 50%, a modification of 2Hz (in absorption) will induce a change to 100% of injection whatever the injected power at the time of frequency deviation.

LSB_RESPONSE_TO_UNDER_FREQ_MODE = 4 (P_FIXED_FREQ_RESPONSE_TO_UNDER_FREQ_MODE)

In that case, two slopes are used to change the active power based on frequency measurements. The first slopes gives the decreasing of consumed active power from 100% of nominal power consumption to 0%. Imagine, at the time the frequency reaches the threshold, the consumption is 30% of nominal power, the system knows the frequency at which the consumed power should be 0 and so applied an adapted slope. The second slope is applied to increase the injection power from 0% to 100%.

Parameters name	Australian grid code	German grid code	European grid code
LSB_RESPONSE_TO_UNDER_FREQ_MODE	Choose 4	Choose 1	Choose 2
MSB_RESPONSE_TO_UNDER_FREQ_SLOPE_pc_per_Hz	$P_n / (f_{LLCO} - f_{stop-ch})$		
RESPONSE_TO_UNDER_FREQ_F1_cHz	f_{LLC}		
RESPONSE_TO_UNDER_FREQ_DELAY_START_5cs	/		
RESPONSE_TO_UNDER_FREQ_F_STOP_cHz	$f_{LLC} + f_{hyst}$		
RESPONSE_TO_UNDER_FREQ_DELAY_STOP_5cs	/		
RESPONSE_TO_UNDER_FREQ_RAMP_UP_TIME_5cs	/		
MSB_RESPONSE_TO_UNDER_FREQ_SLOPE_2_pc_per_Hz	$P_n / (f_{stop-ch} - f_{Pmax})$		

8.13 Response To An Increase in Frequency for Multiple Mode Inverters With Energy Storage

Every national code has different way to implement the freq-watt function, the correspondence between our parameters and grid codes parameters is not always the same depending of the grid code. The previous explanation gives you the general principle of freq-watt function. The first below table give an explanation for each parameter existing in the sierra allowing to implement freq-watt function. The second table gives the relation between these parameters and the one given in the different grid codes.

Parameters name	Description	Units
LSB_RESPONSE_TO_OVER_FREQ_MODE	Choose how the change of power is calculated based on frequency measurement. More explanation in the following.	Need to choose between 0, 1 or 2.
MSB_RESPONSE_TO_OVER_FREQ_SLOPE_pc_per_Hz	Slope value at which the system change its active power based on frequency measurement for over frequency event	%/Hz. 100 means that the active power
RESPONSE_TO_OVER_FREQ_F1_cHz	Frequency value above which the system begins to react and change its active power.	cHz. A value of 5000 = 50Hz
RESPONSE_TO_OVER_FREQ_DELAY_START_5cs	Delay between the moment the frequency reach INDEX_RESPONSE_TO_OVER_FREQ_F1_cHz and the moment the system begins to adapt its active power.	5 cs. So, a value of 20 = 1s.
RESPONSE_TO_OVER_FREQ_F_STOP_cHz	Frequency value using for fstop function. When the frequency goes back at a value below this parameters, the system goes back to the active power level before the frequency disturbance.	cHz. A value of 5000 = 50Hz
RESPONSE_TO_OVER_FREQ_DELAY_STOP_5cs	Delay to return to pre frequency disturbance power setpoint after the over frequency goes back to the normal range of value.	5 cs. So, a value of 20 = 1s.
RESPONSE_TO_OVER_FREQ_RAMP_UP_TIME_5cs	Ramp-up time of active power to reach new setpoint if a newsetpoint, higher than the one before the disturbance, has been given during the over frequency event.	5 cs. So, a value of 20 = 1s.
LSB_RESPONSE_TO_OVER_FREQ_SLOPE_2_pc_per_Hz	Second slope used during over frequency event. This slope is used for Australian certification. This slope is used after the power reach zero. It drives how the power goes from zero to maximum consumption.	%/Hz. 100 means that the active power

The first parameter 'LSB_RESPONSE_TO_OVER_FREQ_MODE' allow to choose how we want to adapt the power based on frequency measurements. Indeed, based on national grid code, there is several way to adapt active power. So, here are the different way:

LSB_RESPONSE_TO_OVER_FREQ_MODE = 0 (P_MAX_RESPONSE_TO_OVER_FREQ_MODE)

In this case, the active power modification is based on the nominal power of the system as in the following formula:

$$\Delta P = \frac{1}{s} \cdot \frac{(f_1 - f)}{f_n} \cdot P_{ref}$$

Where Pref is the nominal power of the system.

LSB_RESPONSE_TO_OVER_FREQ_MODE = 1 (P_M_RESPONSE_TO_OVER_FREQ_MODE)

In this case, the active power modification is based on the active power provided by the system at the moment the frequency reached the limit activating the freq-watt function. This means, in the previous formula, have a Pref = Pm where Pm is the actual AC output power at the instant when the frequency reaches the threshold.

LSB_RESPONSE_TO_OVER_FREQ_MODE = 4 (P_FIXED_FREQ_RESPONSE_TO_OVER_FREQ_MODE)

In that case, two slopes are used to change the active power based on frequency measurements. The first slopes gives the decreasing of injected active power from 100% of nominal power consumption to 0%. Imagine, at the time the frequency reaches the threshold, the injection is 30% of nominal power, the system knows the frequency at

which the consumed power should be 0 and so applied an adapted slope. The second slope is applied to increase the consumption power from 0% to 100%.

Parameters name	Australian grid code	German grid code	European grid code
LSB_RESPONSE_TO_OVER_FREQ_MODE	Choose 2	Choose 1	Choose 2
MSB_RESPONSE_TO_OVER_FREQ_SLOPE_pc_per_Hz	$P_n / (f_{ULCO} - f_{transition})$		
RESPONSE_TO_OVER_FREQ_F1_cHz	f_{ULCO}		
RESPONSE_TO_OVER_FREQ_DELAY_START_5cs	/		
RESPONSE_TO_OVER_FREQ_F_STOP_cHz	$f_{ULCO} - f_{hyst}$		
RESPONSE_TO_OVER_FREQ_DELAY_STOP_5cs	/		
RESPONSE_TO_OVER_FREQ_RAMP_UP_TIME_5cs	/		
LSB_RESPONSE_TO_OVER_FREQ_SLOPE_2_pc_per_Hz	$P_n / (f_{transition} - f_{Pmin})$		

Here is a typical example of grid code parameters for both under and over frequency response:

VAC_AVERAGE_HIGH_STOP_dV	2580	Slope1_AS4777.2:2020	
RESPONSE_TO_OVER_FREQ_MODE	51202	200	
RESPONSE_TO_OVER_FREQ_F1_cHz	5025		
RESPONSE_TO_OVER_FREQ_DELAY_START_5cs	0		
RESPONSE_TO_OVER_FREQ_F_STOP_cHz	5023		
RESPONSE_TO_OVER_FREQ_DELAY_STOP_5cs	0		
RESPONSE_TO_OVER_FREQ_RAMP_UP_TIME_5cs	7200	Slope1_AS4777.2:2020	
RESPONSE_TO_UNDER_FREQ_MODE	34052	133	
RESPONSE_TO_UNDER_FREQ_F1_cHz	4975		
RESPONSE_TO_UNDER_FREQ_DELAY_START_5cs	0		
RESPONSE_TO_UNDER_FREQ_F_STOP_cHz	4977		
RESPONSE_TO_UNDER_FREQ_DELAY_STOP_5cs	0		
RESPONSE_TO_UNDER_FREQ_RAMP_UP_TIME_5cs	7200	Slope2_OverFreq	Slope2_UnderFreq
RESPONSE_TO_FREQ_SLOPE_2_pc_per_Hz	25680	80	100

In that tabular, you can see there is several differences compare to the previous tabular of parameters. This can be explained by the clustering of several parameters. So, the following formula explain the relation between the parameters you can see in the example and the parameters given in the explication table before:

$$RESPONSE_TO_FREQ_SLOPE_2_pc_per_Hz = LSB_RESPONSE_TO_OVER_FREQ_SLOPE_2_pc_per_Hz + 256 * LSB_RESPONSE_TO_OVER_FREQ_SLOPE_2_pc_per_Hz$$

$$RESPONSE_TO_OVER_FREQ_MODE = LSB_RESPONSE_TO_OVER_FREQ_MODE + 256 * MSB_RESPONSE_TO_OVER_FREQ_SLOPE_pc_per_Hz$$

$$RESPONSE_TO_UNDER_FREQ_MODE = LSB_RESPONSE_TO_UNDER_FREQ_MODE + 256 * MSB_RESPONSE_TO_UNDER_FREQ_SLOPE_pc_per_Hz$$

8.14 Rate of Change of Frequency

The inverter maintains continuous operation for frequency excursions with a rate of change of frequency (ROCOF) that do not exceed +/- 4.0 Hz/s for a duration of 0.25 s. To be able to handle this, the parameter MAX_AC_SYNCHRO_SPEED_1 should be set to -4, the maximum frequency tracking speed.

8.15 Disconnection on External Signal

The automatic disconnection device incorporates the ability to disconnect on an external signal. If an external signal or demand response DRMO is asserted, the automatic disconnection device operates within 2s. This requirement is achieved using dry contactor on the NS protection.

When the NS protection observe an open dry contact (if normally close, we can choose the logic), or a close dry contact (if normally open, we can choose the logic), it automatically triggers the decoupling relays disconnecting the Sierra system from the grid.

8.16 Connection and Reconnection Procedure

Only after all the following conditions have been met shall the automatic disconnection device operate to connect or reconnect the inverter to the grid:

- The voltage has been maintained within the utilisation limits of AS 60038 for at least 60 s,
- The frequency has been maintained within the range 47.5 Hz to 50.15 Hz for at least 60 s,
- The inverter and the grid are synchronized and in phase with each other; And
- No external signal is present, or DRM 0 asserted requiring the system to be disconnected.

After the automatic disconnection device operates to connect or to reconnect the inverter, the output limits the increase in power generation to the set power rate limit W (clause 3.3.4).

Unconstrained power operation may recommence after the automatic disconnection device operates to connect or to reconnect the inverter, when **EITHER** the rated power output is reached **OR** the required power output level of the inverter exceeds the available energy source.

The following table gives the parameters in the Sierra that allows to configure the connection and reconnection process. Some grid codes make a distinction between connection and reconnection and want different parameters based on the case. That explain why we distinguish the connection parameters from the reconnection parameters.

Parameters names	Description	Units
START_OBSERVATION_TIME_5cs	Time during which frequency and voltage have to be observed (and included into the range) before to start the system.	5 cs. So, a value of 20 = 1s.
START_RAMP_UP_TIME_5cs	Time needed to reach 100% of active power after a connection.	5 cs. So, a value of 20 = 1s.
VAC_LOW_START_dV	If the measured voltage remain above this value during START_OBSERVATION_TIME_5cs, the system can start.	dV. A value of 2300 = 230V
VAC_HIGH_START_dV	If the measured voltage remain below this value during START_OBSERVATION_TIME_5cs, the system can start.	dV. A value of 2300 = 230V
FREQ_AC_LOW_START_cHz	If the measured frequency remain above this value during START_OBSERVATION_TIME_5cs, the system can start.	cHz. A value of 5000 = 50Hz
FREQ_AC_HIGH_START_cHz	If the measured frequency remain below this value during START_OBSERVATION_TIME_5cs, the system can start.	cHz. A value of 5000 = 50Hz
RESTART_OBSERVATION_TIME_5cs	Time during which frequency and voltage have to be observed (and included into the range) before to restart the system.	5 cs. So, a value of 20 = 1s.
RESTART_RAMP_UP_TIME_5cs	Time needed to reach 100% of active power after a reconnection.	5 cs. So, a value of 20 = 1s.
VAC_LOW_RESTART_dV	If the measured voltage remain above this value during START_OBSERVATION_TIME_5cs, the system can restart.	dV. A value of 2300 = 230V

Parameters names	Description	Units
VAC_HIGH_RESTART_dV	If the measured voltage remain below this value during START_OBSERVATION_TIME_5cs, the system can restart.	dV. A value of 2300 = 230V
FREQ_AC_LOW_RESTART_cHz	If the measured frequency remain above this value during START_OBSERVATION_TIME_5cs, the system can restart.	cHz. A value of 5000 = 50Hz
FREQ_AC_HIGH_RESTART_cHz	If the measured frequency remain below this value during START_OBSERVATION_TIME_5cs, the system can restart.	cHz. A value of 5000 = 50Hz

Here is an example of typical values for grid code:

START_OBSERVATION_TIME_5cs	1200
START_RAMP_UP_TIME_5cs	7200
VAC_LOW_START_dV	2050
VAC_HIGH_START_dV	2530
FREQ_AC_LOW_START_cHz	4750
FREQ_AC_HIGH_START_cHz	5015
RESTART_OBSERVATION_TIME_5cs	1200
RESTART_RAMP_UP_TIME_5cs	7200
VAC_LOW_RESTART_dV	2050
VAC_HIGH_RESTART_dV	2530
FREQ_AC_LOW_RESTART_cHz	4750
FREQ_AC_HIGH_RESTART_cHz	5015

Note: The upper frequency reconnection threshold for Australia zone C has been increased to 50.50 Hz in compliance with AS4777.2:2020 - Amendment 2 which came into affect on 23rd August 2025. This change is included in the Australia C grid configuration file from InView 6.9 onward.

8.17 Security of Protection Settings

The following parameters of the automatic disconnection device are secured against inadvertent or unauthorized changes:

- The specific regional settings selected for Australia,
- The limit values of the settings,
- The actual settings.

Changes to the settings require the use of a tool and special instructions not provided to unauthorized personnel.

8.18 Activation of Protection Settings

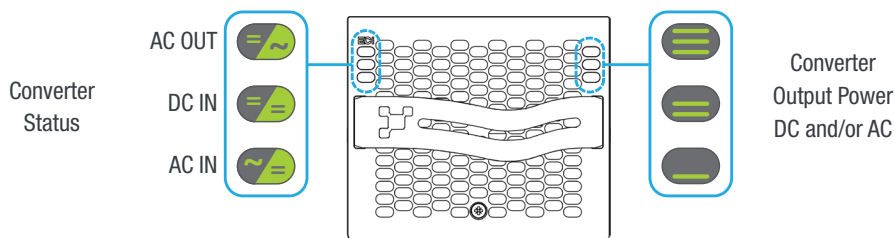
The inverter does not operate the automatic disconnection device to connect until a regional setting has been selected and activated by an authorized person. Where the inverter does not connect due to no selection or activation of a regional configuration, the inverter provides a visible alert. The inverter settings can be viewed in read-mode only for verification.

8.19 Generation Control Function

The generation control function is not provided in this system.

9. Operation

9.1 Converter Module



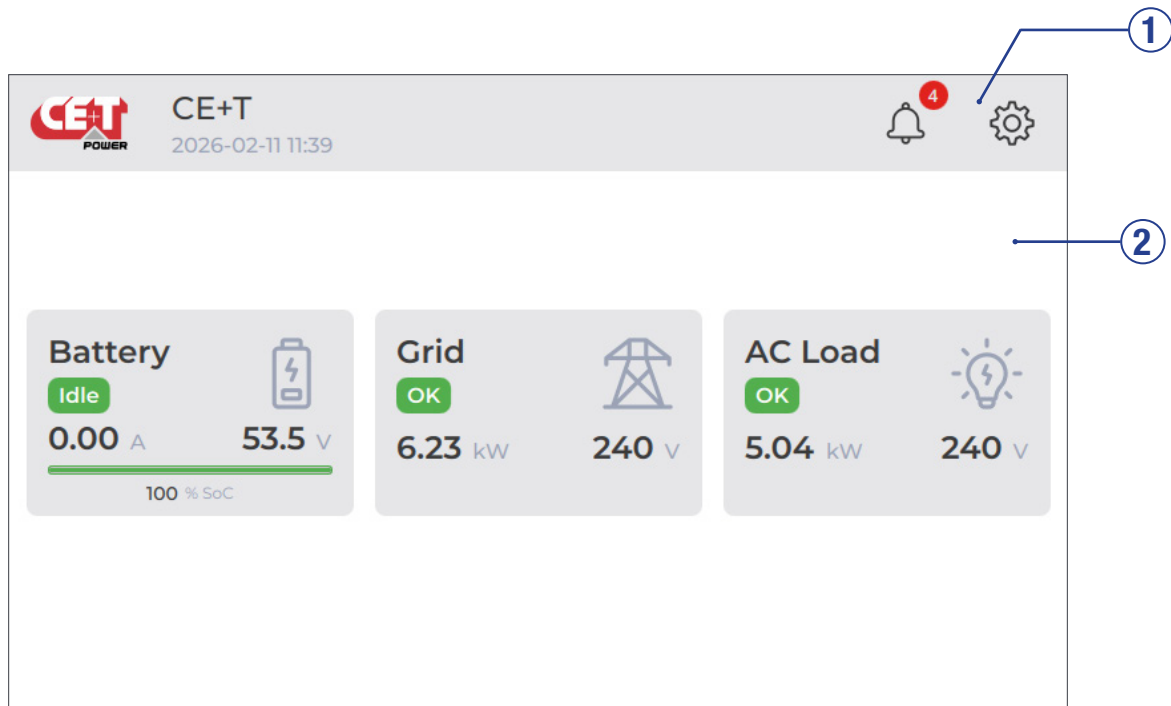
Converter Status LED	Description	Remedial action
OFF	No input power or forced stop	Check environment
Permanent green	Normal Operation	
Blinking green	Converter OK but working conditions are not fulfilled to operate properly	
Blinking green/orange alternatively	Recovery mode after boost (10 In short circuit condition)	
Permanent orange	Starting mode	
Blinking orange	Modules cannot start	Check Inview
Blinking red	Recoverable fault	
Permanent red	Non recoverable fault	Replace module



Output Power (redundancy not counted)						
<5%	5% to 40%	40 to 80%	80 to 95%	100%	100% = overload	Output Power (redundancy not counted)
×	×	×	≡	≡	≡	Status output power LED
×	×	=	=	=	=	
—	—	—	×	—	—	
1B	1P	2P	2P	3P	3B	Behaviour (B = Blinking, P = Permanent)

9.2 Inview X LCD Interface

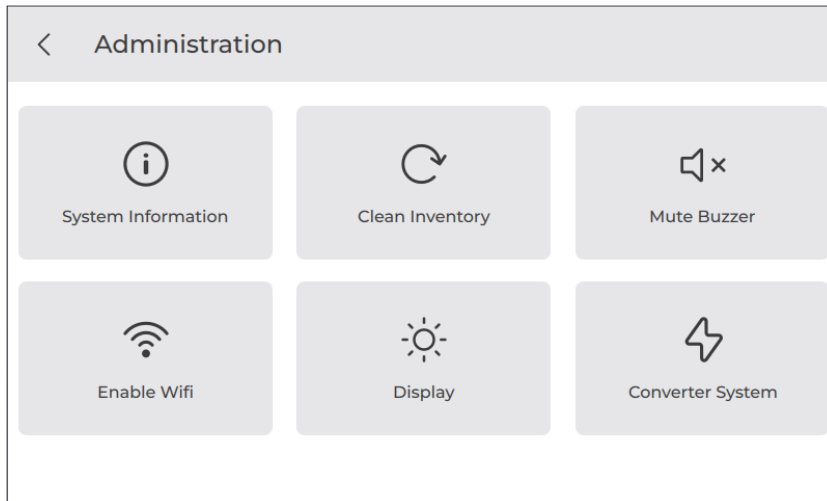
Inview X LCD interface is a 7-inch touch screen. Through the LCD interface, the user can view and access the system details. Once the system is powered upon, the Inview X is up and ready for operation.

Note: Interface graphics and layout may change based on firmware version.



- **Header (1):** Displays the Site name, Date and Time.
 - **Notification:** Tapping on  goes to Active Alarms and Past Events screen.
 - **Administration:** Tapping on  provide access to different action screens.
- **Interface Area (2):** Tapping on the widget provides the corresponding parameter information. Provides information about the corresponding screen. In some screens, left and right navigation buttons appear, indicating more screens are present.
- **Navigation arrows** for the next and previous pages. Up and down arrows appear on some screens, indicating more information is present.

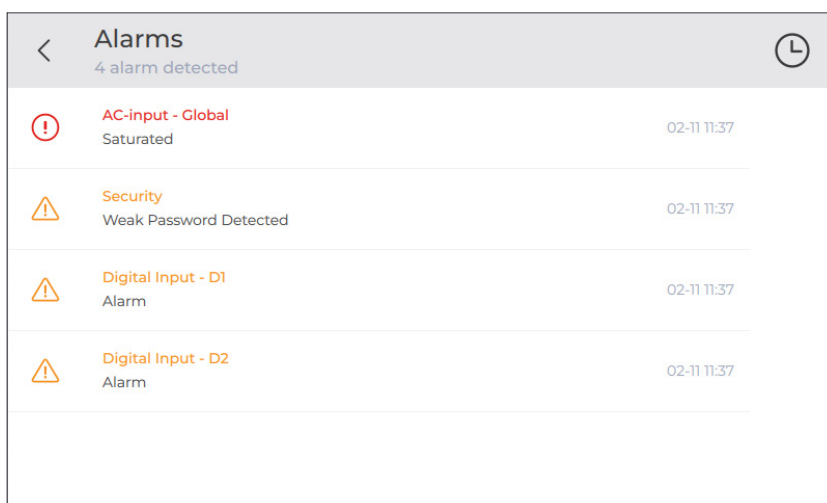
- **Administration:** Tap the Administration  icon to access the administration menu.



- **System Information:** Information on software, Part number, serial number and legal information.
- **Clean Inventory :** Clear the removed inventory alarm warning from the list
- **Mute Buzzer :** Control the buzzer sounds.
- **Enable Wifi:** Enable the Wifi , Password, URL and QR code for URL.
- **Display:** Control the settings related to display
- **Converter System:** Information of the converter system.

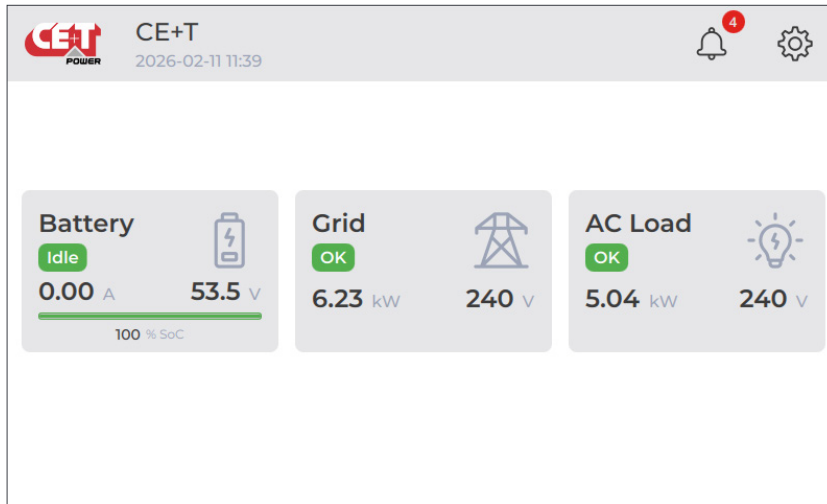
- **Alarms**

Tap the Alarm  icon notification to view the alarms warning related to system.

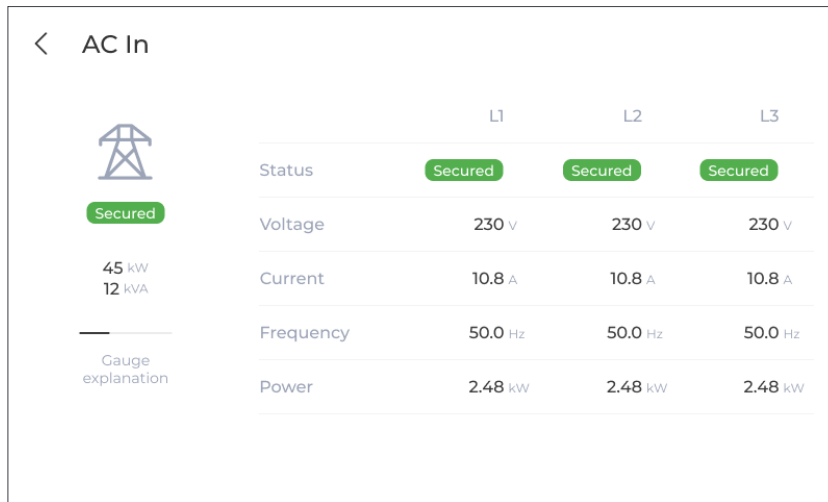


▪ **Information Area**

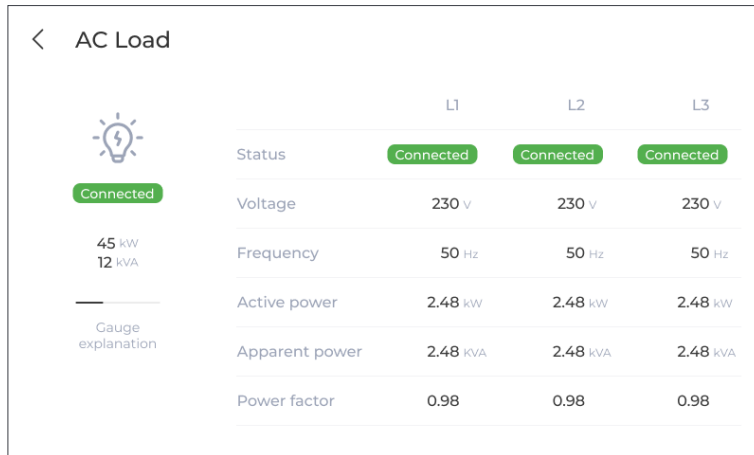
The Main screen on Inview X contains widgets configured as Grid, Battery and AC Load. This widgets can be configured according to the system requirement. Tap any widget to access and view the parameters configured.



- Tap the **Grid** widget to displays AC Inputs Status, Voltage, Current, frequency and power.



- Tap the **AC Load** widget to displays AC Load Status, Voltage, frequency, Active power, Apparent power and Power factor. It shows the power fed to the load on each phase.

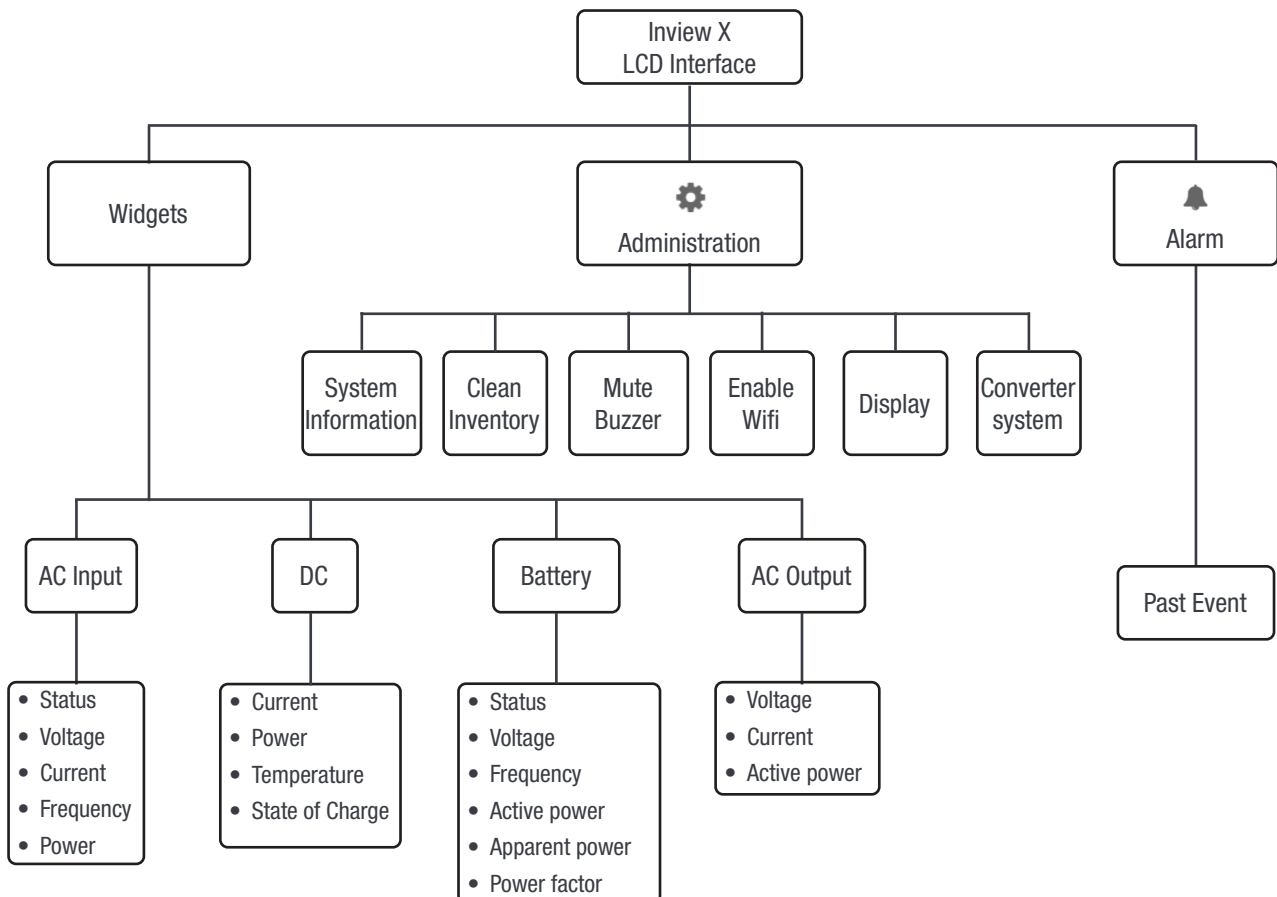


	L1	L2	L3
Status	Connected	Connected	Connected
Voltage	230 v	230 v	230 v
Frequency	50 Hz	50 Hz	50 Hz
Active power	2.48 kW	2.48 kW	2.48 kW
Apparent power	2.48 kVA	2.48 kVA	2.48 kVA
Power factor	0.98	0.98	0.98

- Tap the Widget to access the information.

9.2.1 Menu Structure

The Diagram shows an overview of the menu structure in the Inview X LCD interface.



9.2.2 LED Indications

Three LED's are present behind the front white plastic of the controller to indicate major alarm, minor alarm, and system status. These LED's are not visible until they illuminate during the corresponding action occurs.

Light Blue: Normal Operation

Orange: Minor Alarm

Red: Major Alarm



9.2.3 LCD interface - Terminology

The below table provides the description of abbreviation and terminology which appears in Inview Slot, S and X LCD interface.

S.NO	Terminology	Description
4	Redundancy	Number of redundancy from the configured converters
5	OK	Number of active converters
6	OFF	OFF: Number of non-active or switched off converters.
7	AL	Displays the alarms
8	NT/OK (Not Okay)	Number of faulty converters or missing converters when compare to configured converters
9	Installed power	It is the total power of the configured converters, including redundancy. Moreover, it is a user configuration based upon the system capacity.
10	Available power	It is the total power of active converters present in the system.
11	Modules configured	Total number of converters configured in the system
12	Refresh converter list	The controller performs a complete scan and remove the non-active converters from the converter list. <i>Note: If any parameter is changed, an authentication page appears. Enter the display PIN password to apply changes.</i>
13	Cutoff alarms	Buzzer sound will be muted
14	Logs	Display the latest 100 events occurred.
15	Information	Displays product and network details

9.3 Inview X Web Interface

The Inview X web interface provides efficient and user-friendly access to the system, and it can be accessed to the laptop through ETH port.

This section provides an overview of the web interface, refer the Inview user manual for detailed information.

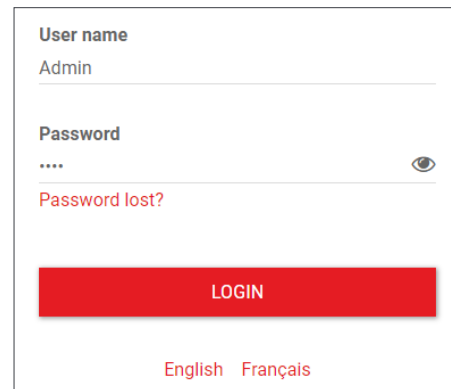
9.3.1 Login

Open the web browser and type the default IP address of inview 10.250.250.1 or INVIEW.LOCAL (if the ETH port is using at front of inview device) at the search URL bar.

Note: Use any one of the following latest version of web browser: Google Chrome, Mozilla Firefox, Safari or Microsoft edge.

Inview X has three logins –

User name: 1. Basic, 2. Expert and 3. Admin. (All first letters are CAPS)
All three logins are password protected.



9.3.2 INVIEW Display Option



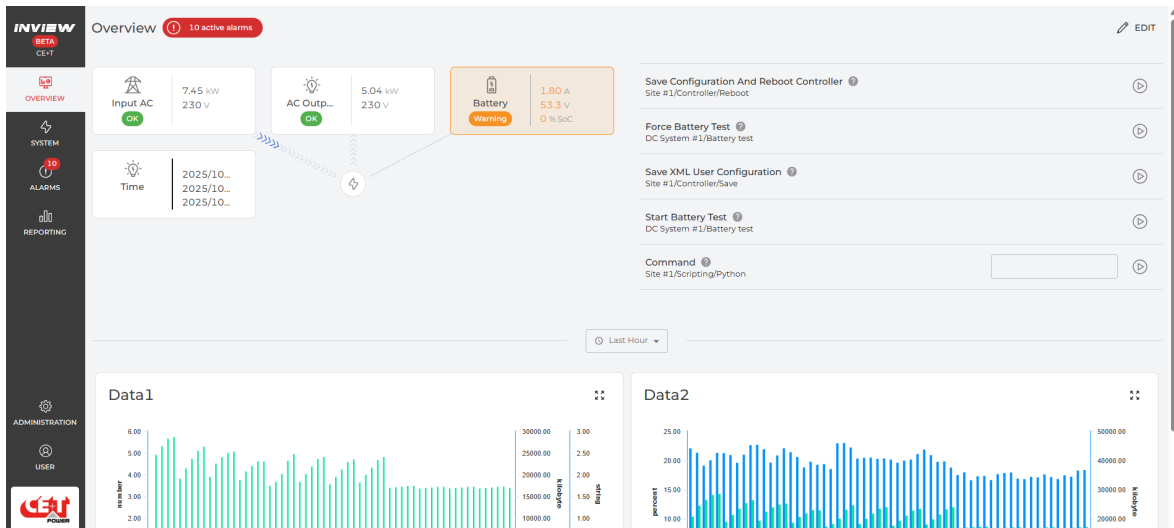
The icons provide quick access to the corresponding pages.

- 1 → **INVIEW:** Click the **INVIEW** logo to navigate to the home page from any menu page in the system.
- 2 → **Notification:** Click the **NOTIFICATION** icon to open the Alarm page and view Current Alarms and Past Events.
- 3 → **Widgets:** Click Widget to view more detailed data and information related to the selected widget.
- 4 → **Control:** Shortcuts to specific control functions that are selected from the drop down list.
- 5 → **EDIT:** Click **EDIT** to edit the main screen overview (widgets/controls/data).

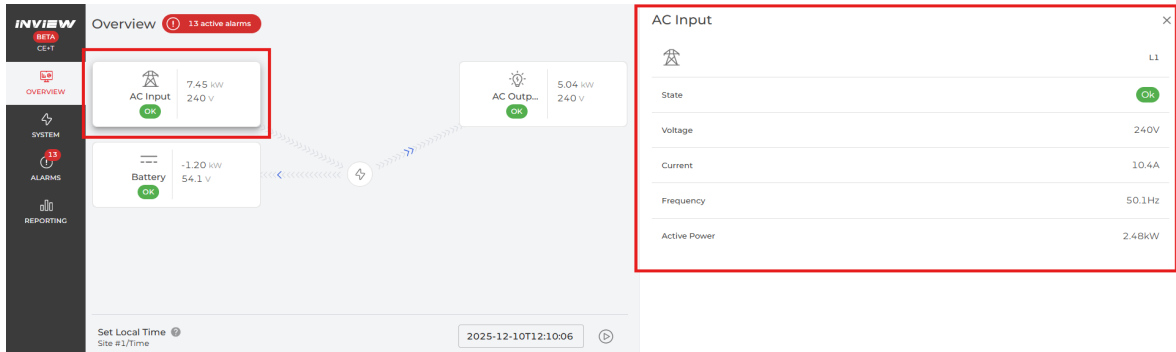
- 6 → **OVERVIEW:** Click **OVERVIEW** to navigate to main screen.
- 7 → **SYSTEM:** Click **SYSTEM** to navigate to advance settings of power system, connectivity, PMS and more.
- 8 → **ALARMS:** Click **ALARMS** to navigate to the Alarm page to view Current Alarms and Past Events.
- 9 → **REPORTING:** Click **REPORTING** to display data graph (Data from Site, Energy system, Converter system DC System, Battery, etc..).
- 10 → **DATA (1 & 2):** The **DATA 1** and **DATA 2** charts shows the variable data in both formate (Graph Chart or Bar Chart).
- 11 → **ADMINISTRATION:** Click **ADMINISTRATION** to access the User management, Software update, Configuration, Inventory, files, Languages selection, Certificates, Web Server, Support package, Time management, Events log and Licensing.
- 12 → **USER:** Click **USER** to access the information of login account such as Quick Links to Save Configuration, Save Inventory and Reboot controller, Website links to download software and documents, Change Password and Logout.

9.3.3 Home Page

The default home page shows Widgets, Optional tabs and Charts (Graph or Bar graph). The widgets displays details system information. The optional tabs can be selected based on the requirement. The charts shows viable data in a graph or bar graph. To perform any configuration, refer to the section 7.9, page 55.



- Click the AC Input Widget to view the corresponding details on right side on the screen.



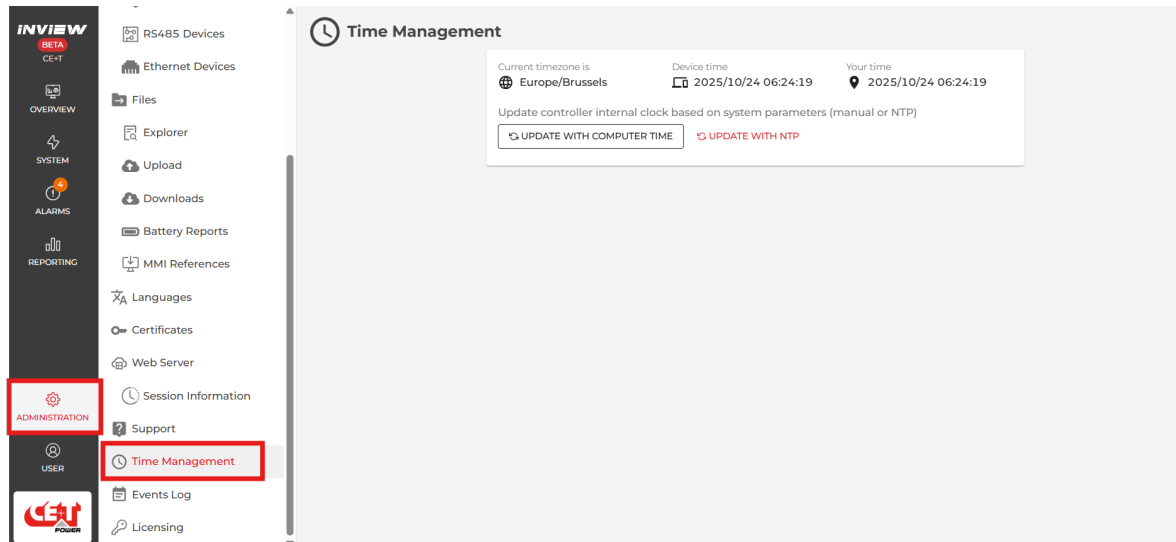
The screenshot shows the INVIEW dashboard with a sidebar on the left containing navigation options: OVERVIEW, SYSTEM, ALARMS, and REPORTING. The main area displays an 'Overview' section with 13 active alarms. Two widgets are highlighted with red boxes: 'AC Input' (7.45 kW, 240 V) and 'Battery' (-1.20 kW, 54.1 V). A detailed 'AC Input' widget is expanded on the right, showing the following data:

Parameter	Value
State	OK
Voltage	240V
Current	10.4A
Frequency	50.1Hz
Active Power	2.48kW

9.3.4 Date and Time Settings

Navigate to *ADMINISTRATION > Time Management*.

- Update with Computer time: Inview read the laptop time during the configuration and adapt that time.
- Update with NTP: Inview Internal clock synchronizes with the server time.



The screenshot shows the INVIEW Administration menu on the left, with 'ADMINISTRATION' and 'Time Management' highlighted with red boxes. The 'Time Management' page is displayed on the right, showing the following information:

Current timezone is	Device time	Your time
Europe/Brussels	2025/10/24 06:24:19	2025/10/24 06:24:19

Update controller internal clock based on system parameters (manual or NTP)

Buttons: UPDATE WITH COMPUTER TIME, UPDATE WITH NTP

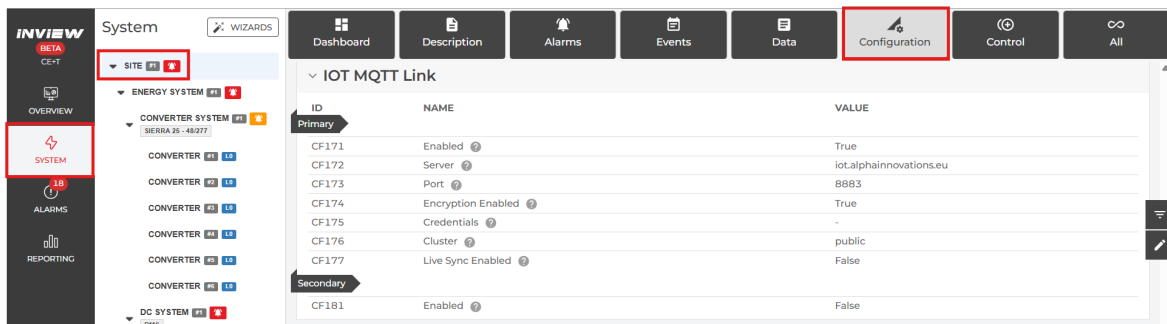
Note: For more information on the Inview display, refer to the Inview manual available upon request.

9.3.5 Remote Monitoring

To setup remote monitoring, provide an internet connection to Inview through any of the ethernet ports. Refer to “6.3.1 Inview X Connections”, page 20.

Navigate to *Site > Configuration*, Scroll down to *IOT MQTT Link* section.

To set up a connection to CE+T's remote monitoring cloud platform – InView MESH, configure CF172 to CF177 with your InView MESH account details.



9.4 Switching OFF the System

Perform the following steps to switch OFF the System.

CAUTION! When switching OFF the system, the power to the critical load will be disconnected.

1. Switch OFF AC Output Breakers.
2. Switch OFF AC Input Breakers.
3. Switch OFF DC Input Breakers.
4. Switch OFF the Upstream and Downstream Breakers.

DANGER! Risk of electric shock. Capacitors store hazardous energy. Wait at least five minutes after disconnecting all sources of power before removing any protective covers.

DANGER! Risk of electric shock. This power equipment receives power from more than one source. Disconnect AC and DC sources to de-energize this unit prior to servicing.

10. Modules - Remove and Install

10.1 Sierra Converter

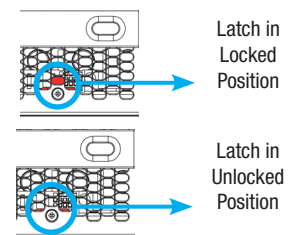
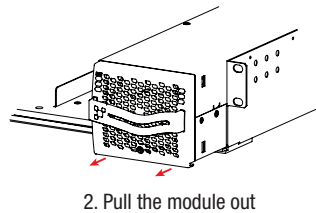
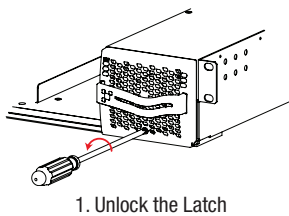
- The Sierra converter is hot swappable.
- When a new module is inserted in a live system it automatically takes the working set of parameters.
- When a new module is inserted in a live system it is automatically assigned to the next available address.

Caution: After removing a module from a slot in a live system, wait at least 60 seconds before inserting it into another slot; make sure that the LEDs are off and the fan is completely stopped.

10.1.1 Remove

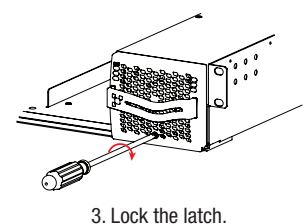
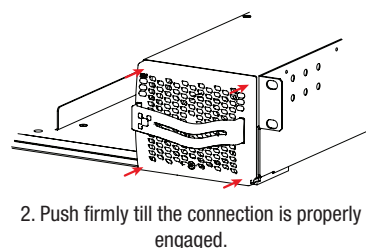
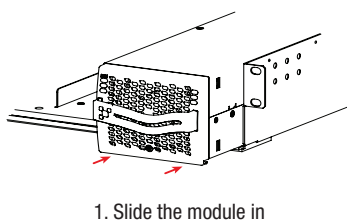
Caution: When one or several converter modules is/are removed, possible to access the live parts. So, replace the module(s) with dummy modules without delay.

1. Rotate the screw counter-clockwise with a #P1 Phillips-head screwdriver to unlock the latch.
2. Hold the front handle and pull the module out.
3. Replace with a new module or a blind unit.



10.1.2 Install

1. Verify module compatibility (AC & DC Voltage match system configuration).
2. Place the module in the shelf and slide in.
3. Using the module handle, push firmly until the unit is properly connected.
4. Rotate the screw clockwise with a #P1 Phillips-head screwdriver to lock the latch.
5. The module will start up and take the first address available on the bus.

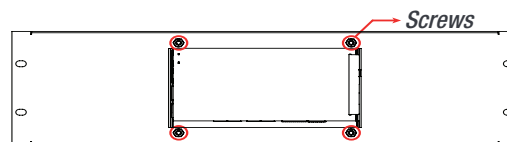


10.2 Inview X

10.2.1 Replacement of panel mount display

Before removing the Inview X display, take special note of where each cable / wiring harness is connected to the installed display unit.

1. Remove all cable connections from the front and rear of the display.
2. Remove the mounting screws (4x) from the rear of the display mounting panel.
3. Remove the Inview X display unit.
4. Place the new Inview X display unit into the door panel.
5. Using the screws removed in step 2, affix the display unit to the door panel.
6. Reattach all cables and wires removed in step 1.



Fix it with four screws

10.3 Fan replacement



1. Let the module rest at least 5 minutes before initiating work.
2. The converter front cover must be removed. Use a screw driver and remove the screws on both side of the module.
3. Free up the fan. (Note the fan connector and wires position).
4. Disconnect the supply cord, and remove the fan.
5. Replace with new fan and connect supply cord.
6. Place the front cover and tighten the screws on both sides of the module.
7. Check fan for operation.
8. Access Inview and reset the fan run time alarm from within the action menu.



11. Final check

- Make sure that the sub-rack/cabinet is properly fixed to the cabinet/floor.
- Make sure that the sub-rack/cabinet is connected to Ground.
- Make sure that all DC and AC input breakers are switched OFF.
- Make sure that all cables are sized according to recommendations and local regulations.
- Make sure that all cables have strain relieved.
- Make sure that all breakers are sized according to recommendation and local regulations.
- Make sure that DC polarity is according to marking.
- Torque all electrical terminations according to recommendation and local regulations.
- Make sure that no converter/controller bays are left open.
- Cover empty converter bays with blanks.
- Make sure that the Remote ON/OFF is appropriately wired according to local regulations.
- Make sure that the point of AC supply meets local regulations.

12. Installation and Commissioning

CAUTION:

- Installation and commissioning must be completed by factory trained personnel.
- It is prohibited to perform any High Potential (HI-POT) insulation test without instruction from the manufacturer.

General Information					
Date /Time of Installation:					
Performed By:					
Site Details:					
Address:					
Contact:					
System Model & Ratings:					
Converter System Serial #					
Converter Modules Serial #					
Phase 1					
Phase 2					
Phase 3					
Display	Inview	<input type="checkbox"/> Yes		<input type="checkbox"/> No	
Inview X Serial Number					
IP Setting	IP Address	Subnet mask		Default gateway	

12.1 Installation Check List

The scope of this document is to provide a general guide for the installation contractor. Please refer to the operation manual for more details. Steps highlighted in **YELLOW** to be performed by authorized electrical personnel.

Pre-Start Up Checklist		OK	NA
1	Check if the AC source transformer is 1.5 x maximum capacity of Converter system, If any.		
2	Verify that the Converter cabinet is properly secured, anchored and has proper rear clearance. (Minimum 20 cm at rear of the unit).		
3	Verify cable entry supports are properly secured. (Input and output terminals are top of the system and makes sure that the cables routed from top through duct which is inside the system.)		
4	Make sure system is de-energised (input / output / bypass / battery disconnects open).		
5	Verify input utility breakers will not be overloaded based on additional AC load added to building.		
6	Positive bus bar connection « + » connected to DC input « + » terminal (check individual or common connection)		
7	Negative bus bar connection « - » connected to DC input – terminal) (check individual or common connection)		
8	Check conductor size and breaker protection rating for AC Input and Output cables.		
9	Verify AC input connection is terminated properly (L1, L2, L3, N, G) on Input terminal X1.		
10	Verify AC output connection terminated properly (L1, L2, L3, N, G) on output terminal X4.		
11	Verify that the Converter cabinet is correctly bonded to GROUND/EARTH. ⊕		
12	Make sure all modules are not seated on the backplane of the system (sticking out approx.3 cm).		
13	Verify that empty slots are covered with blank face plates. (safety)		
14	Verify GROUND connection is terminated properly even if main is not connected.		
	If no AC main is connected to the system, verify that the input Neutral conductor is bonded/ connected to GROUND/EARTH.		
15	Check for short circuits between Phase & Neutral and between Phases on the AC Input & AC Output wiring.		
16	Verify all Power and Control cable terminations are torqued properly.		

12.2 Commissioning Procedure

Start Up Checklist		OK	N/A
17	Check if commercial AC is present in the AC distribution source.		
18	<p>Switch ON the commercial AC breaker and check the regional settings:</p> <ul style="list-style-type: none"> • EN50549 • VDE4105 • AS4777: Australia A, B or C 		
19	Turn off commercial AC breaker.		
20	Check if DC power supply is present in the DC Power Plant.		
21	Turn ON the DC breaker from DC Power plant and check if the voltage is present on the DC Bus - Verify proper voltage & polarity for the system ratings.		
22	Verify polarity of DC « + » and DC « - »		
23	Insert one module on each phases (Ph-1, Ph-2 and Ph-3) and wait for 20 - 60s. Verify DC-IN LEDs turns Green.		
24	<p>Connect laptop and review configuration via T2S ETH Connection and review all parameters. (Number of phases & phase rotation). Refresh Module List.</p> <p>Three phase 400Vac L-L L1 Phase shift: 0° L2 Phase shift: 120° L3 Phase shift: 240°</p>		
25	Verify module Addressing, Input & Output Phase assignment, and DC Group assignment via T2S-ETH.		
26	Turn ON commercial AC breaker and local AC input breaker (if equipped) for the ECI system. If “Synchronization Error”, may be phase sequence problem.		
27	Check AC output voltage (L-N) on converter output terminal or line side of output breaker.		
28	Install all remaining modules one by one in all phases		
29	Check if the AC IN LEDS are Green. Correct any errors on the system.		
30	Verify all LEDS on all modules are Green.		
31	Verify absence of alarms on the T2S ETH (LEDS are Green) and via the interface.		
32	If T2S ETH: Verify that Delta Mode is disabled.		
33	Switch OFF commercial AC input breaker & check if system is working on DC.		
34	Switch ON commercial AC input breaker & check if system correctly transferred load back to AC.		
35	Set Date / Time / 12H or 24H & °C or °F..		
36	Set AC / DC primary according to customer preference.		
37	Verify all modules addressed correctly according to numeric sequence		
38	Set local IP, Subnet Mask, & Default Gateway as provided by customer. Then reconnect laptop with given settings.		

Start Up Checklist		OK	N/A
39	Set Password according to customer preference.		
40	Clear event log		

Remarks:

Any changes in the configuration file should be approved from the authorized person/customer in charge for the site.

Commissioning Contractor:
Company:

Date:	Customer (Print):	Customer (Sign):

Date:	End User (Print):	End User (Sign):

13. Troubleshooting

Converter module does not power up	Check AC input present and in range (AC breakers)
	Check DC input present and in range (DC breakers)
	Check that the converter is properly inserted
	Remove converter to verify that slot is not damaged, check connectors
	Check that module(s) is (are) in OFF state
	Check for loose terminations
Converter system does not start	Check that Inview is present and properly connected
	Check remote ON/OFF terminal
	Check the configuration and setting
	Check threshold level
Converter only run on AC or DC	Check AC input present and in range (AC breakers)
	Check DC input present and in range (DC breakers)
	Check the configuration and setting
	Check threshold level(s)
No output power	Check output breaker
All OK but I have alarm	Check configuration file and correct No of modules
	Download/clear log file
No output alarm	Check the default time delay (UA "Major Alarm" - 60s, NUA "Minor Alarm" - 30s)
	Check configuration file
No information on display	Check that Inview X is present and properly inserted

13.1 Defective modules

Make sure that the input power is on. All LEDs on each module must be green. Refer to Section 9 on page 56 for more information.

A light that is off, orange, red, or flashing is a problem. Collect and record the information for the module. If you cannot correct the problem, replace the module.

13.1.1 Replacing modules

Refer to section 10, page 68 to remove and re-insert modules.

13.1.2 Return defective Inview controller

If no display in the Inview or no communication with the laptop is evidence of failure, proceed as per section 13.1.4, page 71.

13.1.3 Return defective shelf

There are no active devices on the converter module shelf. Due to this failure of the shelf is uncommon and difficult to validate. If it is determined that the shelf is faulty please dispose as per section 13.1.4, page 71.

13.1.4 Return defective modules

- A repair request should follow the regular logistics chain:
End-user => Distributor or Value Added Reseller => CE+T Power.
- Before returning a defective product, a RMA number must be requested through the <http://my.cet-power.com>. Repair registering guidelines may be requested by email at repair@cet-power.com.
- The RMA number should be mentioned on all shipping documents related to the repair.
- Be aware that products shipped back to CE+T Power without being registered first will not be treated with high priority!
- While returning the defective module, should mention all the details in the RMA document.

13.1.5 Return defective batteries

- Consult the battery manufacturer or local service representative for proper battery replacement and disposal instructions.

13.2 Spare Parts

CE+T Recommends that the following spare parts are maintained on site in critical facilities applications.

Item	Part Number	Effect on system when failed
Sierra 25 - 48/230-277 Power Module	T721D30201	Reduced load capacity
Inview X Panel Mount Controller	T602004200	Loss of remote monitoring Battery Charging Safe Mode
Battery Measure Box	P602006000	Loss of charging temperature compensation Loss of LVD control (LVD will not change state)
Temperature Probe	V092099366	Loss of charging temperature compensation

14. Service

For Service

- Check Service Level Agreement (SLA) of your vendor. Most of the time they provide assistance on call with integrated service. If such SLA is in place, you must call their assistance first.
 - If your vendor doesn't provide such assistance (*) you may contact through email:
 - USA and Canada: tech.support@cetamerica.com
 - Rest of the world: customer.support@cet-power.com
- (*) CE+T will redirect your call to your vendor if he has such SLA in place.

15. System Maintenance

As maintenance will be performed on live system, all task should be performed only by trained personnel with sufficient knowledge on ECI product.

Tasks:

- Identify the site, customer, rack number, product type.
- Download and save configuration file for back up.
- Check configuration file to be in accordance with operational site conditions.
- Read and save log file for back up.
- Check and analyze log file, and if alarm are present.
- Replace dust filter if present. Filter is mandatory in dusty environment.
- Check module temperature and log value. If internal temperature is higher then previous year, it should be interesting analyze if it is due an increasing load or dust effect. It is common to have a delta of 15°C by 30% of load between the ambient and the internal temperature. Temperature deviation may indicate build up of dust. Clean the module by air suction blower or vacuum cleaner.
- Clean cabinet (vacuum cleaner or dry cloth).
- Control the converter mapping (AC Group, DC Group, Address).
- Check load level and record the rate value (print in word document the 4 screen modules information for the 32 modules, the 3 screen for the phases value and the 2 screens for the group AC and DC value).
- Change the configuration file for AC and DC mix mode to check that all ECI work on both power supply.
- Check alarm operation (eg, Redundancy lost, mains failure, DC failure) on dry contact and through SNMP system or web interface.
- Switch OFF AC IN and check alarms.
- Check temperature terminal and temperature wiring. If possible use an infrared camera.
- Read and record value as wave form, power factor, crest factor, THD I from power analyzer.
- Take cabinet picture.
- Keep track of report and provide end user with a copy.

16. Hardware Replacement

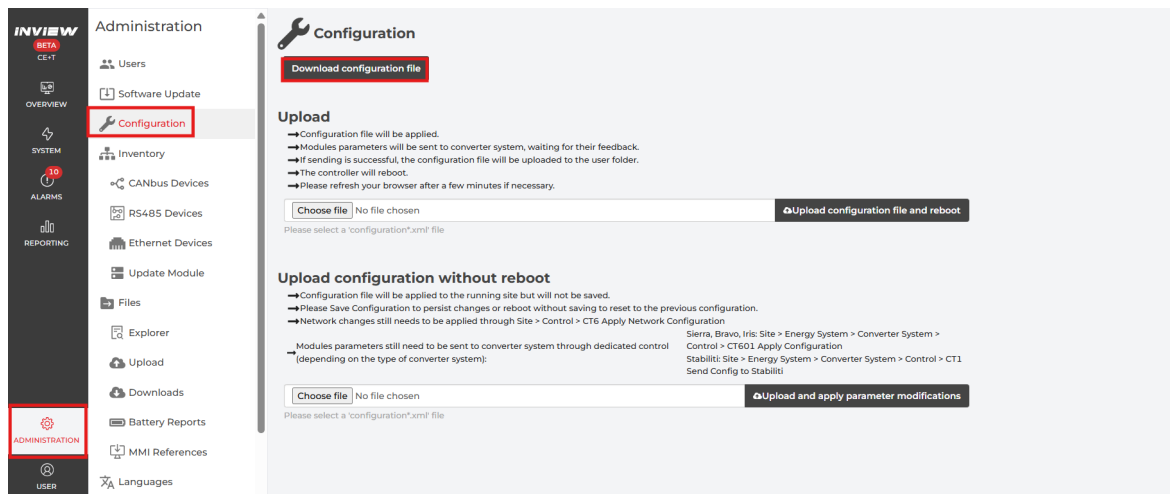
16.1 Inview X

Before replacing the new Inview X, the existing configuration file must be saved and need to upload the same after installing the new controller.

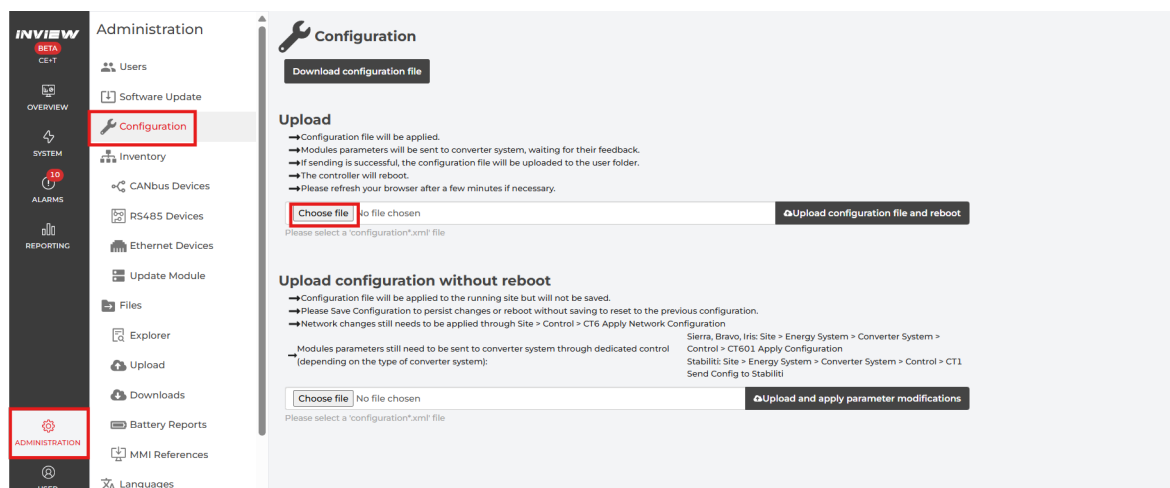
Perform the following steps for replacing Inview X:

1. Login as admin privileged account, go to *Administration > Configuration*, click “Download configuration file” button, and save the file in local.

Note: The downloaded file name will be as “configuration.xml” and it should not be renamed.



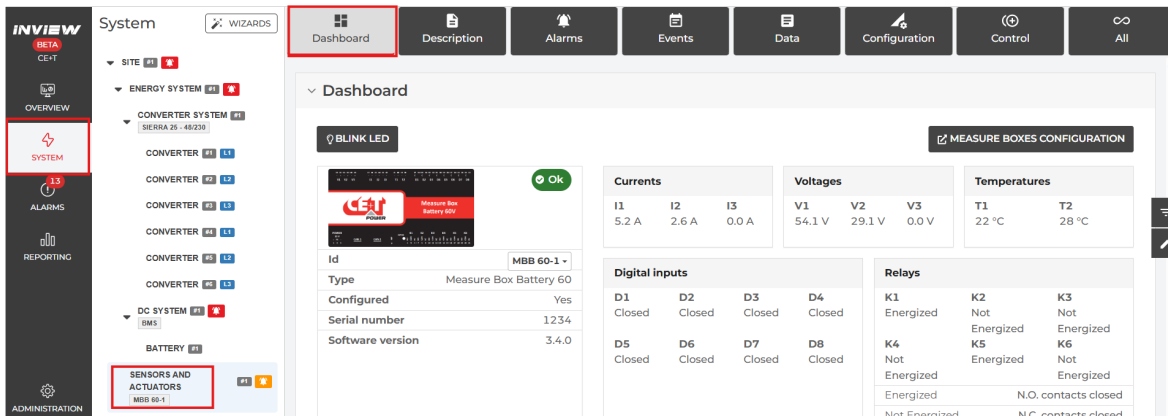
2. Remove the existing controller and install the new controller. To know about installing it and its hardware connections, refer to the section 10.2, page 64.
3. Power on the controller and login as admin privileged account.
4. Go to *Administration > Configuration*, click “Choose file” button, and direct to the downloaded “configuration.xml” file. Then click “Upload configuration and reboot” button.




16.2 MBB (Measure Box Battery)

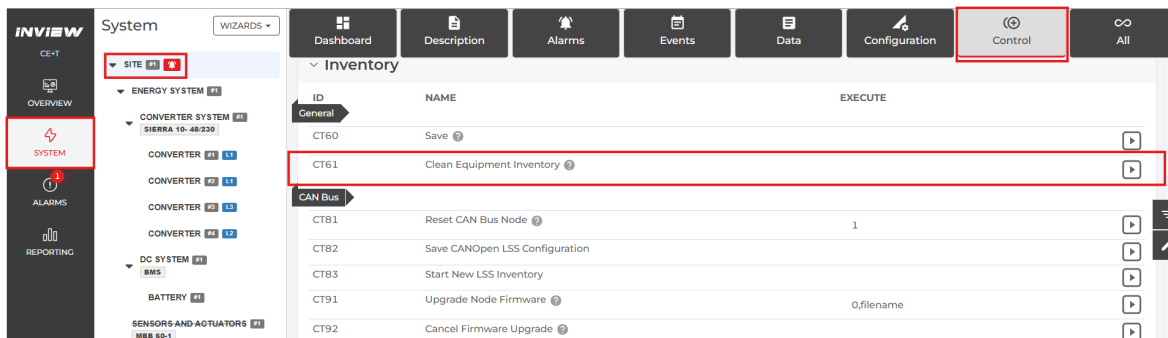
Perform the following steps for replacing MBB:

1. Remove the existing MBB from the system.



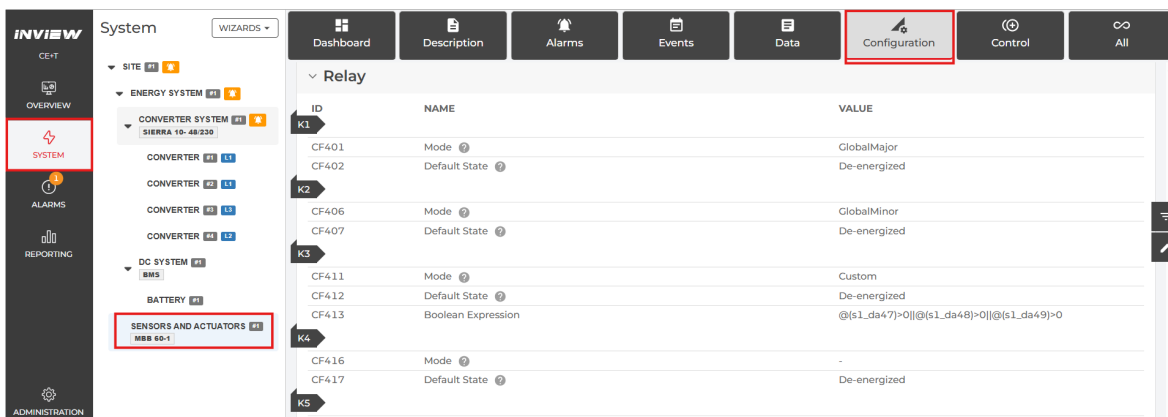
The screenshot shows the INVIEW system interface. The 'Dashboard' tab is active. The 'MEASURE BOXES CONFIGURATION' section is expanded, showing details for MBB 60-1. The 'Currents' table shows I1: 5.2 A, I2: 2.6 A, I3: 0.0 A. The 'Voltages' table shows V1: 54.1 V, V2: 29.1 V, V3: 0.0 V. The 'Temperatures' table shows T1: 22 °C, T2: 28 °C. The 'Digital inputs' table shows D1-D8 all as 'Closed'. The 'Relays' table shows K1-K6 with various states like 'Energized' or 'Not Energized'.

2. Clear from the inventory list: go to *Site > Control*, scroll down to the *Inventory* section. In the ID CT61 (Clean Equipment Inventory), click the  icon to clear it from the list.



The screenshot shows the 'Control' tab selected. The 'Inventory' section is visible, displaying a table with columns for ID, NAME, and EXECUTE. The row for CT61 (Clean Equipment Inventory) is highlighted with a red box. Other items in the inventory include CT60 (Save), CT81 (Reset CAN Bus Node), CT82 (Save CANOpen LSS Configuration), CT83 (Start New LSS Inventory), CT91 (Upgrade Node Firmware), and CT92 (Cancel Firmware Upgrade).

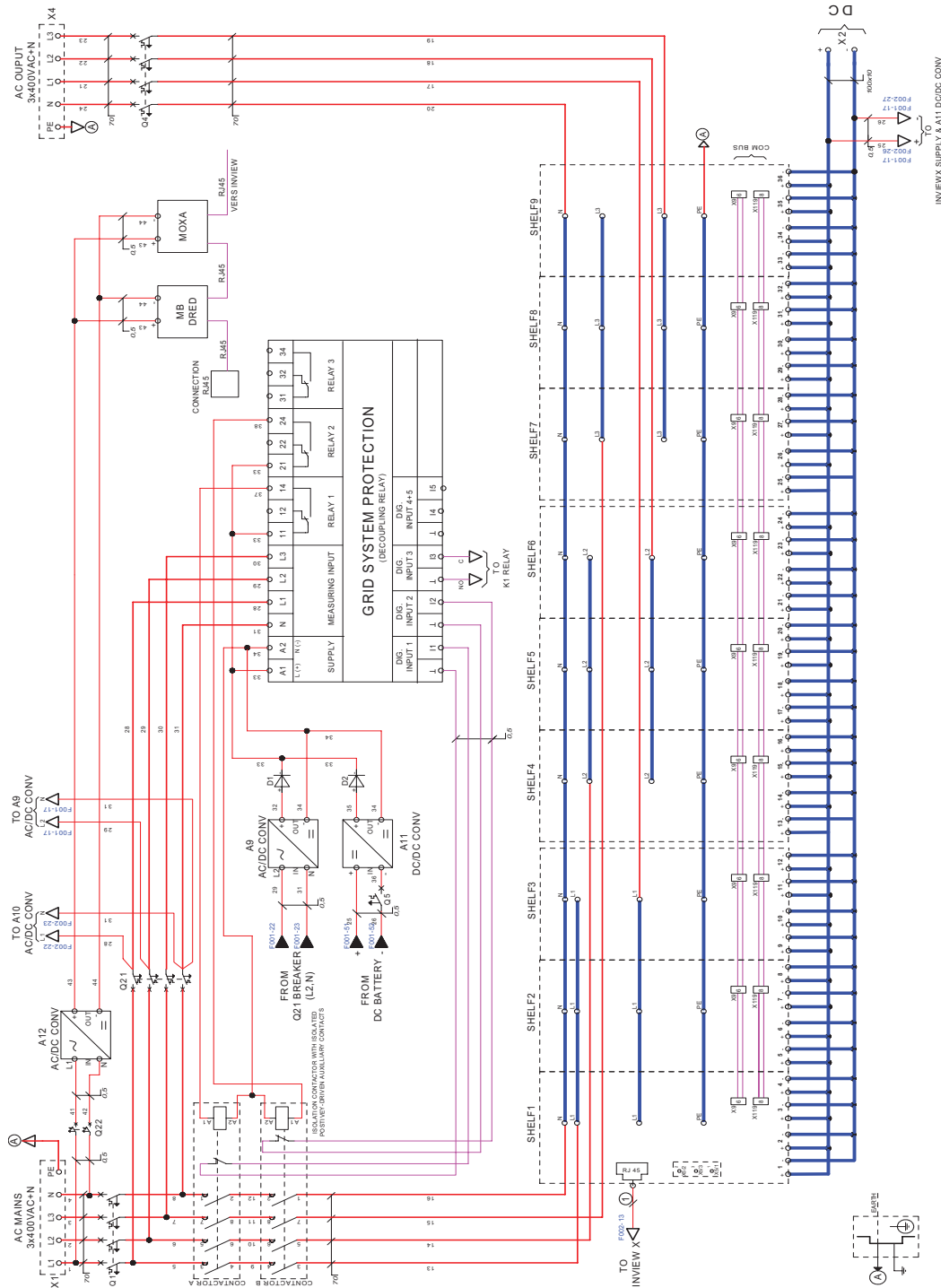
3. Connect the new MBB in the system. To know about the hardware connections, refer to the section 6.4, page 21.
4. Once the MBB is powered on, make sure it was detected and listed in the *Accessories* list.
5. Go to *Site > Sensors and Actuators*, scroll down to *Relay* and *Digital Input* section, and verify the mappings are done correctly.



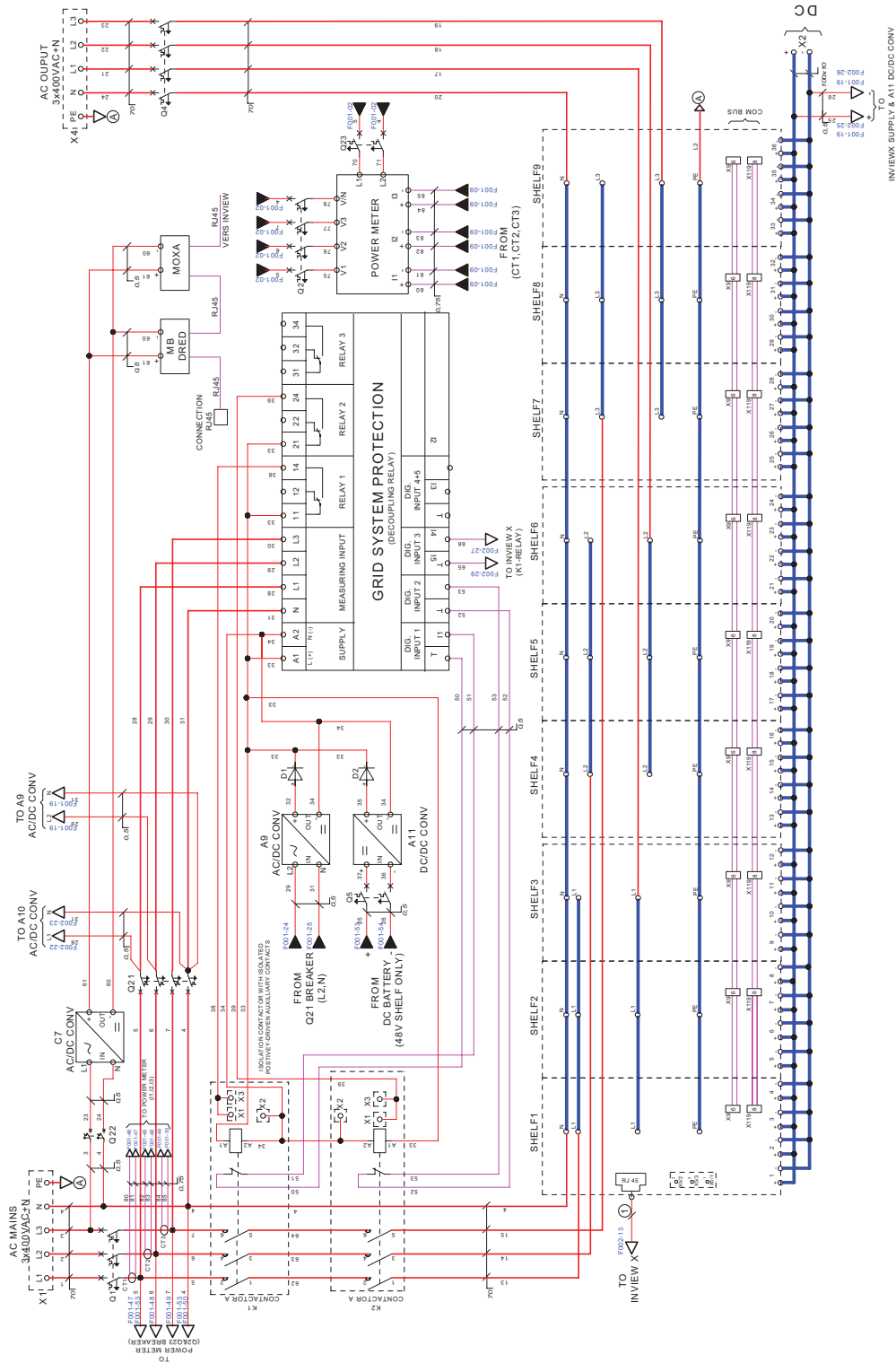
The screenshot shows the 'Configuration' tab selected. The 'Relay' section is visible, displaying a table with columns for ID, NAME, and VALUE. The table lists relays K1 through K5 with their respective configurations. For example, K1 has relays CF401 (Mode: GlobalMajor) and CF402 (Default State: De-energized). K2 has relays CF406 (Mode: GlobalMinor) and CF407 (Default State: De-energized). K3 has relays CF411 (Mode: Custom), CF412 (Default State: De-energized), and CF413 (Boolean Expression: @(s1_da47)=0|[(s1_da48)=0]|[(s1_da49)=0]). K4 has relays CF416 (Mode: -) and CF417 (Default State: De-energized). K5 has relay CF421 (Mode: -).

18. Electrical Diagrams

18.1 System Connections (TN+S)



18.2 System Connections (TN-C-S)



18.3 Inview X and GW Connections

