

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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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	03/11/2025	-	Updated according to CEC comments.

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-energized when necessary.
- AC and DC circuits shall be terminated with no voltage / power applied (de-energized).
- 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 Preliminary

The Sierra Hybrid System is a grid-interactive inverter comprising between 2 to 10 Sierra inverter modules per phase, combined with auxiliary hardware required for grid interactive operation such as grid protection relays, DRM interfacing components and an (optional) power meter.

The block diagram below gives an overview of the major components that make up the Sierra Hybrid System:

1. At its core are the modular Sierra inverter modules, available in a 48Vdc or 380Vdc nominal DC bus version.
2. An NA003 (Grid and System protection relay) measuring the voltage and the frequency of the grid and controlling the decoupling relays when there is a grid failure.
3. A DRM interface circuit, accepting the standard 8-pin DRM interface.
4. A Power Meter providing a reference point for measuring power flows in and out of the system.
5. The InView controller, controlling the power flow of the Sierra modular inverter modules and interfacing with peripheral devices resulting in the desired application behaviour.

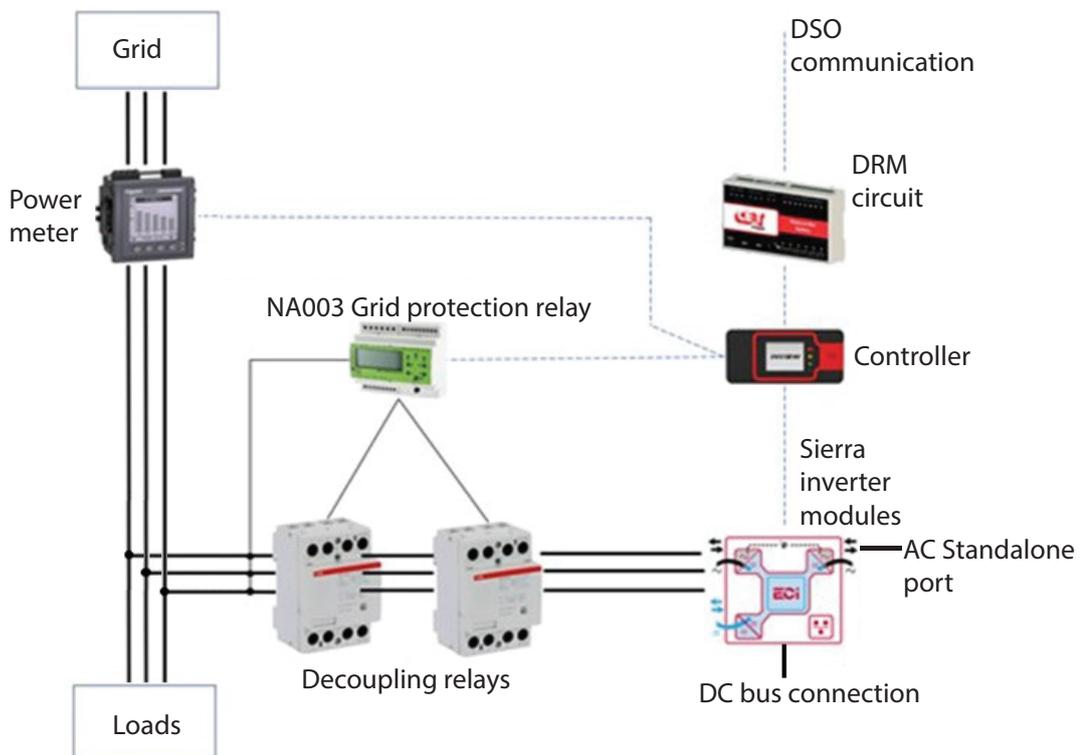


Figure 1. Sierra Hybrid system Block Diagram

5. Cabinet Layout

A Sierra Hybrid System is a cabinetized modular converter designed for clean and temperature controlled environments comprising all components mentioned in the previous chapter.

The system is designed for top cable entry with the circuit protection breakers accessible from the front of the cabinet.

The controller is door mounted, providing an user friendly interface showing the current status and operation of the system.

At its core are the Sierra 48Vdc or Sierra 380Vdc inverter modules, mounted in the bottom half of the cabinet.

All other hardware which does not require user access are mounted behind blind cover plates in the top half of the cabinet.

Further qualities 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

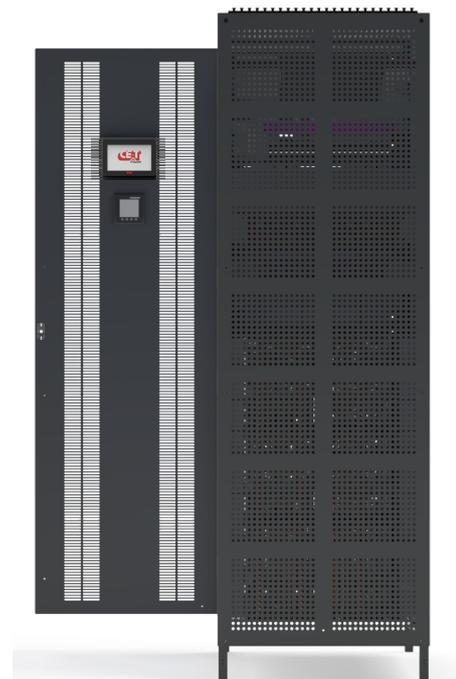


Figure 4. Hybrid Sierra System - Rear View

5.1 System Specifications - 48 Vdc

Specifications	Hybrid Sierra 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	Hybrid Sierra 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	Hybrid Sierra 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 Specifications - 380 Vdc

Specifications	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% / 94.5% / 94.5%								
Operating T° and relative humidity / Storage T°	-20°C to 65°C, power de-rating from 40°C to 65°C / -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 - 380/230-277								
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 Vac + N								
Nominal power (kVA / kW)	18 / 15	27 / 22.5	36 / 30	45 / 37.5	54 / 45	63 / 52.5	72 / 60	81 / 67.5	90 / 75
Nominal current at 230 VAC / 3x400 VAC (A)	26.1	39.1	52.2	65.2	78.3	91.3	104.3	117.4	130.4

Specifications	18 kVA	27 kVA	36 kVA	45 kVA	54 kVA	63 kVA	72 kVA	81 kVA	90 kVA
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.								
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)	18	27	36	45	54	63	72	81	90
Nominal current at 230 Vac (A)	21.7	32.6	43.5	54.3	65.2	76.1	87	97.8	108.7
Inrush current (A)	Max 125 %								
Power factor	>0.99 (above 50% load)								
Surge arrestor	Not included								
Energy storage port									
Nominal voltage (range)	336 Vdc (200 – 400 Vdc)								
Nominal current at 336 Vdc (A)	45	67	89	112	134	156	179	201	223
Maximum current (for 15 seconds) (A)	48	72	96	120	144	168	192	216	240
DC input connection	Single DC feed per cabinet								
Storage type	Batteries								
Compatible battery chemistries	Lead-Acid, Self managed Lithium, Lithium								
DC Output Specifications (Energy storage port)									
Nominal voltage (range)	336 Vdc (200 - 400 Vdc)								
Maximum current per module at 336 Vdc	8 A								
Source Transfer Performance									
Voltage deviation and duration	0 V, 0 s (no interruption)								

Specifications	18 kVA	27 kVA	36 kVA	45 kVA	54 kVA	63 kVA	72 kVA	81 kVA	90 kVA
Performance (EN62040-3)	VFI-SS-111								
Monitoring									
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								
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 weight without modules	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

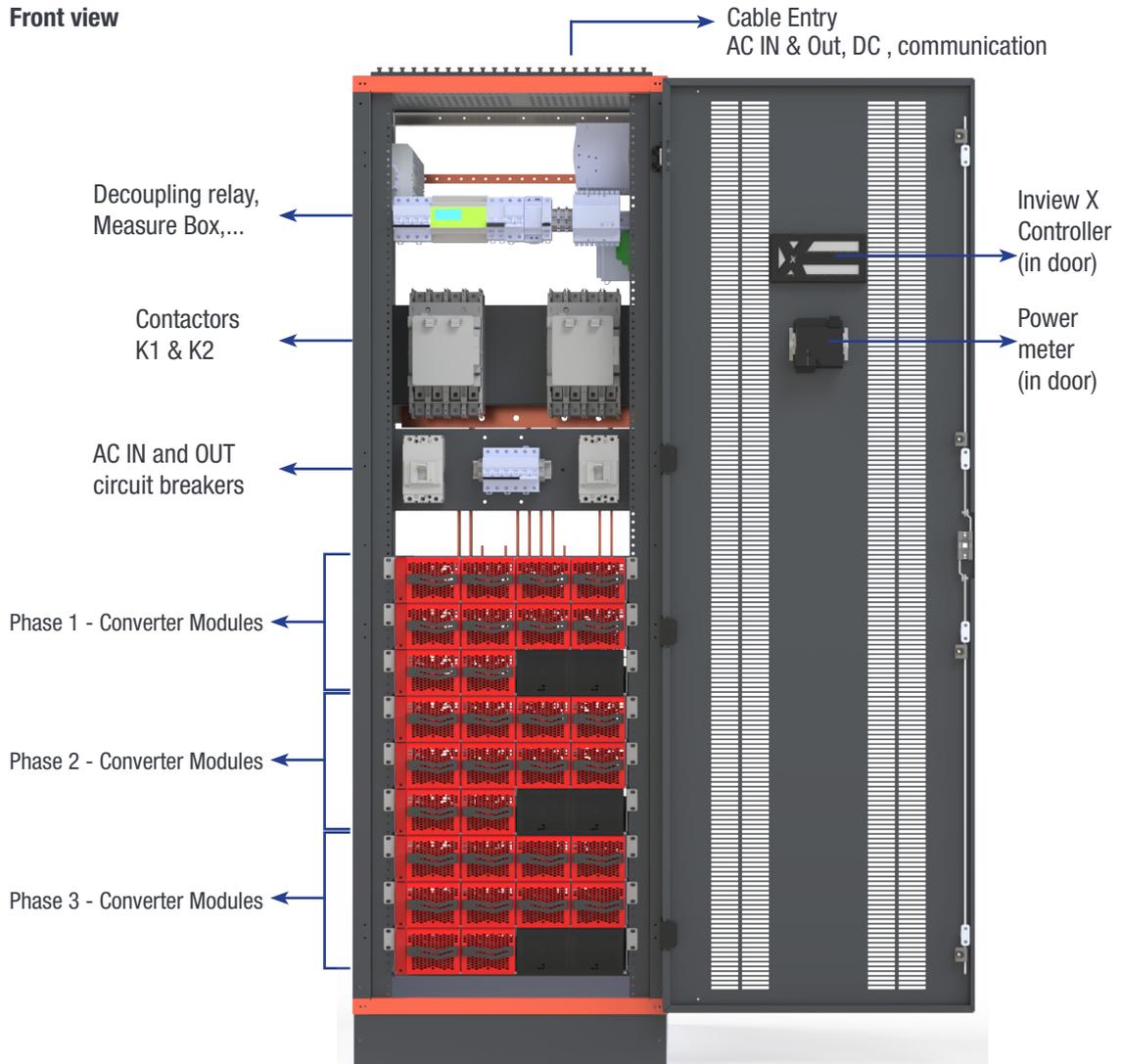
Table 2. System specifications - 380 Vdc

5.3 System Description

Hybrid Sierra System is composed of 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 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

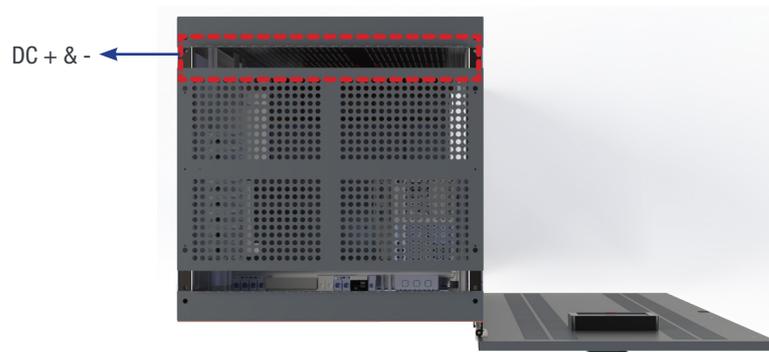
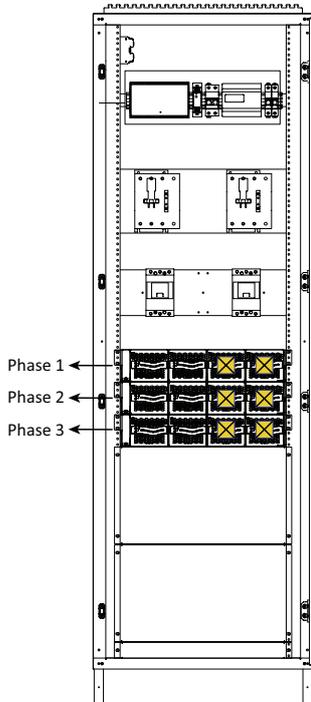
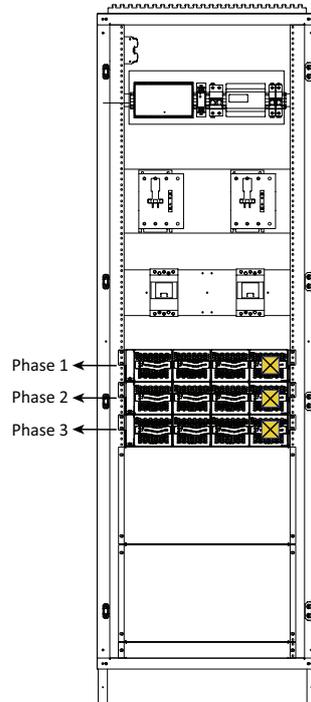


Figure 2. Hybrid Sierra System 90 kVA - General Arrangement

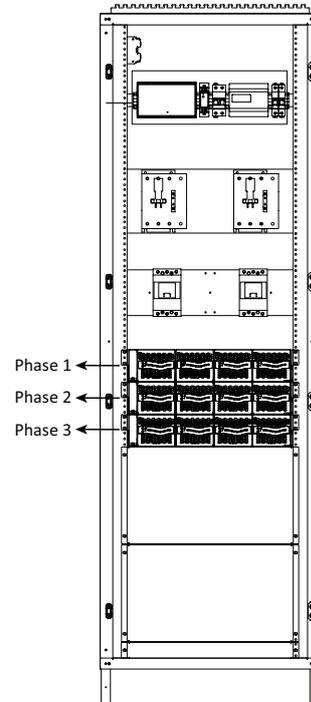
5.4 System General Arrangement - 18 to 90 kVA



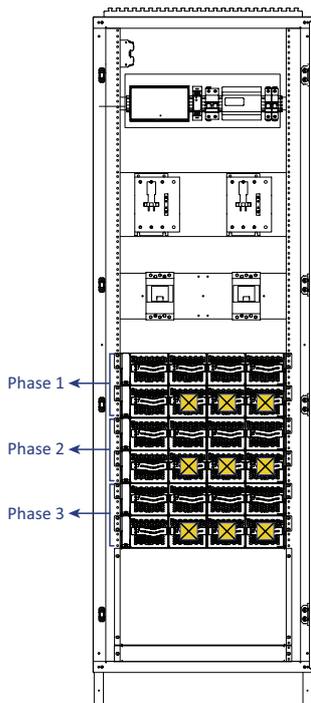
Hybrid Sierra System - 18 kVA



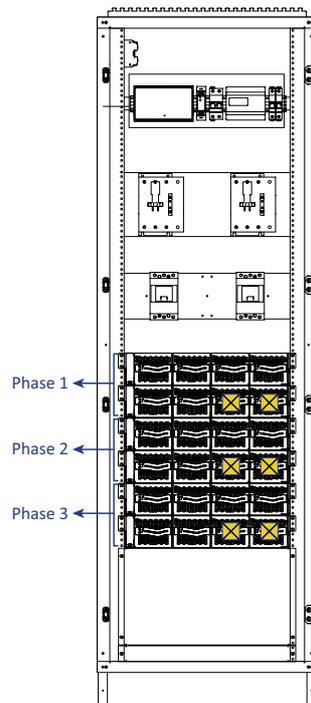
Hybrid Sierra System - 27 kVA



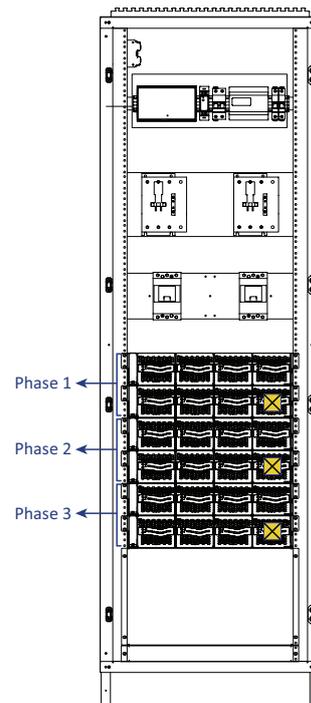
Hybrid Sierra System - 36 kVA



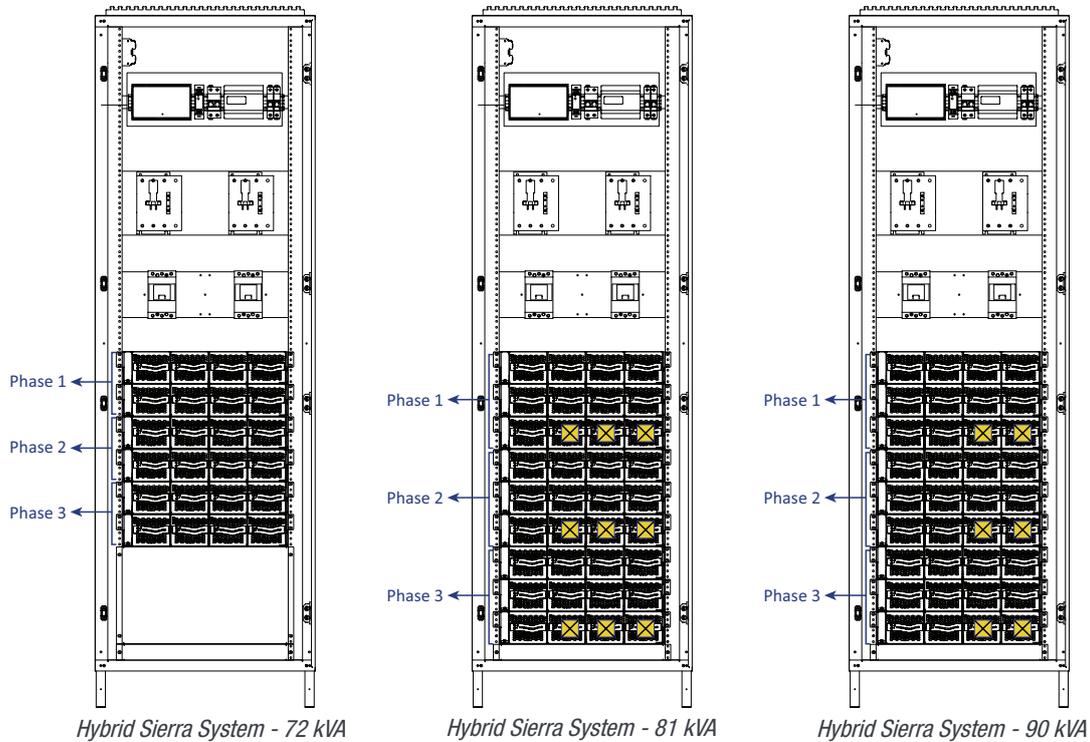
Hybrid Sierra System - 45 kVA



Hybrid Sierra System - 54 kVA



Hybrid Sierra System - 63 kVA



5.5 Battery Integration

The Sierra Hybrid System is compatible with Lead-Acid, Self-managed Lithium (without BMS communication) and smart Lithium batteries (with BMS communication). Integration with the battery is the responsibility of the system integrator. The points in the following chapters need to be taken into consideration.

5.5.1 Earth Fault Monitoring

- When a Sierra Hybrid System is used with a Battery energy storage system operating at a Decisive Voltage Classification (DVC) B or C, an earth fault monitoring with alarm needs to be chosen by the system installer according to the battery manufacturer's specifications and as per AS/NZS 5139 requirements.
- The Earth monitoring Device is not provided by CE+T and must be installed by the integrator prior to commissioning of the system.

5.5.2 Lead Acid batteries

When using Lead-Acid batteries, a temperature sensor shall be installed to monitor the battery temperature. The Sierra Hybrid System provides a temperature sensor input on the Measure Box Battery (MBB) and is able to apply temperature compensation and has build-in alarm and protection levels to avoid damage to the Lead-Acid batteries.

Refer to "6.4 Measure Box Battery (MBB)", page 23 for the location of the temperature sensor input on the MBB.

5.5.3 Self-managed Lithium batteries

Self-managed lithium batteries monitor their operational conditions and disconnect 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 batteries.

5.5.4 Smart lithium batteries

Smart Lithium batteries have a communicating BMS which provides operational information to the inverter such as required charge voltage and maximum charge or dis-charge current capabilities. The Sierra Hybrid System is integrated with a number of smart Lithium batteries using Modbus or CAN. The BMS communication is connected to the iso CAN or RS485 port on the InView controller. Please consult our website for the latest list of integrated compatible batteries.

5.5.5 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	Sierra 25 - 380/230-277
Telecom / Datacom:	Input	48 Vdc 230, 240 & 277 Vac, 50/60 Hz	380 Vdc 230, 240 & 277 Vac, 50/60 Hz
	Output	48 Vdc 230, 240 & 277 Vac, 50/60 Hz	380 Vdc 230, 240 & 277 Vac, 50/60 Hz
	Power	3 kVA / 2.4 kW	3 kVA / 2.5 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 is the highest priority. Even if AC output is fully loaded (2.4 kW), still 300 W is available for DC output.
- Each **Sierra 25 - 380/230-277** converter can supply 2.5 kW on any **DC, AC** or combination of **both AC and DC** output ports. AC output load is the highest priority. Even if AC output is fully loaded (2.5 kW), still 200 W is available for 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 max four (4) 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 graphic 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 webinterface.
 - 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

6.6 Surge Arresters

The mains (AC) supply of the modular converter system shall have suitable Lightning surge suppression and Transient voltage surge suppression installed. The manufacturer's recommendations of installation shall be followed. It is recommended to select a device with an alarm relay for function failure.

Indoor sites are considered to have a working lightning surge suppression device in service.

- Indoor sites Min Class II.

Lightning surges in converter circuits can cause immediate and catastrophic equipment failure. Surges from induced lightning and power switching operations are smaller but are more numerous and can result in equipment mis-operation, lockup or damage.

Some areas are more susceptible to lightning than other areas, whereas the intensity dramatically increases with the altitude.

The selection of the surge arresters, as well as their installation, shall adhere to strict rules. Not adhering to these rules could simply void their actions. The selection of the surge arrester and its physical implementation cannot be covered in this document. The installer must analyze the local conditions and he should require the site to be inspected to cover his liability.

In any case, converter damages that could be related to improper protection are not covered by CE+T product warranty.

Caution: For continued protection against the risk of fire, replace only with the same type and rating of fuse.

6.7 Power meter

The PowerLogic PM5000 series power meter is the new benchmark in affordable, precision metering. It is the ideal fit for high-end cost management applications, providing measurement capabilities needed to allocate energy usage, perform tenant metering and sub-billing, pin-point energy savings, optimize equipment efficiency and utilization, and perform a high level assessment of the power quality in electrical networks.

All meters provide Modbus serial communications. PM5500 level meters are also capable of simultaneous ModBus TCP and BTL-certified BACnet IP communications over Ethernet.

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

In the Sierra grid interactive system, the power meter is used to give information about power exchange with the grid and so control what is injected based on measurements. This is grid interactive grid-oriented functionalities. However, once the power meter is in the system, it is possible to use its measurement for other purpose like peak shaving or auto-consumption. Inverter has export control capabilities but are not tested to AS/NZS 4777.2:2020



6.8 DRM Circuit

DRED stands for Demand Response Enabling Device (from electrical power industry Australia) The MeasureBox_Dred is a passive device which allow CE+T to determine the status of all the switches (S0-1-2-3-4-5-6-7-8) of a DRED device connects to an “auxiliary DRED test circuit”. It is described in an Australian standard AS/NZS 4777.2:2020. These components are used to fulfill DRM requirements.

MB_Dred should be placed between the “Auxiliary DRED test circuit” of the Australian GRD and a Moxa ILOGIK E1240 device that measures the info from MB_DRED (analog voltage levels) and help the Inview deducting the switches status of the DRED.



6.9 System Integration Components

6.9.1 Earth Fault Monitoring

When a Sierra Hybrid system is used with a Battery energy storage system operating at a Decisive Voltage Classification (DVC) B or C, an earth fault monitoring with alarm needs to be chosen by the system installer according to the battery manufacturer’s specifications and as per AS/NZS 5139 requirements.

6.9.2 Decoupling Contactor

The decoupling contactor should be chosen according to the characteristics in the below table.

Product or component type	Contactor
Contactor application	Power switching
Poles description	4P for grid interactive / 3P for standalone
[Ue] rated operational voltage	≤ 1000 V AC 50/60 Hz, ≤ 460 V DC
[Ie] rated operational current	250 A (at <40 °C) at ≤ 1000 V AC-1
[Uc] control circuit voltage	200...500 V AC 50/60 Hz 200...500 V DC
Control circuit voltage limits	Operational: 0.8 Uc Min...1.1 Uc Max (at <60 °C) Drop-out: 0.1 Uc Max...0.45 Uc Min (at 60 °C)
[Uimp] rated impulse withstand voltage	8 kV
Overvoltage category	III [Ith]
Rated breaking capacity	1040 A at 440 V
[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
[Ui] 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 Hybrid Sierra Systems are designed for commercial and industrial applications. These systems are not intended for household use. Installation and commissioning must be performed by qualified personnel.

7.1 Site Preparation

- The System must be installed in an indoor conditioned, dry environment and without condensation.
- All cables should be copper wire and must be rated for min 90°C (194°F).
- All cables must be sized according to the rated current of the converter system and to the customer terminal connection.
- All AC input, AC output, DC input, and signal cables should be routed properly.
- Empty converter positions shall be covered with blank module covers.
- **System Position**
 - The system should not be installed at close to the wall, mainly at rear side.
 - **A minimum of 50 cm clearance is required in and around of the unit.**
 - The System is designed to operate in a temperature controlled (maximum operating ambient 40°C/104°F) and clean environment.
 - If the system has a **front door**, a filter must be installed to avoid ingress of airborne particles such as dust, sand and metallic debris.

7.1.1 Transformer Sizing

The converter is capable of operating at 125% of rated capacity for 15 seconds.

- Assure any upstream transformers supplying AC to the converter is sized at a minimum of 1.5 times the kVA rating of the converter to meet this requirement.

7.2 Packaging Information

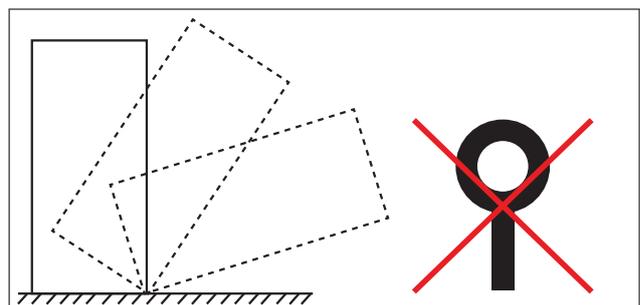
CE+T cabinets are always fixed on a pallet, and then packed in a wooden crate. These crates are usually delivered laying flat, horizontally.

To unpack your cabinet, we recommend the following method:

1. Make sure that the crate is laying flat, with the correct side up. This side is identified by a double red arrow.
2. Remove the top cover in order to be able 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.

If you prefer to take the wooden crate apart before raising the cabinet, make sure you do not damage or dent the cabinet while doing so.

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



7.3 Removing the cabinet rear protection

Wooden wedges are fixed at the back of the cabinet to make sure that no parts may move and be damaged during transportation.

These wooden wedges must be removed before going further with the cabinet's installation 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).

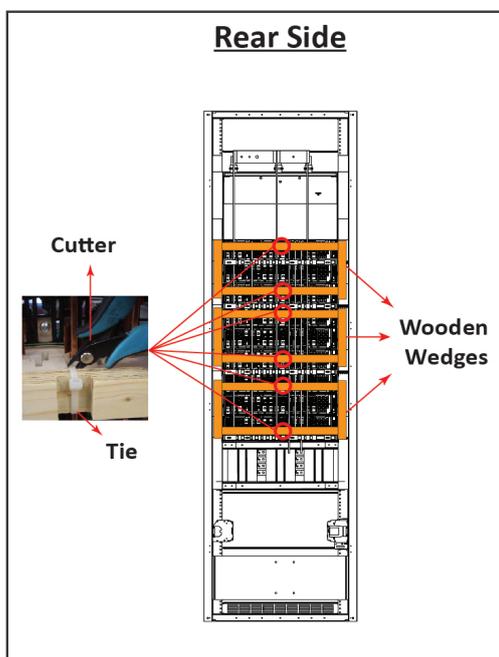


Figure 5. System rear view

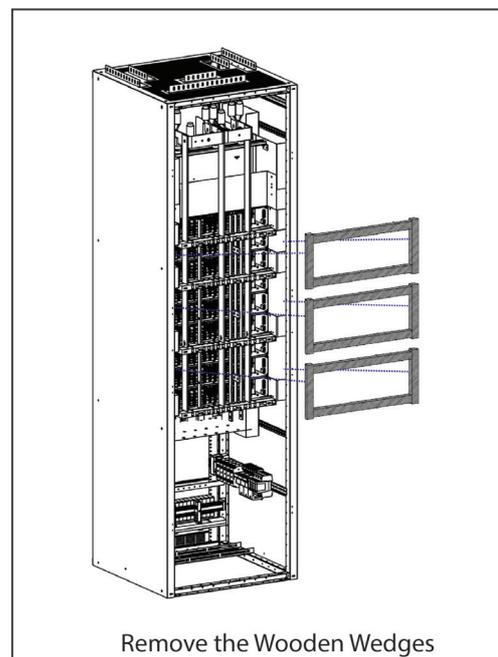


Figure 6. Remove the wedges

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

- For that appropriate filter should be installed.

7.3.1 Clearance and ventilation

Observe the minimum clearance around the Sierra Hybrid System as follows:

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

When installing the Sierra Hybrid System in an enclosed room, assure Ventilation of 60m³/min for a 90 kVA system, 2m³/min per module.

7.4 Fixing the cabinet in the floor

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

Place the system in upright position on the floor and fix it with four ground anchoring bolts size **M8 bolt**, to a **torque of 20–29 Nm**.

(Refer below foot print for the holes marking)

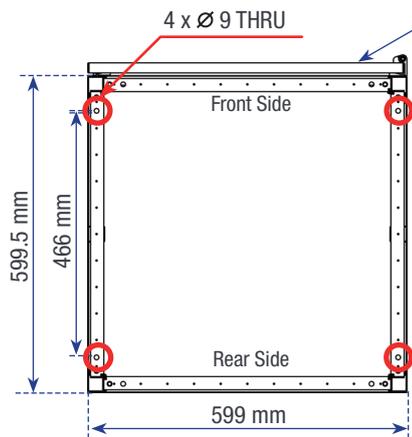


Figure 7. Frame Cabinet - Footprint

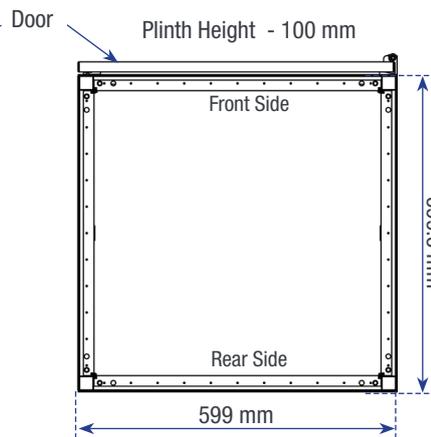


Figure 8. Frame Cabinet - Footprint with Plinth

7.5 Cable Entrance

All the cable routings are made through the **top** of the system. Use appropriate collar to fix the conduits to the cabinet roof panel. The top panel may be removed to facilitate placement of conduit knockouts where needed without introducing foreign contaminants into the system.

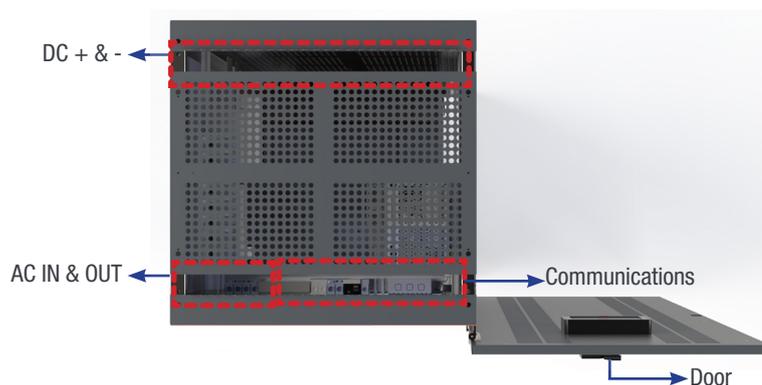


Figure 9. Cable entrance from System top

7.6 Grounding

The main Protective Earthing (PE) bus bar is located at the top left side of the system (below the AC terminal blocks (X1 & X4)) and is marked with this symbol for identification



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

PE must be terminated even if commercial Mains is not available and shall be connected to building or main panel ground.

Recommended cable cross section is the same size as the Neutral cable cross section mentioned in section 1.1.

Ground has to be connected in accordance with local code.

The cabinet is bounded to the PE bar during manufacturing.

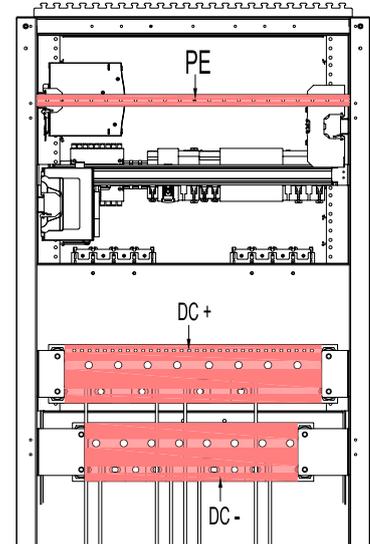


Figure 10. PE Bus bar

7.7 AC Input and Output

The AC Input and Output terminals are present at the top of the system, and the terminal blocks are arranged as below.

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.

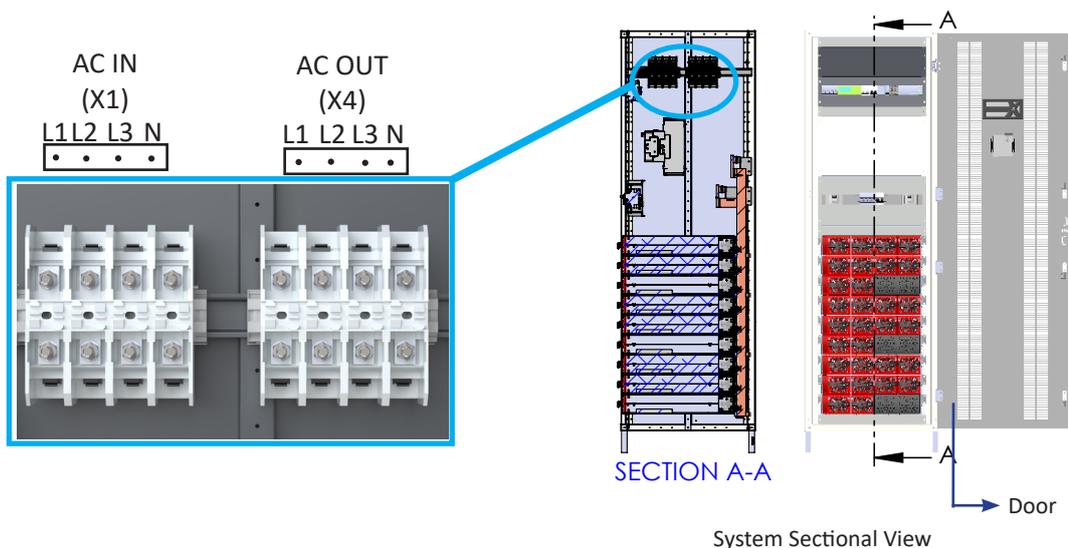


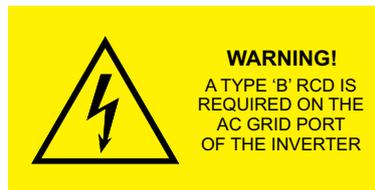
Figure 11. AC Input and Output terminals

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 3. AC Input and Output connections

7.7.1 Residual Current Detection (RCD)

The Residual current device (RCD) is used to disconnect all live conductors, including the phase and neutral, due to earth fault or high leakage current. The External RCD protection installed in the system is Type B. Residual current detection should follow the manufacturer's instructions.



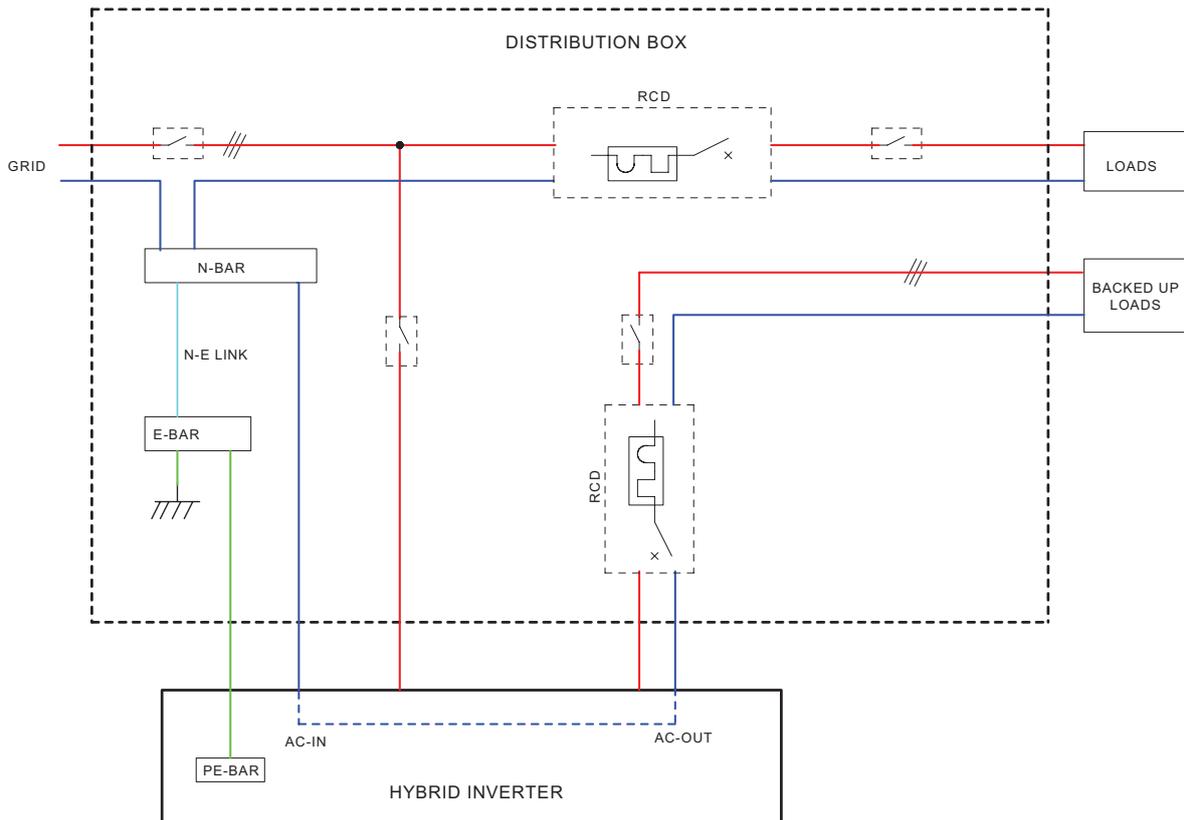
Recommended RCD values for AC Grid interactive port can be followed according to the following table.

Specifications	Hybrid Sierra System 48 Vdc & 380 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

For installations in Australia, ensure a NEM connection is made in the distribution box.

The below diagram shows a typical installation.



A MEN connection can be created by linking the N terminal of either AC in or AC out terminals (X1 or X4). Refer to the “18.2 System Connections (TN-C-S)”, page 82.

The cable used to create MEN connection must not be smaller than the size mentioned in “Table 3. AC Input and Output connections”, page 30.

7.8 DC

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

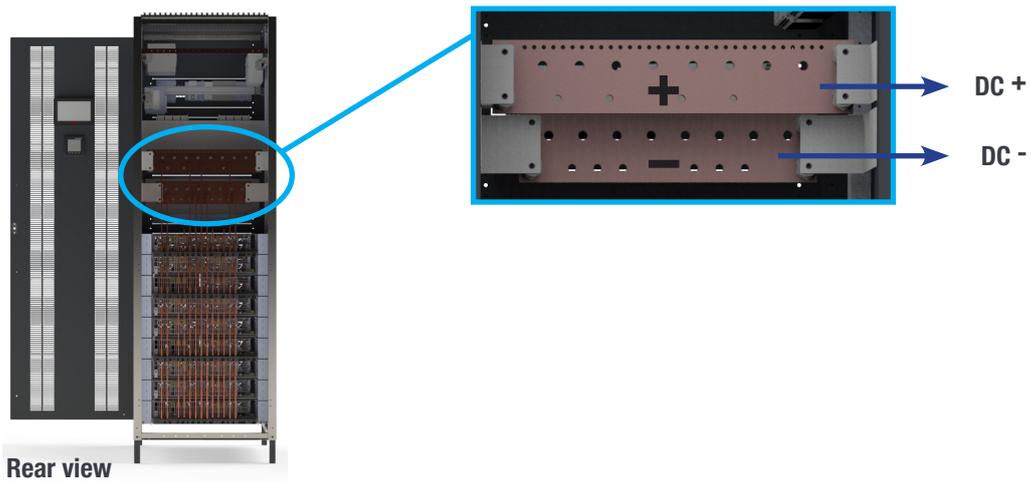


Figure 12. DC Copper bar

7.8.1 DC Connections

It has separate DC bus bar for positive & Negative cable termination. The bus bar details as below,

- Each bus bar has 8 x termination points with hole size of 13 mm.

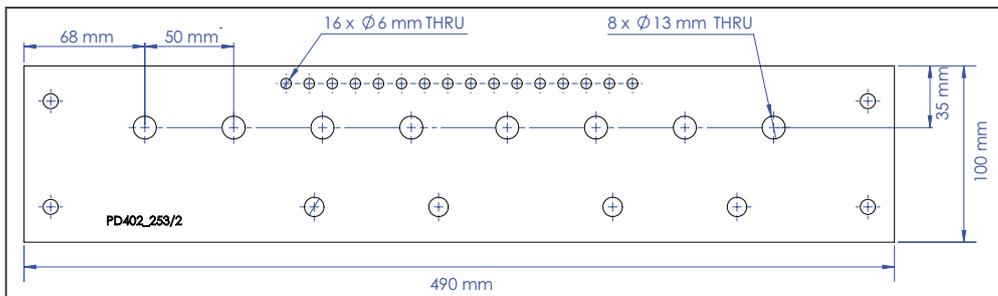


Figure 13. DC Positive bar

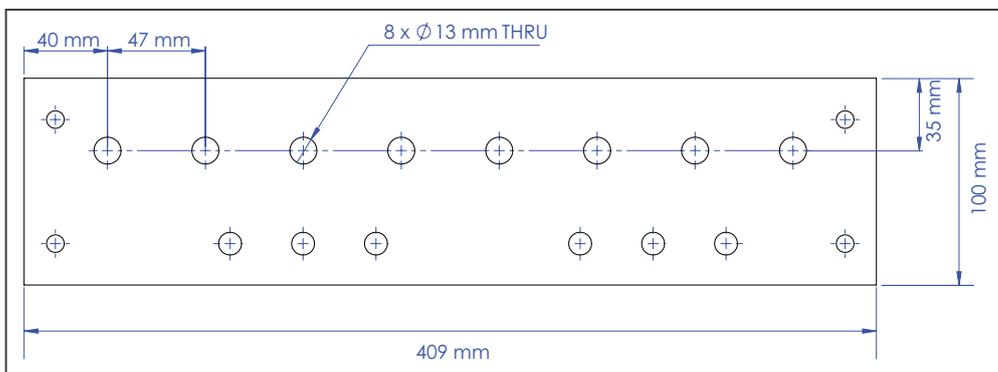


Figure 14. DC Negative bar

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 4. DC connections - 48 Vdc Systems

Hybrid Sierra System Model	Common DC Input - 380 Vdc			
	Maximum DC Current	Connection Cable	Torque	Lug Hole Size
18 kVA	48 A	16 mm ²	3 Nm	13 mm
27 kVA	72 A	25 mm ²	3 Nm	13 mm
36 kVA	95 A	35 mm ²	3 Nm	13 mm
45 kVA	119 A	50 mm ²	7 Nm	13 mm
54 kVA	143 A	70 mm ²	7 Nm	13 mm
63 kVA	167 A	70 mm ²	7 Nm	13 mm
72 kVA	190 A	95 mm ²	10 Nm	13 mm
81 kVA	214 A	95 mm ²	10 Nm	13 mm
90 kVA	238 A	120 mm ²	15 Nm	13 mm

Table 5. DC connections - 380 Vdc Systems

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

The switching device used for isolating the energy source shall:

- Have a voltage rating equal or greater than the maximum DC voltage of the inverter,
- Be able of interrupting the maximum rated normal and fault current of the inverter,
- Interrupt all live conductors simultaneously,
- Be able to be secured in the open position and only secured when the main contacts are in the open position,
- Be either a switch dis connector or a circuit breaker
- As hybrid Sierra systems are intended to be connected to external battery sources:
 - It shall conform to AS 60947-3,
 - It shall be of the non-polarized type,
 - It shall have a category of at least DC-21B.

DC circuit breaker is not an integral part of the system. The customer needs to install a DC circuit breaker according to the ratings mentioned in Table 4 and Table 5.

8. Operational modes

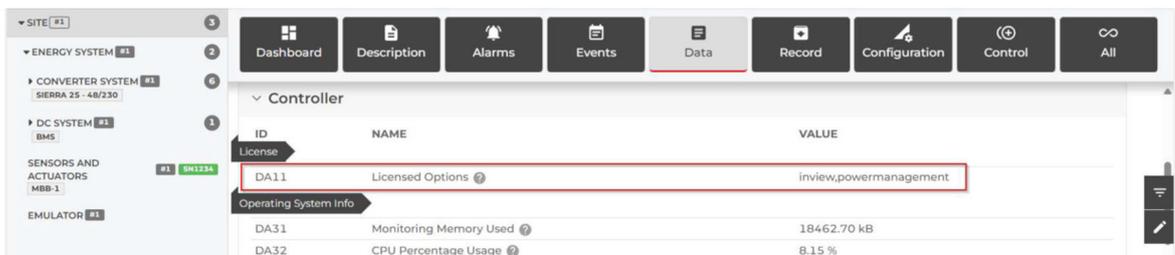
8.1 Grid Interactive Mode

8.1.1 Enable Grid Interactive mode

Note: changing these settings is only possible when logged in as Administrator and the Powermanagement software license is installed on the InView controller.

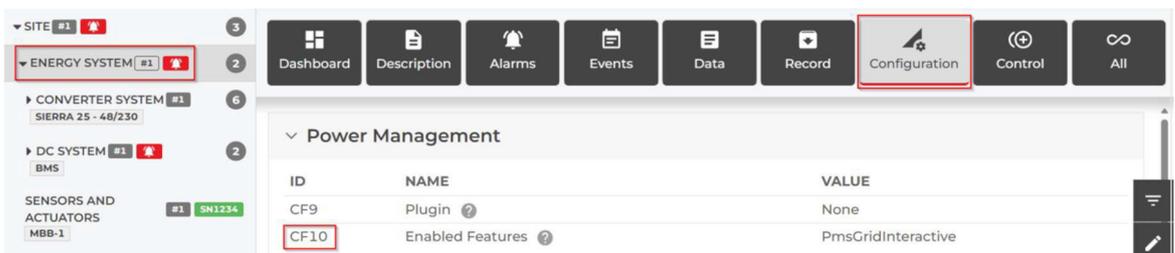
To enable Grid Interactive mode, follow the following configuration steps:

1. Make sure the powermanagement software license is loaded.



ID	NAME	VALUE
DA11	Licensed Options	inview.powermanagement
DA31	Monitoring Memory Used	18462.70 kB
DA32	CPU Percentage Usage	8.15 %

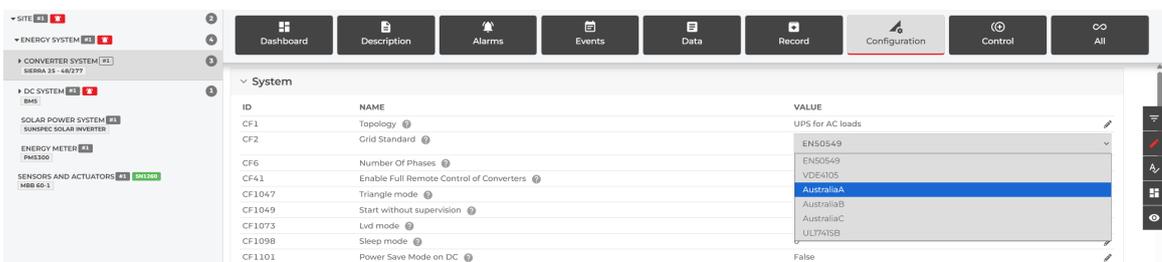
2. Enable the Power Management – Grid interactive feature by entering the PmsGridinteractive keyword at CF10



ID	NAME	VALUE
CF9	Plugin	None
CF10	Enabled Features	PmsGridInteractive

3. Select the appropriate Grid code for region where the system is being installed.

Select 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.

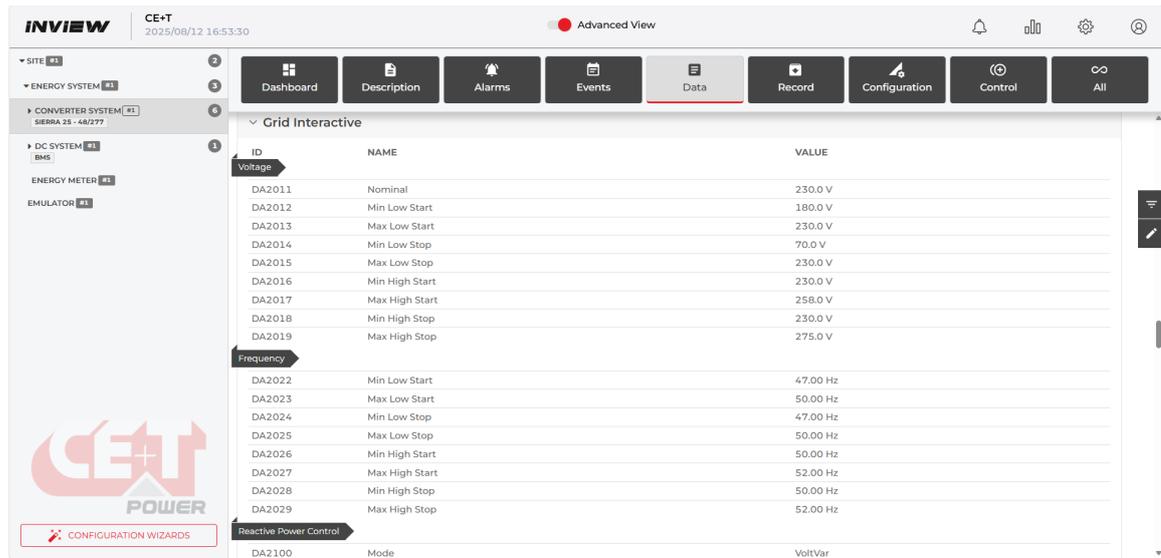


ID	NAME	VALUE
CF1	Topology	UPS for AC loads
CF2	Grid Standard	AustraliaA
CF6	Number Of Phases	3
CF41	Enable Full Remote Control of Converters	True
CF1047	Triangle mode	False
CF1049	Start without supervision	False
CF1073	Lvd mode	False
CF1098	Sleep mode	False
CF1101	Power Save Mode on DC	False

8.1.2 Verify the active Grid interactive module parameters

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

Go to Converter system > Data > Grid Interactive to see the parameters taken into account by the inverters.



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

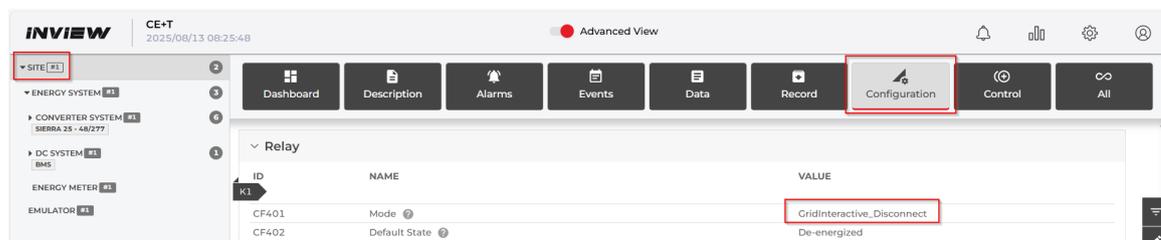
The settings of the demand response or power quality response modes of the inverter are secured against inadvertent or unauthorized change.

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.

The parameters include the modes described later in this document : Volt-watt response mode, Volt-var response mode, Volt-var and Volt-watt response set point values, Fixed power factor mode, Reactive power mode, Power rate limit and Volt-watt response mode inverter with energy when charging.

8.1.3 Configure the Grid interactive Disconnect relay

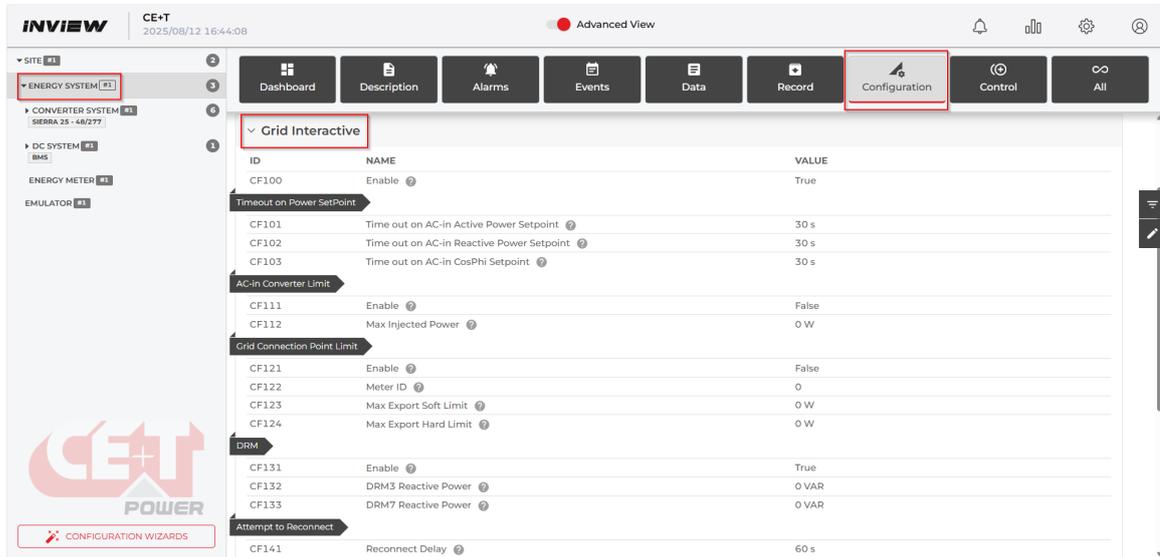
Go to Site > Configuration > Relay or Sensors and Actuators > Configuration > Relay and add the GridInteractive_Disconnect mode to the relay that will be used for grid protection.



ID	NAME	VALUE
CF401	Mode	GridInteractive_Disconnect
CF402	Default State	De-energized

This relay will be energized (if Default State is De-energized) 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 energized as well.

8.1.4 Verify the Grid interactive configuration



Before setting CF100 to True, configure all other parameters. Once configured, activate the Grid interactive feature by setting CF100 to True.

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 energized.

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 energized.

Next to that, there is a software limit CF123 that ensures by software control that the maximum allowed power injected at the grid connection point is not higher than CF123.

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 energized.

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)

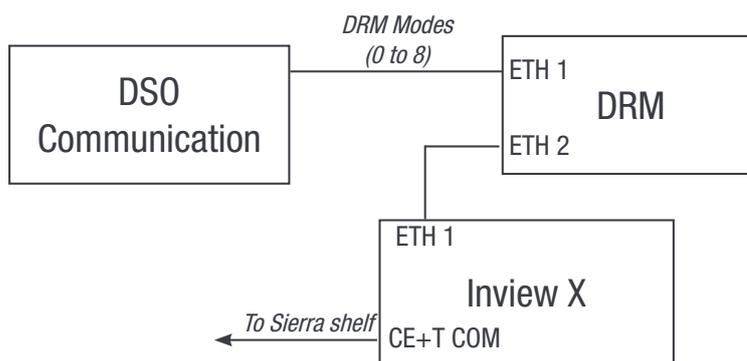
e. Attempt to Reconnect

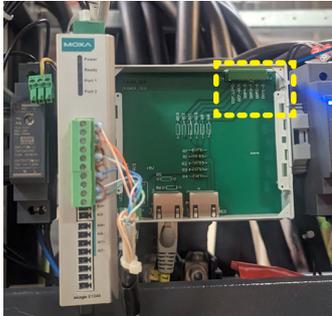
Once conditions are met to de-energize the GridInteractive_Disconnect relay, there is a reconnection delay defined by CF141.

8.2 Demand Responses Modes (DRMs)

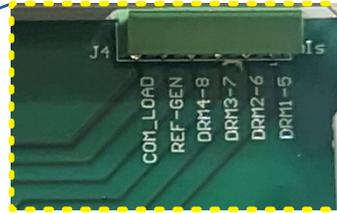
DRED connections are present in the system, which supports all nine DRM codes. The DRED ensures that if DRM0 is not enabled, no other DRM functionalities can be enabled.

8.2.1 DRM Connections

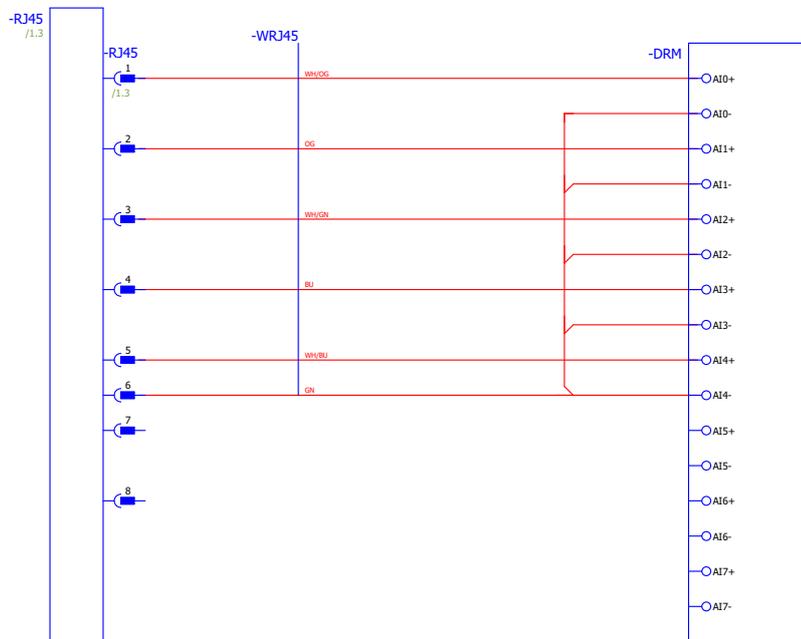




DRM Unit



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

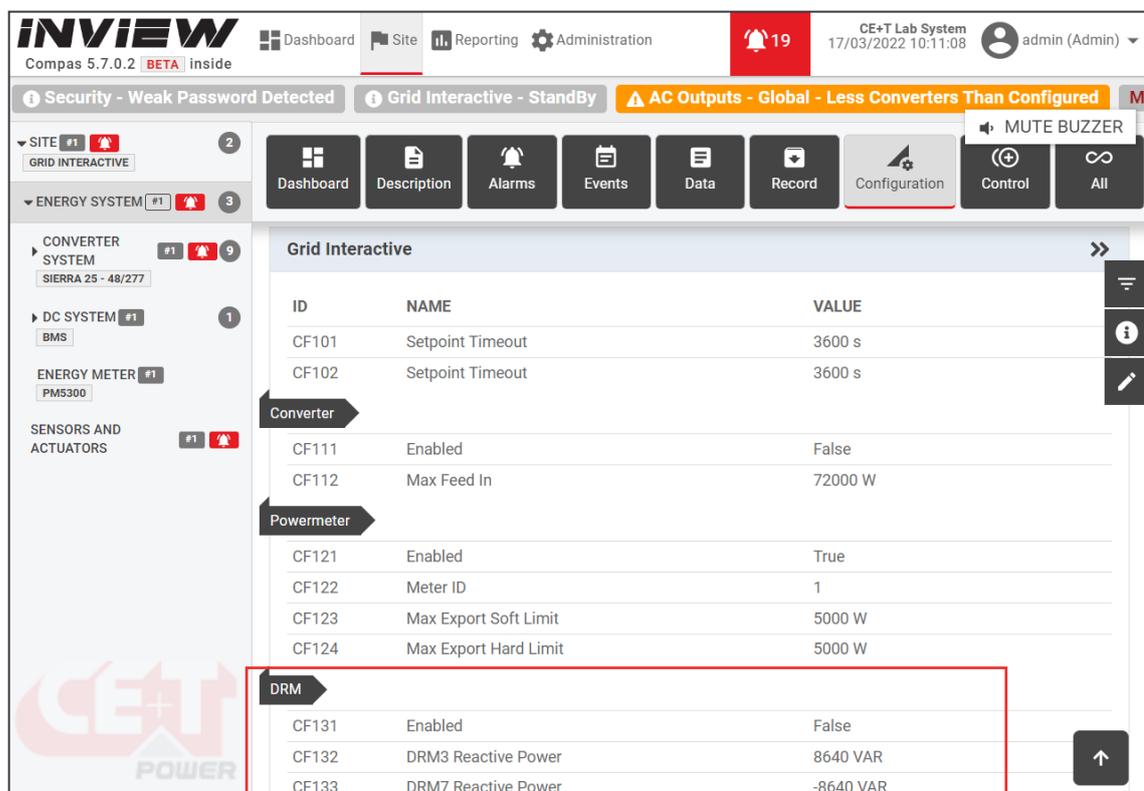
To enable DRM, go to Configuration and CF131 and select True.

Go to *Site > Energy System > Configuration > Grid Interactive > Global*

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.



The screenshot shows the INVIEW web interface for a CE+T Lab System. The main configuration table is as follows:

ID	NAME	VALUE
CF101	Setpoint Timeout	3600 s
CF102	Setpoint Timeout	3600 s
Converter		
CF111	Enabled	False
CF112	Max Feed In	72000 W
Powermeter		
CF121	Enabled	True
CF122	Meter ID	1
CF123	Max Export Soft Limit	5000 W
CF124	Max Export Hard Limit	5000 W
DRM		
CF131	Enabled	False
CF132	DRM3 Reactive Power	8640 VAR
CF133	DRM7 Reactive Power	-8640 VAR

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:

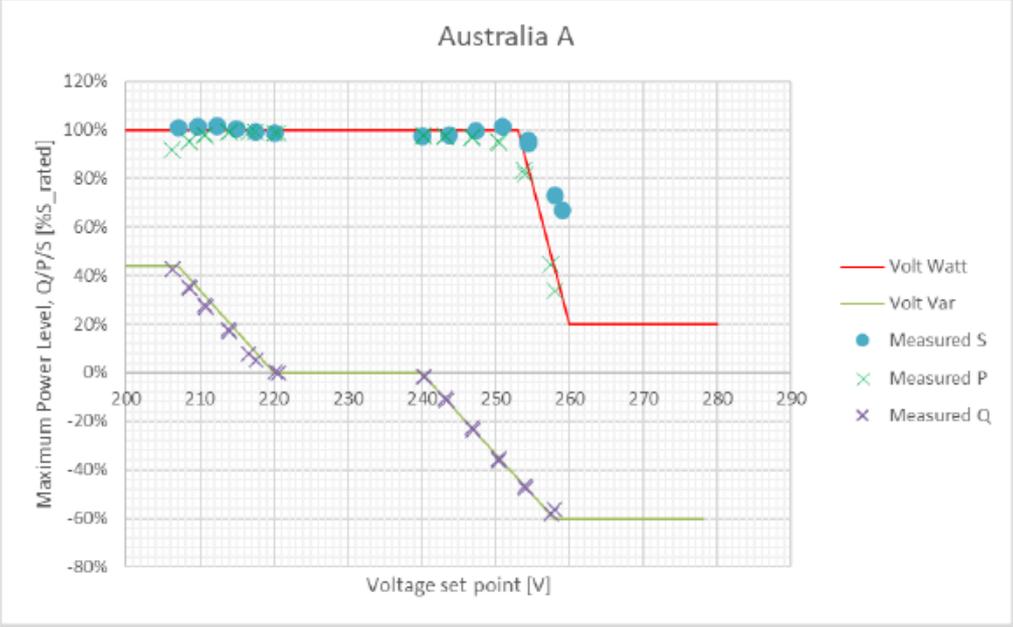
$$XY_{VarModeCurve} = Round \left(200 * \frac{X}{V_{Nom}} \right) + 256 * IF (Y < 0; Y + 256; Y)$$

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					
<p style="text-align: center;">Australia A</p> 					
<p>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</p>					

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

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

The Volt-watt mode and reactive power mode shall be able to operate concurrently.

The minimum setting range for ratio of reactive power (Vars) to rated apparent power (VA) shall be at least 60% absorbing to 60% supplying.

The default reactive power setting shall be 0%.

Where 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.

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

VAR_MODE	3
XY1_VAR_MODE_CURVE	500
XY2_VAR_MODE_CURVE	0
XY3_VAR_MODE_CURVE	0
XY4_VAR_MODE_CURVE	0

In that case, the reactive power will be constant at 500Var.

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.

Parameters name	Description	Units
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.

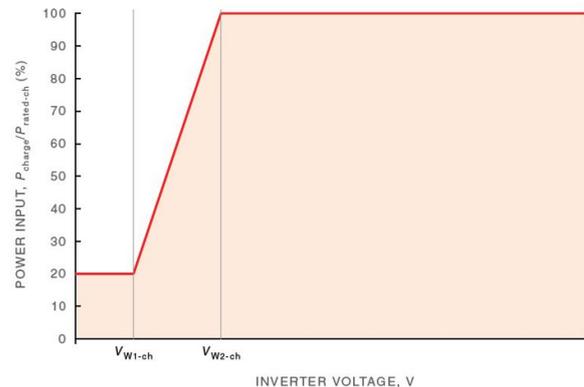


Figure 15. Example curve for the Volt-watt response mode for multiple mode inverters with energy storage when charging

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:

A small example is given in the following table:

POWER RESP TO OVER VOLT RAMP UP TIME 5cs	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 Remote monitoring

To enable remote monitoring, configure the IOT MQTT parameters.

IOT MQTT requires specific software. Contact your sales representative for more information.

Remote monitoring can be done via Modbus or SNMP communication also. For more information, consult the Inview User Manual.

Go to [Site > IOT MQTT Link](#)

If the list of parameters is not shown as below, set CF171 to Enable and save the configuration. The remaining parameters will now be shown.

IOT MQTT Link		
ID	NAME	VALUE
Primary		
CF171	Enabled ?	True
CF172	Server ?	iot.alphainnovations.eu
CF173	Port ?	8883
CF174	Encryption Enabled ?	True
CF175	Credentials ?	demo:8WWOhbQNdD+IBU6gxTmMQQnyWV5+OVXicsJyxicsgIY=
CF176	Cluster ?	public
CF177	Live Sync Enabled ?	False
Secondary		
CF181	Enabled ?	False

8.12 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)

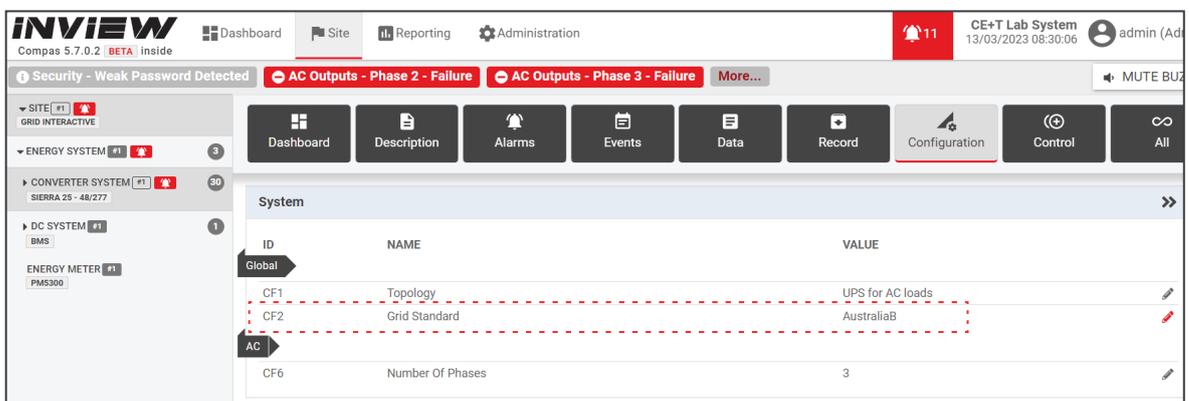
The active anti-islanding function can be activated or deactivated but is activated by default.

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 easily changeable (voltage threshold, trip delay time, ...). However, the default value are the ones of Australian certification:

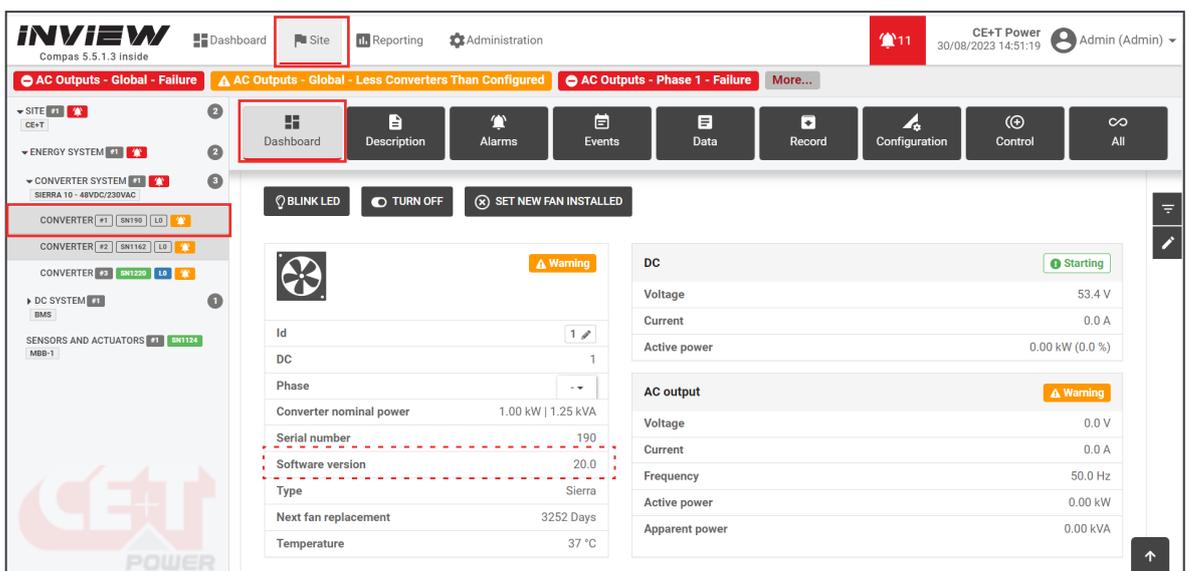
Go to *Site > Converter System > Configuration > System > Global*

In System section > **ID CF2** (Grid Standard), select the region from the drop-down list.



ID	NAME	VALUE
Global		
CF1	Topology	UPS for AC loads
CF2	Grid Standard	AustraliaB
AC		
CF6	Number of Phases	3

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

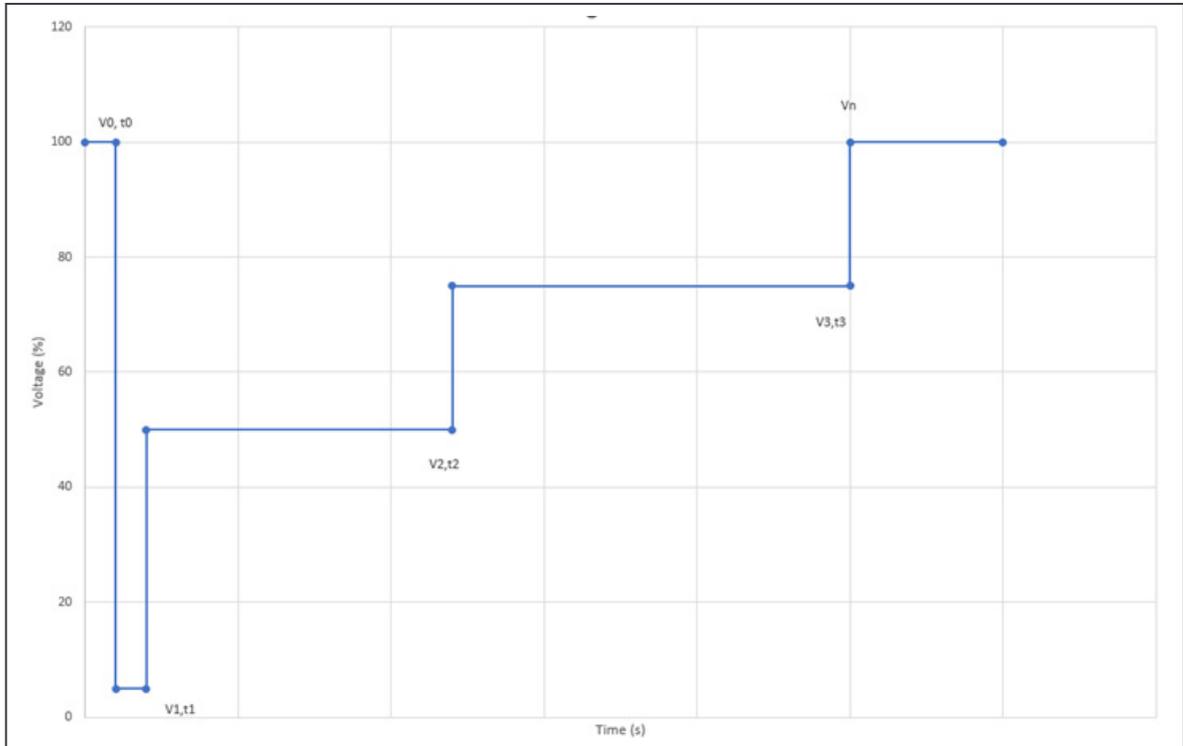


Field	Value
Id	1
DC	1
Phase	
Converter nominal power	1.00 kW 1.25 kVA
Serial number	190
Software version	20.0
Type	Sierra
Next fan replacement	3252 Days
Temperature	37 °C

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

Parameters name	Description	Units
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.
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 immediatly.	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.

8.13 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 adaptation 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	$P_n / (f_{stop-ch} - f_{Pmax})$		

8.14 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	$Pn/(f_{ULCO} - f_{transition})$		
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	$Pn/(f_{transition} - f_{Pmin})$		

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:

$$RESPONSE_TO_FREQ_SLOPE_2_pc_per_Hz = LSB_RESPONSE_TO_OVER_FREQ_SLOPE_2_pc_per_Hz + 256 * LSB_RESPONSE_TO_OVER_FREQ_SLOPE_2_pc_per_Hz$$

$$RESPONSE_TO_OVER_FREQ_MODE = LSB_RESPONSE_TO_OVER_FREQ_MODE + 256 * MSB_RESPONSE_TO_OVER_FREQ_SLOPE_pc_per_Hz$$

$$RESPONSE_TO_UNDER_FREQ_MODE = LSB_RESPONSE_TO_UNDER_FREQ_MODE + 256 * MSB_RESPONSE_TO_UNDER_FREQ_SLOPE_pc_per_Hz$$

8.15 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.

8.16 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.

8.17 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 utilization 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.

8.18 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.

8.19 Activation of protection settings

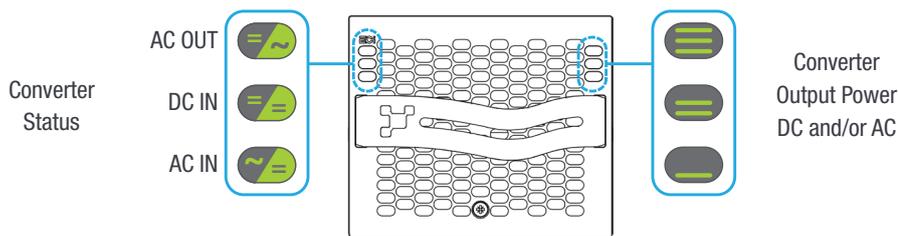
The inverter does not operate the automatic disconnection device to connect until a regional setting has been selected and activated by an authorized person. Where the inverter does not connect due to no selection or activation of a regional configuration, the inverter provides a visible alert. The inverter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

8.20 Generation control function

The generation control function is not provided in this system.

9. Operation

9.1 Converter module



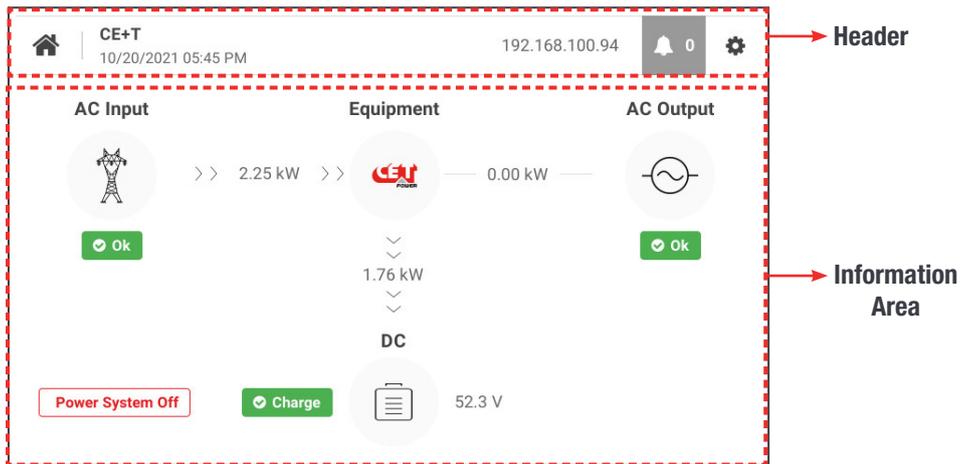
Converter Status LED	Description	Remedial action
OFF	No input power or forced stop	Check environment
Permanent green	Normal Operation	
Blinking green	Converter OK but working conditions are not fulfilled to operate properly	
Blinking green/orange alternatively	Recovery mode after boost (10 In short circuit 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)						Output Power (redundancy not counted)
<5%	5% to 40%	40 to 80%	80 to 95%	100%	100% = overload	
×	×	×	≡	≡	≡	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.

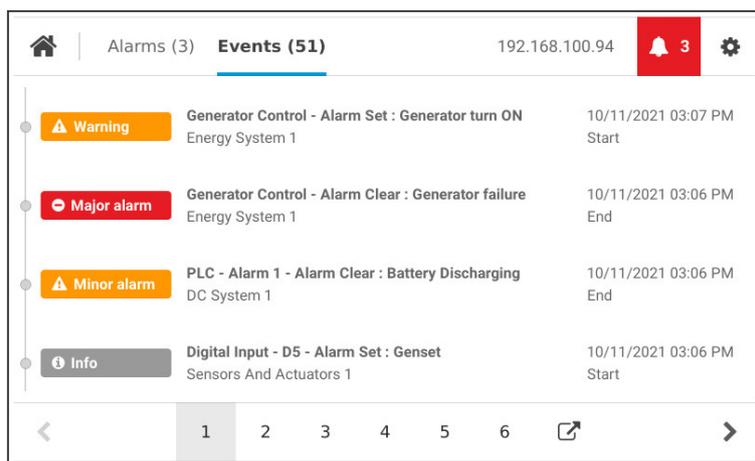
Note: Interface graphics and layout may change based on firmware version.



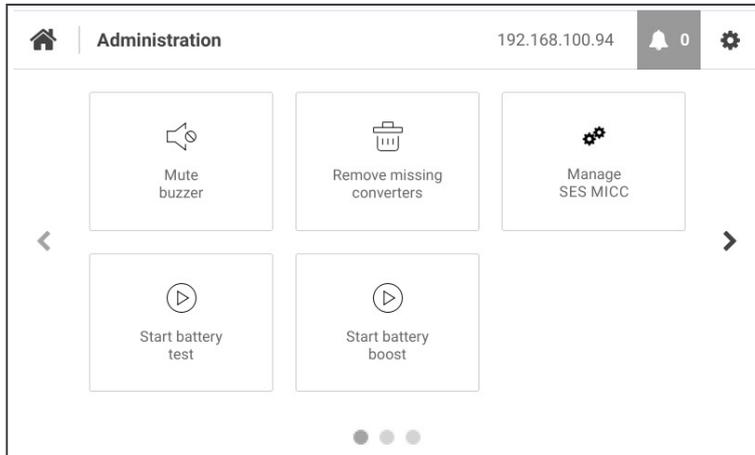
- **Header**

Displays the title of the corresponding and IP address of the system. It also has three icons for navigating to different screens.

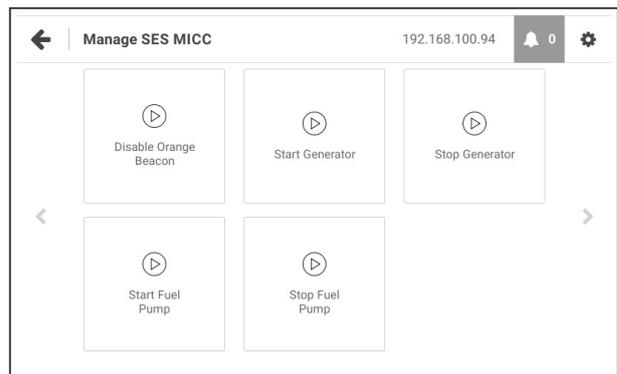
- **Home:** Tapping on  goes to the home screen from any screen you are accessing in the interface.
- **Events:** Tapping on  goes to Alarms and Events screen.



- **Administration:** Tapping on  provide access to different action screens.

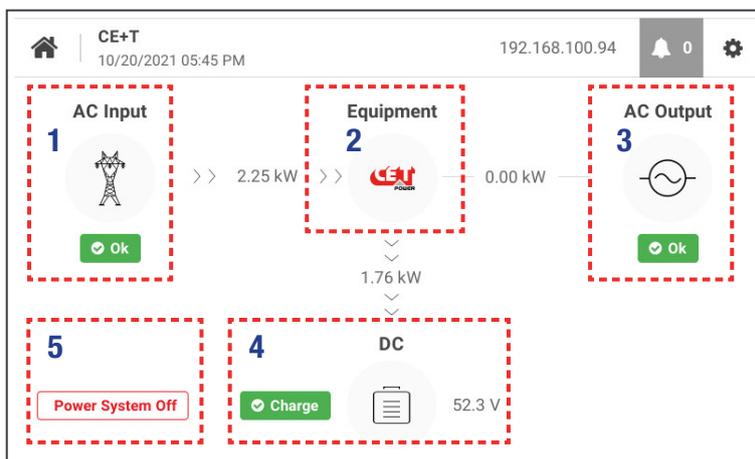


- **Mute buzzer:** Buzzer sound will be muted
- **Remove missing converters:** removes all the non-active modules from the list
- **Manage SES MICC:** provide access to *Disable Orange Beacon*, *Start and Stop Generator*, and *Start and Stop Fuel Pump* actions
- Start battery test
- Start battery boost

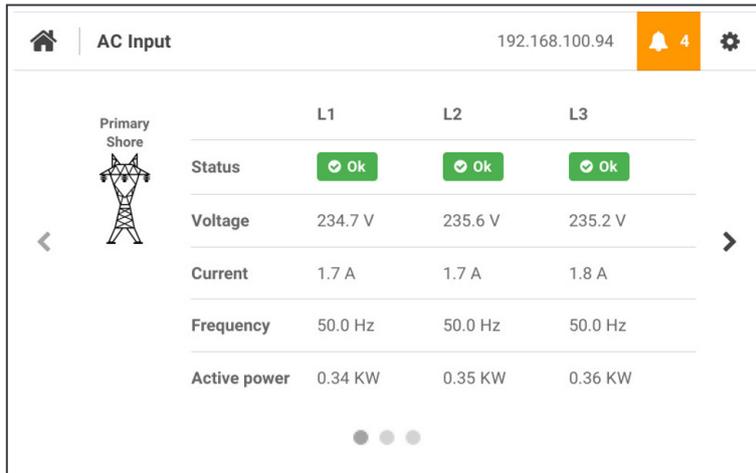


- **Information Area**

It provides information about the corresponding screen. In some screens, left and right navigation buttons appear, indicating more screens are present.



- 1 → Tapping on the **AC Input region** displays the page containing all measurements of AC Inputs from Primary shore, Diesel Generator and Secondary shore.

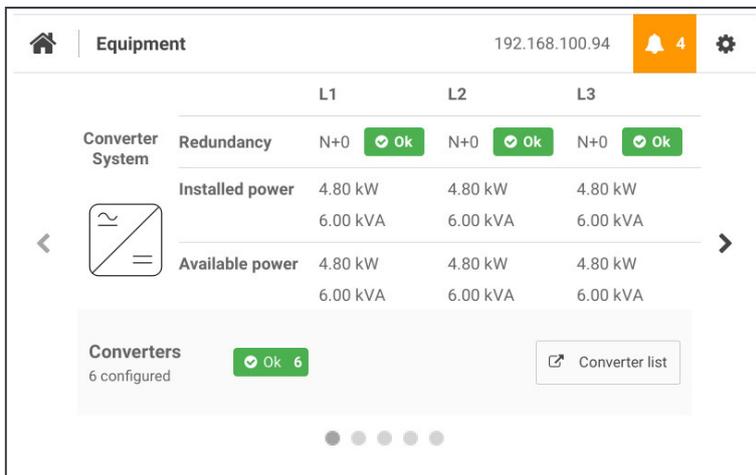


	L1	L2	L3
Status	Ok	Ok	Ok
Voltage	234.7 V	235.6 V	235.2 V
Current	1.7 A	1.7 A	1.8 A
Frequency	50.0 Hz	50.0 Hz	50.0 Hz
Active power	0.34 KW	0.35 KW	0.36 KW

Tap the right navigation arrow to go Diesel Generator and Secondary Shore screens.

- 2 → Tapping on the **Equipment region** displays the page containing each Converter system and Sensor & Actuator.

- Converter System (Primary shore, Diesel Generator and Secondary shore):
 - Redundancy, Installed and Available power
 - Configured and Active converters.

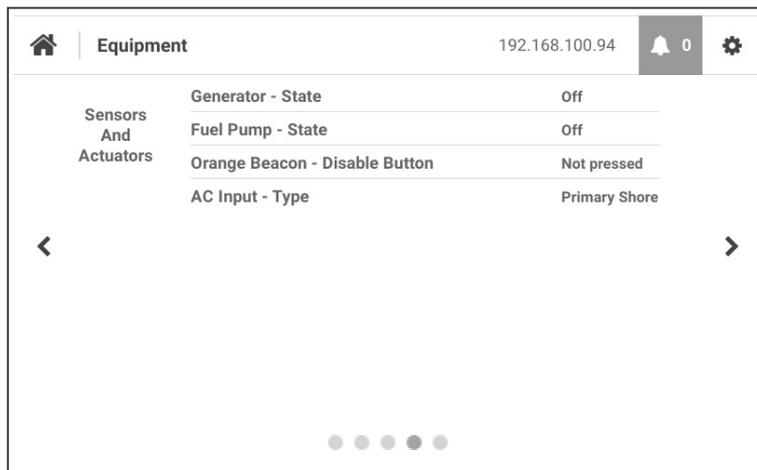


	L1	L2	L3
Converter System Redundancy	N+0 Ok	N+0 Ok	N+0 Ok
Installed power	4.80 kW 6.00 kVA	4.80 kW 6.00 kVA	4.80 kW 6.00 kVA
Available power	4.80 kW 6.00 kVA	4.80 kW 6.00 kVA	4.80 kW 6.00 kVA

Converters: 6 configured, Ok 6

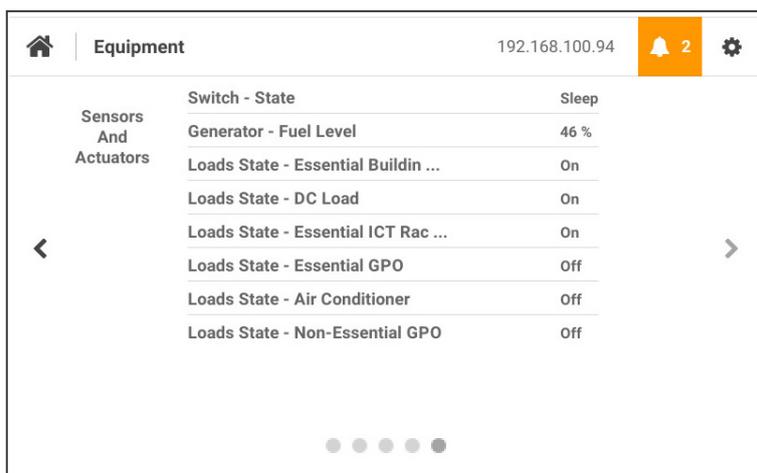
Tap the right navigation arrow to go other two Converter Systems and Sensor and actuators screens.

- Sensor and Actuators 1:
 - Generator state (On, Off or Failure)
 - Fuel pump state (On, Off or Failure)
 - Orange beacon disable button (Pressed or not)
 - AC input type (Genset, primary or secondary shore)



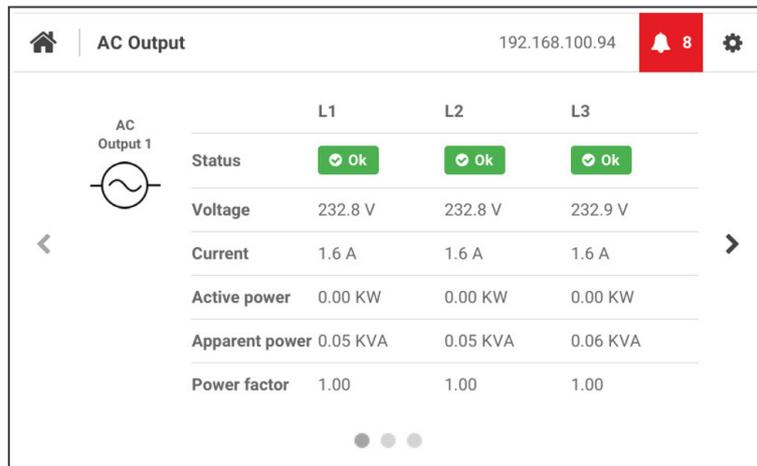
Tap the right navigation arrow to go **Sensor and Actuators 2** and left to **Converter System** screens.

- Sensor and Actuators 2:
 - Operating Mode (On, Sleep or Off)
 - Fuel level
 - Loads state (On or Off)



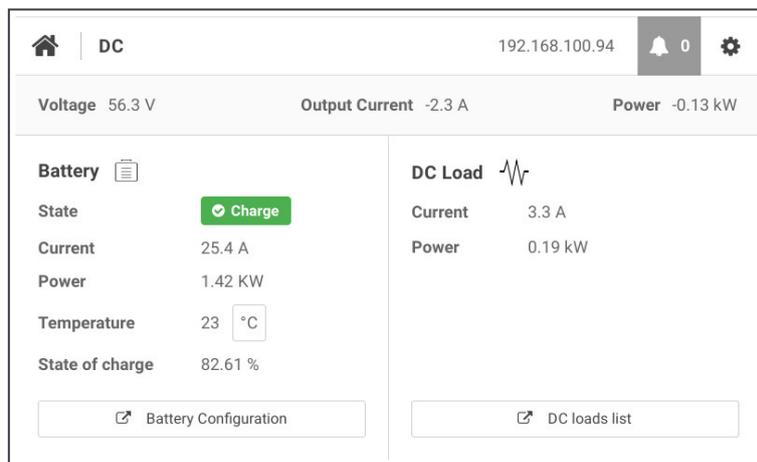
Tap the left navigation arrow to go **Sensor and Actuators 1** and **Converter System** screens.

- 3 → Tapping on the **AC Output region** displays the page contains all measurements regarding all three AC Outputs. Regardless of the system configuration (1P, 3P), it shows the power fed to the load on each phase.



Tap the right navigation arrow to go AC Output 2 and 3 screens.

- 4 → Tapping on the DC region displays the page contains all measurements regarding Battery and DC Load. From this screen, you can go to the **Battery configuration** and **DC loads list**.



On this page, the values are the sum of all batteries and the sum of DC Load.

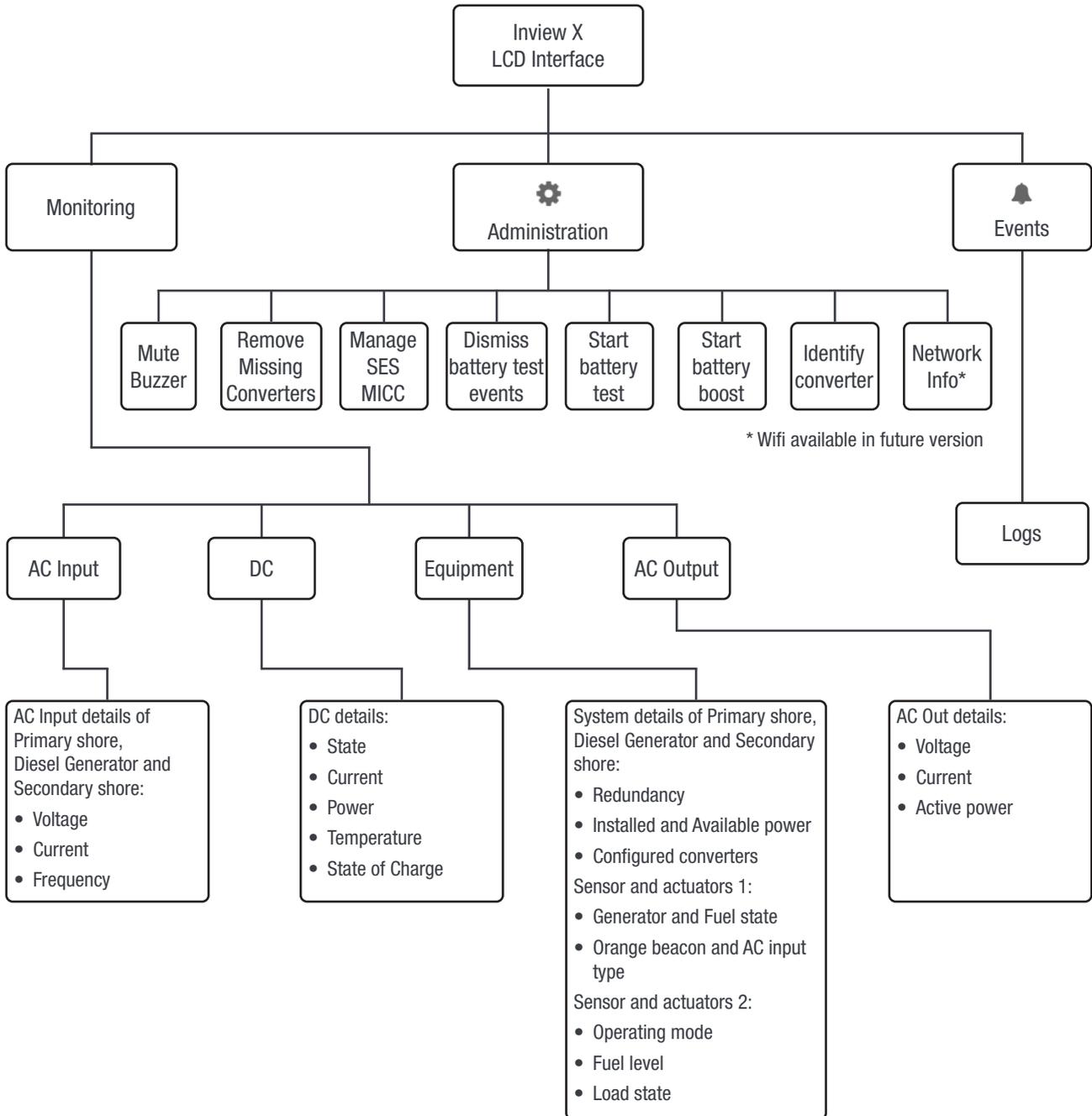
It also shows the battery state as:

- Charge/Discharge
- **Unknown:** if all children battery state unknown or measurements missing
- **Disconnected:** if all children battery state disconnected or battery disconnect open (AL302)
- **Error:** if at least one child battery state Unknown, Disconnected, Error or any DC system critical/major alarm
- **Warning:** if at least one child battery state warning or any DC system Minor alarm, Warning or Error

- 5 → **Operating mode:** Displays system operation such as *Power System ON*, *Power System Sleep* and *Power System Off*.

9.2.1 Menu structure

The below tree provides 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.

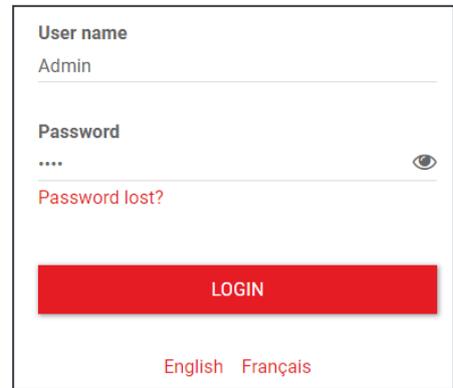
9.3.1 Login

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.

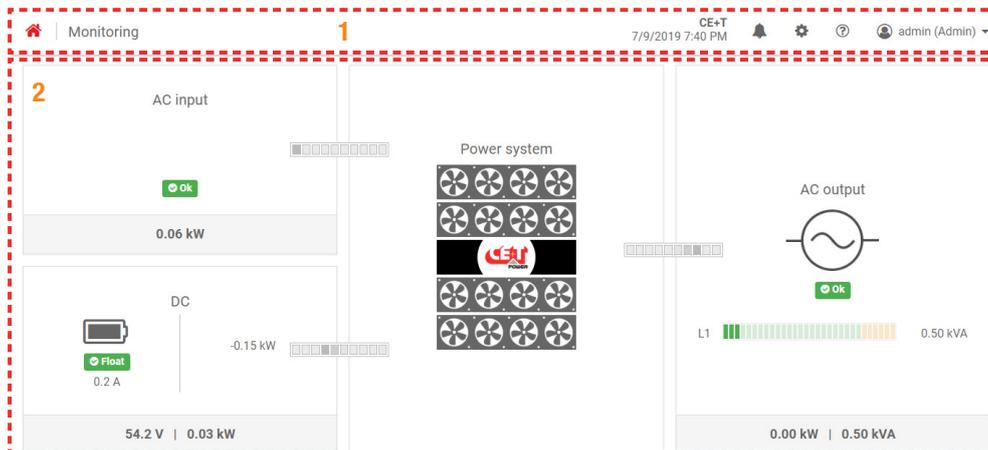


The screenshot shows a login form with the following elements:

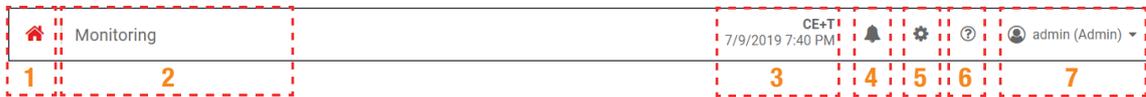
- User name:** A text input field containing "Admin".
- Password:** A text input field with masked characters "...." and a toggle icon for visibility.
- Password lost?:** A red text link below the password field.
- LOGIN:** A prominent red button.
- Language:** Links for "English" and "Français" at the bottom.

9.3.2 Interface Areas

- 1 → Header
- 2 → Main Page



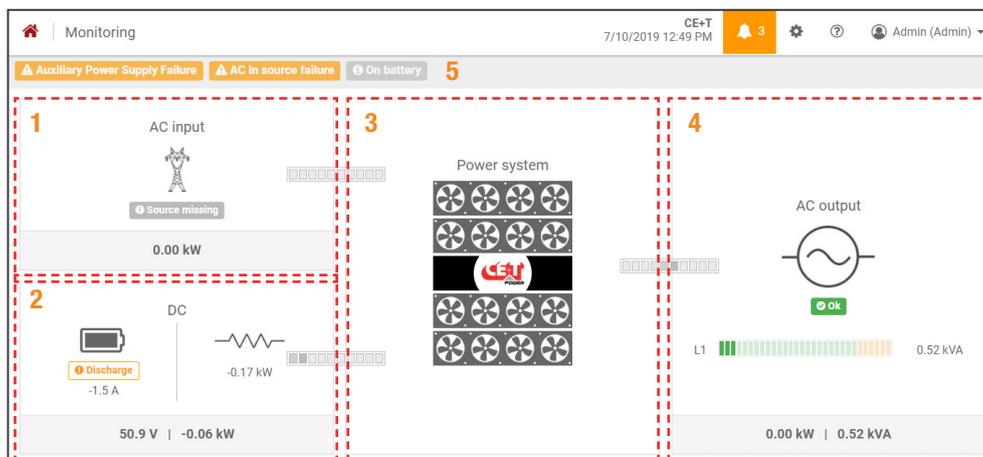
9.3.2.1 Header



The tabs in header provide quick access to the corresponding pages.

- 1 → **Home:** Clicking on  goes to the home page from any page you are accessing in the interface.
- 2 → **Breadcrumbs:** Provide navigation of the page. It trails all levels so that user can know where you are within the interface and can go to any previous menu.
- 3 → Display the date, time and the site name of the system.
- 4 → **Events:** Clicking on  goes to Events and Logs page.
- 5 → **Settings:** Clicking on  provides access to Users, Parameters and Maintenance pages.
- 6 → **Info:** Clicking on  in the home page, provides brief information about the system, while in other pages provide the latest three ongoing events.
- 7 → **Account:** Provides the information of which account is logged in (Basic, Expert or Admin). Clicking on drop-down arrow user can access the following pages:
 - **Administration** - Provide quick access to Users, Parameters and Maintenance pages.
Note: Administration page will only be visible when logged in as Expert.
 - **About** - Provides the information of Inview product details and network connectivity details.
 - **Logout** - An act of logging out of an Inview X.

9.3.2.2 Home Page



- 1 → **AC Input:** Clicking on the AC Input region displays the page containing all measurements of AC Input.
- 2 → **DC:** Clicking on the DC region displays the page containing all measurements of Battery and DC Output.

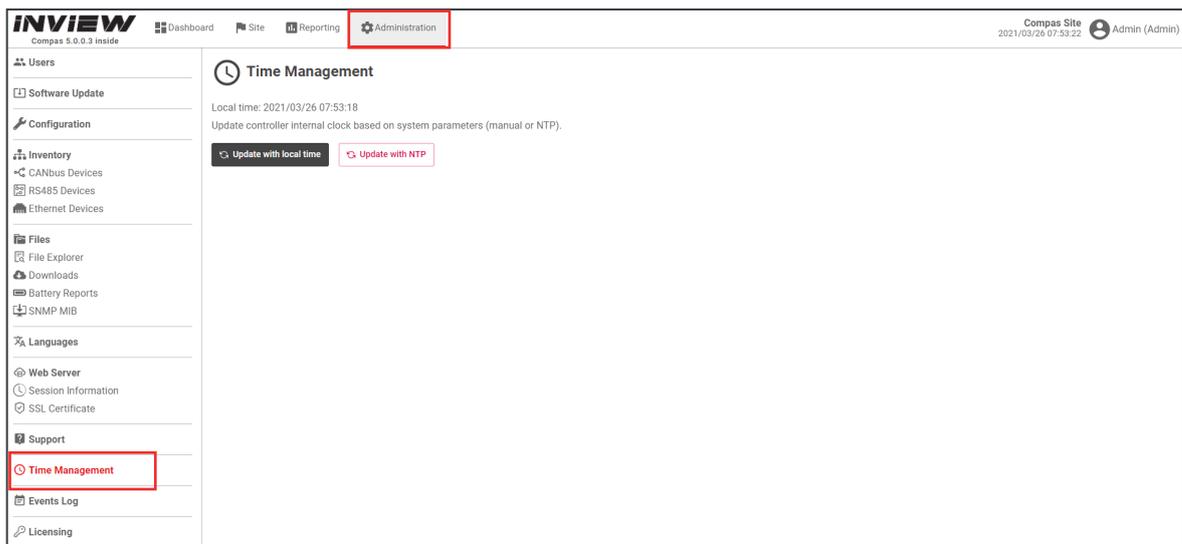
- 3 → **Power System:** Clicking on the Power System region displays the page containing system information such as overall system power and also in each phase, configured modules, active modules, and list of detected modules and accessories.
- 4 → **AC Output:** Clicking on the AC Output region displays the page contain all measurements of AC Output. Regardless of the system configuration (1P, 3P), display the power fed to the load on each phase.
- 5 → **Notifications:** Display the current generated alarms and events.

9.3.3 Date and Time Settings

Go to [Administration > Time Management](#).

Choose any one option from the below.

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



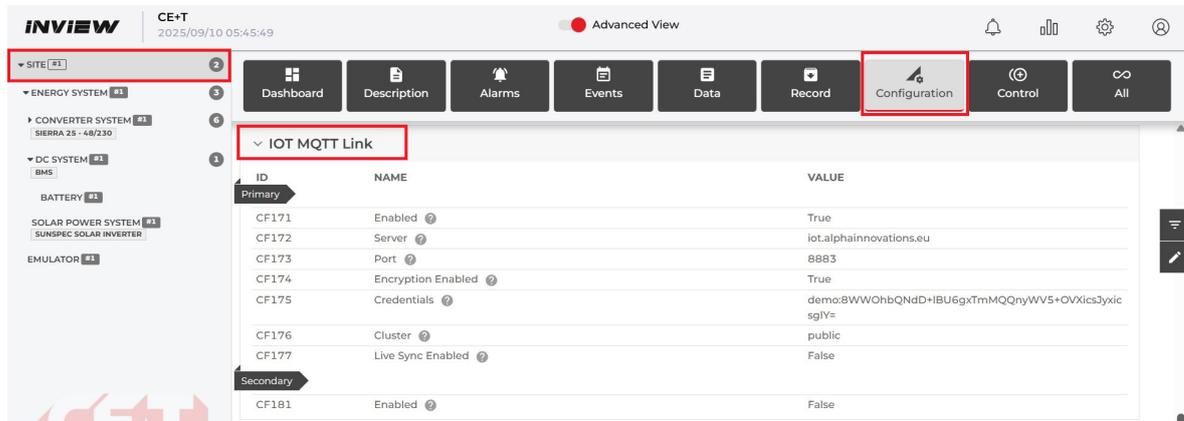
Note: For more information on the Inview display, refer to the Inview manual available upon request.

9.3.4 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 22.

Go to *Site > Configuration > IOT MQTT Link*.

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.



ID	NAME	VALUE
Primary		
CF171	Enabled	True
CF172	Server	iot.alphainnovations.eu
CF173	Port	8883
CF174	Encryption Enabled	True
CF175	Credentials	demo:8WWOhbQNdD+IBU6gxTmMQQnyWV5+OVXicsJysic sglV=
CF176	Cluster	public
CF177	Live Sync Enabled	False
Secondary		
CF181	Enabled	False

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. Inserting/removing/replacing - modules

10.1 Sierra Converter

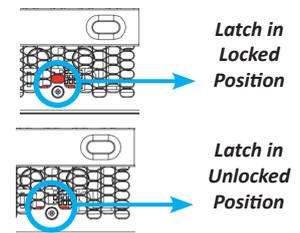
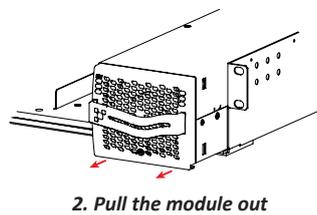
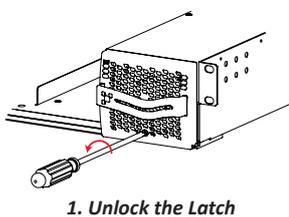
- The Sierra converter is hot swappable.
- When a new module is inserted in a live system it automatically takes the working set of parameters.
- When a new module is inserted in a live system it is automatically assigned to the next available address.

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

10.1.1 Removal

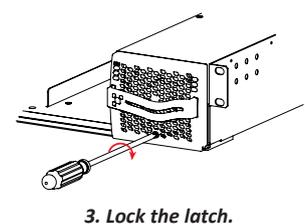
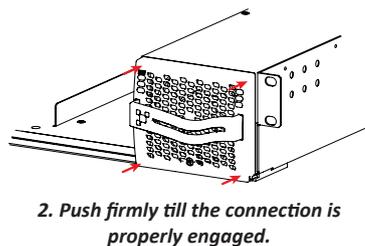
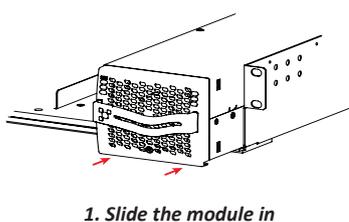
Caution: When one or several converter modules is/are removed, possible to access the live parts. So, replace the module(s) with dummy modules without delay.

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 Inserting

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.

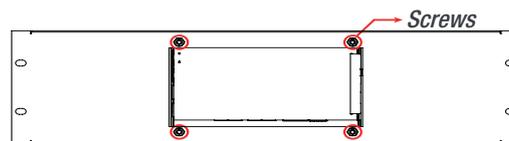


10.2 Inview X

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.

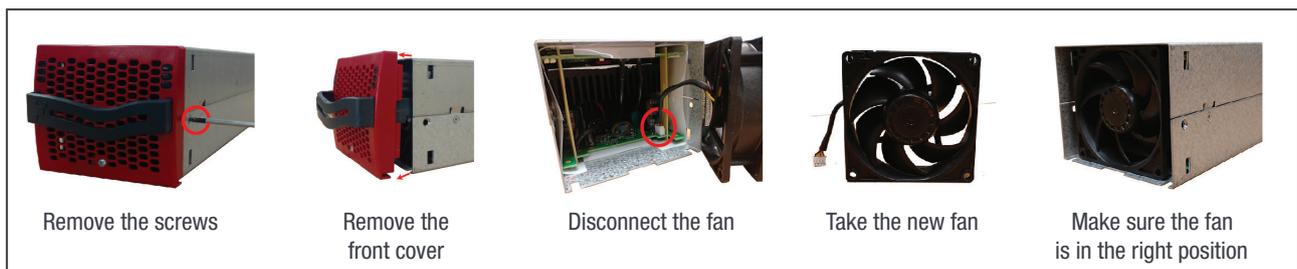


Fix it with four screws

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 & 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 ensure the cables routed from top through duct which is inside the system.)		
4	Ensure system is de-energized (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	Ensure 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. Trouble shooting

13.1 Trouble shooting

Converter module does not power up:	<ul style="list-style-type: none"> 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:	<ul style="list-style-type: none"> Check that Inview X is present and properly inserted Check remote ON/OFF terminal Check the configuration and setting Check threshold level
Converter only run on AC or DC:	<ul style="list-style-type: none"> 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:	<ul style="list-style-type: none"> Check output breaker
All OK but I have alarm:	<ul style="list-style-type: none"> Check configuration file and correct No of modules Download/clear log file
No output alarm:	<ul style="list-style-type: none"> Check the default time delay (UA "Major Alarm" - 60s, NUA "Minor Alarm" - 30s) Check configuration file
No information on display:	<ul style="list-style-type: none"> Check that Inview X is present and properly inserted

13.2 Defective modules

Unless input power is down, all LED's on each module should be green (see section 9, page 55). No light, orange light, red or flashing light are abnormal conditions. Collect and record the module information. If no fix can be found, replace the module.

13.2.1 Replacing modules

Refer to section 10, page 67 to remove and re-insert modules.

13.2.2 Return defective Inview controller

If no display in the Inview or no communication with the laptop is evidence of failure, proceed as per section 13.2.4, page 75.

13.2.3 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 13.2.4, page 75.

13.2.4 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.

13.2.5 Return defective batteries

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

13.3 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
Sierra 25 - 380/230-277 Power Module	T721D70201	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 (e.g., 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

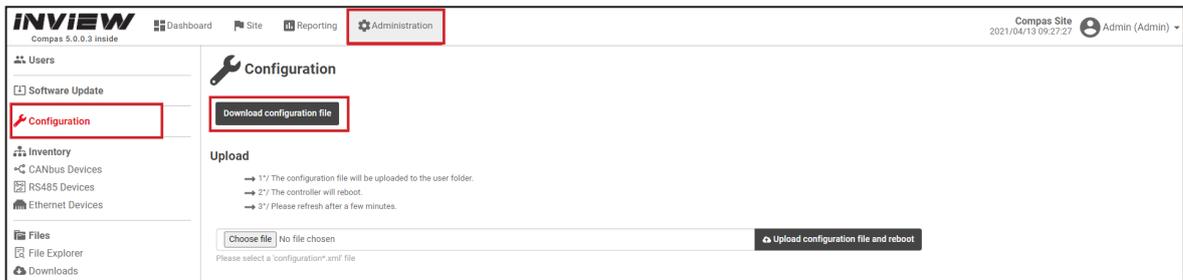
16.1 Inview X

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.



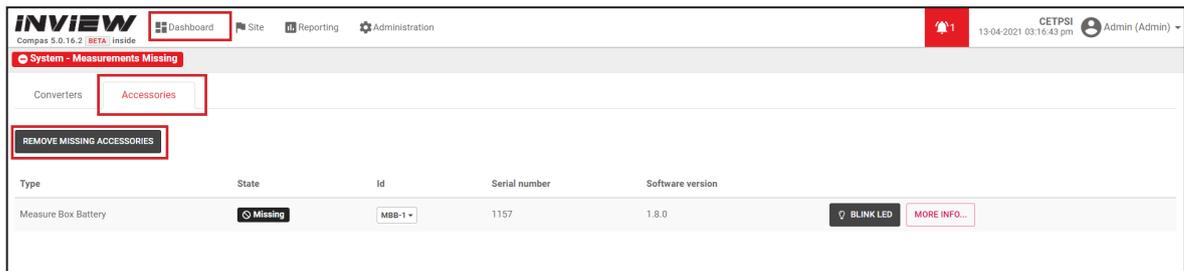
2. Remove the existing controller and install the new controller. To know about installing it and its hardware connections, refer to the section 10.2, page 68.
3. Power on the controller and login as admin privileged account.
4. Go to *Administration > Configuration*, click “Choose file” button, and 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.
2. Clear from the accessories list: go to *Dashboard > Power system > Accessories* and click “REMOVE MISSING ACCESSORIES” button to clear it from the list.

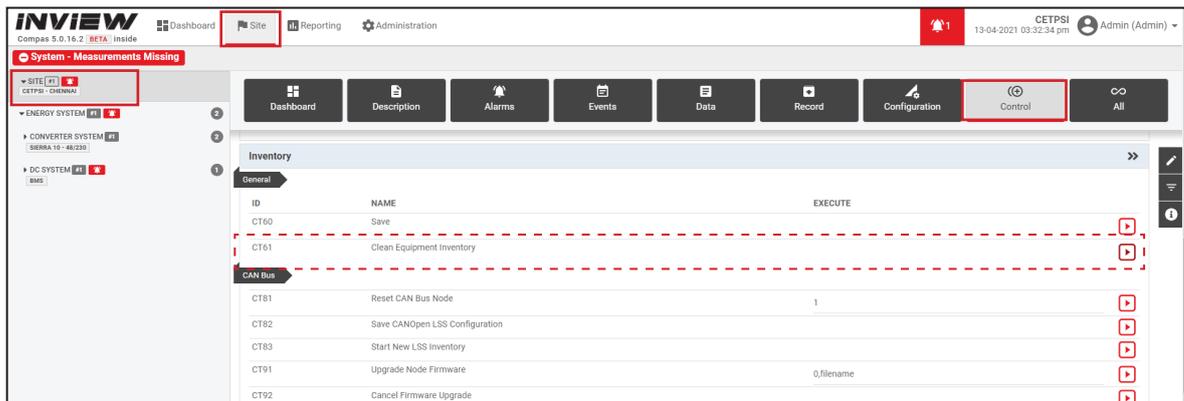


The screenshot shows the INVIEW web interface. The top navigation bar includes 'Dashboard', 'Site', 'Reporting', and 'Administration'. A red box highlights the 'Accessories' tab in the 'System - Measurements Missing' section. Below the tabs, a table lists accessories. The first row is highlighted with a red dashed box and contains the following data:

Type	State	Id	Serial number	Software version
Measure Box Battery	Missing	MBB-1	1157	1.8.0

A button labeled 'REMOVE MISSING ACCESSORIES' is highlighted with a red box above the table.

3. 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.

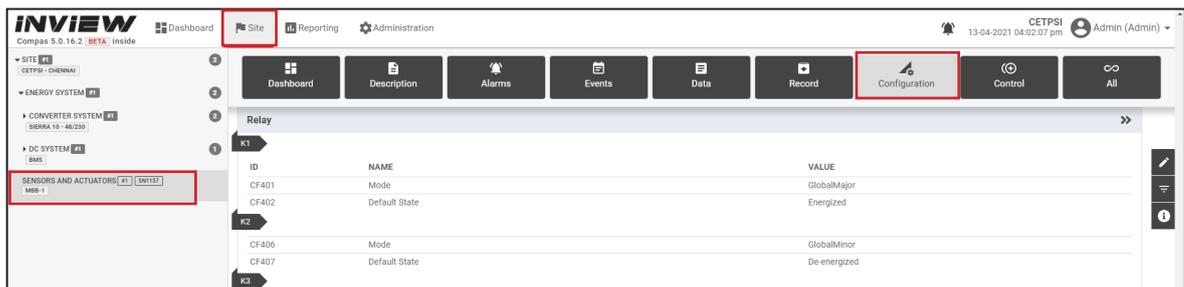


The screenshot shows the INVIEW web interface. The top navigation bar includes 'Dashboard', 'Description', 'Alarms', 'Events', 'Data', 'Record', 'Configuration', 'Control', and 'All'. A red box highlights the 'Control' tab. Below the tabs, the 'Inventory' section is visible. A table lists inventory items with columns for ID, NAME, and EXECUTE. The row for ID CT61 is highlighted with a red dashed box and contains the following data:

ID	NAME	EXECUTE
CT60	Save	
CT61	Clean Equipment Inventory	

A red square icon with a white X is visible to the right of the CT61 row.

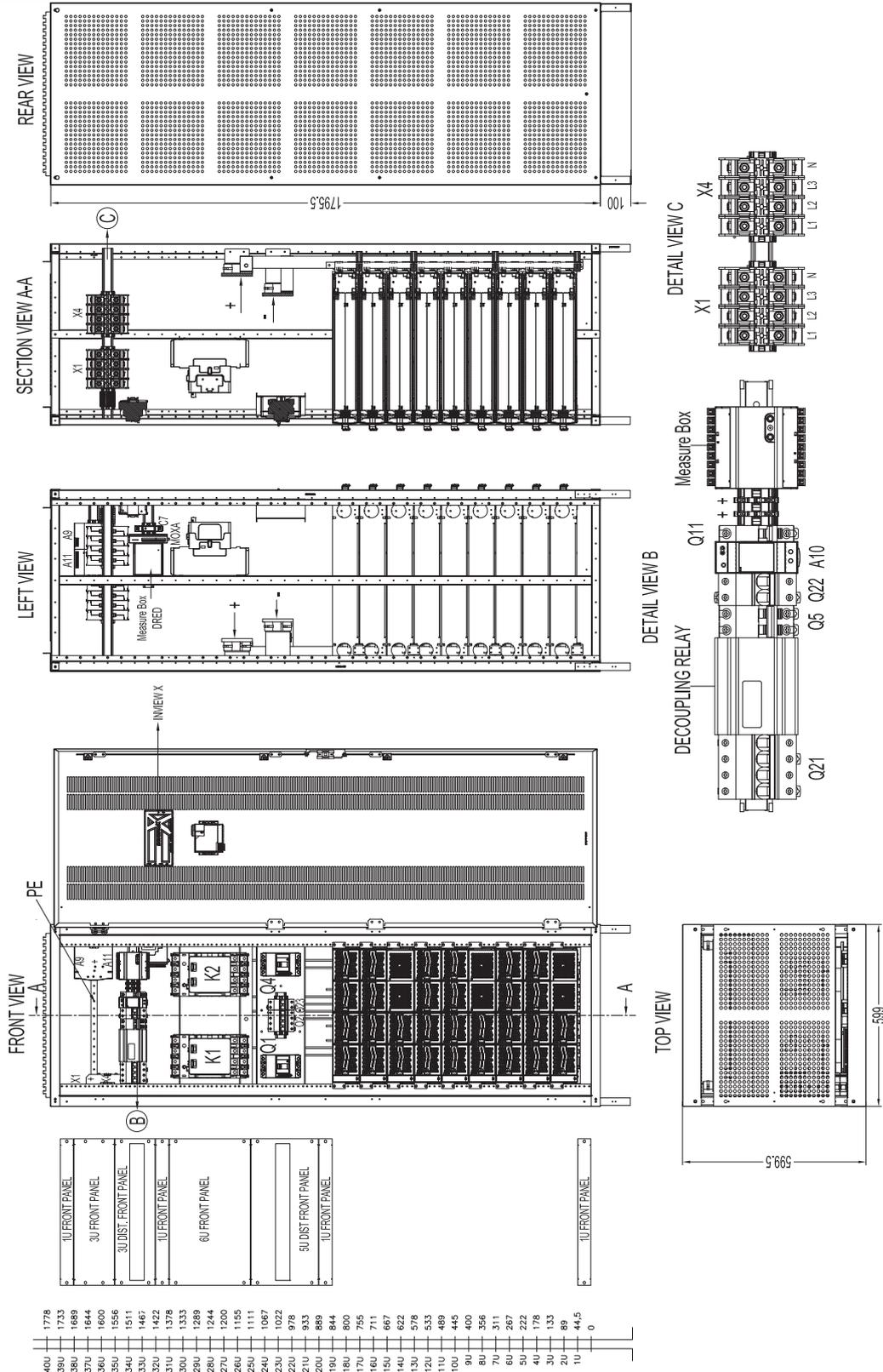
4. Connect the new MBB in the system. To know about the hardware connections, refer to the section 6.4, page 23.
5. Once the MBB is powered on, make sure it was detected and listed in the *Accessories* list (*Dashboard > Power system > Accessories*)
6. Go to *Site > Sensors and Actuators*, scroll down to *Relay* and *Digital Input* section, and verify the mappings are done correctly.



The screenshot shows the INVIEW web interface. The top navigation bar includes 'Dashboard', 'Description', 'Alarms', 'Events', 'Data', 'Record', 'Configuration', 'Control', and 'All'. A red box highlights the 'Configuration' tab. Below the tabs, the 'Relay' section is visible. A table lists relay configurations with columns for ID, NAME, and VALUE. The table is grouped into sections K1, K2, and K3. The data is as follows:

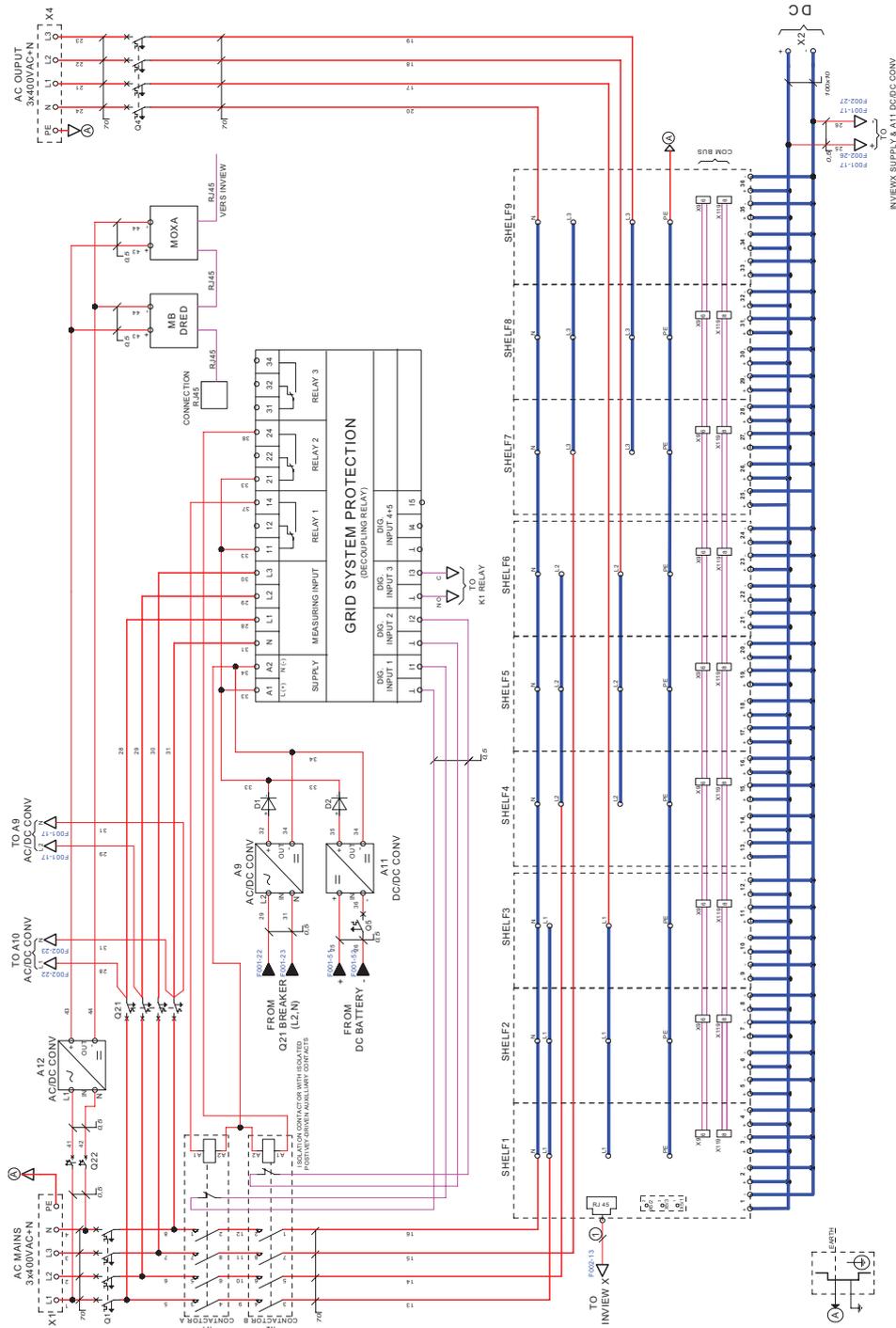
ID	NAME	VALUE
CF401	Mode	GlobalMajor
CF402	Default State	Energized
CF406	Mode	GlobalMinor
CF407	Default State	De-energized

17. Mechanical Diagrams

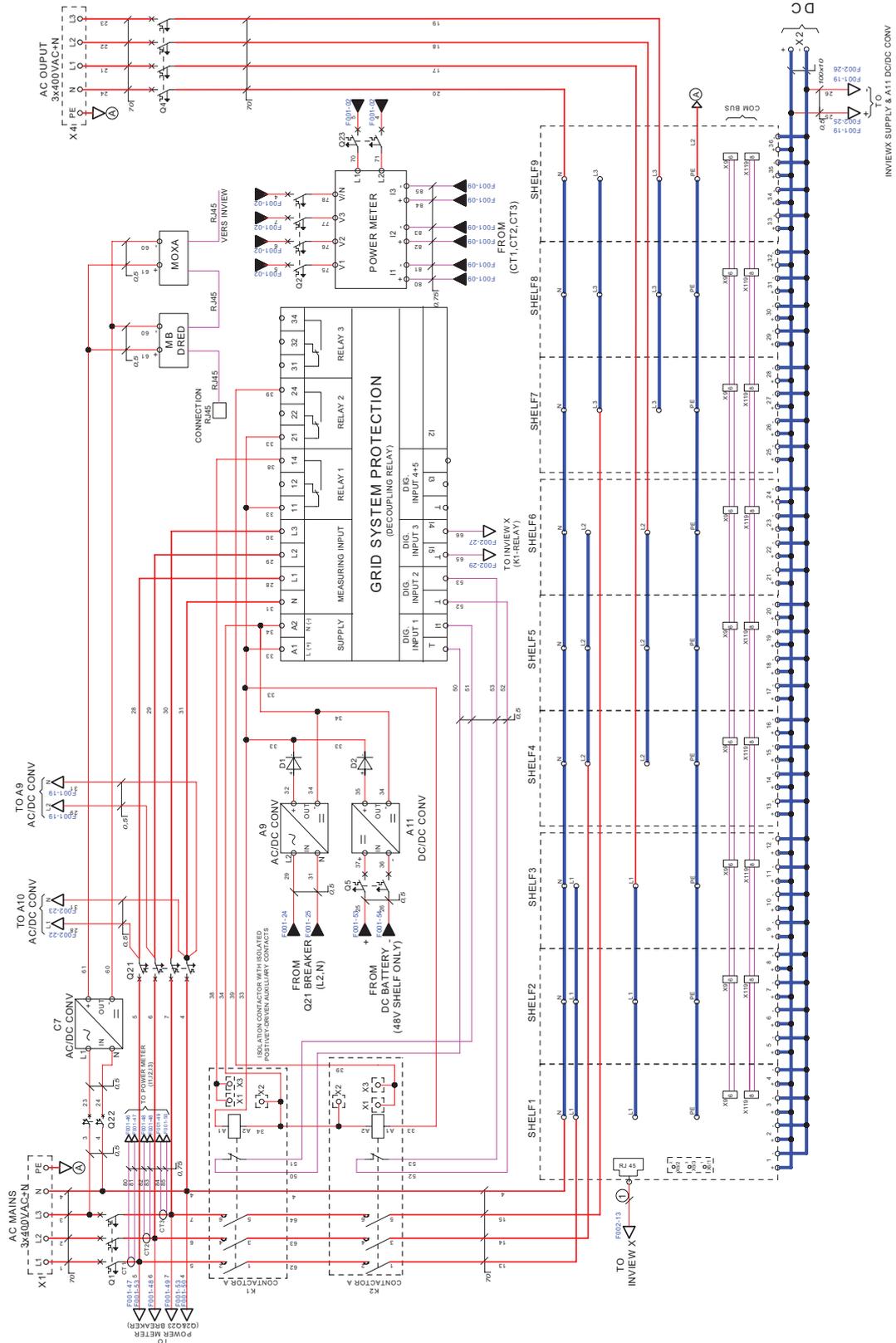


18. Electrical Diagrams

18.1 System Connections (TN+S)



18.2 System Connections (TN-C-S)



18.3 Inview X and GW Connections

