Leading Conversion Technology for Power Resilience

FLEXA 200 - UPS SYSTEMS

20 to 640 kVA/kW

User Manual V3.0

RE-INVENTING THE MODULAR UPS

THE NEW GENERATION OF POWER CONVERTERS

- SELECTIVITY
  Adapted response to short circuit and overload
- VERSATILE CHARGING
  Short or long backup recovery time at no extra cost
- BATTERY SUSTAINABILITY
  Qualitative charging for longer battery life expectancy
- HARSHEST AC INPUT CONDITIONS
  Without compromising the quality of the AC output

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Leading Conversion Technology for Power Resilience

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Release Note:

Version	Release date (DD/MM/YYYY)	Modified page number	Modifications
1.0	11/05/2020	-	First release of the Manual
1.1	22/03/2021	35	Updated DC group details
2.0	07/12/2022	-	Added 3ph/1ph information
3.0	12/10/2023	-	Replaced CATENA with INVIEW X

1. Introduction to CE+T

CE+T Power designs, manufactures and markets a range of products for industrial operators with mission critical applications, who are not satisfied with existing AC and DC backup systems performances, and related maintenance costs.

Our product is an innovative AC and DC backup solution that unlike most used UPS's

- Maximizes the operator's applications uptime;
- Operates with lowest OPEX;
- Provides best protection to disturbances;
- Optimizes footprint.

Our systems are:

- Modular
- Truly redundant
- Highly efficient
- Maintenance free
- Battery friendly

CE+T power puts 60+ years expertise in power conversion together with worldwide presence to provide customized solutions and extended service 24/7 - 365.

2. Abbreviations

AC	Alternating current
CB	Circuit Breaker
DC	Direct current
DHCP	Dynamic Host Configuration Protocol
DSP	Digital Signal Processor
EPC	Enhanced Power Conversion
ESD	Electro Static Discharge
ETH	Ethernet
HTTP	HyperText Transfer Protocol
HTTPS	Secure HyperText Transfer Protocol
LAN	Local Access Network
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)
PWR	Power
REG	Regular
SNMP	Simple Network Management Protocol
TCP/IP	Transmission Control Protocol/Internet Protocol
TRS	True Redundant Structure
TSI	Twin Sine Innovation
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, outdoor or indoor, it is important to:

- Install an appropriate filter on the enclosure door, or on the room's air conditioning system.
- Keep the enclosure door closed during operation.
- Replace the filters on a regular basis.

Important Safety Instructions and 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 skilled technicians according to local regulations.
- Warranty does not apply if the product is not installed, used and handled according to the instructions in the manuals.

3.2 Technical care

- This electric 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 electrical 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 should know how to lock out and tag out machines, so the machines will not accidentally be turned on and injure employees working on them.
- Qualified employees also understand safety related work practices, including those by OSHA and NFPA, as well as knowing what personal protective equipment should be worn.
- All operators are to be trained to perform the emergency shut-down procedure.
- Operating ambient temperature is -20°C to 50°C.
- This unit is intended for installation in a temperature-regulated, indoor area that is relatively free of conductive contaminants.
- Never wear metallic objects such as rings, watches, or bracelets during installation, service or maintenance of the product.
- This product is suitable for use in a computer room.

* These instructions are valid for most CE+T Products/Systems. Some points might however not be valid for the product described in this manual

- 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 only with same type and rating of fuse.
- Insulated tools must be used at all times when working with live systems.
- When handling the system/units pay attention to sharp edges.

3.3 Installation

- This product is intended to be installed only in a restricted access area as accordance with the National Electrical Code ANSI/NFPA 70, or equivalent local agencies.
- The system may contain output over-current protection in the form of circuit breakers. In addition to these circuit breakers, the user must observe the recommended 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 system rack is a dual input power supply. The complete system shall be wired in a way that both input and output leads can be made power free in a single action.
- In EPC mode, if the AC IN put is not connected, then to comply with local and international safety standards N (output) and PE shall be bonded. The bonded between N output and L must be removed once the AC input is being connected.
- When AC Mains is not connected, the output AC circuit is considered as a separately-derived source. If local codes require grounding of this circuit, use the identified terminal for bonding this circuit to the enclosure. Ground the enclosure to a suitable grounding electrode in accordance with local code requirements.
- Use 90°C copper wires / conductors only.
- AC and DC circuits shall be terminated with no voltage / power applied.
- The safety standard IEC/EN62040-1-1 requires that, in the event of an output short circuit, the converter must disconnect in 5 seconds. The parameter can be adjusted on monitoring ; 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. Default setting is 60 seconds.
- All illustrations in the manual are for general reference, refer to the technical drawing which is received along with the system for exact information.

3.3.1 Handling

- The cabinet shall not be lifted using lifting eyes.
- Remove weight from the cabinet by unplugging the converters. Mark converters clearly with shelf and position for correct rebuild.
- The converter slots must not be left open. Replace with a dummy cover or front plate. A minimum of two people are required to handle modules.

3.3.2 Surge and Transients

The mains (AC) supply of the modular converter system shall be fitted with Surge protective device (SPD) and Transient voltage surge suppression suitable for the application at hand. Manufacturer's recommendations of installation shall be adhered to. Selecting a device with an alarm relay for function failure is advised.

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

- Indoor sites Min Class II.
- Outdoor sites Min Class I + Class II or combined Class I+II.

Note:

Choosing and installing surge arrestors must obey to precise technical rules. Distance to equipment to protect, cable gage and cable routing have significant influence on proper device service.

Some areas are more susceptible to be hit by electrical strikes, especially when altitude increases.

Good earthing is also crucial for surge arrestors to work properly.

CE+T declines any liability in regard to damaged caused to equipment not correctly or not sufficiently protected.

3.3.3 Other

- Isolation test (Hi-Pot) must not be performed without instructions from the manufacturer.

3.4 Maintenance

- The converter system/rack can reach hazardous leakage currents. Earthing must be carried out prior to energizing the system. Earthing shall be made according to local regulations.
- Prior to any work conducted to a system/unit, make sure that AC input voltage and Battery are disconnected.
- Prior to accessing the system or modules, make sure all source of supply is disconnected.
  CAUTION – Risk of electric shock. Capacitors store hazardous energy. Do not remove cover until 5 minutes after disconnecting all sources of supply.
- Some components and terminals carry high voltage during operation. Contact may result in fatal injury.

3.5 Replacement and Dismantling

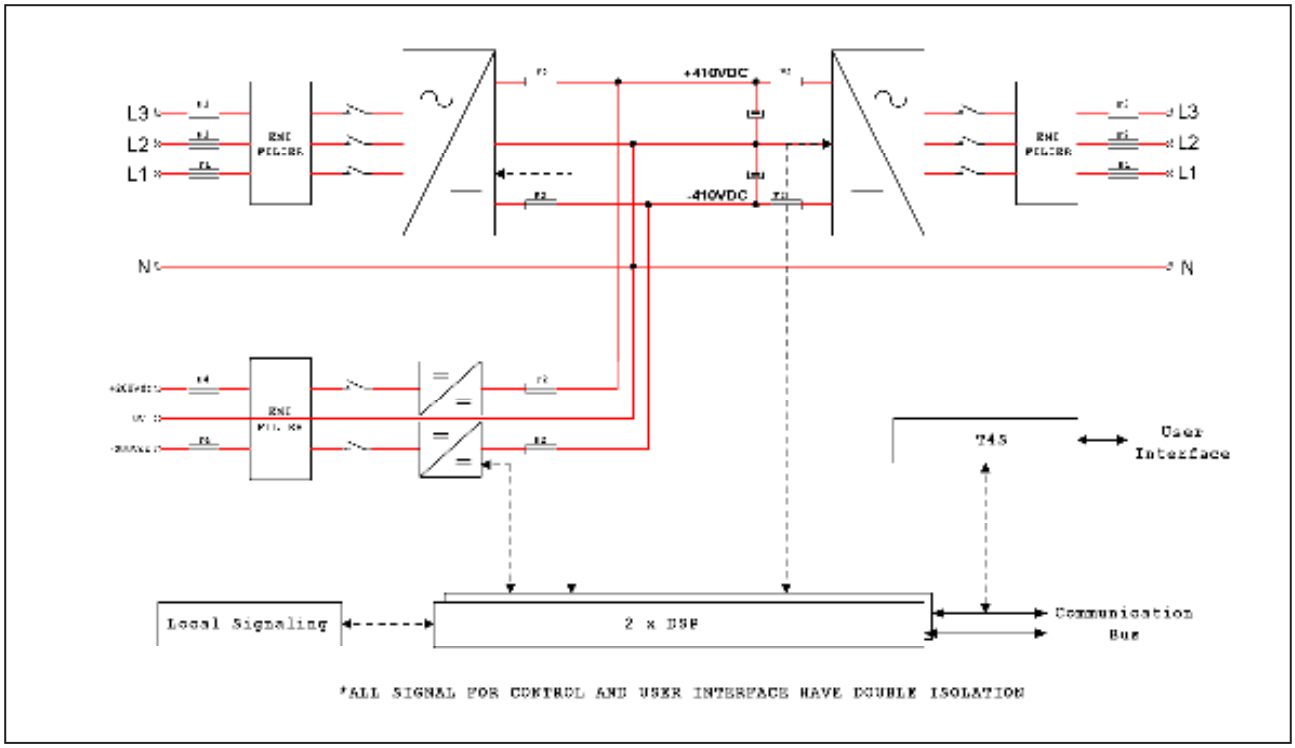
- ESD Strap must be worn while handling PCBs and open units. It is not recommended to open the modules at the site unless properly trained by CE+T.
- The UPS system/rack is not supplied with internal disconnect devices on input nor output.
- CE+T cannot be held responsible for disposal of the UPS system 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.

To download the latest documentation and software, please visit our website at www.cet-power.com

4. TSI Technology[1]

UPS modules carrying the TSI logo and the EPC mark are triple port converters (AC in, DC in, AC out). Sinusoidal output is converted from Mains or/and DC.

The block diagram here below gives an explicit description of the topology and operation.



The module is built around the following sub-converters

- AC to DC at input
- DC to DC at input
- DC to AC at output

The energy can flow either from the AC source or the DC source under the control of the local DSP controller. Thanks to internal energy buffering, the output sine wave is constant and disturbance free regardless of the active source.

The BOOST functionality multiples the nominal current to 2.4 x In times for a period of 20ms (max) in the event of down stream failures. The upstream breakers does not have to be oversized to prevent tripping. The overload capacity is 150% for 15 seconds.

The TSI works according to True Redundant Structure (TRS) that features decentralized and independent logic, redundant communication bus and three internal levels of disconnection to isolate a module after internal failure.

The functionality is included in every UPS module. Running them in parallel provides a modular system with, no single point of failure, always conditioned output, high system efficiency and 0ms source transfer time.

1 | Information and data given in this chapter intend to for an overview on the technology. Detailed features and parameters for each individual module type of the range may differ and should be referred in the dedicated data sheet.

5. Introduction

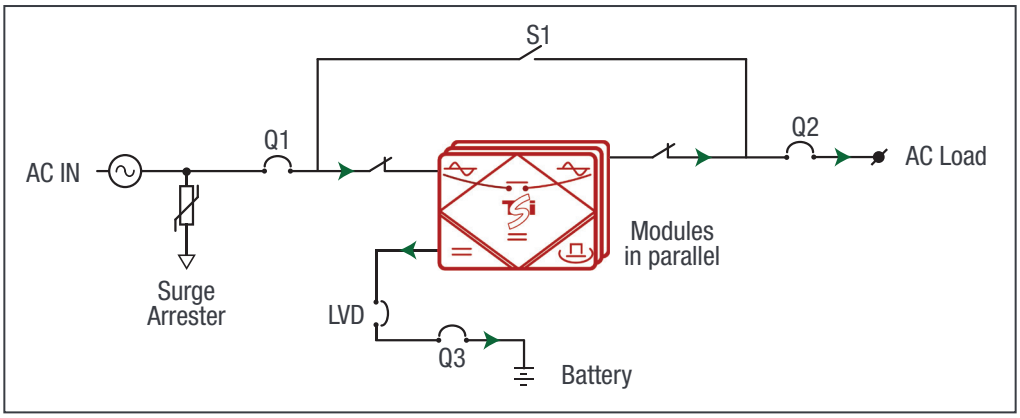
5.1 Overview

Flexa UPS system secure AC critical loads by taking energy from AC input (Grid) or Battery in case of AC mains failure. The system is specially designed to provide quality power, easy to access, and reliability.

Normal Mode (AC mode)

When AC input is present, the Flexa module takes energy from AC source to feed:

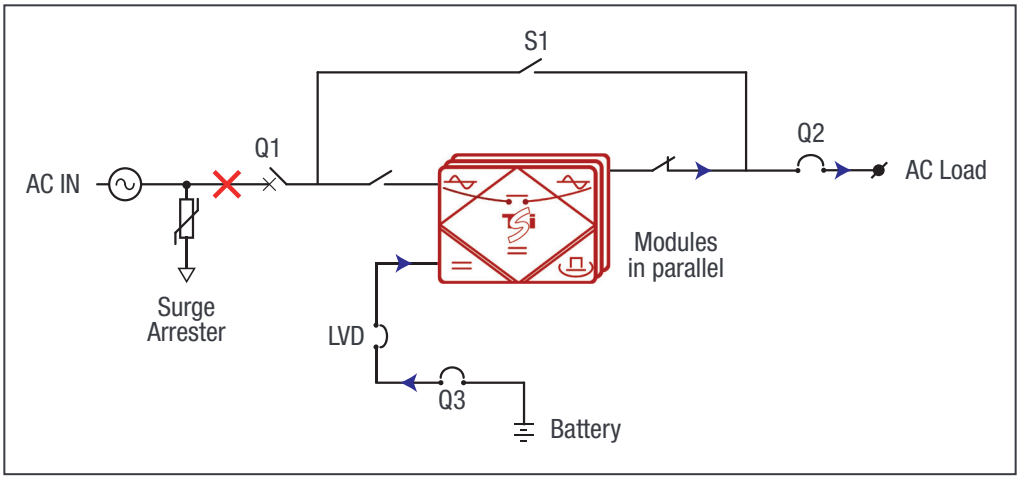
- AC Load via a double conversion to provide pure sinusoidal waveform.
- Charging the battery with a regulated DC voltage.



Flexa UPS System - Normal Mode Operation

Battery Mode

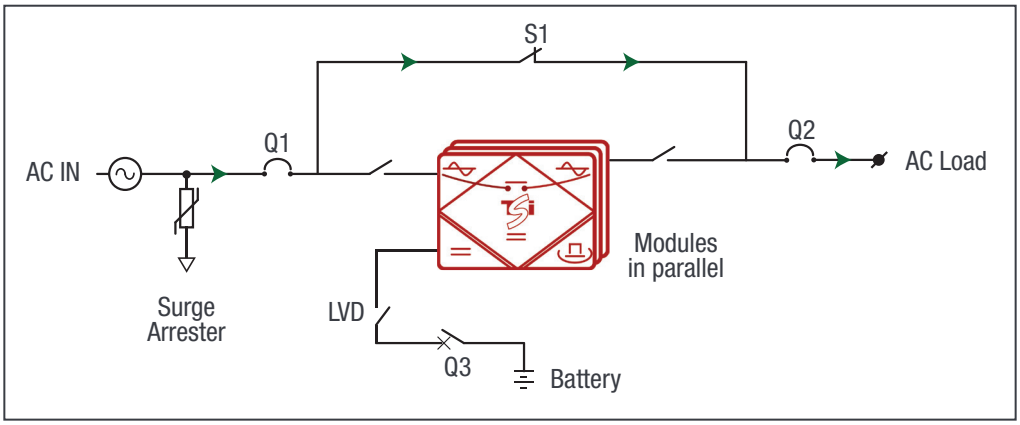
In the case of AC mains failure, the Flexa module takes energy from the battery and feed AC load via a double conversion to provide pure sinusoidal waveform.



Flexa UPS System - Battery Mode Operation

By-Pass Mode (Manual Operation)

The By-pass mode is used for maintenance purpose; in this mode, the AC mains is directly connected to the output load. When the system is in by-pass, the load is subjected to AC main disturbances.



Flexa UPS System - By-Pass Mode Operation

Note: Before engaging manual bypass, make sure the voltage difference between AC IN and AC OUT should be less than 5 Vac to limit the inrush current.

5.2 System Design

The Flexa UPS system is specifically designed to operate in clean and temperature controlled environments.

- Telecom grade design
- 200 kVA
- Modularity Design
- Redundant configurations
- Support ECO mode

5.2.1 Flexa 200 - 400/400 (3ph-3ph) - Configurations

Flexa 200 - 3ph-3p systems can be configured from 20 kVA to 640 kVA. The standard configurations are

- System with SBP: 80, 160, 200, 400 and 580 kVA
- System without SBP: 60, 160, 200 and 640 kVA

Flexa 200 - 80 kVA

Flexa 200 - 160 kVA

Flexa 200 - 200 kVA

Flexa 200 - 400 kVA

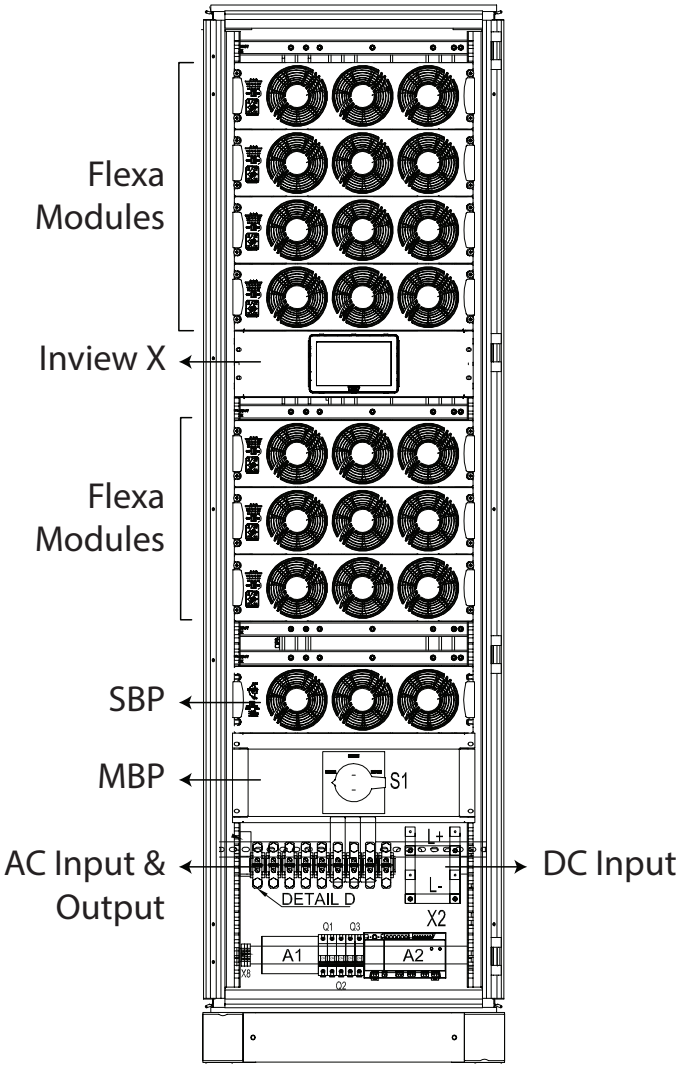
Flexa 200 - 580 kVA

Note: CE+T also do Customized solution as per requirement from 20 to 640 kVA

5.2.2 Flexa 200 - 400/400 (3ph-3ph) - Details

5.2.2.1 Single cabinet system - 20 to 160 kVA

In a single cabinet, the Flexa 200 - 3p/3p system can be configured up to 160 kVA. If SBP is used, then the maximum configuration is 140 kVA.

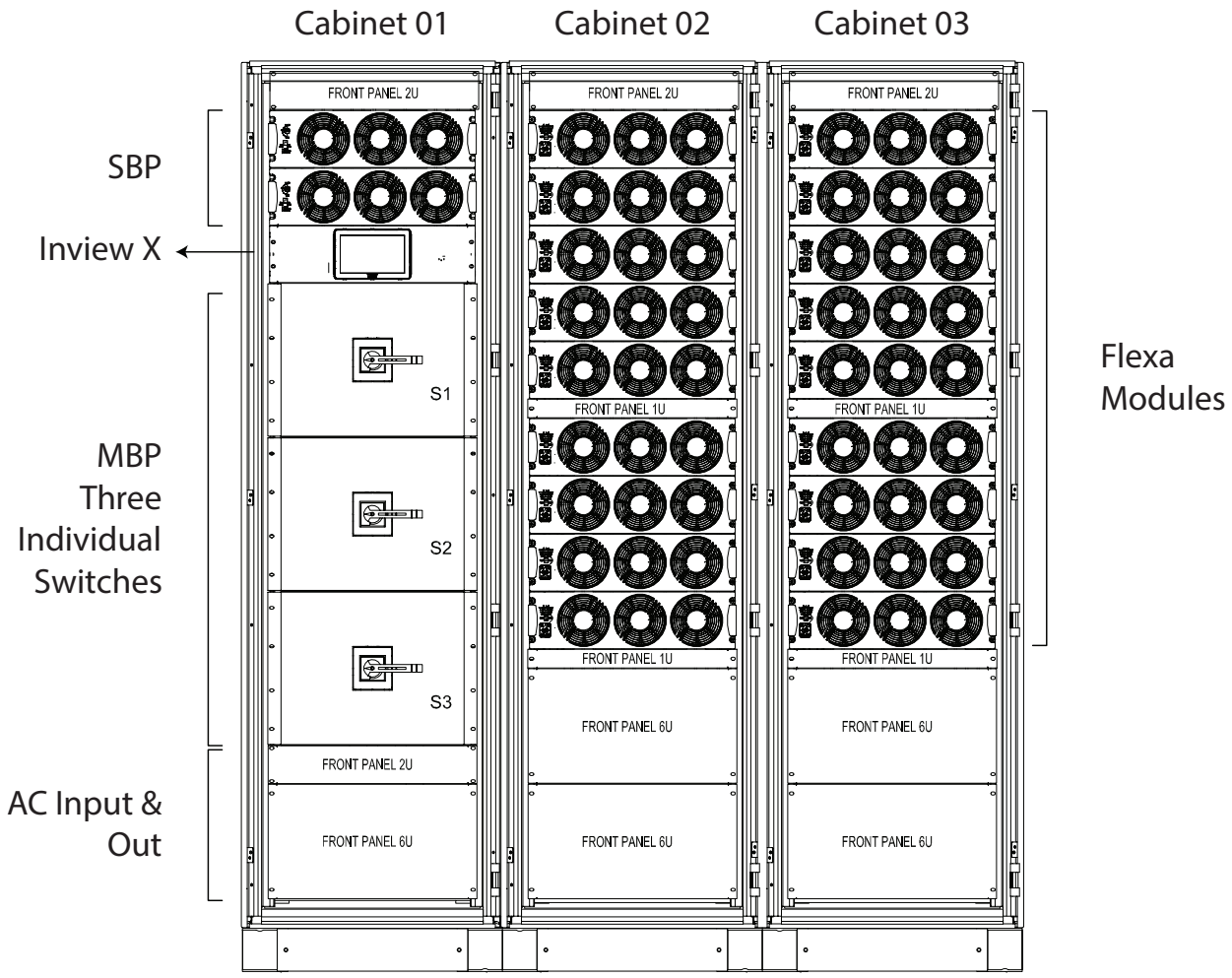


Note: *The above drawing is for general reference. Refer to the technical drawings received along with your cabinet for the exact arrangement.*

5.2.2.2 Multiple cabinet system - 200 to 580 kVA

The Flexa 200 - 3p/3p systems can be configured up to 520 kVA using four cabinets. In the multiple cabinet system, the first cabinet will be the distribution cabinet, and in the remaining cabinets, the Flexa modules are placed.

- **Cabinet 1:** SBP, MBP, AC Input & Output terminals, controller, monitoring and signalling products are installed.
- **Cabinets 2 to 4:** Flexa modules and monitoring device are placed.



Note: The above drawing is for general reference. Refer to the technical drawings received along with your cabinet for the exact arrangement.

5.2.3 Flexa 200 - 400/400 (3ph-3ph) - Specifications

	80 kVA/kW	160 kVA/kW	200 kVA/kW	400 kVA/kW	580 kVA/kW
General					
Module Part Number	T451970112				
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)				
Safety	EN 62040-1-1				
EN62040-3 performance level	VFI-SS-111				
MTBF / Cooling / Audible noise	240 000 hrs / Forced / <60 dBA @1meter (100% load at 25°C)				
True Redundant Systems - Compliant	Yes (3 disconnection levels on AC IN, AC Out and DC IN power ports)				
RoHS / Material (casing)	Compliant / Coated steel-ALU ZINC-Front plate coated black RAL9005				
Operating T° / Relative Humidity (RH) non-condensing	Tested according ETS300-019-2-3 Class 3.1 -20°C to 65°C, power de-rating from 40°C to 65°C / Max RH 95% for 96 hours per year				
Storage T° / Relative Humidity (RH) non-condensing	Tested according ETS300-019-2-1 Class 1.2 -40°C to 70°C / Max RH 95% for 96 hours per year				
Public transport T°/ Relative Humidity (RH) non-condensing	Tested according ETS300-019-2-2 Class 3.1 -40°C to 70°C / Max RH 95% for 96 hours per year				
Vibration	GR63 office vibration 0 to 100 Hz-0.1 g / transport vibration 5-100 Hz 0.5 g 100 to 500 Hz-1.5 g / Drop test				
Altitude above sea without de-rating	< 1500 m / derating > 1500 m – 0.8 % per 100 m				
DC Input Data					
Nominal voltage (DC)	408 Vdc (204 cells VRLA) or 336 cells (NiCd)				
Voltage range (DC)	340 Vdc to 490 Vdc				
Nominal current (at 408 Vdc)	208 A	416 A	520 A	1040 A	1508 A
Maximum input current (for 15 seconds) / voltage ripple	312 A / < 400m V rms	624 A / < 400m V rms	780 A / < 400m V rms	1560 A / < 400m V rms	2262 A / < 400m V rms
Input voltage boundaries	User selectable with T4S interface				
AC Input Data					
Nominal voltage (AC)	3x380 / 400 / 415+Neutral 5 wires for 3 phases				
Voltage range (AC)	150 Vac to 270 Vac Line to Neutral (derating < 222 to 150 Vac)				
Power factor	> 99%				
Frequency range / synchronization range	50 or 60 Hz (selectable) / range 30 to 70 Hz adjustable				
AC Output Data					
Efficiency (Typical): AC / AC - DC / AC	96% - 96% (certified by SGS at 45% load)				

	80 kVA/kW	160 kVA/kW	200 kVA/kW	400 kVA/kW	580 kVA/kW
Nominal voltage (AC*)	3x380 / 400 / 415+Neutral 5 wires for 3 phases				
Frequency / frequency accuracy	50 - 60 Hz / 0.03 %				
Nominal output power (kVA) / (kW)	80 / 80	160 / 160	200 / 200	400 / 400	580 / 580
Short time overload capacity (@PF 0.9)	150% - 15s I 130% - 30s I 120% - 60s I 110% permanent				
Admissible load power factor	Full power rating from 0 inductive to 0 capacitive				
Total harmonic distortion (resistive load)	< 1.5 %				
Load impact recovery time	0.4 ms				
Turn on delay	20 s to 40 s depending on the number of module installed				
Nominal current at 230 Vac per phase	116 A	232 A	290 A	580 A	841 A
Crest factor at nominal power	2.8 : 1 with short circuit management and protection				
Short circuit clear up capacity	133 A for 20 ms, then 41 A for 15 s On Battery: 63 A for 10 ms, then 43.5 A for 15 s				
Internal temperature management and switch off	Yes				
Signalling & Supervision					
Display	Synoptic LED on module, and GUI with Inview X				
Alarms output / supervision	Dry contacts on T4S / MODBUS, TCP/IP, SNMP				
Remote ON / OFF	On hub board via T4S				
Smart By Pass (SBP) module					
Module Part Number	T451970010				
Nominal output power	200 kVA / 200 kW				
SBP in cabinet	Same cabinet	Same cabinet	External cabinet	External cabinet	External cabinet
Number of SBP modules	1	1	1	2	3
Transfer time	Flexa to SBP - max 5 ms, typically 2 ms I SBP to Flexa - 0 ms				
Short time overload capacity	1 x SBP : 300 kVA for 10 minutes / 400 kVA for 1 minute 2 x SBP : 600 kVA for 10 minutes / 800 kVA for 1 minute 3 x SBP: 900 kVA for 10 minutes / 1200 kVA for 1 minute				
Cabinets					
Dimensions (WxHxD) with external MBP	600 x 2000 x 800 mm	600 x 2000 x 800 mm	1200 x 2000 x 800 mm	1800 x 2000 x 800 mm	2400 x 2000 x 800 mm
Number of cabinets	1	1	1+1 (for external MBP & SBP)	2+1 (for external MBP & SBP)	3+1 (for external MBP & SBP)

5.2.4 Flexa 200 - 400/230 (3ph-1ph) - Configurations

Flexa 200 - 3p/1p systems can be configured from 20 kVA to 100 kVA. The standard configurations are

- The System with SBP: 40 and 60 kVA
- The System without SBP: 40, 60, 80 and 100 kVA

Flexa 200 - 40 kVA

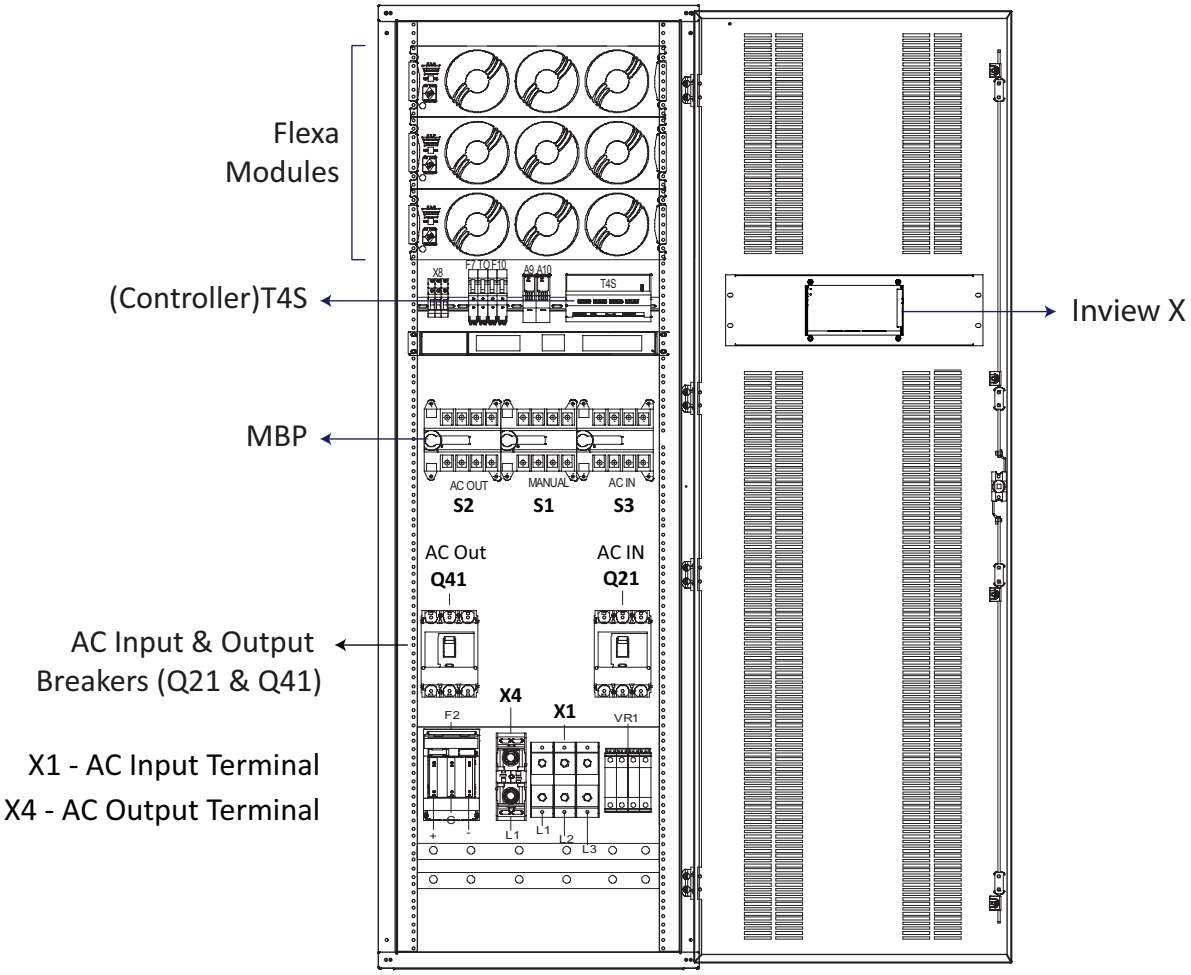
Flexa 200 - 60 kVA

Flexa 200 - 80 kVA

Flexa 200 - 100 kVA

5.2.5 Flexa 200 - 400/230 (3ph-1ph) - Details

In a single cabinet, the Flexa 200 - 3p/1p system can be configured up to 100 kVA. If SBP is used, then the maximum configuration is 60 kVA.



Note: *The above drawing is for general reference. Refer to the technical drawings received along with your cabinet for the exact arrangement.*

5.2.6 Flexa 200 - 400/230 (3ph-1ph) - Specifications

	40 kVA/kW	60 kVA/kW	80 kVA/kW	100 kVA/kW
General				
Module Part Number	T451970212			
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)			
Safety	EN 62040-1-1			
EN62040-3 performance level	VFI-SS-111			
MTBF / Cooling / Audible noise	240 000 hrs / Forced / <60 dBA @1meter (100% load at 25°C)			
True Redundant Systems – compliant	Yes (3 disconnection levels on AC IN, AC Out and DC IN power ports)			
RoHS / Material (casing)	Compliant / Coated steel-ALU ZINC-Front plate coated black RAL9005			
Operating T° / Relative Humidity (RH) non-condensing	Tested according ETS300-019-2-3 Class 3.1 -20°C to 65°C, power de-rating from 40°C to 65°C / Max RH 95% for 96 hours per year			
Storage T° / Relative Humidity (RH) non-condensing	Tested according ETS300-019-2-1 Class 1.2 -40°C to 70°C / Max RH 95% for 96 hours per year			
Public transport T°/ Relative Humidity (RH) non-condensing	Tested according ETS300-019-2-2 Class 3.1 -40°C to 70°C / Max RH 95% for 96 hours per year			
Vibration	GR63 office vibration 0 to 100 Hz-0.1 g / transport vibration 5-100 Hz 0.5 g 100 to 500 Hz-1.5 g / Drop test			
Altitude above sea without de-rating	< 1500 m / derating > 1500 m – 0.8 % per 100 m			
DC Input Data				
Nominal voltage (DC)	408 Vdc (204 cells VRLA) or 336 cells (NiCd)			
Voltage range (DC)	336 Vdc to 490 Vdc			
AC Input Data				
Nominal voltage (AC)	3x380 / 400 / 415+Neutral 5 wires for 3 phases			
Voltage range (AC)	150 Vac to 270 Vac Line to Neutral (derating 150 to 220 Vac)			
Conformity range before transfer to DC	Adjustable			
Power factor	> 99%			
Frequency range / synchronization range	50 or 60 Hz (selectable) / range 30 to 70 Hz adjustable			
AC Output Data				
Efficiency (Typical): AC to AC / DC to AC	96% / 96% (certified by SGS at 45% load)			
Nominal voltage (AC*)	220 / 230 / 240 Vac single phase			
Frequency / frequency accuracy	50 - 60 Hz / 0.03 %			
Nominal Output power (VA) / (W)	40 kVA / 40 kW	60 kVA / 60 kW	80 kVA / 80 kW	100 kVA / 100 kW
Short time overload capacity	130 % (15 seconds) 110 % permanent within T° range			
Admissible load power factor	Full power rating from 0 inductive to 0 capacitive			
Total harmonic distortion (resistive load)	< 1.5 %			
Load impact recovery time	0.4 ms			
Turn on delay	20 s to 40 s depending on the number of module installed			
Nominal current at 230 Vac per phase	174 A	261 A	350 A	435 A

	40 kVA/kW	60 kVA/kW	80 kVA/kW	100 kVA/kW
Crest factor at nominal power	3 : 1			
Short circuit clear up capacity	1.83 In during 15 s and 1.41 In after 15 s 133 A for 20 ms, then 41 A for 15 s On Battery: 63 A for 10 ms, then 43.5 A for 15 s			
Internal temperature management and switch off	Yes			
In Transfer Performance				
Max. Voltage interruption / total transient voltage duration (max)	0 s / 0 s			
Signalling & Supervision				
Display	Synoptic LED			
Alarms output / supervision	Dry contacts on T4S / MODBUS, TCP-IP, SNMP			
Remote ON / OFF	On rear terminal of the shelf via T4S			
Cabinets				
Dimensions (WxHxD) with external MBP	600 x 2000 x 800 mm			
Number of Cabinets	1	1	1	1

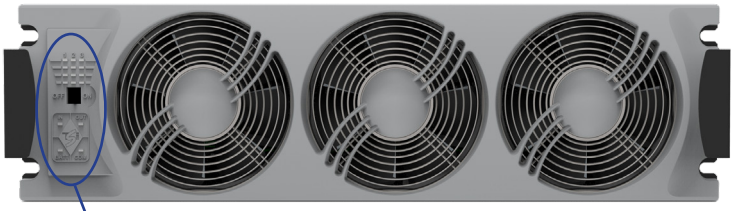
6. Components

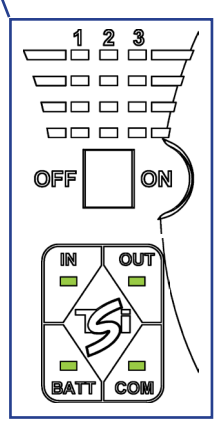
6.1 Flexa Module

The Flexa 200 module is a modular UPS of 20kVA/20kW. The design of the module allows dynamic load transfer, high efficiency, unsurpassed flexibility and scalability.

- The Flexa modules are hot-swappable
- The Flexa front LEDs, display the module status and output power
- The modules are equipped with ON /OFF switch with soft start
- Fans are equipped with an alarm and run time meter and they are field replaceable.
- Dimension: 570 mm (D) x 480 mm (W) x 133 mm (H)
- Weight: 24 Kg

6.1.1 LEDs Indications





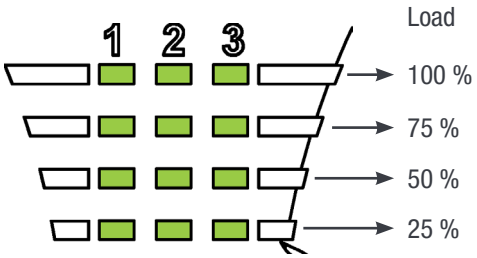
Output power bar graph for each phase 0-100% (25% increment)
Phase 1, phase 2, phase 3

Module ON/OFF switch

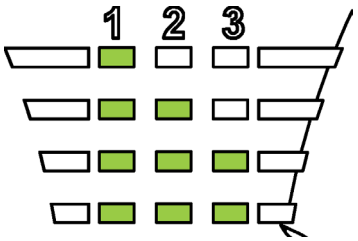
AC Input/ AC output module status

DC input/ Communication module status

6.1.2 Output Power LEDs Interface

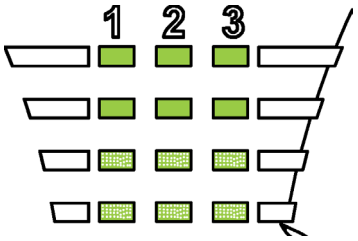


Each segment represent 25% load.



Load can differ between the 3 phases in one module

Load can differ in one phase in several modules



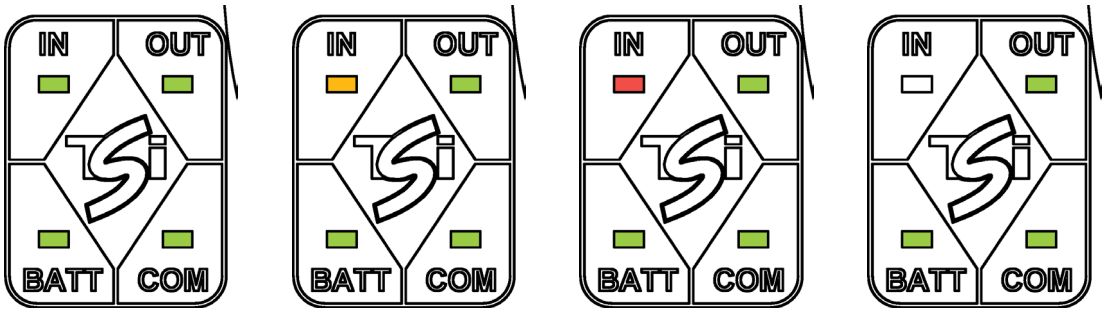
Overload (blinking)

100% - 110% segment 0-25 blinking

110,1% - 135% segment 0-50 blinking

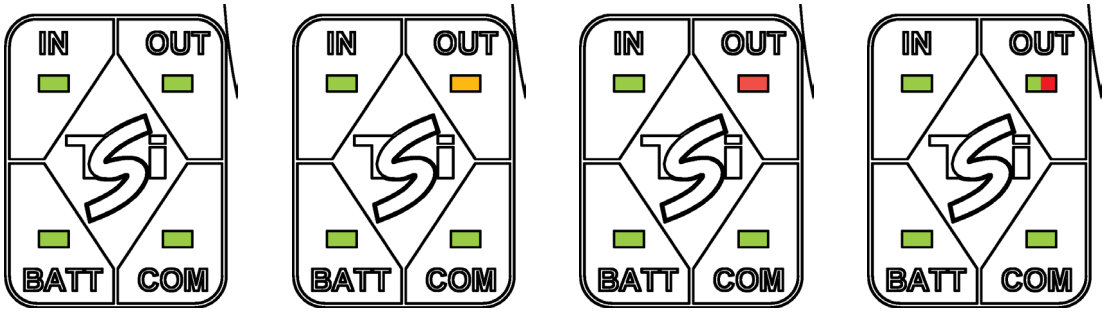
6.1.3 Module status LEDs Interface

6.1.3.1 AC input LEDs Interface



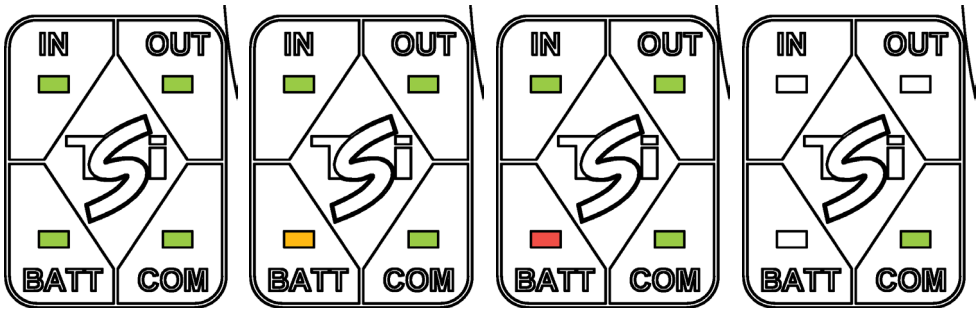
Starting up	(all LEDs)	OFF
AC Input OK	(within limits)	GREEN
AC Input not OK	(out of limits)	ORANGE
	(Auto restart)	Flash ORANGE
	(Manual restart)	Flash RED
	(Non recoverable)	RED
AC failure		OFF + external alarm

6.1.3.2 AC output LEDs Interface



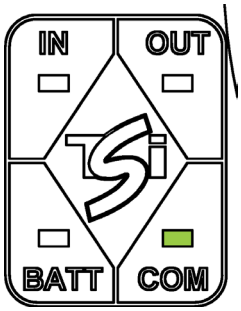
Starting up	( )	GREEN Blink
AC Output OK	(within limits)	GREEN
AC Output not OK	(out of limits)	ORANGE
	(auto restart)	ORANGE Blink
	(manual restart)	RED Blink
	(non recover)	RED
Remote OFF	(man restart)	OR/GR/OR/GR
		Sequence every x seconds

6.1.3.3 DC Input LEDs Interface



Starting up	( )	OFF
DC OK	(within limits)	GREEN
DC not OK	(out of limits)	YELLOW
	(auto restart)	YELLOW Blink
	(man restart)	RED Blink
	(non recover)	RED
No battery		
Connected	( )	OFF

6.1.3.4 Communication LED's interface



COM OK	( )	GREEN
COM ERROR	(Bus A or B)	GREEN Blink still one bus present
COM ERROR	(Bus A & B)	RED Blink

Module/system will continuously operate even with one BUS fail. The module/system will isolate and shut down if two BUS fails.

6.2 Smart By-Pass

The Smart By-Pass transfers the load automatically to bypass mode without interruption by using a static switch.

- A SBP module is a 200 kW.
- SBP module works with parallel mode to avoid the single point of failure.
- To perform service maintenance to the equipment.
- To externally by-pass the UPS installation and allow the removal of the equipment.

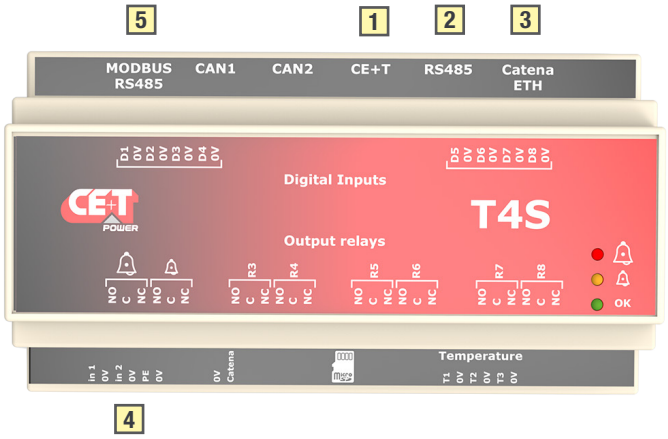
The operation of Manual By Pass is described at "Annexe 3. Smart By-Pass (SBP)", page 85.

Warning: When the system is in Smart By-pass, the load is subjected to AC main disturbances.

6.3 Controller - T4S

T4S is a controller and it act as a link between the system and the user, the control of the system and the modules are distributed on each module.

The standard battery management system of the T4S allows float charge, boost charge, temperature compensated charging, discharge measurements etc.



T4S supervisor monitors the Flexa 200 - module and the SBP module as well as system environment. It is connected to:

1 → Connection from the Hub Board (CE+T BUS).

2 → To monitor the external device.

3 → Connection from Inview X ETH2 port.

4 → Connection from Auxiliary power supply kit (2 x 12 Vdc).

T4S has:

- 8 “digital input“ referred to has D1 to D8.
- 8 output relays Major Alarm, Minor Alarm, R3 to R8.
- 3 temperature probes T1 to T3. T1 should used for battery 1 and T2 for battery 2, T3 is reserved for future.
- Modbus is available on RS485 port [5].

Please note the T4S and Inview X are not master and therefore it can be removed during operation without affecting the operation of the UPS AC output.

6.4 Inview X GUI

Inview X GUI allows the user to easily access the system monitoring via a powerful web based graphic display.

In addition to the touch-screen display, the user can also access every detail through a web UI as well.

6.4.1 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 and Web interface. This additional Ethernet port makes it compulsory to use Inview X with large systems relying on the Power Extension Kit and also when Inview Gateway is required to manage several kinds of CE+T converters.

The Inview X comes up with easier access to connect accessories such as Measure Box Battery, Smart Battery BMS and so on. It 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.

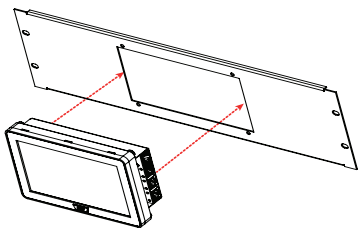
Inview X is featured with the following:

- Monitor up to 32 converters.
- 7" LCD touch screen display with LED strip around the screen to indicate Major alarm, minor alarm and system status.
- Two Digital Inputs and two Output Relay contacts.
- Records 5000 events as FIFO.

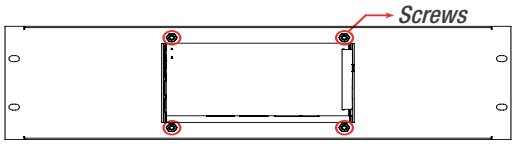
6.4.2 Inview X Mounting

Before mounting the Inview X in the system, route all the required connection cables from the system and place near to the Inview X mounting location.

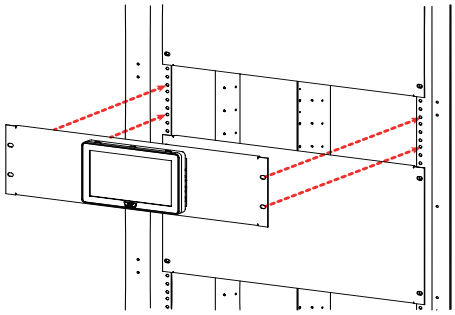
1. Place the Inview X in the panel sheet.
2. Fix the Inview X in the panel sheet using four screws at the rear side.
3. Connect required connection cables to the Inview X.
4. Place the panel sheet in the system and fix it with screws.



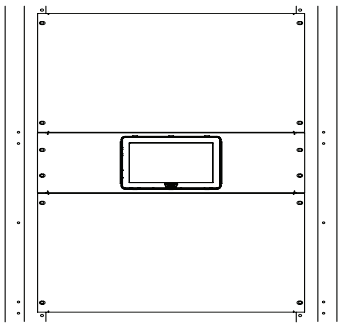
Place the Inview X in the panel sheet



Fix it with four screws



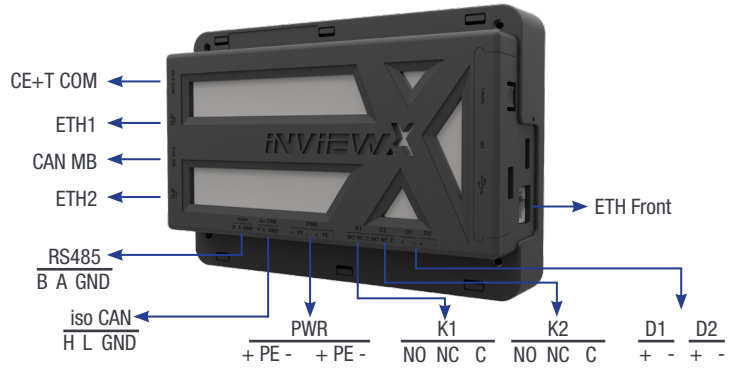
Connect wires and place the panel sheet in the cabinet



Fix the panel sheet with screws

6.4.3 Inview X - Connections

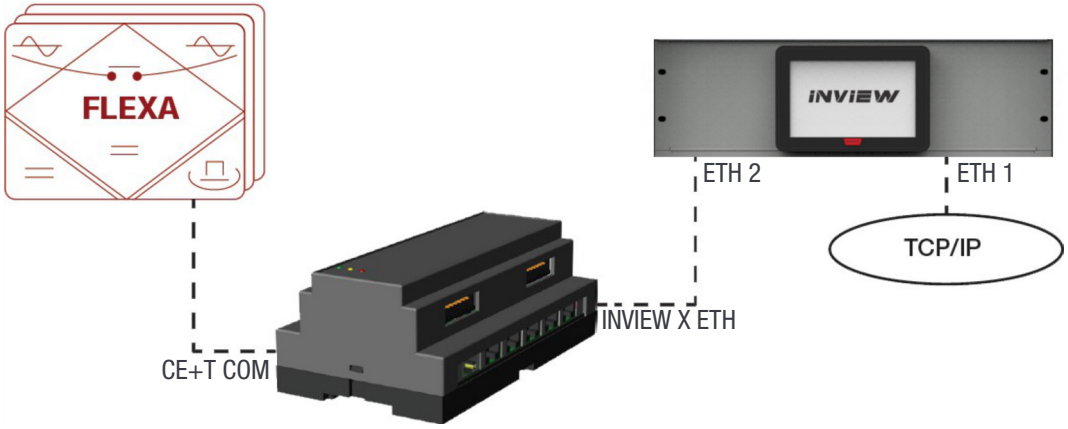
Inview X composed of multiple network ports and inbuilt free potential contacts.



- **CE+T COM** port is dedicated to establish connection between Inview X and Sierra - shelf.
- **ETH** ports are used for network connectivity, and user can access the system information through the web interface.
    - **ETH Front:** DHCP server, providing access to the configuration at URL https://inview.local or https://10.250.252.1
        - Intended for direct connection of a laptop computer.
          Warning: Do not connect this port to the network, as it might interfere with other DHCP servers.
    - **ETH1:** Main network interface
        - Default static IP address: 10.250.250.1/24
        - It can be configured to other static addresses or as a DHCP client in a web-based configuration interface
    - **ETH2:** Secondary network interface
        - Static IP address: 192.168.0.3/24
        - It is dedicated to T4S and does not connect to the network
- **CAN MB** port is used to share the system information to the Measure Box Battery. It also provides the +12 Vdc power to three accessories which are connected in series.
- **iso CAN** is used for CAN communication.
- **RS485** is used for Modbus communication.
- **USB** port is used for internal factory purpose.
- **Digital Inputs (D1 and D2):** Two potential free Digital Inputs are available for customer connections.
    - Digital Input 1 is assigned for MBP operation if used.
    - Digital Input 2 is assigned for Surge Arrester if used.
- **Output Relays (K1 and K2)**: Two output relays are available and can be used for Major and Minor alarms.
- **Power**: The unregulated separate +48 V power supply is required for powering Inview X and this power should not be shared with other devices.

6.5 System Connections

T4S is a DIN rail mountable controller which is connected to the Flexa 200 - 400/400 module / system as indicated in the schematic in the section “Annexe 6. Electrical Diagrams”, page 103.



6.5.1 Software Overview

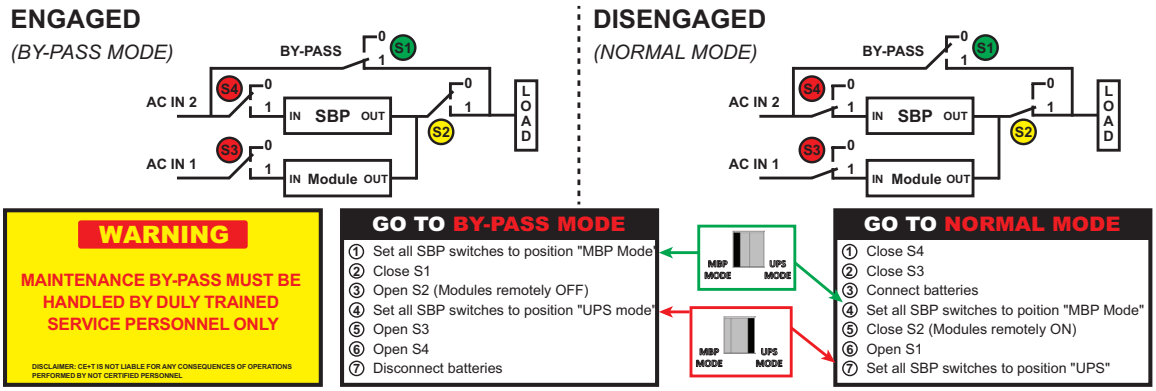
The software embedded in T4S and Inview X allows complete system supervision through web browser, and provides functionalities such as:

- System setting and configuration (password protected).
- System status and information display.
- System alarms and events log file.
- System self-maintenance (battery test, battery boost charge,….)

In addition to these, there is minimal information available via “touch screen display”.

6.6 Manual Bypass (MBP)

MBP is used to transfer the load directly to utility power without interruption by using three independent switches.



The operation of Manual By Pass is described at “Annexe 2. Manual Bypass (MBP)”, page 79.

Warning:

- The load is subjected to AC main disturbances when the system is in Manual Bypass.
- In 3 phase configuration, the phase order between AC input / AC output must be respected prior to engaging the MBP for the first time. Improper phase order might damage the equipment during the manual bypass procedure.
- To verify the phase order L1 to L3, please measure the AC voltage between each corresponding phase’s AC input and AC output.
  - L1 AC into L1 AC out voltage should be lower than 40Vac
  - L2 AC into L2 AC out voltage should be lower than 40Vac
  - L3 AC into L3 AC out voltage should be lower than 40Vac
- If one of those voltages reaches 380 VAC, please check the phase order of the measured phase.

7. Installation

7.1 Site Preparation

- 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 inverter system and to the customer terminal connection.
- All AC input, AC output, DC input, and signal cables should be routed properly.
- Empty inverter positions shall be covered with blank module or dummy covers.
- **System Position**
  - The system should not be installed at close to the wall, mainly at rear side.
  - **A minimum of 20 cm clearance is required at rear 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 **front door is present** in the system:
    - The presence of airborne particles such as dust, sand and metallic debris are forbidden.
      For that appropriate filters should be installed.

7.1.1 Transformer and Generator Sizing

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

- Transformers supplying AC to the UPS should be sized at a minimum of 1.5 times the kVA rating of the UPS to meet this requirement.

7.2 Storing and Unpacking

7.2.1 Storing

If the equipment is not installed immediately, it must be stored in a room so as to protect it against excessive humidity and heat sources. The battery needs to be stored in dry and cool place with good ventilation. The most suitable storage temperature is 20 ºC to 25ºC. Battery should not be stored more than six months without charge.

7.2.2 Initial Checking and Positioning

Check the packaging first upon the arrival of product to see if there is any damage; open the packaging to check the equipment report any such damage to the shipping company immediately.

7.2.3 System Packaging

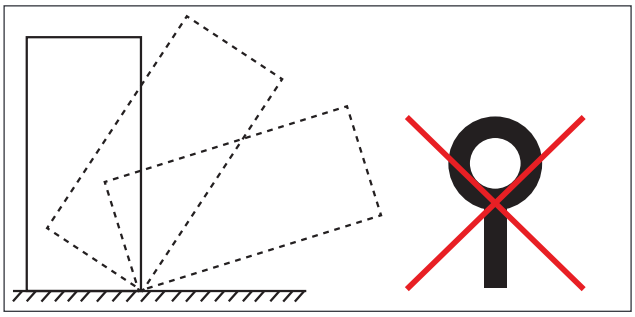
CE+T cabinets are always fixed on a pallet, and then packed in a wooden crate. These crates are usually delivered laying flat, horizontally.

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.

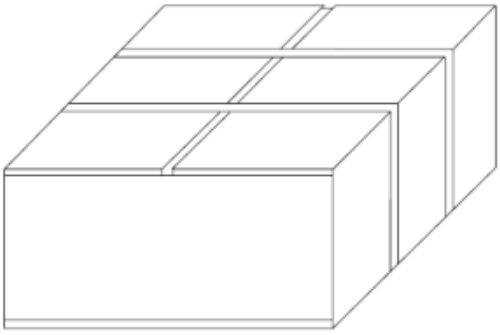


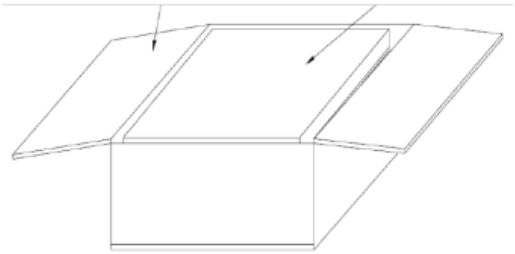
Warning: The top cover fixing bolts may NEVER be replaced with lifting eye bolts.

7.2.4 Module Packaging

Flexa modules are not included in the cabinet. They are packed individually in cartons and on pallet. One Flexa module is 24Kg, maximum 3 modules carton boxes may be stacked on each other at all times. Always transport modules in their carton box with suitable protection.

1. The packing case should be placed horizontal and stable;
2. Cut the plastic packing belt and scotch tape to open the carton.
3. Please dispose wasted material according environmental protection and regulation.

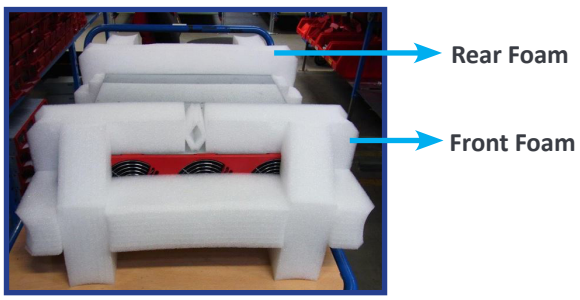




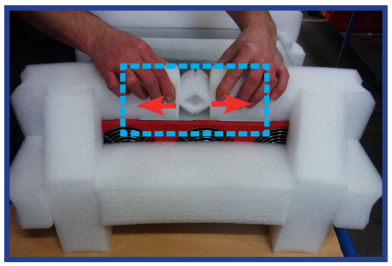
7.2.5 Module Unpacking

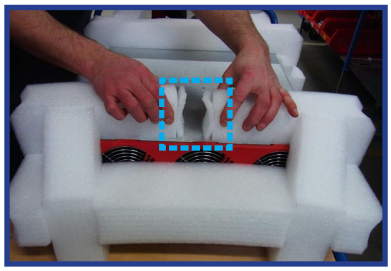
Perform the following steps to unpack the Flexa module from the carton:

Step 1. Remove the Flexa module from its carton and place it horizontally on a support



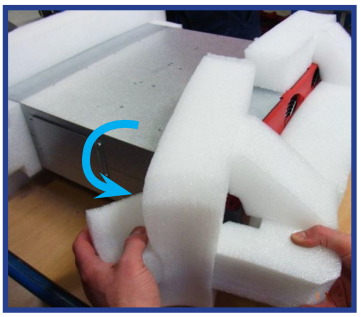
Step 2. In the front foam, tear at middle of top side and middle of bottom side.

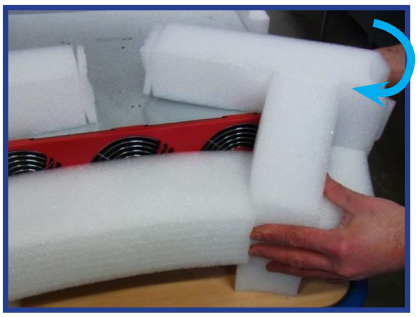




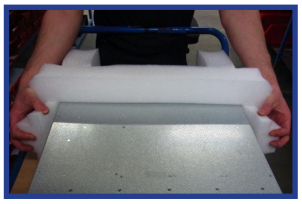
Step 3. Pull on one side of the foam to free the one side of the Flexa hand grip from the foam.

Step 4. Pull on the other side of the foam to free the other side of Flexa hand grip from the foam.





Step 5. Remove the rear foam in one way or each side consecutively.



(Rear foam can be removed without any special method)

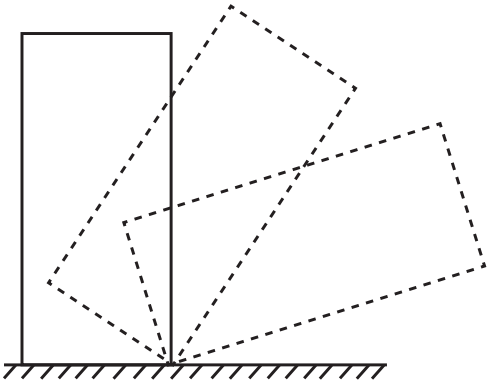
Caution:

- Please use original packaging for any transport.
- Keep the foams and original box as spare parts for any future transport.

7.3 Cabinet lifting

Never try to lift the cabinet on your own. The cabinet can have an individual weight of close to 500kg with modules inserted.

The top cove fixing bolts must NOT be replaced with lifting eye bolts. If modules are present then it must be removed before raising the cabinet.



7.4 Cabinet Door

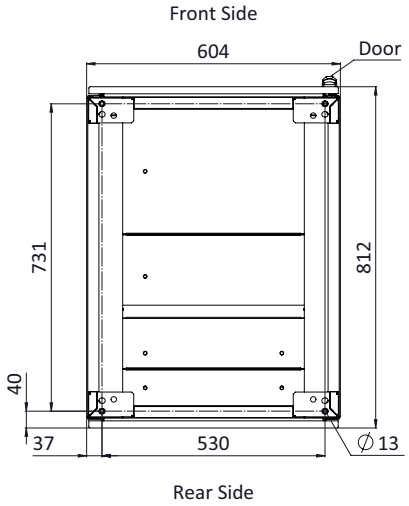
The door of the cabinet is possible to swing open in excess of 180 degrees. The door is right hand hung. It is not possible to change to swing of the door.

The door is strapped on three hinges. Each hinge is fastened by two screws. Work in pair if the door shall be removed. The cabinet must never be left with the door removed.

7.5 Cabinet Fixing

The cabinet is fixed through the base of the cabinet. Remove lowest front cover to gain access to the fixing holes. Max screw diameter is 13 mm. See the hole pattern and foot print for measurements.

Note: A minimum of 20 cm clearance is required at rear of the cabinet.



7.6 Cabling

Each cabinet have bulk AC supply on the input and bulk AC output. The mains cable shall be dimensioned according to the maximum input current. All the cable routings are made through **bottom** of the system.

The battery cable shall be dimensioned according to the battery discharge current at final voltage. The voltage drop has to be considered at every installation.

Input AC must always be separated from Output AC to limit induction of interference and noise passing from primary to secondary side.

Signal cables shall be separated from all other cables.

Cables shall be strain relieved by suitable means. The bottom plate and the top cover have strain relieve fixing points for battery and signalling cables using cable straps. Mains cables are strain relieved and fixed by compression brackets.

Cables need to be terminated in the following order to facilitate the installation:

1. Signal cables	2. AC output	3. AC input
4. Battery Negative	5. Battery Common	6. Battery Positive

7.7 Grounding

Main protective conductor (PE) connection is made to the AC IN terminal block marked with symbol for identification.

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 size equal (min) to Neutral cable cross section. Adhere to local regulations. Ground has to be connected in accordance with local code.

7.7.1 Cabinet Ground

The cabinet ground shall be terminated to the ground stud and bonded to each and every other cabinet of the UPS system.

The PE grounding is located at the bottom of the bay and identified with symbol

All grounding connection are reported in PE protection copper plate.

All grounding cables section should not be lower than the maximum power cable section.

7.7.2 Protective Device

External supply circuit breakers/fuses are required in the mains input supply of the system.

- Flexa 60kVA recommended protection 3 pole 125 A MCB.
- Flexa 160kVA recommended protection 3 pole 300 A MCB.
- Flexa 200kVA recommended protection 3 pole 400 A MCB
- Flexa 420kVA recommended protection 3 pole 700 A MCB
- Flexa 640kVA recommended protection 3 pole 1000 A MCB
- Those MCB protection serve also as AC Input disconnection switch.
- External supply circuit breakers/fuses are required in the battery backup.

7.8 AC Input and Output

WARNING !!!
Recommendation of IEC 60364 4. 43

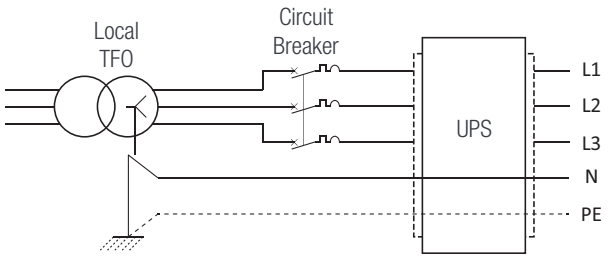
431.3 Disconnection and reconnection of the neutral conductor in multi-phase systems

Where disconnection of the neutral conductor is required, disconnection and reconnection shall be such that the neutral conductor shall not be disconnected before the line conductors and shall be reconnected at the same time as or before the line conductors.

WARNING !!!

Input Neutral is required to operate the UPS

In TN-S System no 4 pole input switch or circuit breaker shall be used. If you have to use 4 pole protective device, be aware that the neutral against the ground is floating. The UPS will operate without problem but you may infringe the local regulation.



- AC cables connected to the system shall be rated min 0,6/1kV +90ºC
- The following instructions are guide lines only superseded by local regulations or code of practice where applicable.
- Mains supply shall be switched OFF, post necessary warning signs for alert.
- Unplug all modules from the system. The modules shall be switched OFF.
- Make sure that the manual by-pass (if a part of the system) is in position OFF
- Battery isolators/fuses shall be removed and one midsection of the battery must be left uninstalled in each half of the battery string.

7.9 DC Input

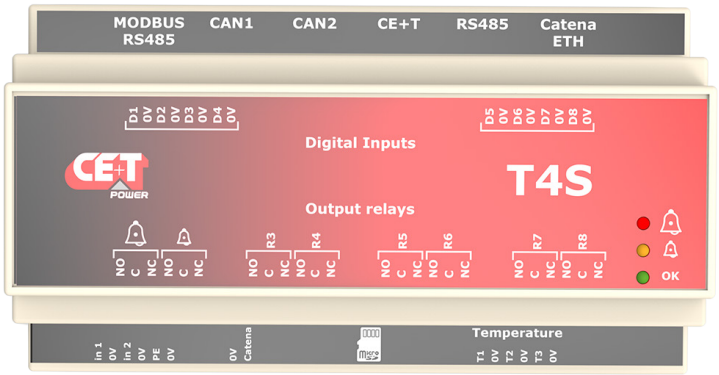
The DC Input terminals are located at bottom of the system. In most of the systems, the DC connections are copper bus bars. Refer to the technical drawings received along with the cabinet for the type of DC connections.

7.10 System Input and Output - Connections

Model	AC Input		AC Output		DC Input		Earthing
	Current (A)	Cable mm²	Current (A)	Cable mm²	Current (A)	Cable mm²	Cable mm²
Flexa 200 - 400/400 (3Ph / 3Ph)							
Flexa 200 - 80 KVA	116	50	116	50	205	95	50
Flexa 200 - 160 KVA	232	95	232	95	409	2 x 95	95
Flexa 200 - 200 KVA	290	120	290	120	511	2 x 120	120
Flexa 200 - 400 KVA	580	2 x 150	580	2 x 150	1022	3 x 150	2 x 150
Flexa 200 - 580 KVA	841	3 x 120	841	3 x 120	1481	3 x 240	3 x 120
Flexa 200 - 400/230 (3Ph / 1Ph)							
Flexa 200 - 40 KVA	58	16	174	70	103	50	16
Flexa 200 - 60 KVA	87	35	261	120	154	70	35
Flexa 200 - 80 KVA	116	50	348	2 x 70	205	95	50
Flexa 200 - 100 KVA	145	70	435	2 x 95	256	3 x 150	70

***Note**: The AC Input & Output and DC input connections might be as terminals or bus bars. It all depends on the system configuration and design. So, refer to the technical drawings received along with the cabinet for the exact location and type of connections.*

7.11 Signalling



Terminal Digital Input:

- Dx – 0V: signal from digital input. Potential free contact !!!
- D1: Aux contact from the manual By Pass
- D2: Aux contact from surge arrestor (optional). Minor alarm generated when active
- D3: Digital input available for user
- D4: Digital input available for user
- D5: Digital input available for user
- D6: Digital input available for user
- D7: Digital input available for user
- D8: Digital input available for user

Output Relays Alarm Form C changeover contact rating 60 VDC /0.5 A

NO – C - NC	Major alarm
NO – C - NC	Minor alarm
R3 to R8	User configurable alarm relay

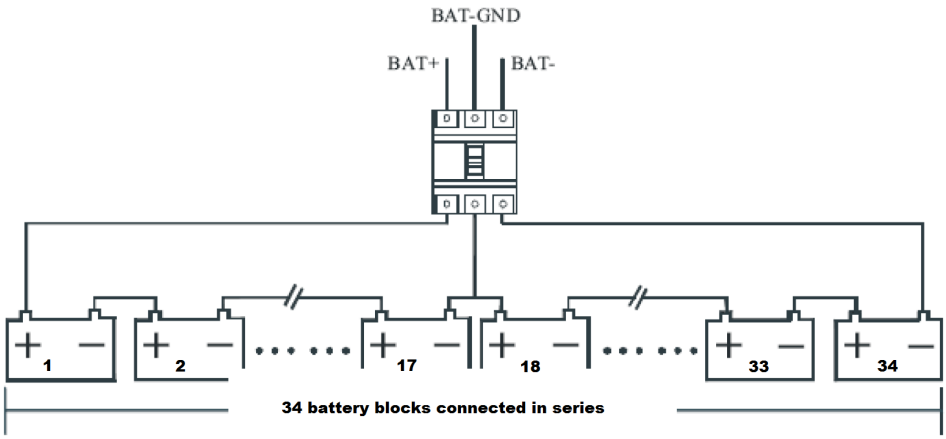
Battery T° probe T1, T2, T3

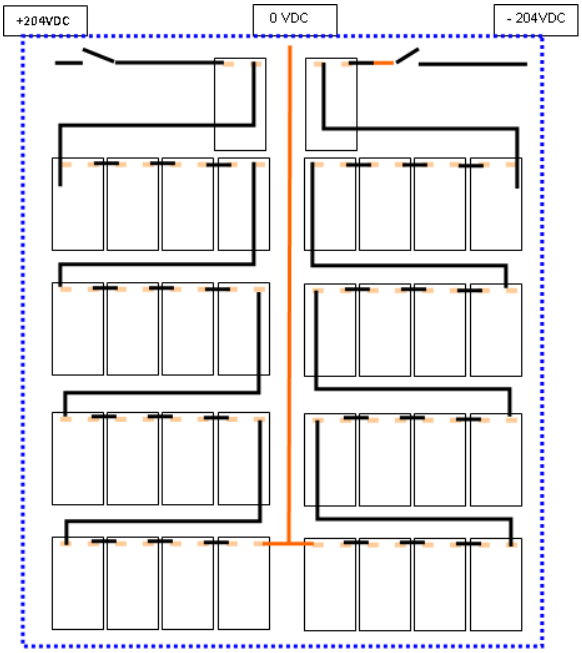
7.12 Battery Connection

Flexa battery consist of 204 cells with nominal voltage of 2 V or 34 block of 12 VDC.

The Flexa battery has a middle connection which means we have +204 VDC / 0 VDC / -204 VDC.

Warning: There is a risk of explosion if battery is replaced by an incorrect battery type dispose of used batteries according to the instructions.





7.13 System Start-up Procedure

1. Ensure that the cabinets are properly positioned and connected.
2. Ensure no foreign items/particles are present inside all the slots in the cabinet.
3. Check the tightness of all the terminations and ensure no short circuit is present. And ensure that all cables are strain relieved.
4. Ensure that all cables comply with recommendations and local regulations.
5. For AC input and AC output, ensure that the phase sequence is properly respected.
6. For DC input, check the Polarity, measure battery voltage, and keep the fuse or breaker in the open position.
7. Ensure T4S and Inview X are connected with 12 V and 48 V power supplies respectively.

8. Ensure that all external breakers have complied with recommendations and local regulations.
9. Ensure all AC Input, AC output and Battery breakers are switched OFF.
10. Insert One Flexa UPS module into the cabinet with the ON/OFF switch in the OFF position.
11. Check that the MBP Switch is in the “NORMAL” position (If present).
12. Check the AC input voltages and Ensure they are within the range of modules. (For more details, refer to the data sheets)
13. Close the AC input breaker(s).
    a) Start the module only with AC input by changing the UPS module switch position to the ON state from the Off position.
    b) T4S monitor start (~30s).
    c) Module LEDs start with fixed orange, then DC IN and AC IN LEDs will turn green. Finally, AC OUT LED will turn green.
    d) Connect the laptop/PC with the ETH Front port at the left side of Inview X and open the web interface. (Refer to the communication section 8.3, page 44)
    e) Check and adjust all parameters according to the required configuration (i.e., module quantity, redundancy, battery parameters like AH, voltage, charge power, temperature compensations, charging mode ….).
    f) Check data received from a module like ID, input details, output details, temperature and so on.
    g) Modify the module ID, input, and output group details per physical connection.
8. Check the DC bus polarity and your battery polarity.
9. If the Polarity is correct, close the DC input breaker(s) or fuse(s).
10. Insert and Switch on the remaining modules one by one and verify that each starts properly (all LEDs are green on the module’s front panel).
11. Once all modules are started properly, check ID, input details, output details, and temperature for all modules and modify as per physical connection if required.
12. Check the UPS output phase sequence, and if it’s as per the defined configuration, close the AC output breaker(s).
13. Finally, download the configuration file and clear all the existing event logs.
14. Fill the commissioning report with all information for future records.

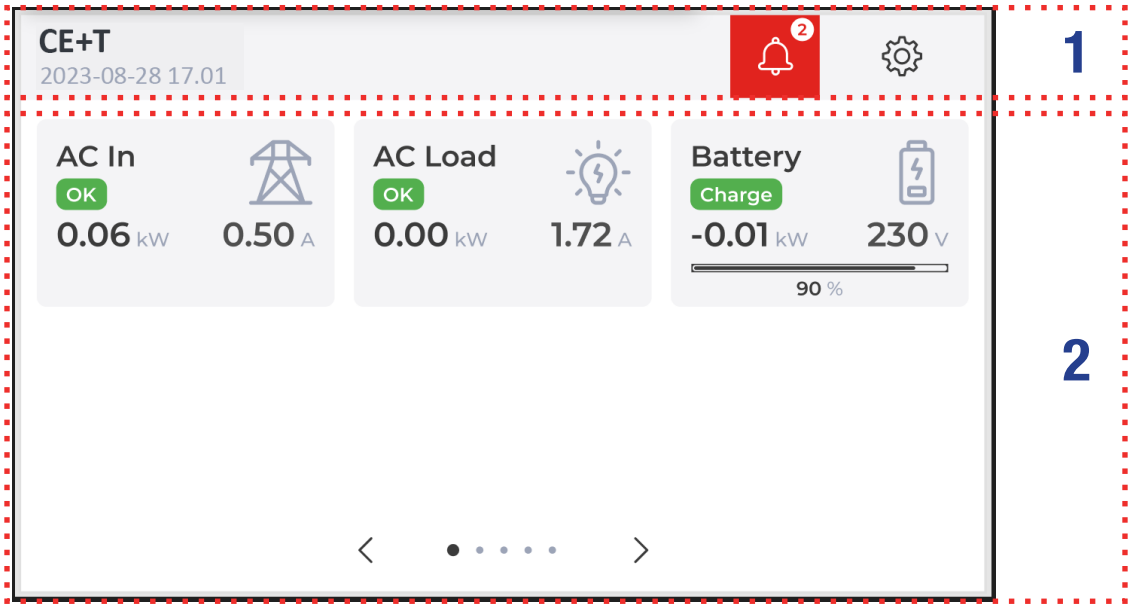
8. T4S / Inview X Start-up

In the complete system, CE+T will install the T4S and Inview X, test them and pre-configure them according to the system. Suppose the T4S and Inview X are purchased separately, make sure that connections are made according to the schematic in “6.3. T4S - Inview X Connections”, page 109.

8.1 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.

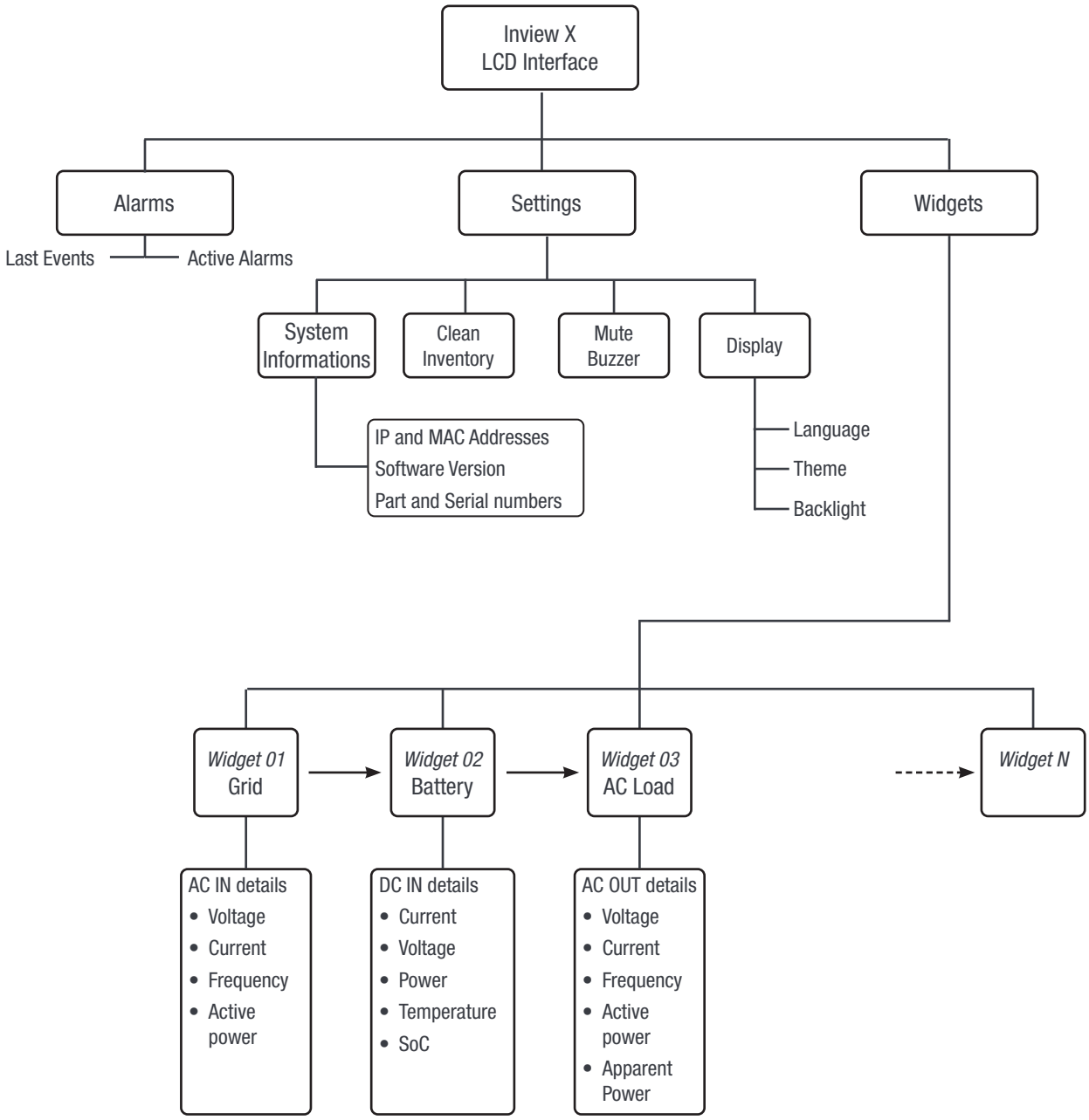


- **[1] Header:** Displays the Site name, Date and Time.
  - **Events:** Tapping on goes to Alarms and Events screen.
  - **Administration:** Tapping on provide access to different action screens.
- **[2] Interface Area:** Tapping on the widget provides the corresponding parameter information.

  Provides information about the corresponding screen. In some screens, left and right navigation buttons appear, indicating more screens are present.
- **Navigation arrows** for the next and previous pages. Up and down arrows appear on some screens, indicating more information is present.

8.1.1 Menu Structure

The below tree provides an overview of the menu structure in the Inview X LCD interface.



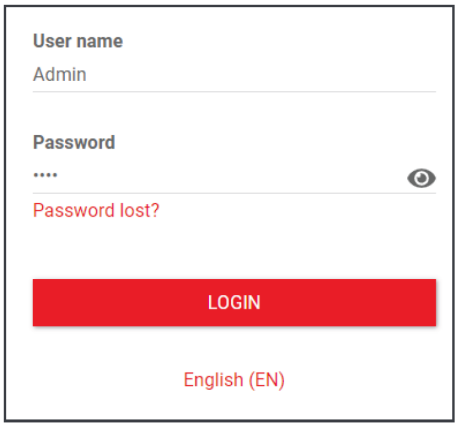
8.2 Inview X start-up

Open the web browser and type the default IP address 10.250.250.1/ site, in the address field and press enter.

Inview X has three login – Basic, Expert and Admin. All three logins are password protected.

The default password for all three logins is “1234”. It can be modified, refer to Inview user manual for more details.

NOTE: The user is not allowed to modify any converter system parameter inside the Inview X Web UI.



8.3 T4S start-up

NOTE: The controller will perform a short self-test as it boots up. Alarm alerts are normal.

- Initiate the start-up routine by applying power to the T4S (close protection breaker powering the controller).
- Use a laptop to connect to the system.

If the system does not have Inview X, the default IP address of the T4S user interface is http://192.168.0.2

If the system has Inview X, the T4S web UI can be accessed through http://10.250.250.1

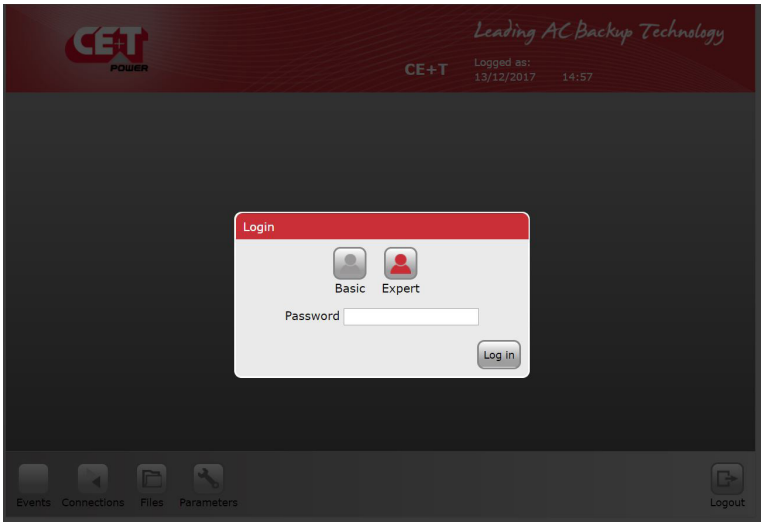
There are two access levels:

- **Basic login** can only browse the pages and download the files.
- **Expert login** can access and also modify the system parameter values. The default password is **pass456** but it’s strongly advised to users to change that password.

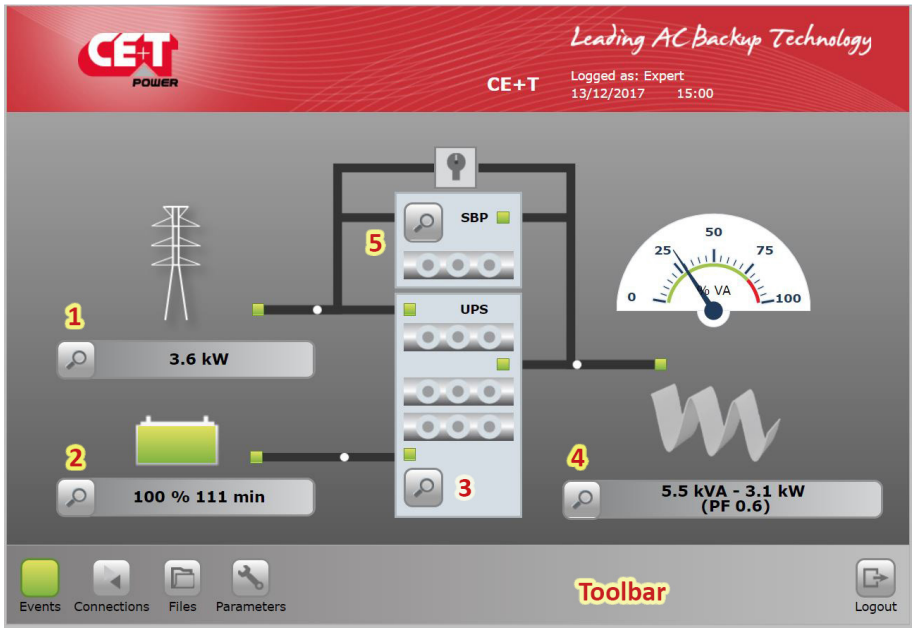
In case of lost password, please refer to FAQ at page 97.

- Check and adjust alarms and control levels in the controller sub-menus.
- Check and adjust battery settings in the battery sub-menus; e.g. float, equalize voltage, etc.

NOTE: System modification and setting may result in alarm event. Make sure you are applying modification carefully.


Leading AC Backup Technology
CE+T
Logged as:
13/12/2017
14:57
Login
Basic
Expert
Password
Log in
Events
Connections
Files
Parameters
Logout

9. T4S Standard Features



The main screen presents an overview of the system where any "click" on the magnifying glass icon will result to access the selected sub-menu:

1 → AC Input sub-menu.

2 → DC Battery sub-menu.

3 → Flexa Modules sub-menu.

4 → AC Output load sub-menu.

5 → SBP Modules sub-menu.

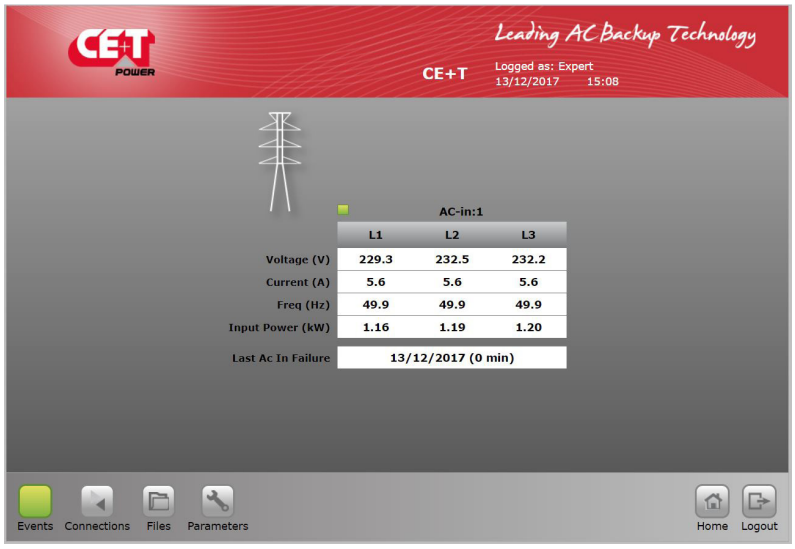
A click on an icon in the toolbar will give you, respectively, access to the event, communication, parameter, files sub-menu.

The main screen shows the status of each of your power system's components.

- AC input: Green, Red.
- Battery: Green, Orange, Red.
- Flexa module(s): 3 LEDs (AC input , DC input, AC output).
- AC output / Load: Green, Red.

The energy flow direction is indicated by the "moving" white ball on the power lines.

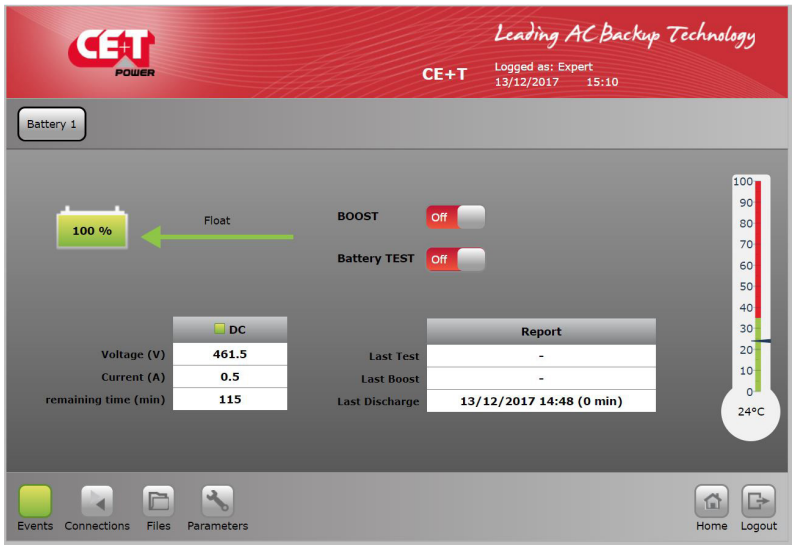
9.1 AC Input Sub-menu



Provides AC input information (up to 3 phases).

- AC input voltage.
- AC input current.
- AC input Frequency.
- AC input Power (kW).

9.2 DC Battery Sub-menu

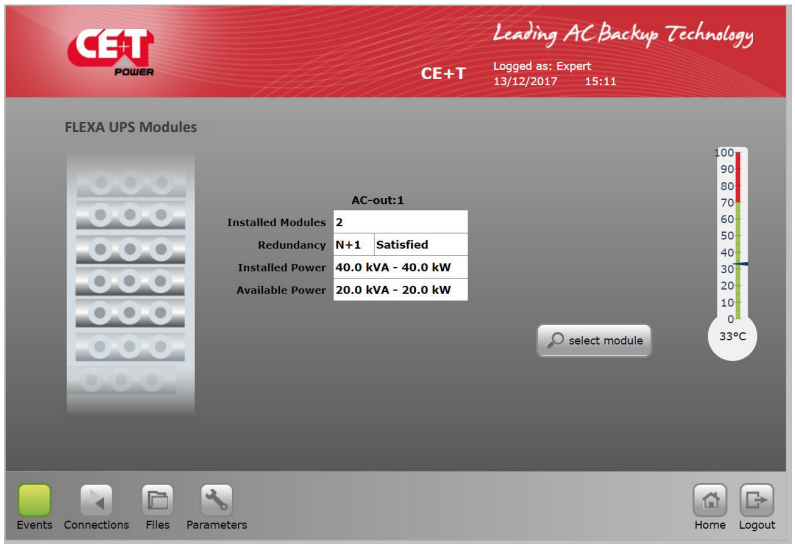


Battery x (x = 1 or 2) provide info on batteries status. The maximum DC group is two.

- BOOST ON or OFF
- Battery Test ON or OFF
- Battery is on float or discharge
- To view DC Voltage and Current

Estimated autonomy and info on last test, boost charge, discharge

9.3 Flexa Modules Sub-menu



Provides Flexa 200 module info

- Number of modules installed
- Redundancy level
- Installed power (Number of modules present in the system).
- Available power (Number of modules including redundancy).
- Ambient temperature of the module.

9.3.1 Flexa Modules Sub-menu

Clicking on the “Select Module” icon will open a module selection table.

Each number represents the address of a module in the system.

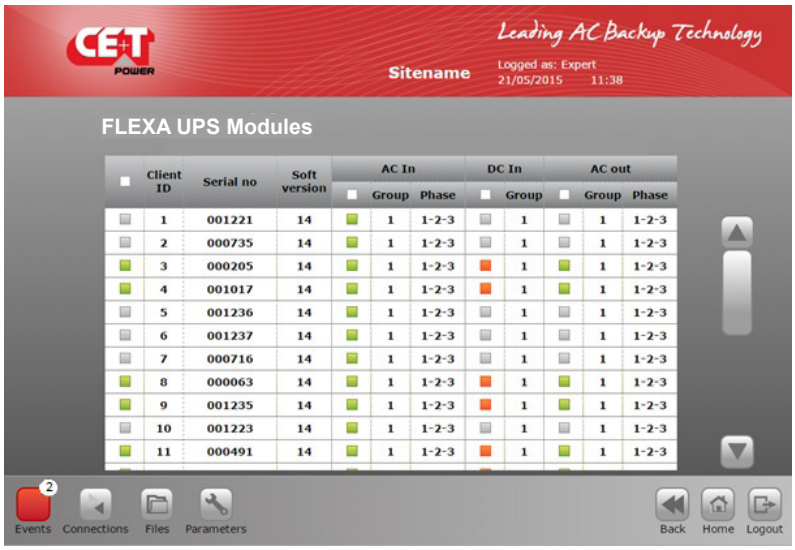
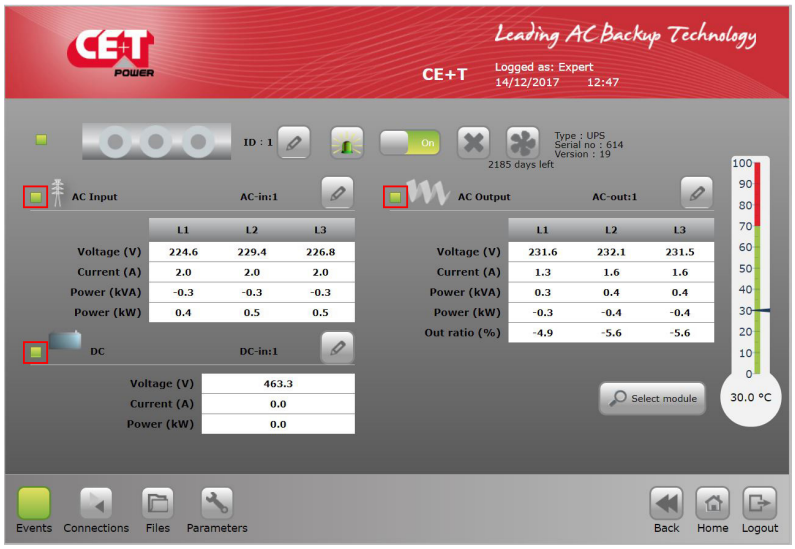


Table indicates the number of modules installed, ID, Serial number, Software version, AC IN, DC IN and AC Out details.

Click on an installed module to access the specific information of the selected module.



Selected Module information

- Click “identify icon”  to see the corresponding module in the bay by all LEDs blinking on the respective module.
- Module status indicated through the LED colour on :
  - AC input.
  - DC input.
  - AC output.

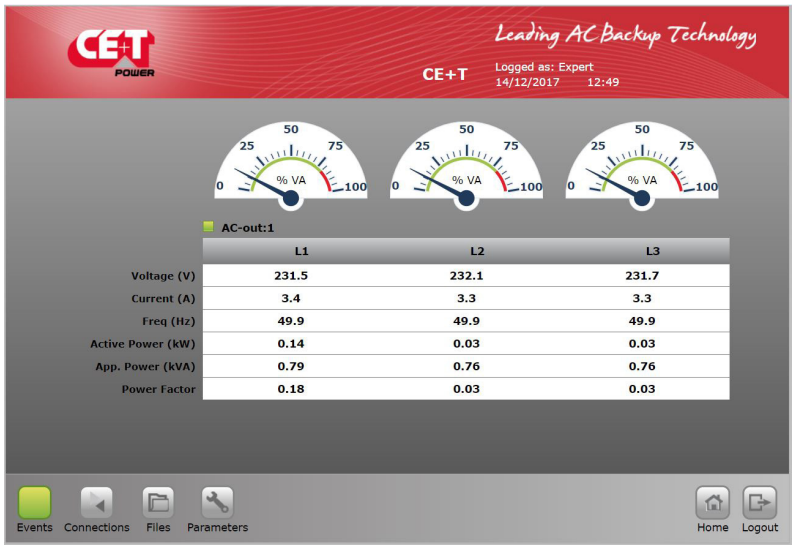
Green: OK.

Orange: Recoverable error.

Red: Non recoverable error.

	When a module is removed from the system, it must be uninstalled by clicking this icon.
	When fan is replaced in the module, the alarm “fan replaced” should be cleared by clicking this icon.
	Module can be switched off through web interface by clicking this icon. The current state (on or off) of the module is also given by this icon.
	Module AC-in, DC-in group and AC-out phase can be change by clicking this icon. Note: while changing the AC-out phase, all the modules should be in OFF condition.
	It will identify the current module in the system by clicking this icon. (All LEDs will blink on the respective module).

9.4 AC Output Load Sub-menu



AC output

- Level of power bar graph in VA.
- Measures: individual phase details of L1, L2, and L3
  - Voltage
  - Current
  - Frequency
  - Active Power
  - Apparent Power
  - Power Factor

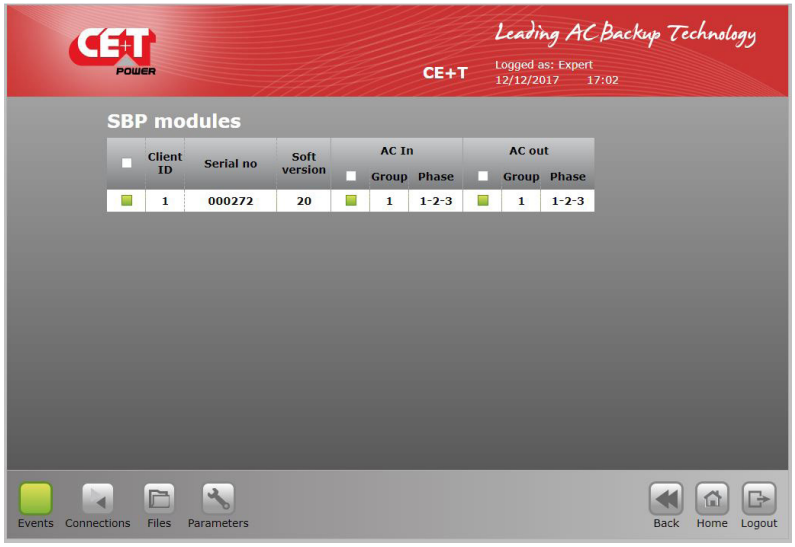
9.5 SBP Modules Sub-menu

NB: This sub-menu is accessible only when there is at least one SBP installed in the system and to select the SBP mode as either “ECO mode” or “Online EPC mode”.

Provides SBP module which works with Flexa module in parallel.

- The number of SBP modules is installed in the system, and the capacity of per module is 200 kVA. (Maximum number of SBP can be installed in a system is three)
- Redundancy level
- Installed power
- Available power
- Ambient temperature of the module

9.5.1 SBP Modules Sub-menu



Clicking on the “Select Module” icon will open a module selection table.

Clicking on any line will give the view of the selected module.

While SBP engaged

- AC IN measures voltage and current
- AC Out measures apparent power and output ratio in percent.

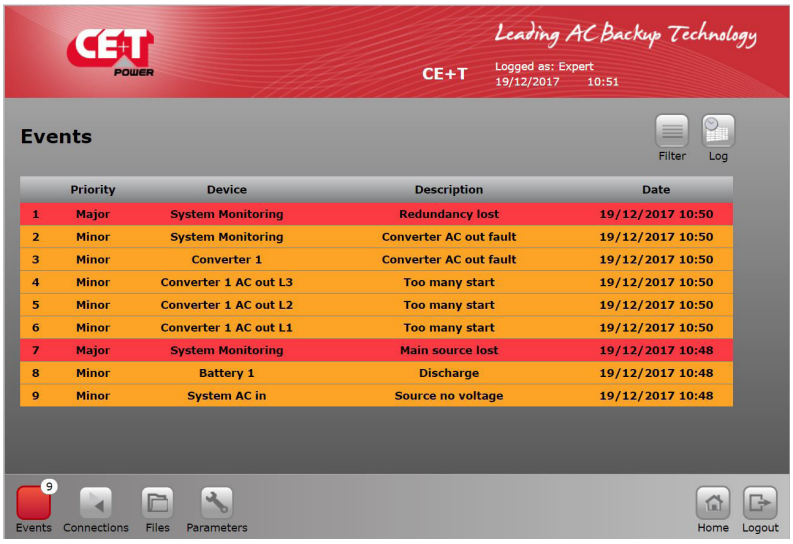
Note: If there are two independent sources, then the AC IN of SBP should be configured accordingly and ensure the sync priority.

Note: If there are two independent sources, then the AC IN of SBP should be configured accordingly and ensure the sync priority. Before changing to the SBP group, ensure the module is in OFF mode.

10. T4S Toolbar

10.1 Events and Log

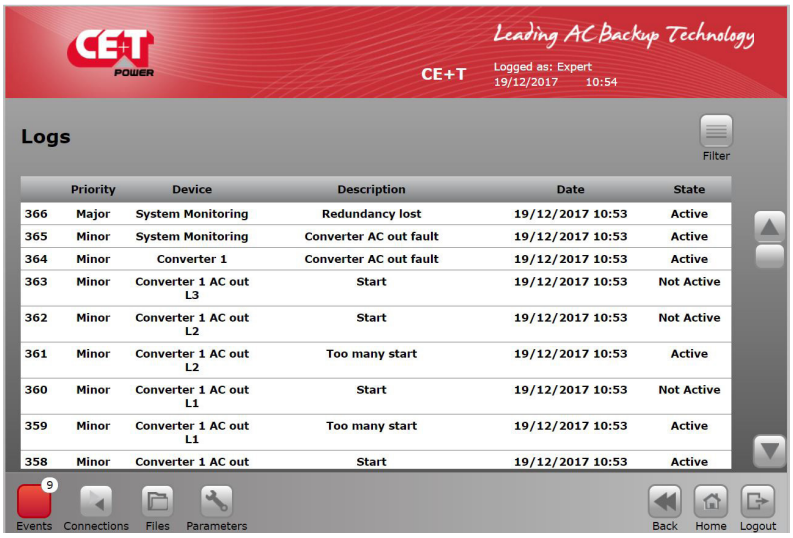
Please note “text alarm page” is refreshed every minute for easy reading while LED’s are active immediately.



Display the active event/alarm present on the system.

- Red: Major alarm.
- Orange: Minor alarm.
- White: No alarm.

Click on “Log” to view the history log file presented below

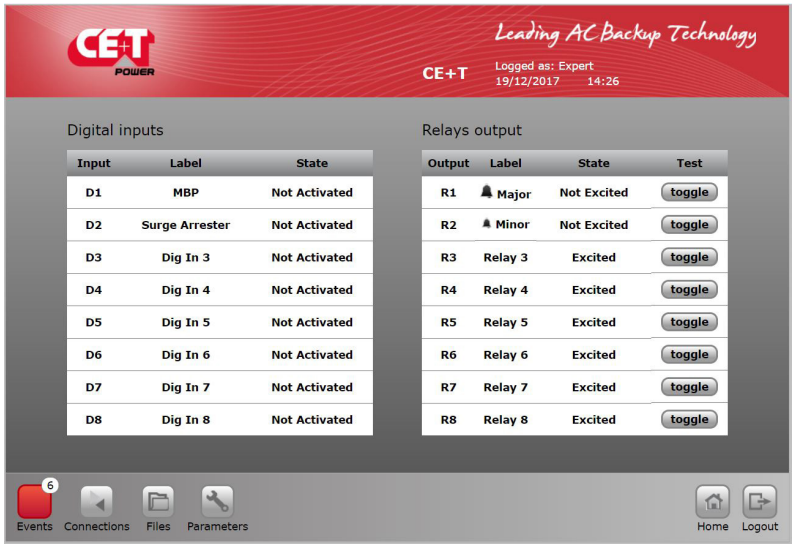


Log file can be filtered using the filter menu.

Do not forget to click apply to activated the selected filter.

Clear Filter will remove all selected filter and view all log file.

10.2 Input and Output Mapping



Present the output relay mapping with possibility to test each relay with the “toogle” button. Click and check relay changing status with an ohmeter.

Note:
Only available in expert mode through laptop web browser.

10.3 Files

Transfer screen allow to export the log file and export or import configuration file

Transfer:

Event History

- Both Event log and configuration file can be exported.
- Event file name cet.log is a text format *.txt file.
- Log size limited to about 500 – 800 lines.
- Click on “clear” will erase the CET log file. Password protected.

Configuration:

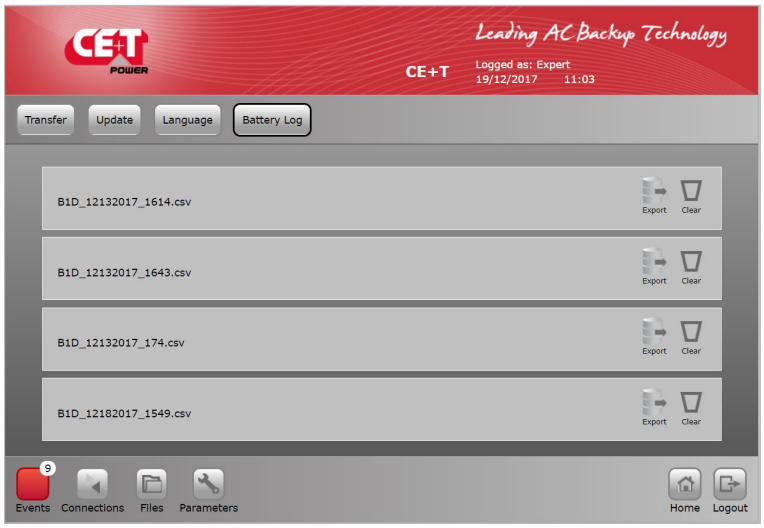
- Configuration file can be exported or imported from T4S.

Update:

To upgrade T4S firmware, download the latest firmware from My.CET website and upload it in T4S.

Language:

T4S store maximum 3 languages that can be changed, updated or cleared.



Battery Log:

The discharged or battery test reports are available to download.

10.4 Parameters

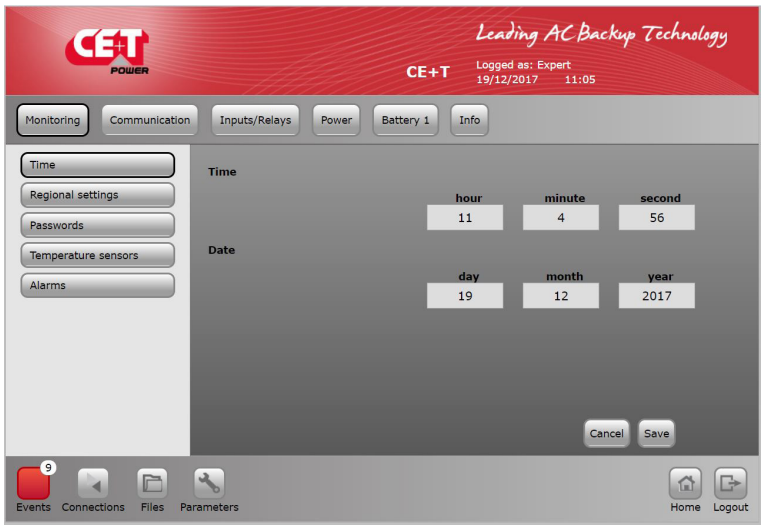
WARNING !

All values present are default values ! User shall consult and change default value with caution. Wrong parameters can affect the system operation, reliability, battery life duration and system autonomy.

10.4.1 Monitoring

NOTE: Once the new parameter has been entered click « save » to record the data otherwise the previous value will be retained.

This menu allow to Set time and region, Change password, Set Inview X network parameter, Set Temperature sensor, and Define the alarm mapping.



Time

- Allow to set Time and Date.

Regional settings

- Choose language.
- Site name.
- Site Location.
- Auto logout delay (will disconnect user after defined seconds).
- Keyboard layout.

Password

Choose password. Read the information carefully at section 8.3, page 44.

Temperature sensors

Allow to configure the temperature probe for battery compensation or ambient temperature.

Alarms

Allow to enable and disable the alarms.

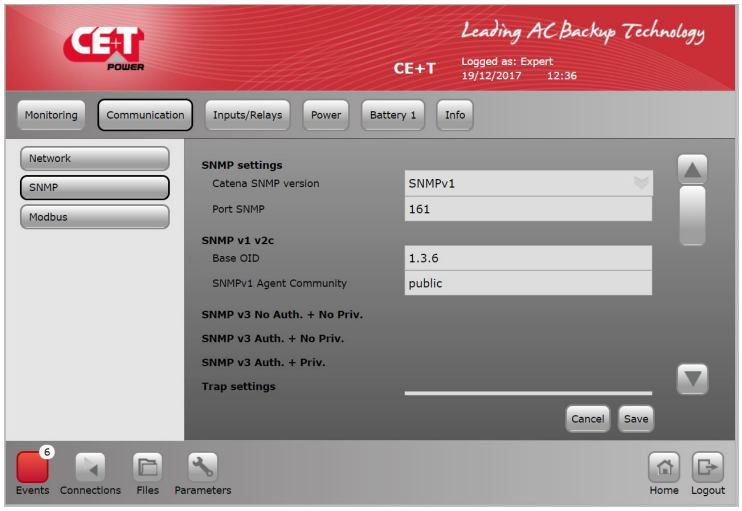
10.4.2 Communication

Network:

Allow to configure the LAN Network parameters

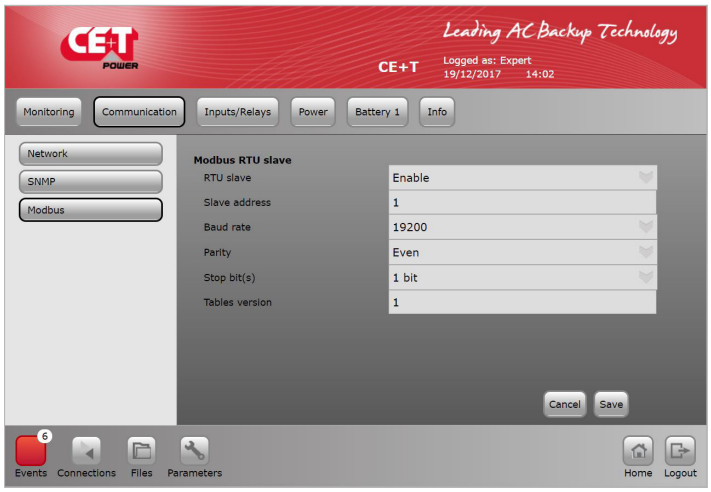
(Note: Default IP address is 192.168.0.2)

"Standalone T4S" must always be selected in the Connection mode.



SNMP:

Do not change any settings in this page. For more details refer section 12, page 71.

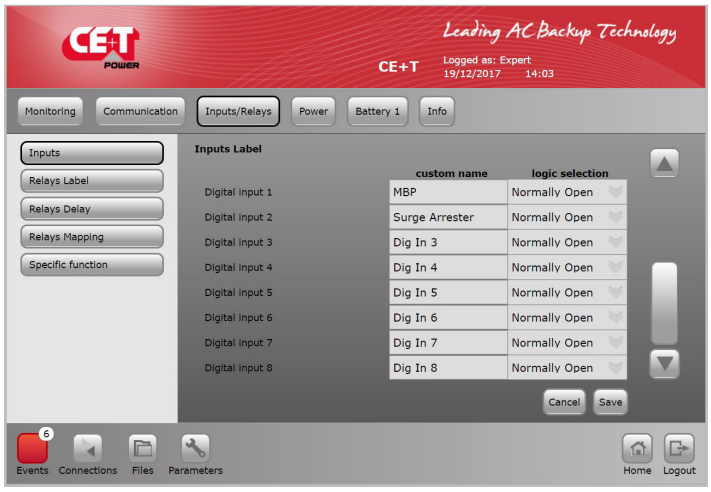


Modbus:

You can view Modbus settings through RTU /TCP/IP mode. For more details refer section 13, page 73.

10.4.3 Digital Input and Output Relay Mapping

Inputs : Digital Input mapping > mapping and assign a “name” to any of the 8 digital input. By default DI-1 and DI-2 are related to Manual By Pass and surge arrestor.



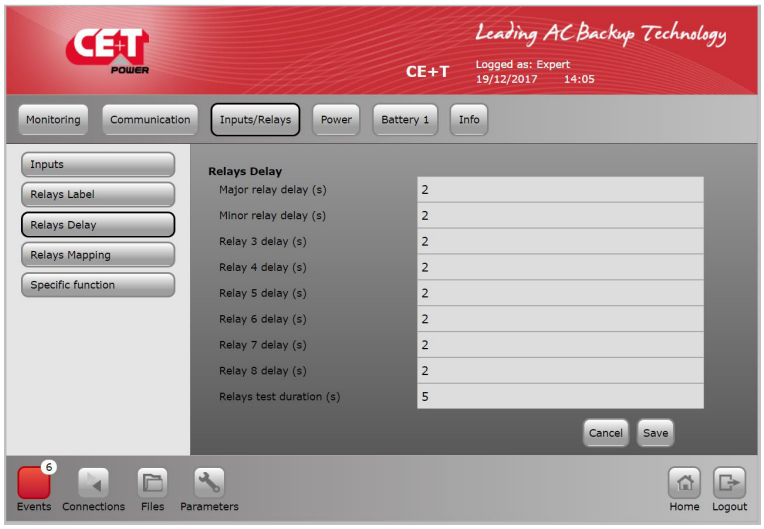
Input labels

- Allow to define a label that will be used for any digital input activated.
- By default **Digital Input 1** is assigned to “Manual By Pass” and **Digital Input 2** is assigned to “Surge protection SPD” if it presents in the system.
  Digital Input3 is used to stop charger power.
- Example, Label 4: Door open will report the event “Dig In 4” every time the digital input 4 is active.

Relay Label

Relay label define the text that will be used for output relay

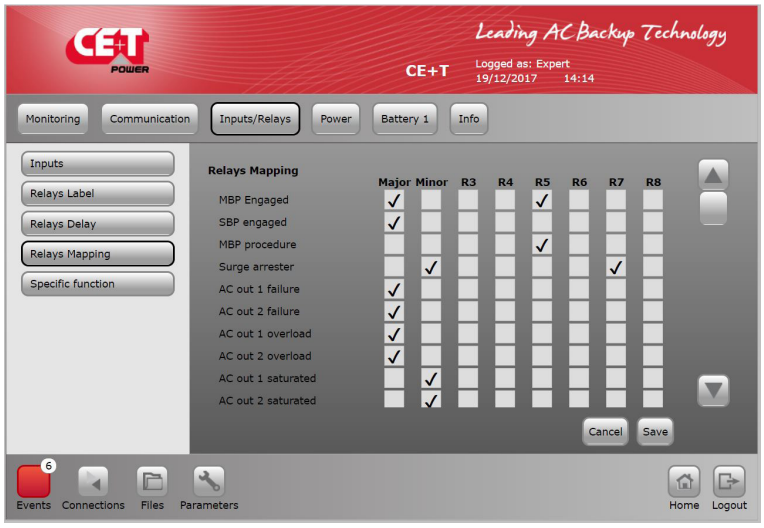
Relay 1 and 2 are reserved for Major and Minor alarm. Relay 3 to 8 are free for any alarm definition



Relays Delay

Allow to define the delay time in seconds after which the relay will change status once the event has occurred.

Range from 2 seconds to 60 seconds.



Relay Mapping

Allow to perform the mapping of mentioned alarms to any relay association.

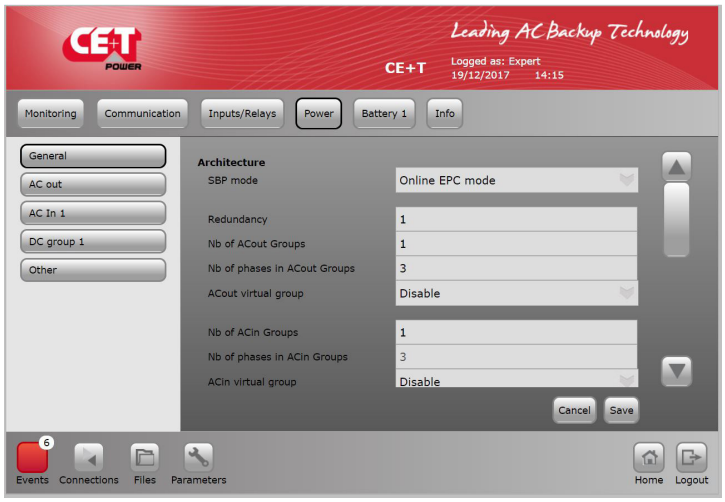
One alarm can be allocated to more than one relays

Specific function that can be used to synchronized time of T4S controller through an impulse on “digital input 08”.

Please contact CE+T if you want to know more about this functionality.

10.4.4 Power Parameter Setting

The menu “Power” allow to perform the setting of the system, AC input, DC battery, AC output and Others.



General

To configure:

- SBP mode: Select “Online EPC mode”, if SBP module is present in the system. To know about **ECO mode**, refer to the Annexe “3.2. Principle of Operation”, page 85.
- Redundancy
- AC IN Groups and Phases
- AC Out Groups and Phases
- DC mode: Select “Battery”

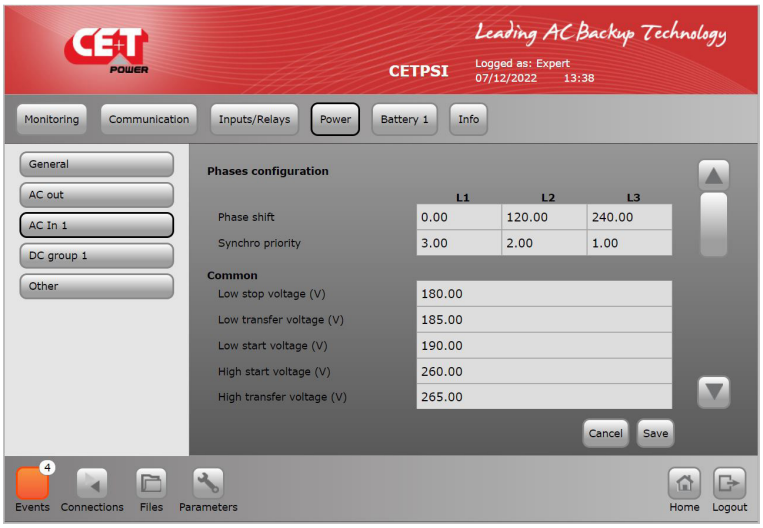
AC out

To configure AC output parameter:

- Phase configuration: AC out voltage window is 200-240 and the frequency to set is +/- 3Hz for 50Hz or 60Hz
- SBP: Max and Min voltage window to set and sync with AC Out from Flexa module

Note: The parameter “Out voltage Set point ” set by default to 230 Vac shall be adjusted according nominal AC input voltage. This will limit the inrush current when operating on Smart By pass and Manual Bypass.

Note: The phase sequence must be respected between AC IN and AC Out. Improper phase sequence might damages equipment during MBP procedure.



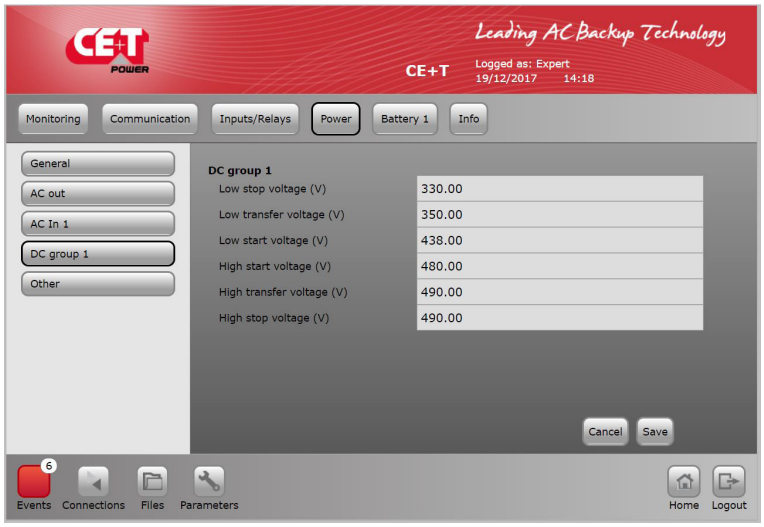
AC In

To configure AC input Parameter.

- Phase shift (120° for 3 phase)
- Sync Priority: Define on which Phase - if all present – the module will synchronise the AC output.
- Low and High defined voltage to configure the voltage boundaries min and max from where Flexa will transfer to DC and vice versa.
- Frequency Window: Allow to sync within the range. Else, will transfer to DC mode
- Maximum power setting at AC input: Description: This function will allow us to limit the power at Input side and act as Peak saving
- SBP Eco mode: This function helps to set the voltage window to operate the SBP mode with range of min - 207 V and max - 253 Vac

DC group

To define min, max battery voltage for default value are related to 408VDC nominal battery (204 cells).



To configure DC input 1 Parameter.

Low and High define voltage to configure boundaries min and max from where Flexa will STOP to preserve battery from deep discharge.

Note:

If more then 1 battery, there will be 2 DC group for Battery 1 and Battery 2.

By default the Flexa config value are listed in the before screen

If those value need to be changed please respect the rules below:

*(Number of cells x V float per cell) = Vdc ref the default value is described in section 10.4.5, page 64, Vref = 204 * 2, 27 = 463.1 V*

300V < Vdc low stop <= Vdc low transfer < [20V hysteresis] < Vdc low start < Vdc ref < Vdc high start < [10V hysteresis] <
Vdc high transfer <= Vdc high stop < 495V

Not respecting the rules above will result is parameters not accepted.

We recommend to proceed as below (respect the sequence):

*To define the new value of **Low start voltage, Low transfer voltage, Low stop voltage** and save.*

*To define the new value for **Battery cells, Float voltage, Capacity, Current limit** in section 10.4.5, page 64, and save.*

*To define the new value for **High start voltage, High transfer voltage, High stop voltage** and save.*

BATTERY type and capacity. To enter the data for charging voltage adjustment and T° compensation coefficient and T° compensation range where the compensation apply.

Other

- **Customer repartition:** 0 to 100% to define the ratio from AC in and battery.
  0% - AC input as primary source.
- **Commutation time:** define the duration to return from DC to AC.
- **Synchro speed:** To define the speed for synchronization (**0** is a default value).
  - Very Fast Synchronization: **- 2**
  - Very Slow Synchronization: **+ 2**
- **AC reinjection**: Can select either Enable or Disable, depends on the condition of boost In mode.
- **Vout min ovrl too long**: To define the value before alarm Over Load Alarm appear.
- **Delay ovrl too long:** To define the timeout to generate Over Load Alarm.
- **Triac enabled:** To define the BOOST function either Enable or Disable.
  - **Enable Boost**: If Flexa and SBP has same AC input source.
  - **Disable Boost:** If Flexa and SBP has two different AC input source.

10.4.5 Battery 1 and Battery 2

Warning: !!!

Battery configuration is extremely important. There must be correct value entered for battery. The wrong value will affect the operation of the system and might have an impact on the battery lifetime. Those parameter will define:

- The float voltage;
- The boost voltage (if enabled);
- The current limitation to protect battery from overcharging current;
- The prediction of the battery capacity when battery test are performed.

General

Note: Configure battery. Refer to battery manufacturer for detail value.

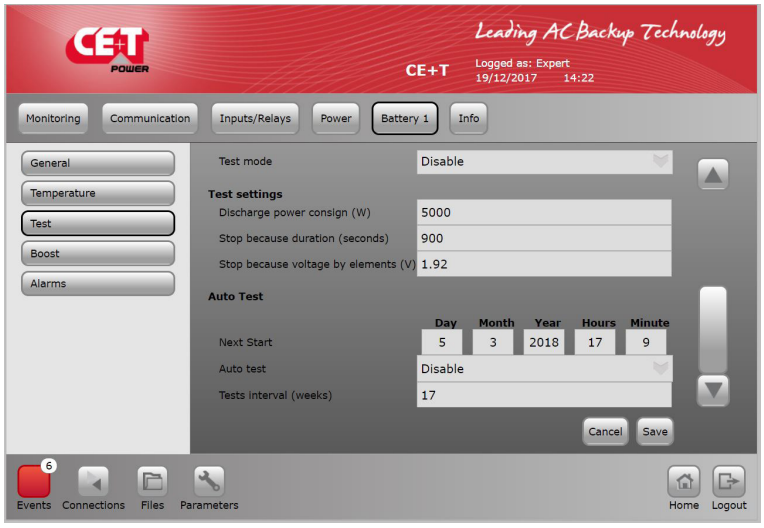
- Flexa need always even number as there is middle point. Ideal 204 cells (2V), Min is 192 V and Max is 216 V.
- Cell float V at 20°C
- Max current to limit during charging. Never exceed C10/4
- Cells capacity, If more then one string please multiply the cell capacity x number of string.

Temperature

Compensation

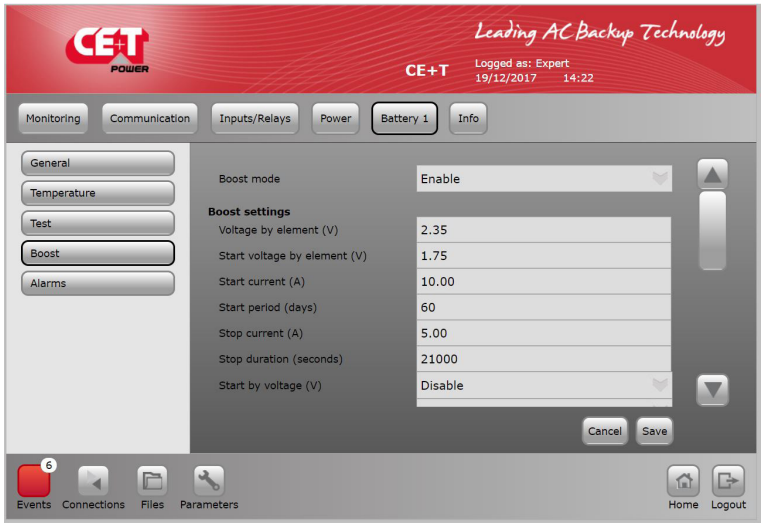
- Enter the value from manufacturer mV/°C
- Min: from where the compensation start
- Max: from where compensation stop

Note: Temp probe is must to connect between battery bank to Temp input at T4S.



Test

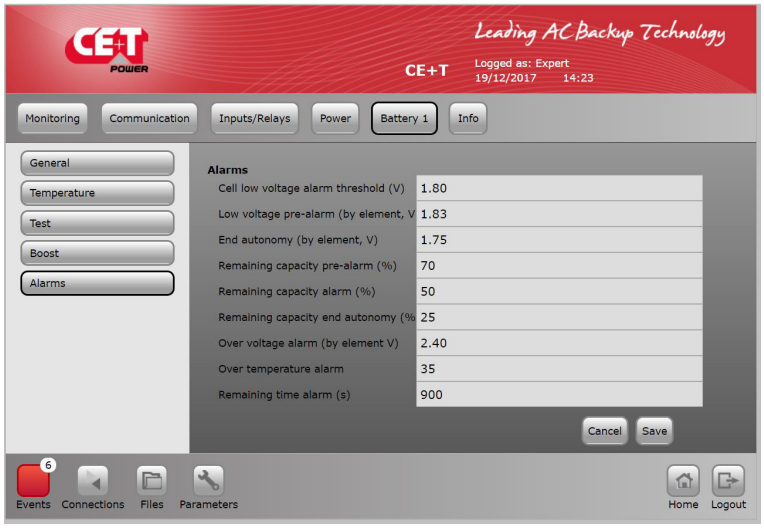
- To set up the battery test parameter Power, time duration and voltage stop
- Auto test to define the periodicity of the test



Boost

To set up Boost, enable the “Boost Mode” and set the parameters.

- Boost mode will be activated depending upon the values in the start and stop parameters of **Voltage, Current** and **Period**.
- To activate each conditions, the corresponding parameters should be enabled.

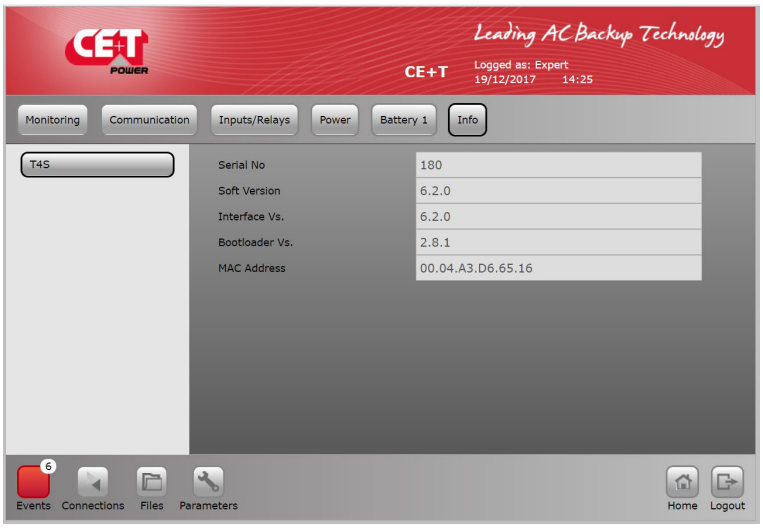


Alarms

The alarm will generate when the battery reaches any one of the following conditions occurs:

- Cell low voltage, pre-low and end of autonomy
- Battery remaining capacity at three levels
- Cell over-voltage and battery temperature
- Battery remaining time

10.4.6 Info



Info

Provides information about T4S:

- Serial number
- Software version
- Interface version
- Bootloader version
- MAC Address

Note: Check the latest T4S software version at My.CET portal.

11. Product Replacement Procedures

11.1 Flexa / SBP module replacement

Flexa and SBP modules are hot-swappable. The replacement procedure of Flex and SBP are the same. After replacing the module, it will automatically synchronize with other modules and does not need any configuration.

Note: After the system detects the new module, clear the missing module alarm in the T4S interface.

Perform the following steps to replace the module:

Step 1. Remove the module by pulling out using the front handle.

Caution: Before sliding the module into the cabinet, make sure nothing is blocking the module such as objects, Inview X wires and other wires.

Step 2. Place the new module in the cabinet.

Step 3. Using the front handle, slide in firmly until the module is properly engaged with the rear terminals.

Place the module

Slide in Firmly

11.2 Fan Replacement

The FAN pre-alarm “FAN life elapse” has been set to 5 years. An event will appear on the Inview X to remind the “FAN life elapse”.

Perform the following steps to replace the Flexa Fan Kit:

1. Order and receive a replacement Flexa Fan Kit which consist of a metallic front plate on which the new three fans are already fixed (T451030001).
2. Remove the module from the system and let it rest at least five minutes prior to initiating the work.
3. Remove the **Front Red Plastic** by releasing all the five latches (3 latches at top and 2 latches at bottom) in the module.
4. Remove the **Flexa Fan Kit** (Front Metallic Plate) by unscrewing the eight screws.

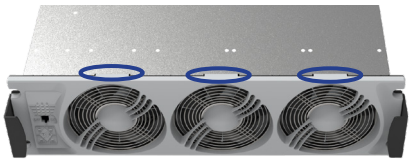


Figure 1: Remove Front Plastic

Figure 2: Remove FAN Kit

5. Unplug the **Fan wires** from the terminal in the module.
6. Remove the **Synoptic Board** and **Mylar sheet** from the Flexa Fan Kit by unscrewing the four screws..

Figure 3: Disconnect the fan wires

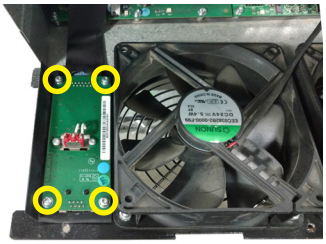


Figure 4: Remove Synoptic Board

7. Take the new **Flexa Fan Kit** (T451030001).
8. Fix the **Synoptic Board** into the new Flexa Fan Kit by using four screws, refer “Figure 4”.
   Note: Place the Synoptic Board and Mylar sheet in exact position before tightening the screws.
9. Connect the **Fan wires** from Flexa Fan Kit to terminal in the module, refer “Figure 3”.
10. Fix the **Flexa Fan Kit** back in place by tightening the eight screws, refer “Figure 2”.
11. Fix the **Front Red Plastic** back in place, make sure all the five latches are fixed properly, refer “Figure 1”.
12. Insert the module in the system.
13. Once it has started, access the fan counter through the T4S/Inview X and reset it (see page 49).

11.3 T4S Replacement

T4S is a hot-swappable device. It can be removed from the live system and will not affect the load and system operations.

Perform the following steps to replace the T4S on Flexa 200 UPS systems.

1. Turn OFF the power supply (12 Vdc) of the T4S.
2. Remove all the connectors from the T4S (Note the position of all removed cables)
3. Take out the fault T4S from the system.
4. Remove the **micro-SD card** from the T4S and copy the content to your laptop. Ensure the "**Configuration.ini**" file is copied.
5. Install the new T4S and connect back all the removed cables.
6. Switch ON the Aux power supply of the T4S
7. T4S will take a few minutes to extract the .saf file (both LEDs on the T4S will be flashing)
8. Once files are extracted, then T4S will come into normal operation. It means Modules transferred all the module parameters to T4S.
9. Connect it to the laptop and access it through the web interface using the default IP **192.168.0.2**; the password is **pass456**.
10. Then check all the power parameters, Alarm settings, Relay and DI mapping as per your setup.
11. Change the IP Address according to your local network if needed.
12. For any deviation or alarms on the T4S, update the downloaded "**Configuration.ini**" from the old T4S copied on your laptop.

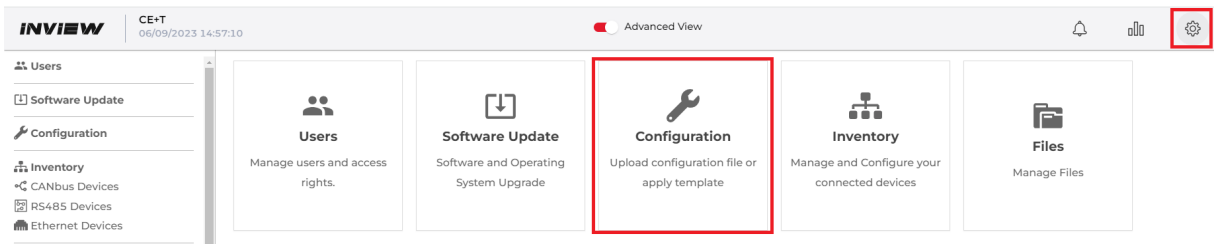
Disclaimer: This file (Configuration.ini) should be manually edited by the CE+T crew or any specially trained operator. Any mistake made in this file could prevent the system from starting, and we shall not guarantee the whole system's behaviour once this file has been corrupted. All modifiable values contained here are easily accessible through the T4S web interface, which allows you to change this configuration carefully.

11.4 Inview X Replacement

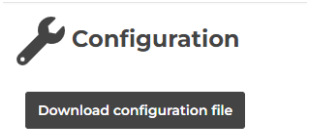
Inview X is a hot-swappable device. It can be removed from the live system and will not affect the load and system operations.

Perform the following steps to replace the Inview X on Flexa 200 UPS systems.

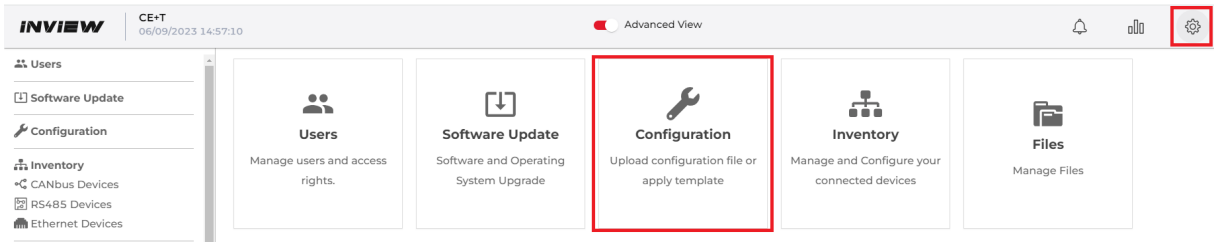
1. Go to Inview X Web UI
   - Click the Administration button and click on Configuration



- Click on 'Download configuration file' and save the file in a folder.



2. Remove the four screws at Inview X's front plate.
3. Pull out the plate slowly from the system.
4. Unplug the power supply (48 Vdc) at the Inview X rear side.
5. Remove all other connectors from the Inview X rear side (Note the position of all removed cables).
6. Remove the Inview X from the system.
7. Check the new Inview X version from the sticker.
8. Install the New Inview X and connect all the removed cables including the power supply (48 Vdc) at the rear side.
9. Inview X will get powered up and wait a few minutes to communicate with T4S.
10. Go to Inview X Web UI
    - Click the Administration button and click on Configuration



- Under the 'Upload' option, click on 'Choose file' button, choose the saved configuration file and click on 'Upload configuration file and reboot' button.

11. If T4S communication is not established, go to Inview X web UI, select Site > Configuration.
    - Scroll down to 'Network' and make sure that the parameter CF340 value is 192.168.0.5/24.
    - Scroll down to 'Ethernet' and make sure that the parameter CF220 value is T4S(192.168.0.2,es1_convs1).
    - If the T4S IP address is changed by the user, then the same has to be entered in CF340 and CF220 values acordingly.
12. Ensure that the Dashboard and data are on the GUI screen.

12. SNMP v1 / SNMP v2c / SNMP V3 Configuration

SNMP is now available on the T4S supervisor and in the Inview X Web UI.

SNMPv1 is available on the T4S supervisor. The MIB implemented on the T4S SNMP agent is the standard USP MIB defined by RFC1628. This can only be accessed via a direct connection to the T4S (the T4S should be connected to the network).

The Inview X web UI includes support for SNMPv1, SNMPv2, and SNMPv3 which is Inview specific MIB.

12.1 SNMP Configuration via T4S

12.1.1 SNMPv1 Configuration

For SNMPv1 agent configuration, go to Parameters > Monitoring > Network.

See T4S network section for ETH port configuration:

- IP address.
- Subnet mask.
- Gateway.

See T4S SNMP section for SNMP agent configuration:

- Trap receivers IP addresses. Up to 5 trap receivers can be configured.
- Note that ports 161 and 162 (for traps) are used. Not configurable.

12.1.2 SNMPv1 MIB (RFC1628)

The MIB is the standard UPS MIB defined by RFC1628.

Meaning of “input lines”: input lines are AC input groups as existing in T4S web interface. One tri-phase system will have 3 input lines, one for each phase.

Meaning of “output lines”: output lines are AC output groups as existing in T4S web interface.

The following features of UPS MIB are not implemented in T4S:

- Writable entries. The current MIB is read-only. Entries can only be edited through the web server. For this reason, the upsConfig section is also read-only.
- Bypass values. As T4S doesn’t include the monitoring of bypass devices, bypass measurements are not available in the MIB. It is however possible to know when the system switched to MBP by reading ups Output Source value (OID .1.3.6.1.2.1.33.1.4.1).
- Well known test. Only standard battery test is available. No other test is implemented in T4S at current state.

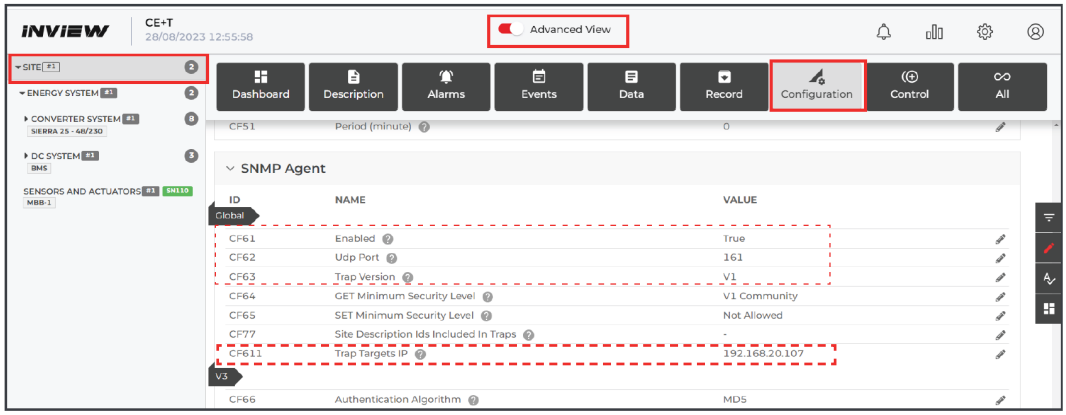
Any feature defined in RFC1628 that is not in the previous list is available.

12.2 SNMP Configuration via Inview X

12.2.1 SNMPV1, V2 and SNMPv3 configuration

For the SNMP configuration via Inview X web UI, go to *Advanced View* > *Site* > *Configuration*, scroll down to the SNMP Agent section and select the following options.

- In the ID CF61, select "True" to enable the SNMP function and enter the port address in the ID CF62.
- In the ID CF63, select the SNMP version V1, V2c and V3.
- In the ID CF611, enter the Trap Targets IP.

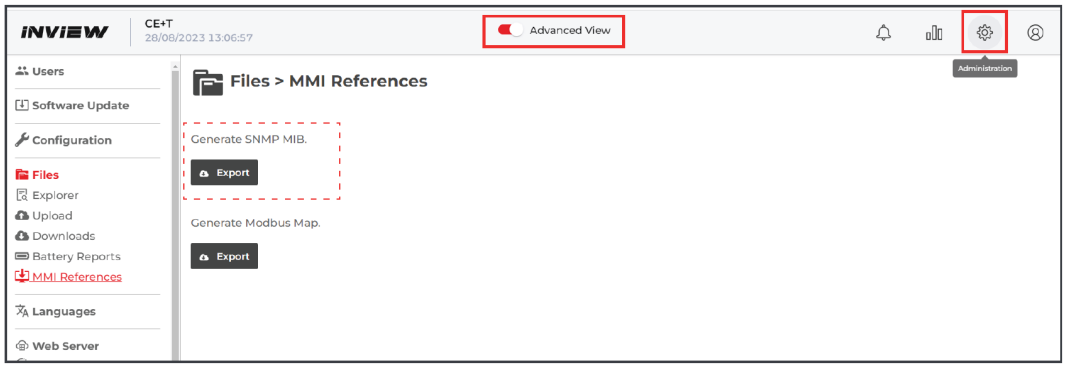


12.3 MIB

This section describes the Inview Management Information Base (MIB) schema design for SNMP V1, V2c and V3 configuration. A MIB schema describes the structure of information served by a Simple Network Management Protocol Subsystem (SNMP) agent.

The data is grouped in terms of high-level objects and therefore models a top-down hierarchical design.

To download the SNMP MIB file, go to *Administration* > *Files* > *MMI References* and click SNMP MIB "Export" button.



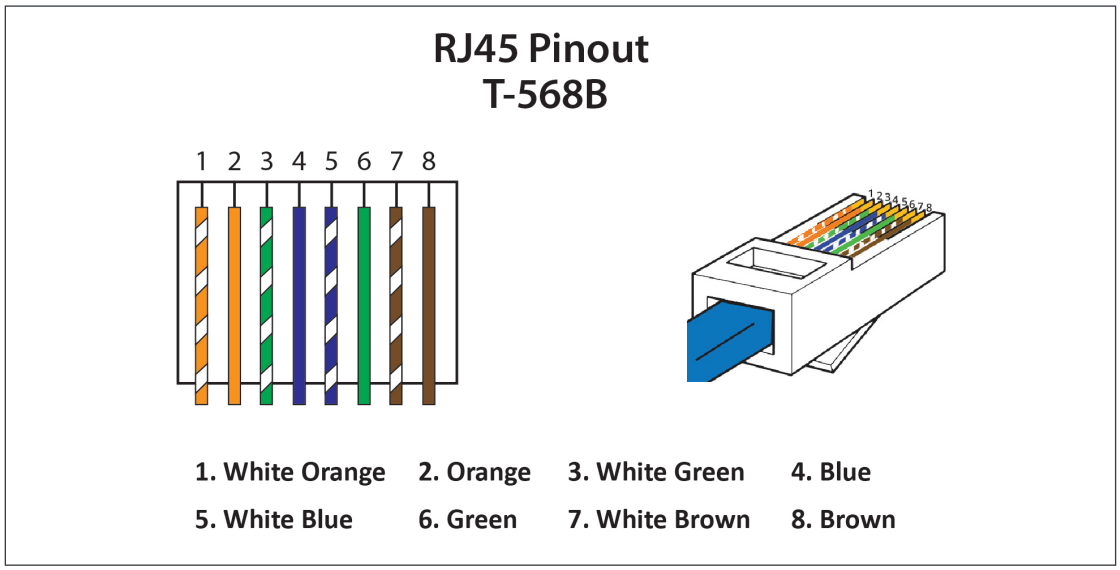
13. ModBus

13.1 ModBus RTU

T4S can act as a ModBus RTU slave with various baud rates and configuration options. No action can be done on the system through ModBus port; it's only for monitoring purposes.

13.1.1 Physical Connection

To get access to the ModBus, the RJ45 labelled "RS485" on T4S monitoring unit should be connected. RJ45 pin out is as follow:

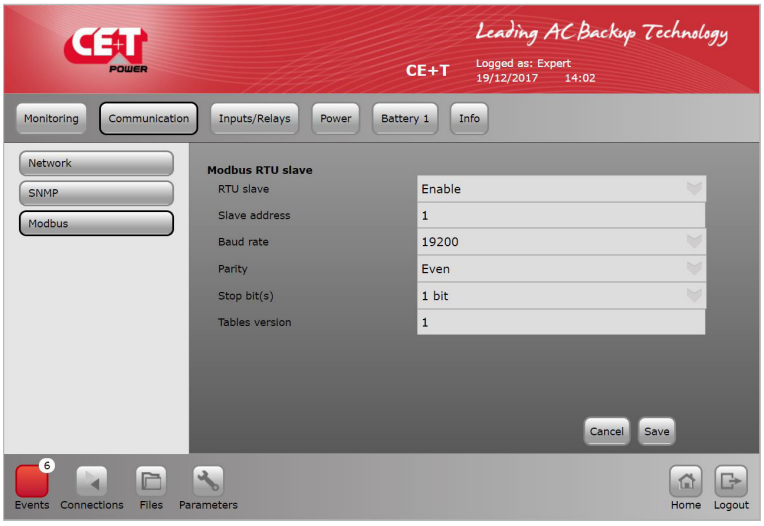


Note: The colour of wires is irrelevant and may vary, but make sure the position of wires is exactly crimped.

- Pin 4 = D1
- Pin 5 = D0
- Pin 8 = Common (GND)

13.1.2 Configuration

ModBus slave configuration is accessible through user interface by browsing menu *Parameters, Monitoring* tab*, ModBus* sub menu.



- Modbus RTU slave can be either *enabled* or *disabled*.
- Slave address ranges from *1* to *247*. Default is *1*.
- Supported baud rates are: *9600, 19200, 38400, 115200*, or *460800*. Default is *19200*.
- Parity can be *none, even,* or *odd*. Default is *even*.
- Stop bits can be *1* or *2*. Default is *1*.
- Configuration is applied once *save* button is clicked.

Table version parameters ensure that customer can use any revision of the modbus tables he wants. First release is based on table revision 1.

To know more about modbus, download it from My.CET.

For Modbus Data and Alarm details, refer to “Annexe 7. ModBus Table”, page 110

14. Commissioning

DATA	
Date	
Performed by	
Site	
System serial number	
Module serial numbers	

Actions	OK / Not OK
System is running	
All module inserted inside the system.	
AC load is supplied.	
Battery is charged.	
Switch OFF AC IN and check that the AC load continue to be supplied by Battery source.	
Switch ON AC IN and check that battery is recharged by the system.	
System recover “**No alarm**” state.	

Record the following values

Parameters	Description
Number of module seen by T4S	
Redundancy	
AC IN	
Voltage	
Current	
Power	
AC OUT	
Voltage	
Current	
Power	
Battery	
Voltage	
Current	
Power	
Temperature	
Download configuration file and clear log file.	

15. Trouble Shooting and Defective Situations Resolution

15.1 Trouble Shooting

Module does not power up:	Check AC input present and in range (AC breakers) Check Battery input present and in range (Battery breakers) Check that the module is properly inserted Remove the module to verify that slot is not damaged, check connectors Check that module(s) is (are) in OFF state Check for loose terminations
System does not start:	Check that T4S is present and properly inserted Check remote ON/OFF terminal Check the configuration and setting Check threshold level
Module only run on AC or Battery:	Check AC input present and in range (AC breakers) Check Battery present and in range (Battery breakers) Check the configuration and setting Check threshold level(s)
No output power	Check output breaker
All OK but one has alarm:	Check configuration file and correct number of modules Download/clear log file
No output alarm:	Check the default time delay (UA: 60 s, NUA: 30 s) Check configuration file

16. Defective Situations Resolution

16.1 Defective modules

Unless input power is down all LEDs on each module should be green (see section 6.1.1, page 24). No light, orange light, red or flashing light are abnormal conditions. Record module information. If no fix can be found, replace module.

16.1.1 Replacing Modules

Refer to section 11.1, page 67 to remove and re-insert modules.

16.1.2 Return Defective T4S Interface

A T4S totally dark (indication area) or that cannot interface with your laptop are evidence of failure. Proceed as per section 16.1.4, page 77.

16.1.3 Return Defective Shelf

The shelf is passive. Failure is unlikely to happen. In turn defective situation are barely always visible. After depose proceed as per section 16.1.4, page 77.

16.1.4 Return Defective Modules

- A repair request should follow the regular logistics chain:
  End-user => Distributor => CE+T Power.
- Before returning a defective product, a RMA number must be requested through the http://my.cet-power.com extranet. 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!
- Information on failure occurrence as well as module status given through Menu 2-1 shall be attached to defective unit return package or recorded in RMA.

17. 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 CE+T through email: customer.support@cet-power.com

(*) CE+T will redirect your call to your vendor if he has such SLA in place.

18. Maintenance Task

As maintenance will be performed on live system, all task should be performed only by trained personnel with sufficient knowledge on TSI 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 analyse 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 analyse 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. If temperature increase due to internal 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 TSI 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 from power analyzer.
- Take the cabinet picture.
- Keep track of report and provide end user with a copy.

Annexe 1. Battery Management with Flexa Technology and T4S

1.1. Introduction

Battery is critical element in a UPS. Many manufacturer offer high performances of their electronic but sometimes forgot about providing an efficient and reliable battery management.

Battery is fragile and needs to be treated accordingly in discharge and recharge conditions. The purpose of this document is to provide an overview of how TSI and Flexa manage the batteries, prevent their end of life and reduce possible occurrence of thermal runaway.

1.2. CE+T Battery Charging and Discharging Mode

The purpose of a charger is to “refill” the charge tank of the battery. There are many other features which enhance the convenience of the charger, or grant protection for the battery being charged. These built-in protection features is what fundamentally elongates the battery’s life, or more correctly, prevents premature failure.

TSI technology provide those features:

- Higher current levels reduce recharge times (assuming the battery can accept charge at high rates).
- Voltage limits, current limits, and time out to reduce excessive gassing at end-of charge, and prevent dry-out.
- Modified voltage and current limits as a function of temperature reduce gassing and electrode damage.
- BOOST or Equalize mode to equalize battery blocs periodically

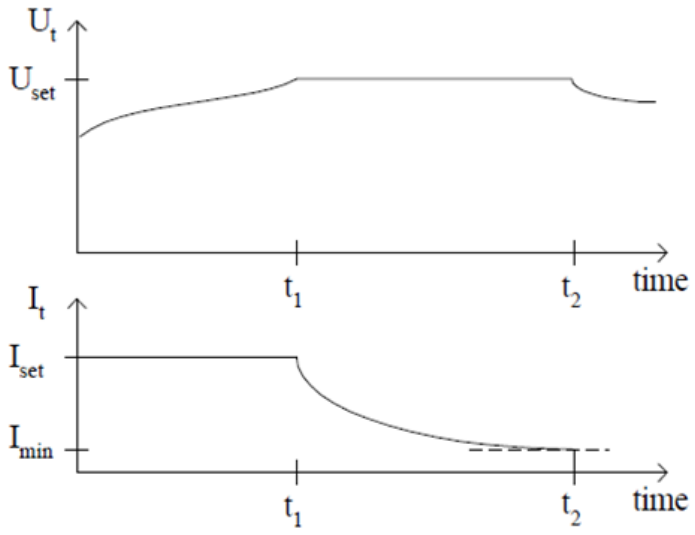
CE+T Flexa and controller T4S battery operating mode are described below

1.2.1 MODE 1 BOOST

This mode need to be activated and configured according the battery data from the manufacturer

A CCCV (constant current, constant voltage) algorithm to provide a “quick an fast recharge. Ideally to recover 80% of the battery capacity in maximum 8 hours. This mode use a U_{set} voltage level associated to current limit protection

Figure 1. Typical recharge curve versus time for voltage and current.



MODE 1 algorithm can be trigger based on the following parameter:

- Trig Start Voltage : Will activate MODE 1 when battery voltage goes below pre-set level
- Trig Start Current : will activate MODE 1 when battery current goes above the pre-set value
- Trig Start Period : Will activate MODE 1 periodically base on pre-set value
- Manual Start : Will activate MODE 1 manually through the GUI menu

In mode 1 the temperature compensation is disabled.

MODE 1 algorithm can be stopped based on the following parameter :

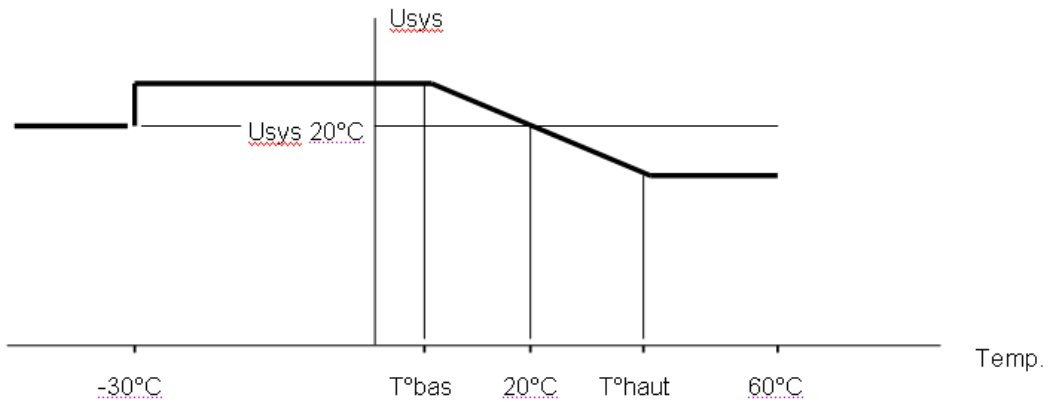
- Trig Stop Current: Will stop MODE 1 when battery voltage goes below pre-set level and MODE 1 for minimum 5 minutes (to avoid successive Start and Stop)
- Trig Stop Duration: 1H to 48H will stop MODE 1 (always active) will stop the MODE1 after the duration.

Note: If MODE1 stop based on "duration" before the "Stop current" reached an alarm will be generated as the battery need to be checked.

- Trig Start Period: Will activate MODE 1 periodically base on pre-set value
- An alarm appear in the system: MODE 1 will be disabled in case of alarm presence
- Manual stop: will STOP MODE 1 manually through the GUI menu

1.2.2 MODE 2 FLOAT:

This is the normal operating mode for maintaining the battery in charge. This mode is enabled by default



The MODE 2, charging voltage is adapted (provided it is enabled in the configuration) according the temperature. Using the charging curve below.

T° bas-low and T° haut-high are adjustable

Note: If the temperature probe is disconnected or defective the voltage will come back to the value at 20°C. An alarm T° sensor fail" will be generated.

1.2.3 MODE 3 Discharge

Discharge mode is active when energy flow is taken from the battery to the DC/AC converter (inverter) of each module.

In this mode the T4S monitoring sent a voltage and current value to the Flexa module. This help in case of one module has AC input failure to take power from DC and is feed through the other module to avoid discharging the battery and assure the continuity of supply for the AC load.

Following alarms and time out available:

- Ubat < Ufloat
- BAT cell V low
- BAT end of autonomy
- BAT discharge time out (Battery in discharge for more than xx minutes)
- V BAT stop: Flexa will stop operating to prevent deep discharge

Note: During discharge, T4S will record battery discharge value

1.2.4 MODE 4 BATTERY TEST

Battery test is a helpful function to get reliable information on the battery conditions and capacity.

It is recommended to perform periodic test of the battery but more important to perform those test in the same conditions in order to obtain comparative data over the years of the battery lifetime.

Starting BATTERY TEST conditions:

- Manual
- Trig Start Period: Specify the day of the week to perform the periodic test and the number of weeks between 2 tests.

Note: Periodic test will start only if no discharge during last 96 hrs. to guarantee the same start conditions for every test.

Stopping BATTERY TEST conditions:

- Trig Stop Duration : always active. Define the maximum time duration of a test
- Trig Stop Voltage : stop the test when battery voltage reaches the pre-set value
- An alarm appears in the system:
  - AC IN failure
  - Module failure
  - V BAT too low
  - System Overload
- Manually through the GUI menu

Note: During any test or battery discharge the following data will be recorded.

START BAT x TEST + data and time

FIN BAT x TEST + data and time

For every delta of 1VDC record of:

- Date in seconds
- Battery voltage
- Battery current
- Bat Temperature

END BAT TEST + date+Time, VBAT, Temp+ Success, FAIL

START BAT x DISH + data and time

FIN BAT x DISH + data and time

For every delta of 1VDC record of:

- Date in seconds
- Battery voltage
- Battery current
- Bat Temperature

END BAT DISH + date+Time, VBAT, TEMP

Annexe 2. Manual Bypass (MBP)

The purpose of this document is to provide guidelines for customers to implement, assemble, wire and test external manual by-passes using CE+T Flexa modular UPS' with T4S monitoring units.

The CE+T delivered cabinets equipped with manual by pass are not concerned by this document.

2.1. Introduction

The purpose of the Manual Bypass also named "service by pass" is to provide the capability to completely by-pass the modular UPS Flexa system and SBP in order:

- To perform service maintenance to the equipment
- To externally by-pass the UPS installation and allow the removal of the equipment

2.2. Principle of Operation

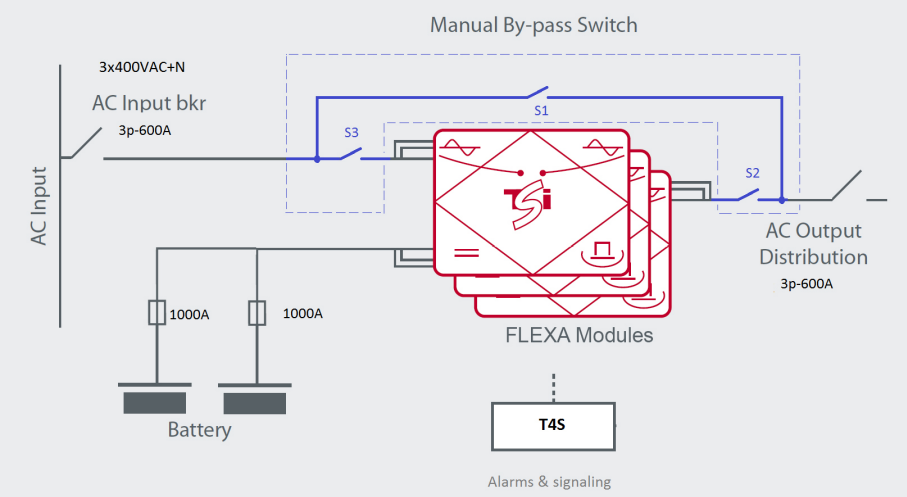
The manual by-pass (MBP) is a "make before break" Bypass manual switch.

The MBP can be in 3 position mode:

OFF or NORMAL:	The MBP is not engaged (OFF) and the USP normally feeds the critical load.
INTERIM or TRANSFER:	The MBP is in a temporary interim position where the AC load is supplied through the manual by-pass. The Flexa UPS is in start up mode and not yet connected to the AC output.
ON or BY PASS:	The MBP is engaged, the AC input feeds the AC load, the UPS modules are OFF. Disconnect DC source to turn OFF the system completely. (Note: Flexa Module auxiliary power supply and monitoring are still power up by DC source once MBP is engaged)

Warning: If MBP is engaged, the neutral connection is not isolated and not voltage free.

Block wiring of the MBP



NORMAL mode or OFF: S1 is open, S2 and S3 are closed

INTERIM or TRANSFER: S1 is closed
S2 and S3 can be in position OPEN or CLOSED depending where you are in the manual by pass procedure

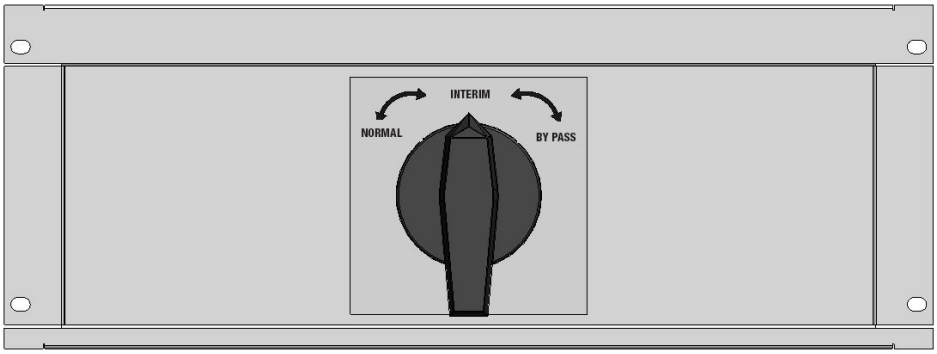
Note: This position is only temporary. It is used to allow the modules to start up and synchronize with the AC input. The user should not keep the Bypass in the INTERIM position.

BY-PASS mode or ON: S1 is closed. S2 and S3 are open.

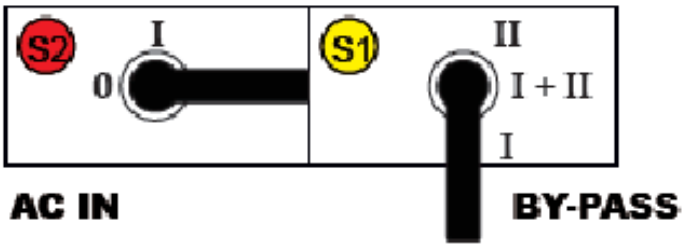
2.3. Presentation

The Manual By-pass can be provided with 2 executions:

1. Rotary Switch for Flexa 60 kVA and Flexa 160 kVA



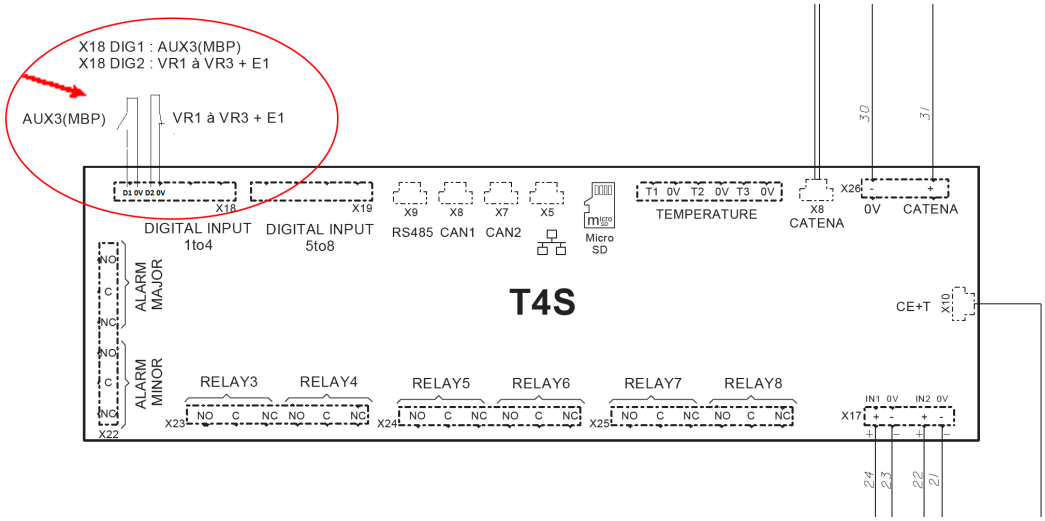
2. Two (2)power switches external to the Flexa cabinet for power above 160 kVA



Please refer to the Flexa installation manual for more specific procedures.

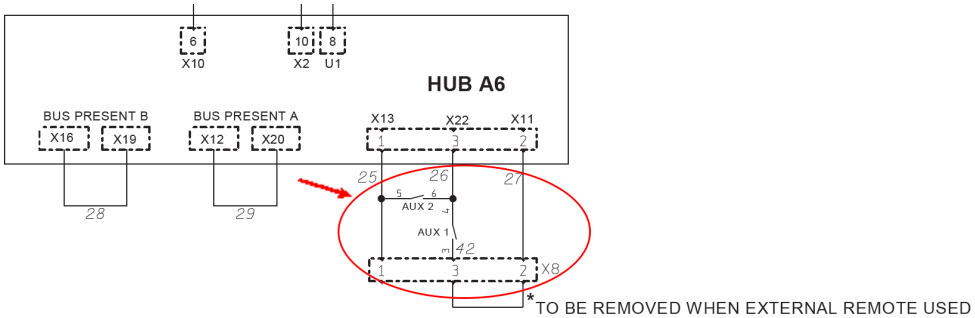
2.4. MBP Wiring

Both solutions (rotary by-pass or separate switches) need to have auxiliary contacts that need to be wired to the monitoring unit as described below and as shown on the drawing present in annexe



Aux 3 (from the by pass switch) : Provides an input to the controller indicating that the MBP is engaged

Aux 1 (From AC input switch) and Aux 2 (from the by pass SWITCH):



- Switch OFF the Flexa modules once the MBP is engaged.
- Allow the Flexa modules to switch ON when the MBP placed in the INTERIM position.

Note:

The parameter “Out voltage consign” set by default to 230 Vac shall be adjusted according nominal AC input voltage. This will limit the inrush current when operating on Smart By pass and Manual By pass.

2.5. MBP Procedure

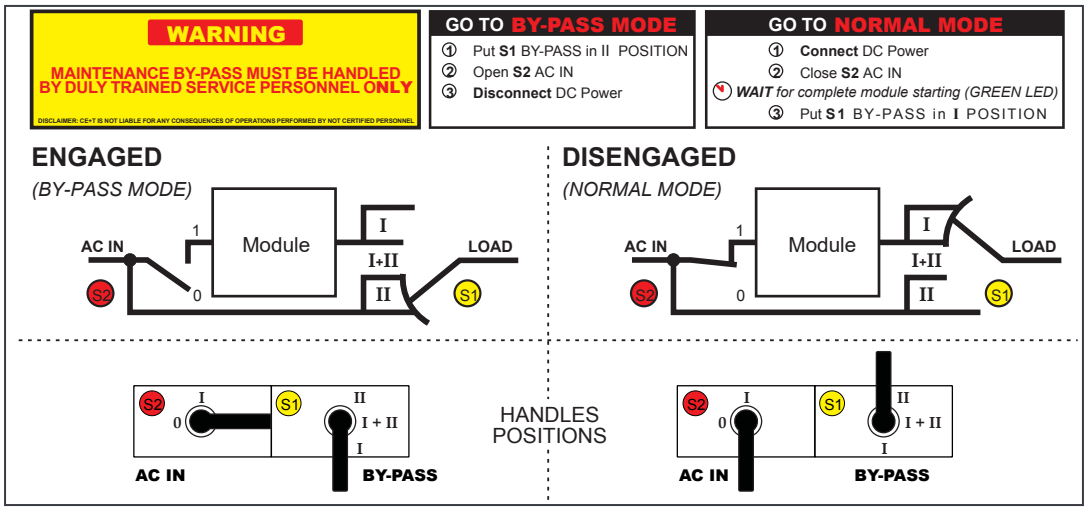
2.5.1 Normal to By-Pass

Internal MBP

1. Turn the MBP switch from position **NORMAL** to **BYPASS.**
2. Switch OFF the DC Input from the battery to the Flexa Cabinet.

External MBP

1. Turn switch **S1** to position 2
2. Turn Switch **S2** to OFF (Position 0)
3. Switch OFF the DC Input from the Battery to the Flexa cabinet



2.5.2 By-Pass to Normal

Internal MBP

Switch on the DC feed to the Flexa Cabinet (DC battery fuse ON)

1. Turn Rotary Switch from BYPASS to “INTERIM” position
2. Wait for all LED on Flexa module to be permanent green
3. Turn Rotary Switch to NORMAL.

External MBP

1. Switch on the DC feed to the Flexa Cabinet (DC battery fuse ON)
2. Turn switch S2 to ON(Position 1)
3. Wait for all LED on Flexa module to be permanent green
4. Turn Switch S1 to Position 1

2.6. MBP Procedure with SBP

2.6.1 MBP - Single rotary switch

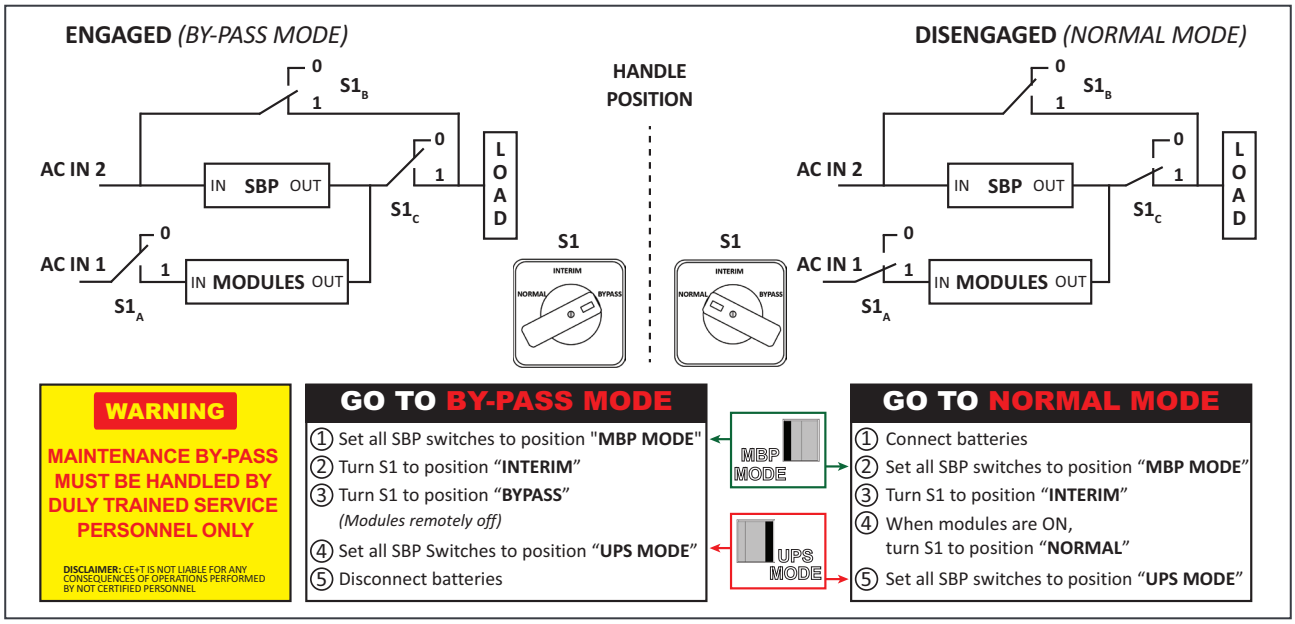
In this model, Manual By-pass operates in a single switch with three positions - NORMAL, INTERIM and BYPASS.

Normal to By-Pass Procedure

1. Set the switch to **MBP Mode** in all the SBP modules.
2. Rotate the MBP switch (S1) from **NORMAL** to **BYPASS** position.
3. Turn the switch to **UPS MODE** in all the SBP modules.
4. Switch OFF the **DC Input** from the battery to the Flexa Cabinet.

By-Pass to Normal procedure

1. Switch ON the **DC power** and/or connect batteries.
2. Set the switch to **MBP Mode** in all the SBP modules.
3. Rotate the MBP switch (S1) from **BYPASS** to **INTERIM** position.
   (Wait for all LEDs on the Flexa module turns to permanent green)
4. Rotate the MBP switch (S1) from **INTERIM** to **NORMAL** position.
5. Turn the switch to **UPS MODE** in all the SBP modules.



2.6.2 MBP - Three individual switches

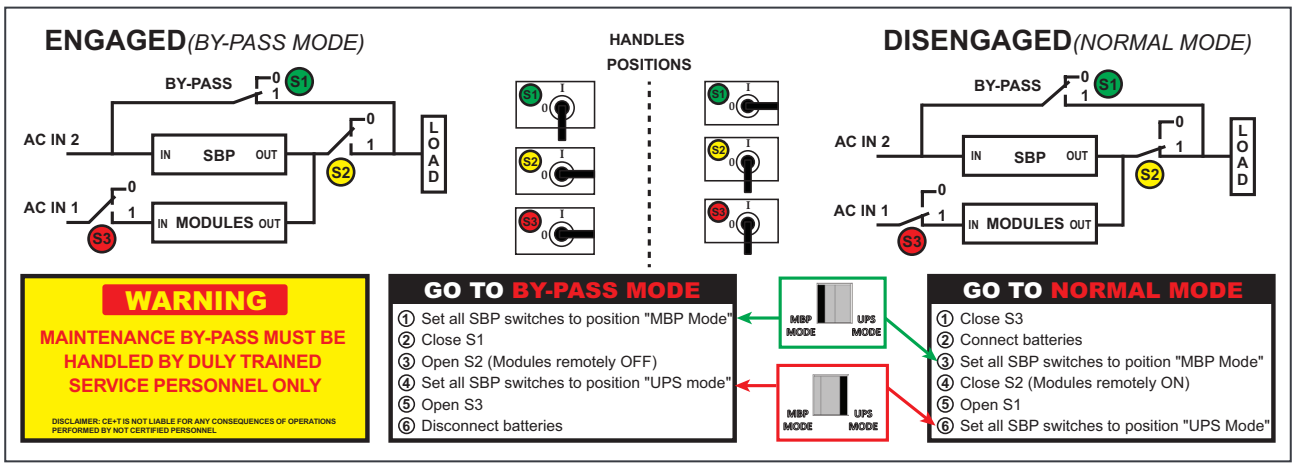
In this model, Manual By-pass operates through three individual switches - S1 (Manual By-pass), S2 (AC Output) and S3 (AC Input).

Normal to By-Pass Procedure

1. Set the switch to **MBP Mode** in all the SBP modules.
2. Close the By-Pass switch **(S1)**, 0 to 1.
3. Open the AC Output switch **(S2)**, 1 to 0
4. Open the AC Input switch **(S3)**, 1 to 0
5. Turn the switch to **UPS MODE** in all the SBP modules.
6. Switch OFF the **DC Input** from the battery to the Flexa Cabinet.

By-Pass to Normal procedure

1. Switch ON the **DC power** and/or connect batteries.
2. Set the switch to **MBP Mode** in all the SBP modules.
3. Close the AC Input switch **(S3)**, 0 to 1.
   (Wait for all LEDs on the Flexa module turns to permanent green)
4. Close the AC Output switch **(S2)**, 0 to 1.
5. Open the By-Pass switch **(S1)**, 1 to 0.
6. Turn the switch to **UPS MODE** in all the SBP modules.



Annexe 3. Smart By-Pass (SBP)

The purpose of this document is to provide guidelines for customers to access the Smart By Pass using CE+T Flexa modular UPS' with T4S monitoring units.

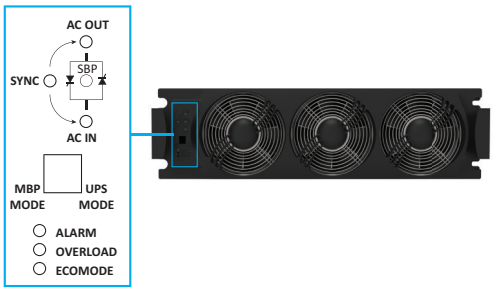
Note: SBP should be installed and operated only in Flexa UPS System.

Caution: If Flexa and SBP has two different input source, it is mandatory to disable the Boost function. Refer "Triac enabled" parameter at section "Other", page 58.

3.1. Introduction

The purpose of the Smart By-Pass is to provide the capability to completely by-pass the modular UPS Flexa system in order:

- SBP will transfer the Load to Bypass without interruption.
- To perform service maintenance to the equipment.
- To externally by-pass the UPS installation and allow the removal of the equipment.



3.2. Principle of Operation

The SBP operates in two modes:

1. UPS Mode

The priority is given to the Flexa module and the SBP is in standby.

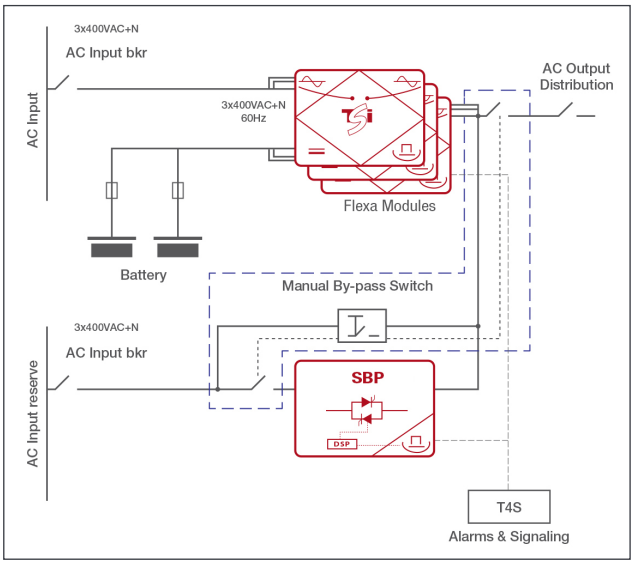
In the event of a disturbance of the Flexa and/or battery end of discharge, the system will provide unconditioned power to the load by returning to ECO mode feeding the load through SBP in AC to AC.

2. ECO Mode

The priority is given to the SBP while Flexa are in support mode.

If the SBP AC input voltage is out of range min or max the Flexa will take over the load.

In the event of a power disturbance, the system will provide conditioned power to the load by returning to UPS mode feeding the load through Flexa in AC to AC or DC/AC. When operating in ECO mode Flexa fan speed shall be reduced to its minimum.



Block diagram - SBP with Flexa and MBP

Note: The parameter "Out voltage consign" set by default to 230 Vac shall be adjusted according nominal AC input voltage. This will limit the inrush current when operating on Smart By pass and Manual By pass.

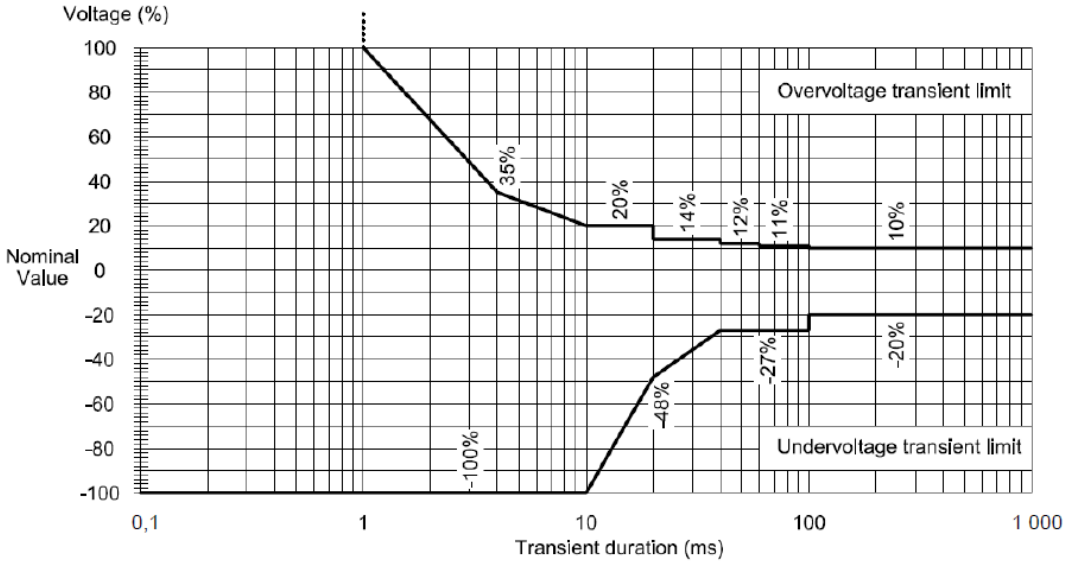
In any of the operating mode: "ECO mode" or "UPS Mode", the AC output will always be synchronized on the SBP AC input. Only Flexa module without BOOST will be used in ECO mode. If module with BOOST are

used the BOOST shall be disabled.

Warning: If SBP is engaged, the neutral connection is not isolated and not voltage free.

System will stay in ECO mode provided that:

- The AC input voltage range are within the configured limits min and max Vac in of the SBP;
- Below and above those limits the UPS will go in Flexa mode (either AC to AC or DC to AC, depending on AC input connected to Flexa module). The transfer shall not suffer any interruption of the load and shall respect classification 3 of IEC 62040-3 (see curve here below);

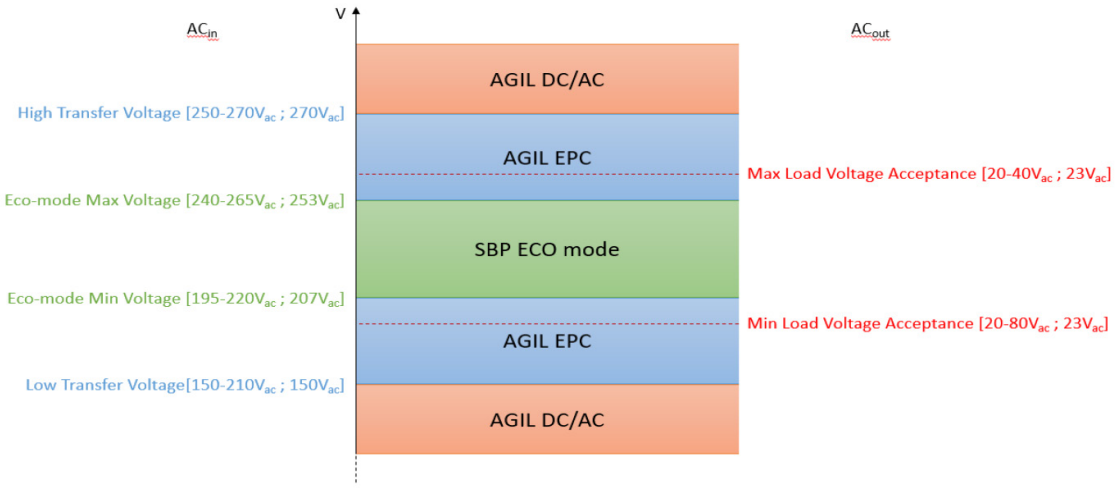


- Vac min and Vac max will be adjustable between:
  - 195 Vac to 210 Vac for Vac min transfer;

  Note: Vac min too low could lead to higher transfer time.
  If 195 Vac doesn't allow to guarantee classification 3 of IEC 62040-3, the minimal acceptable value must be identified.

  - 250Vac to 265Vac for Vac max transfer.
- Hysteresis will be constant and fixed to the most appropriate value according the measurements device of the SBP/Flexa and to prevent any intermittent transfer ECO to Flexa and vice versa;
- One alarm shall be generated if the output power through the SBP in ECO mode exceed the Flexa installed power. In this eventuality, the system will be blocked in ECO mode and prevent any transfer;
- The return from Flexa mode to ECO will be automatic once the SBP AC input is within the range. A adjustable timer 1 to 90 sec will delay the return to ECO mode except if end of autonomy of the battery is reached.
- In order to detect a back feed on SBP input in some cases, ECO mode should be disabled when under a percentage of the max output power of the system (20% of the Flexa installed power);
- CE+T requires electrical schematics of the system deployed in order to facilitate the integration, I/O and alarm mapping;
- The monitoring will generate an URGENT alarm in case output power exceed the maximum power of the available Flexa module. Any transfer from ECO mode to UPS mode will be blocked if the AC load power exceed the power available from Flexa module. "Saturation" and "OVL" alarms active;

- CE+T will activate function to enable the eco-mode via a parameter (configured via T4S);
- It is asked to be able to configure the delay to return to eco-mode between 1 sec to 90sec (default value 90 sec). We would like to fix this time a little above 90s, because of the typical time constants of external electrical devices;
- If the Flexa & SBP are on the same AC source and the walk in mode is implemented. The walk in mode shall be used before returning to ECO mode. This means from Flexa UPS operating on battery a smooth transfer to AC input and when completed the SBP will switch to ECO mode. If the walk-in mode duration is longer than the eco-mode delay (see above paragraph), the walk-in mode duration is used instead of the eco-mode delay. No walk-in mode is implemented when Flexa and SBP are not on the same AC source.



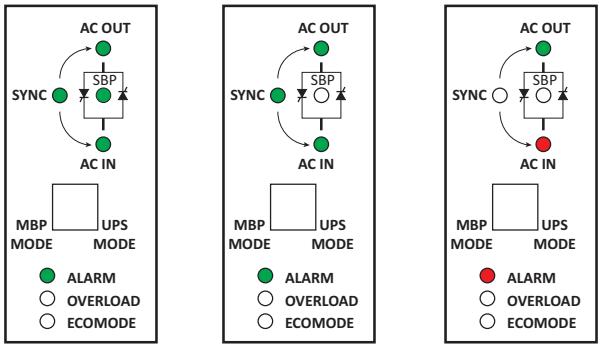
ECO mode - Operating zone

3.3. SBP LEDs Indication

LEDs in SBP indicates the status of AC Input, AC Output, SYNC, SBP, Alarm, Overload, and Ecomode.

The following image illustrates the status of:

- SBP Engaged.
- SBP Ready.
- SBP Input Not OK.



Annexe 4. T4S Alarms

4.1. Supervisor Alarms: T4S

This is the list of alarms issued by supervisor. Other alarms are issued by modules directly (see Flexa alarm table & OCA document). The supervisor is able to generate alarms that are related to the system, to Flexa modules, or to itself. Alarms related to Flexa will be seen as system alarms when module alarm is present on all Flexa modules.

Each alarm has a priority level. The level can be {disabled, event, minor, major}. If the level can be configured in user interface, then it is marked as “mappable”, please refers to the last table for standard mapping.

Monitoring Alarms				
Text ID	**Name**	**Level**	**Def. Map**	**Description/ Possible action**
224	MBP engaged	Mappable	/	The system is in manual by pass mode. Disengaged MBP to recover normal mode
225	Surge arrester	Mappable	/	Surge protection trip. Check & replace surge protection device
226	Redundancy lost	Mappable	/	The defined redundancy for a group is lost. According to config replace or restart faulty module
227	System saturated	Mappable	/	Load power is above the defined level (settable in Saturation threshold parameter). Check load level and add modules if possible or change parameter level
228	Main source lost	Major	/	Depending on the configuration, the AC input power source is missing. Check AC input breaker or source presence
229	Secondary source lost	Minor	/	The DC source (battery) is not present or end of autonomy. Check battery fuse or voltage
230	System overloaded	Mappable	/	The load power is above 100% of the system capacity
231	Log nearly full	Event	/	The number of events in the log file is above 80% of the maximum number of events
232	Missing converter	Mappable	/	A module is not seen on the bus. It can be bus failure at module level. Unplug module and re-plug. If problem still present module need to be replaced
233	Aux power supply fail	Minor	/	One of the two power supply of the T4S is lost. Check auxiliary power supply
234	New module	Event	/	A new module is seen on the bus, it will be installed by the system automatically
235	Log cleared	Event	/	The log file has been cleared
236	Config modified	Event	/	This temporary event appears to confirm the modification of some parameters
237	System started	Event	/	The system started and is in normal operation
238	DigIn 3	Mappable	/	The digital input 3 is active (NO or NC depending of the configuration)
239	DigIn 4	Mappable	/	The digital input 4 is active (NO or NC depending of the configuration)
240	DigIn 5	Mappable	/	The digital input 5 is active (NO or NC depending of the configuration)

Monitoring Alarms				
Text ID	**Name**	**Level**	**Def. Map**	**Description/ Possible action**
241	DigIn 6	Mappable	/	The digital input 6 is active (NO or NC depending of the configuration)
242	DigIn 7	Mappable	/	The digital input 7 is active (NO or NC depending of the configuration)
243	DigIn 8	Mappable	/	The digital input 8 is active (NO or NC depending of the configuration)
244	Monitoring started	Event	/	The T4S/INVIEW X has restarted
245	Log full	Minor	/	The log file has reach the maximum number of events. More events will not be recorded anymore
246	Converter off	Minor	/	The given module is off manually or remotely.
247	Converter AC out fault	Mappable	/	The given module has AC out problem. Module need replacement and repair
248	DigIn 1	Mappable	/	The digital input 1 is active (NO or NC depending of the configuration)
249	DigIn 2	Mappable	/	The digital input 2 is active (NO or NC depending of the configuration)
250	Redundancy +1 lost	Mappable	/	Means that the system has lost one module more than the configured redundancy for a group. Means that this groups could be overloaded.
251	Missing SBP	Mappable	/	A SBP is missing in the system.
252	SBP AC out fault	Mappable	/	Problem in SBP Ac out. Module need replacement
253	SBP engaged	Mappable	/	System is running on Smart By Pass
254	Time synchronized	Event		Time synchronization through digital input occurred
255	MBP procedure	Mappable		System with SBP is in MBP procedure
256	Battery charge remote off	Mappable		Battery charging is disabled through digital input
512	Discharge	Mappable	/	Battery is discharging.
513	Charging failure	Minor	/	Battery cannot be charged.
514	Boost in progress	Mappable	/	A boost charge is in operation on BAT1 or BAT 2
515	Test in progress	Mappable	/	A battery test is in operation on BATTERY 1 or BATTERY 2
516	Defect	Minor	/	Problem detected on a battery 1 or 2 after battery test
517	Low voltage pre	Minor	/	Battery voltage has reach the settable pre-alarm level
518	Low voltage	Mappable	/	Battery voltage has reach the settable alarm level
519	End autonomy	Mappable	/	The battery voltage has reach the settable end of autonomy level
520	Low capacity pre	Minor	/	Battery capacity is in pre-alarm condition
521	Low capacity	Minor	/	Battery capacity is in alarm condition
522	No more autonomy	Mappable	/	Battery has reach its lower level, DC converter will soon stop

Monitoring Alarms				
Text ID	**Name**	**Level**	**Def. Map**	**Description/ Possible action**
523	Overvoltage	Mappable	/	Battery is in overvoltage alarm
524	Unknown capacity	Minor	/	At startup, the battery is in unknown capacity state, the supervision system will soon detect the capacity
525	Temperature sensor fail	Mappable	/	Battery temperature sensor fail appears when the probe is disconnected
526	Over temperature	Mappable	/	Battery T° is above configured limits
527	Limited charging	Minor	/	The charger limits current to the battery according parameter.
528	Boost too long	Minor	/	Means that a boost charge of the battery exceed the specified time out. Please check battery is healthy
529	Low remaining time	Minor	/	The battery remaining time is low
530	Test: manual stop	Minor	/	Means that a test has stopped due to user manipulation
531	Test: recent discharge	Minor	/	A test will not start because battery has been in discharge within 96 hours
532	Test: voltage low	Minor	/	A test will not start because the voltage is too low
533	Test: system alarm	Minor	/	A test will not start because there is an alarm that prevent the battery test to start
534	Test: already in boost	Minor	/	A test will not start because the battery is already in boost charge.
535	Test: charger OFF	Minor	/	A test will not start because the charging is disabled and so the battery will not be charged after the test.

Mappable Events (Not alarms !!)				
Text ID	**Name**	**Level**	**Def. Map**	**Description**
632	AC in failure	/	Major + R3	
633	AC out 1 failure	/	Major	
634	Battery 1 discharge	/	Major	
635	Battery 2 discharge	/	Major	
636	Battery 1 low	/	Major	
637	Battery 2 low	/	Major	
638	Digital input 1	/	Event	
639	Digital input 2	/	Event	
640	Digital input 3	/	Event	
641	Digital input 4	/	Event	
642	Digital input 5	/	Event	
643	Digital input 6	/	Event	
644	Digital input 7	/	Event	

Mappable Events (Not alarms !!)				
Text ID	**Name**	**Level**	**Def. Map**	**Description**
645	Digital input 8	/	Event	
646	MBP Engaged	/	Major + R5	
647	Battery bad	/	Minor	Means that a test has failed
648	AC out 1 overload	/	Major	
649	AC out 1 redundancy lost	/	Event	
650	AC in freq out of limit	/	Minor	
651	Converter failure	/	Minor	
652	Temperature sensor 1 fail	/	Minor	Battery probe
653	Temperature sensor 2 fail	/	Minor	Battery probe
654	Not used	/	Event	
655	Module overtemperature	/	Minor	
656	Surge arrester	/	Minor	
657	AC out 1 redundancy +1 lost	/	Event	
658	AC out 1 saturated	/	Minor	System load is above the settable limit (normally 80%)
661	Battery 1 overvoltage	/	Event	
662	Battery 2 overvoltage	/	Event	
663	Battery 1 overtemperature	/	Event	
664	Battery 2 overtemperature	/	Event	
665	Battery 1 test active	/	Event	
666	Battery 2 test active	/	Event	
667	Battery 1 boost active	/	Event	
668	Battery 2 boost active	/	Event	
722	Battery test cancelled	/	Minor	Battery test has not started because of another event (See 530 -> 535)
723	SBP failure	/	Major	
724	SBP engaged	/	Major	
736	AC out 2 failure	/	Major	
737	AC out 2 overload	/	Major	
738	AC out 2 redundancy lost	/	Event	
739	AC out 2 redundancy +1 lost	/	Event	
740	AC out 2 saturated	/	Minor	
745	AC out 1 manual off	/	Event	
746	AC out 2 manual off	/	Event	
747	Log full	/	Minor	
758	MBP procedure	/	Major + R5	
759	Battery safe charging control	/	Major	

4.1.1 Module alarms (T4S)

Module alarms				
Text ID	**Name**	**Level**	**Def. Map**	**Description**
96	Start	Minor		System is starting
97	Boost not available	Minor		AC in and AC out not synchronized (boost cannot be used)
98	Boost recovery	Minor		Boost (triac) cooling down from previous activation
99	Boost failure	Minor		Boost (triac) fault short-circuit
100	Fan to be replaced	Minor		The timeout indicating FAN operates for 7 years
101	Fan failure	Minor		Fans are not functioning properly
102	Power disturbed	Minor		Transient power alarm with output stopped (module KO)
103	Param phase query	Minor		No assigned AC group or DC group yet (in progress)
104	Param mismatch	Minor		Param not compatible with the rest of the system
105	No source	Minor		No AC/DC input
106	Vcap too high	Minor		Internal voltage too high
107	Vcap too low	Minor		Internal voltage too low
108	Vref error	Minor		Reference voltage from auxiliary supply out of acceptable range
109	Memory eeprom error	Minor		Not implemented
110	Memory flash error	Minor		Flash continuous verification failed
111	OFF remote	Minor		Module remote OFF
112	OFF manual	Minor		Module OFF manually (ON / OFF switch)
113	BUS com fail	Minor		Too many missing bus frames
114	Bus A fail	Minor		Sync tops reception issue on bus A (com lost)
115	Bus B fail	Minor		Sync tops reception issue on bus B (com lost)
116	Bus sync filter error	Minor		Sync top filtering circuit fault (detected because sync tops are received at different times)
117				
118				
119	Bus A not present	Minor		bus A present signal of backplane not seen by the module
120	Bus B not present	Minor		bus B present signal of backplane not seen by the module
121	Bus frame collision	Minor		Bus A and bus B are not identical in content
122	Bus fail	Minor		Module can't see what it writes on both bus
123	Warm up too high	Minor		One of the measured temperature is above a threshold
124	Power noise	Minor		Transient power alarm (some trips happening)
125	Not defined 30			
126	Not defined 31			
127	Not defined 32			

Module DC input alarms				
Text ID	**Name**	**Level**	**Def. Map**	**Description**
128	Start up	Minor		
129	Temperature derating	Minor		Power is decreased due to high temperature
130	Temperature too high	Minor		DC converter stopped because of too high temperature
131	Temperature sensor fail	Minor		Communication with temperature probe was lost
132	Auto-calib error	Minor		Error during auto calibration of current offsets
133	Pdc too low	Minor		Pdc = f(Vdc). Alarm if Pdc < Pout
134	Impedance too high	Minor		DC input too high impedance detected
135	No AC voltage	Minor		For PV (photo-voltaique) mode
136	Current trip	Minor		Too many consecutive DC-/+ over-current trips
137	Driver error	Minor		Too many “not ready”/”fault” from DC-/+ drivers over some time
138	Not defined 43			
139	Not defined 44			
140	Not defined 45			
141	Not defined 46			
142	Not defined 47			
143	Not defined 48			
144	Source+ too low - transferred	Minor		DC+ V is under input transfer to AC threshold
145	Source- too low - transferred	Minor		DC- V is under input transfer to AC threshold
146	Source+ too high - transferred	Minor		DC+ V is over input transfer to AC threshold
147	Source- too high - transferred	Minor		DC- V is over input stop threshold
148	Source+ too low - stop	Minor		DC+ V is under input stop threshold
149	Source- too low - stop	Minor		DC- V is under input stop threshold
150	Source+ too high - stop	Minor		DC+ V is over input stop threshold
151	Source- too high - stop	Minor		DC- V is over input stop threshold
152	Source+ no voltage	Minor		DC+ V is under input not present threshold
153	Source- no voltage	Minor		DC- V is under input not present threshold

Module DC input alarms				
Text ID	**Name**	**Level**	**Def. Map**	**Description**
154	Source+ brownout (<150V)	Minor		DC+ V is under extended lower limit for too much time
155	Source- brownout (<150V)	Minor		DC- V is under extended lower limit for too much time
156	Not defined 61			
157	Not defined 62			
158	Not defined 63			
159	Not defined 64			

Module AC input alarms				
Text ID	**Name**	**Level**	**Def. Map**	**Description**
160	Start	Minor		
161	Temperature derating	Minor		Power is decreased due to high temperature
162	Temperature too high	Minor		ACin converter stopped because of too high temperature
163	Temperature sensor fail	Minor		Communication with temperature probe was lost
164	Auto-calib error	Minor		Error during auto-calibration of current offsets
165	Impedance Too High	Minor		AC input too high impedance detected
166	Backfeed error	Minor		Input stopped because of backfeed on it
167	Not defined 72			
168	Overcurrent	Minor		Too many consecutive ACin over-current trips
169	Driver not ready	Minor		Hardware driver not ready signal received
170	Driver fault	Minor		Hardware driver fault signal received
171	Driver perturbed	Minor		Too many consecutive “not ready”/”fault” from Acin driver or more than a threshold over some hours
172	Not defined 77			
173	Not defined 78			
174	Not defined 79			
175	Vres Absent	Minor		Fast alarm when source V is no longer present
176	Source V too low transferred	Minor		Source V is under input transfer to DC threshold
177	Source V too high transferred	Minor		Source V is over input transfer to DC threshold
178	Vres out of range	Minor		Source V is out of expected envelope

Module AC input alarms				
Text ID	**Name**	**Level**	**Def. Map**	**Description**
179	Source V too low stop	Minor		Source V is under input stop threshold
180	Source V too high stop	Minor		Source V is over input stop threshold
181	Source frequ too low	Minor		Source freq is under input stop threshold
182	Source frequ too high	Minor		Source freq is over input stop threshold
183	Source no voltage	Minor		Source V RMS is below 60V (SELV threshold) - no sync possible
184	SBP Vres absent	Minor		SBP Fast alarm when SBP source V is no longer present
185	SBP Source V too low stop	Minor		SBP source V is under output stop threshold
186	SBP Source V too high stop	Minor		SBP source V is over output stop threshold
187	SBP Source frequ too low	Minor		SBP source freq is under output stop threshold
188	SBP Source frequ too high	Minor		SBP source freq is over output stop threshold
189	SBP Res not sync	Minor		SBP source is not in sync (freq + phase shift) with system
190	Not defined 95			
191	Not defined 96			

Module AC output alarms				
Text ID	**Name**	**Level**	**Def. Map**	**Description**
192	Start	Minor		
193	Temperature derating	Minor		Power is decreased due to high temperature
194	Temperature too high	Minor		ACout converter stopped because of too high temperature
195	Temperature sensor fail	Minor		Communication with temperature probe was lost
196	Auto-calib error	Minor		Error during auto calibration of current offsets
197	Overload not ready	Minor		Overload capability is in cool-down
198	Overload	Minor		Output power is higher than a threshold above nominal power
199	Power derating	Minor		Derate output power because it cannot be supplied
200	Vout too Low	Minor		Output V is under a threshold (due to an overload)

Module AC output alarms				
Text ID	**Name**	**Level**	**Def. Map**	**Description**
201	Overload too long	Minor		Output V is under a threshold (due to an overload) for too much time
202	Vout modify	Minor		Output V setpoint was modified and is being converged on
203	Load-sharing low	Minor		Flexa module is supplying too much power to the load compared to the other modules
204	Load-sharing high	Minor		Flexa module is not supplying enough power to the load compared to the other modules
205	Mode support	Minor		Flexa is supporting either the SBP or MBP output, i.e. it does not supply any current, but in case of a voltage drop will try to keep the voltage at an acceptable level
206	Igbt driver alarm	Minor		An individual driver is sending an alarm but global drivers monitoring signals are OK
207	Not defined 112			
208	Driver not ready	Minor		Hardware driver not ready signal received
209	Driver fault	Minor		Hardware driver fault signal received
210	Over-current	Minor		Too many consecutive AC out over-current trips
211	Igbt error	Minor		Software detected IGBT fault
212	Vout pi2 error	Minor		Output V at Pi/2 (sine max) is out of expected range with open relay
213	Vout mpi2 error	Minor		Output V at -Pi/2 (sine min) is out of expected range with open relay
214	Off (bus)	Minor		Output Off from bus request
215	Backfeed error	Minor		Output stopped because of backfeed from this module or another one
216	Too many start	Minor		Too many attempts to start output over some time
217	AC out fuse open	Minor		Output fuse open or enventualy output connector not connected
218	SBP AC out open	Minor		SBP could not close when needed
219	SBP AC out short circuit	Minor		SBP could not open when needed
220	SBP temperature too high	Minor		SBP stopped because of too high temperature
221	SBP temperature sensor fail	Minor		Communication with temperature probe was lost
222	SBP overload	Minor		SBP Output power is higher than a threshold above nominal power (105%) (not KO)
223	SBP overload too long	Minor		SBP Output power is higher than a threshold (200%) above nominal power for too much time (KO)

Annexe 5. FAQ

How can I reset my admin password if I have unfortunately forgotten it?

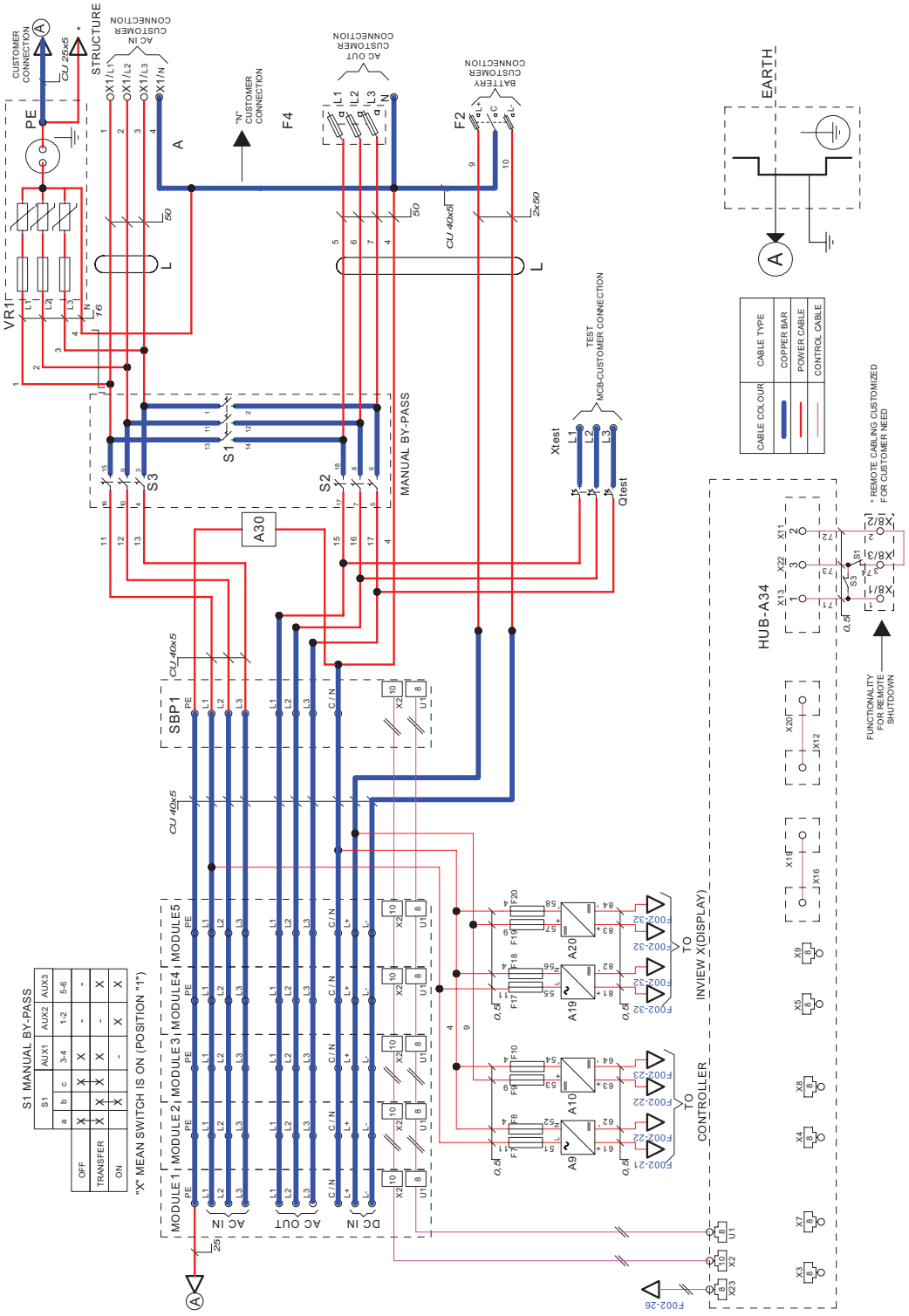
Before version 3.1, there is a generic password that always works: 123TEC. You can use it to connect and change your expert password. As this has been identified as a potential risk for system integrity, we strongly recommend to update to a newer version where security has been improved.

From version 3.1, in case of password loss, a new temporary password (valid 24 hrs. after creation) can be issued by CE+T Power. To receive a temporary password, send an email with your T4S serial Number and the date at which you expect to go back on site to change the password to customer.support@cet-power.com specifically requesting a new temporary password. The serial number can be found on the sticker on the T4S, or on screen in 'Parameters' then 'Info'.

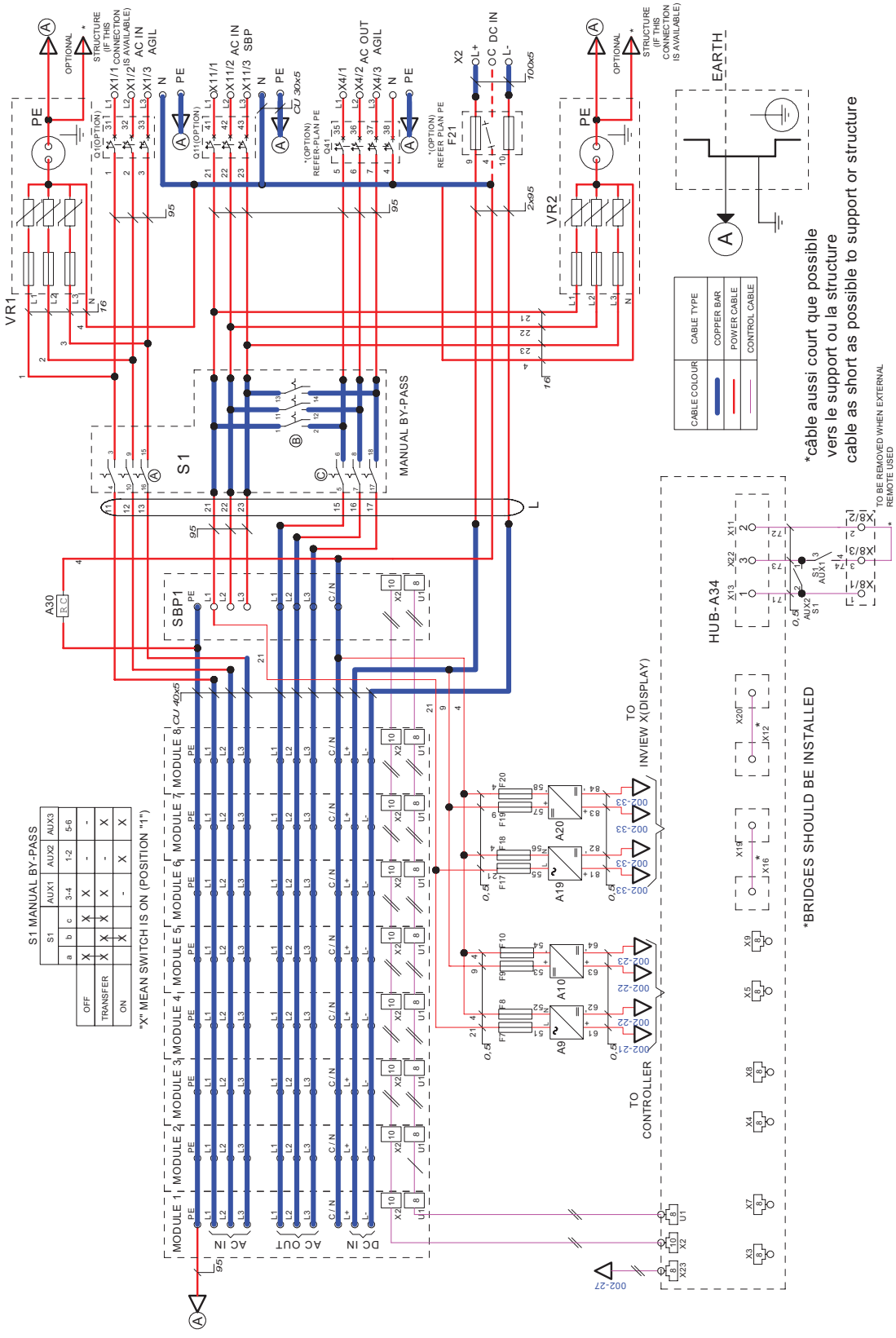
Annexe 6. Electrical Diagrams

6.1. Flexa 200 - 400/400 (3ph-3ph)

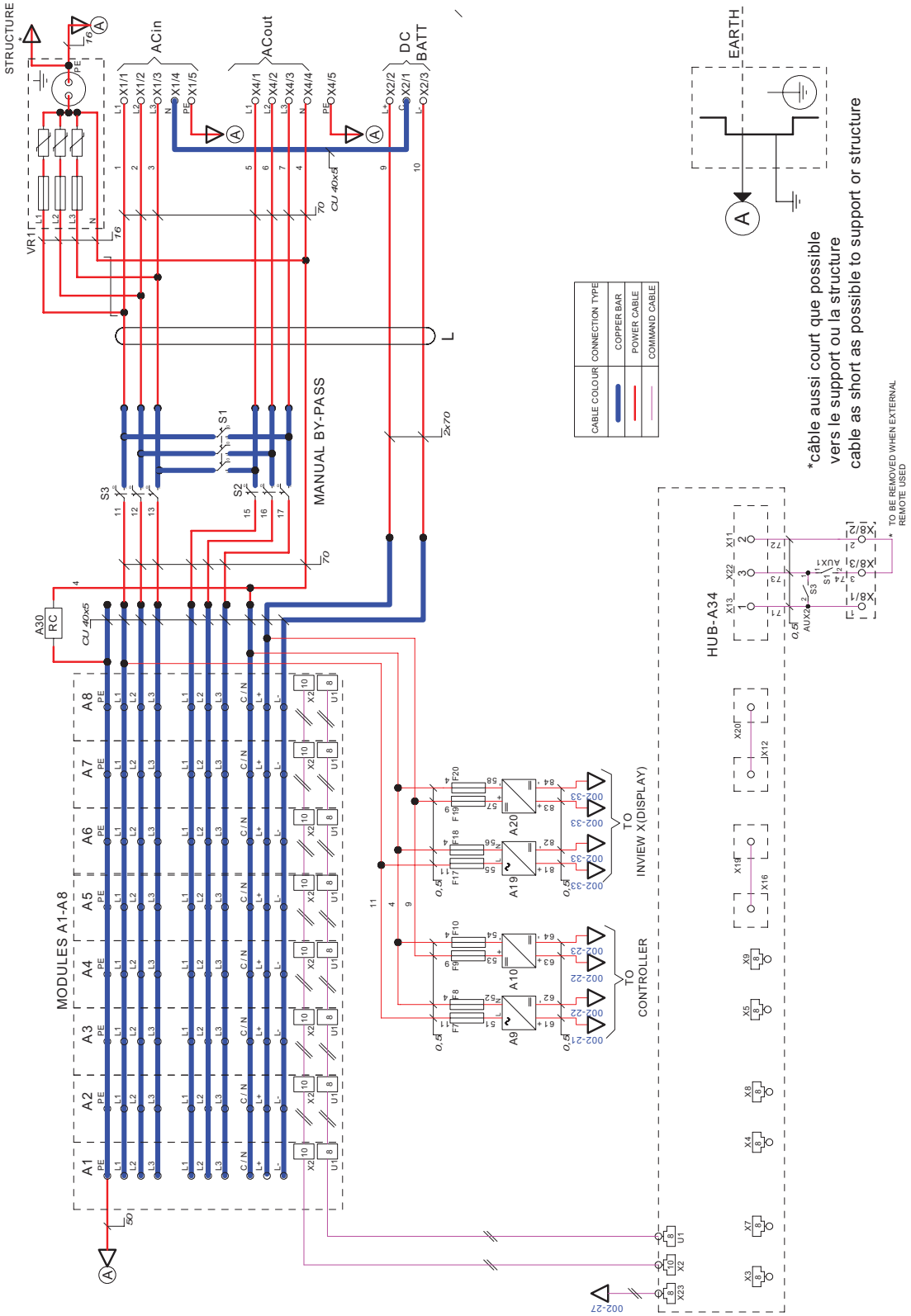
6.1.1 Flexa 200 - 400/400 with MBP and SBP - Common Input



6.1.2 Flexa 200 - 400/400 with MBP and SBP - Dual Inputs

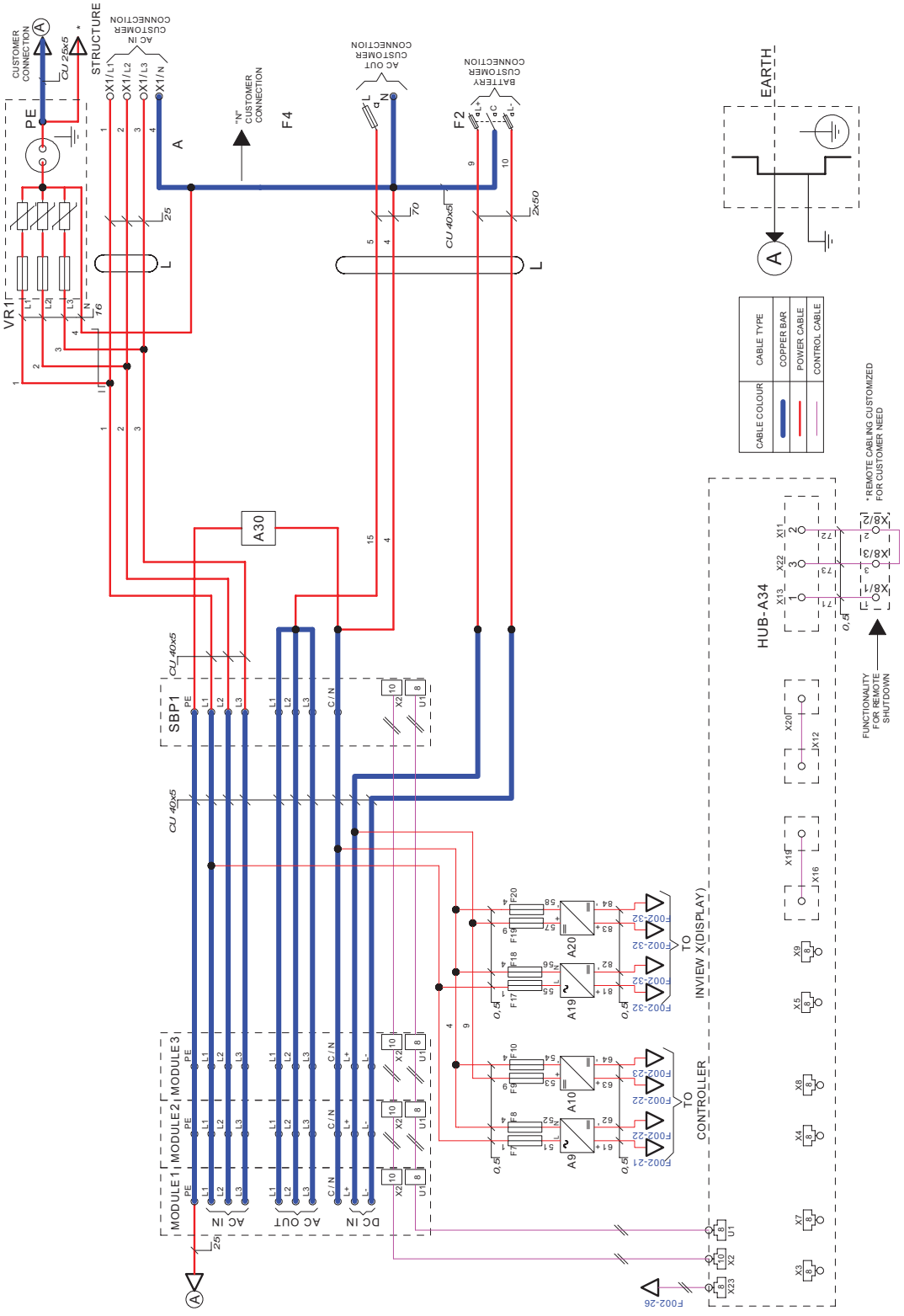


6.1.3 Flexa 200 - 400/400 with MBP

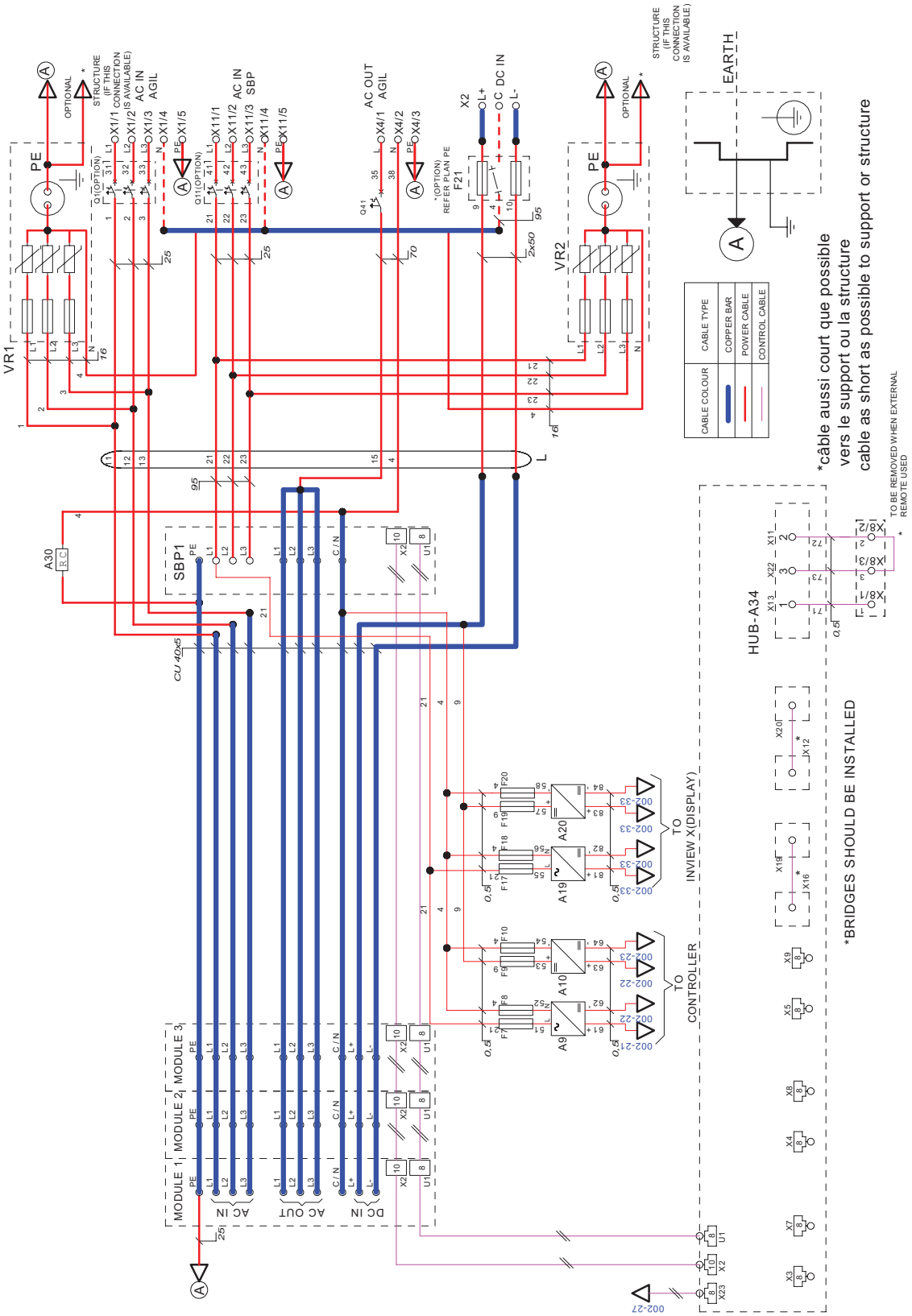


6.2. Flexa 200 - 400/230 (3ph-1ph)

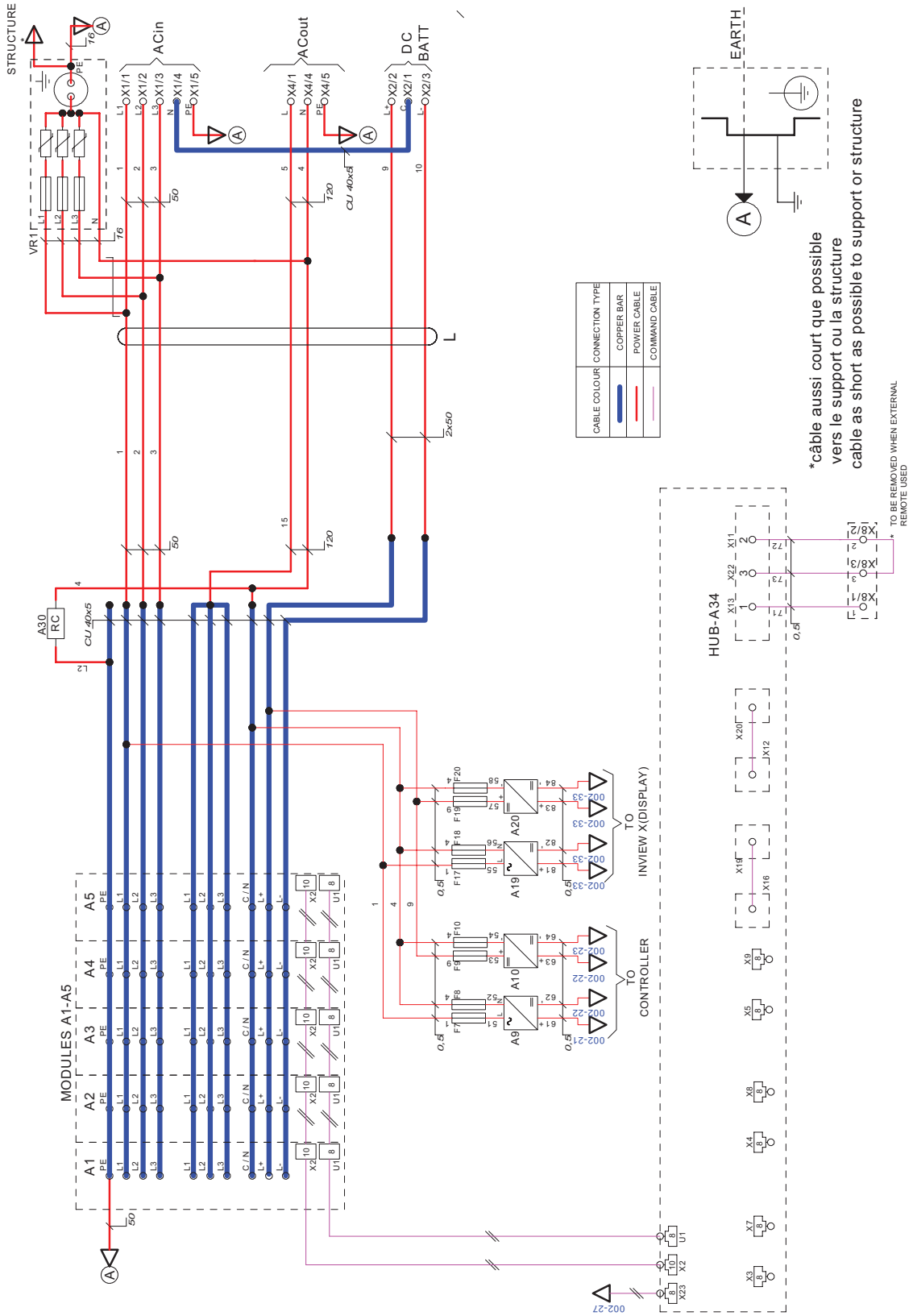
6.2.1 Flexa 200 - 400/230 with SBP - Common Input



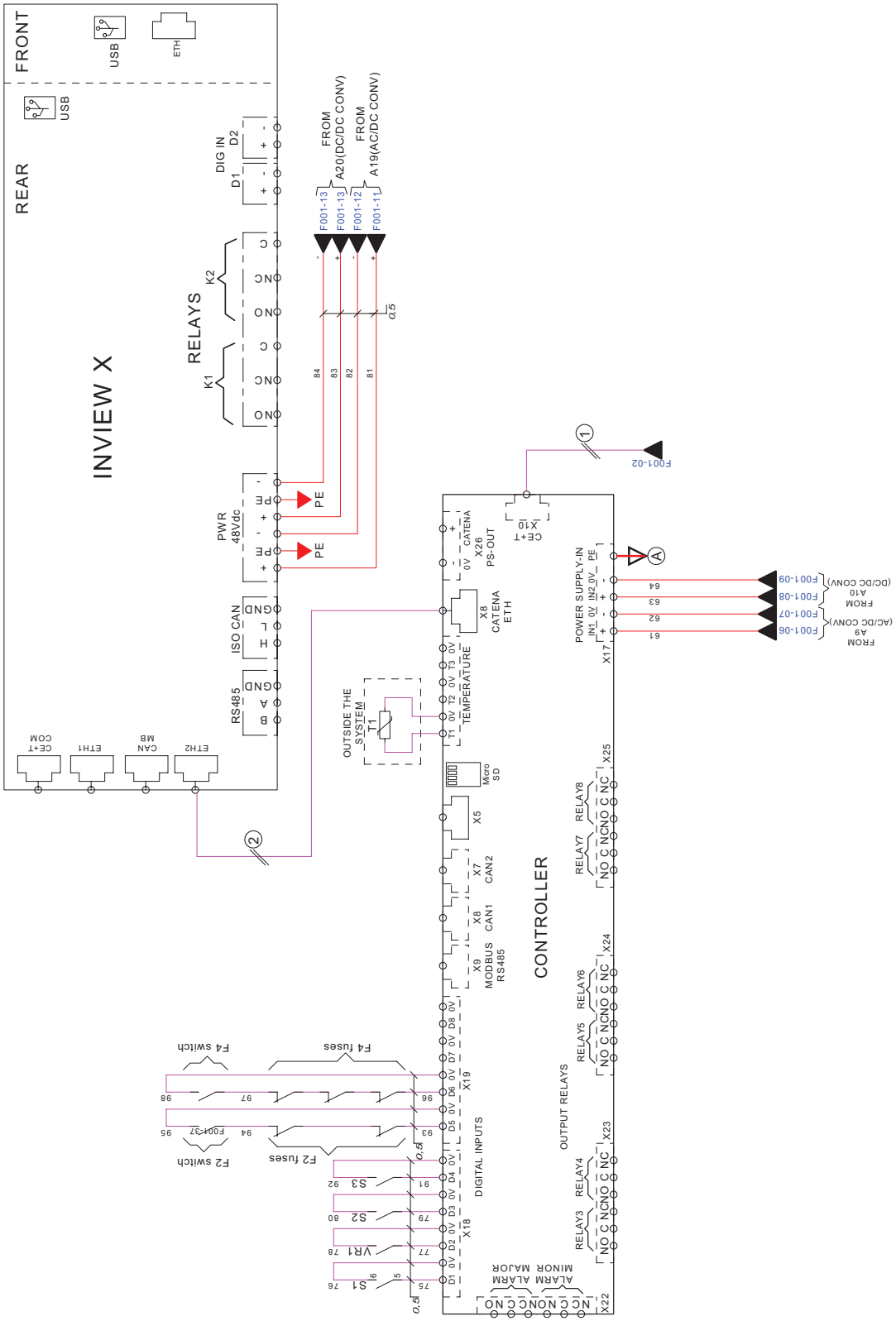
6.2.2 Flexa 200 - 400/230 with SBP - Dual inputs



6.2.3 Flexa 200 - 400/230 without SBP



6.3. T4S - Inview X Connections



Annexe 7. ModBus Table

7.1. Data table

Device ID	Modbus Address	Scale	Description	Unit	Register type function 03
100	30015	No Conversion - Signed Short	Megabytes Received	MB	Input register
100	30016	No Conversion - Signed Short	Megabytes Sent	MB	Input register
100	30031	Divided By 100	Monitoring Memory Used	kB	Input register
100	30032	Multiplied by 100	CPU Percentage Usage	%	Input register
100	30033	No Conversion - Signed Short	Free Flash Memory Space	MB	Input register
100	30036	Multiplied by 10	CPU Temperature	°C	Input register
100	30037	No Conversion - Signed Short	CPU Frequency	MHz	Input register
100	30041	No Conversion - Signed Short	Total Fifo Size Of Second Records		Input register
100	30042	No Conversion - Signed Short	Total Fifo Size Of Minute Records		Input register
100	30043	No Conversion - Signed Short	Total Fifo Size Of Hour Records		Input register
100	30044	No Conversion - Signed Short	Total Fifo Size Of Day Records		Input register
100	30047	No Conversion - Signed Short	Number Of Active Major		Input register
100	30048	No Conversion - Signed Short	Number Of Active Minor		Input register
100	30049	No Conversion - Signed Short	Number Of Active Warning		Input register
100	30501	No Conversion - Signed Short	State		Input register
100	30502	No Conversion - Signed Short	Counter		Input register
100	30506	No Conversion - Signed Short	State		Input register
100	30507	No Conversion - Signed Short	Counter		Input register
91	30511	No Conversion - Signed Short	Power	kW	Input register
91	30512	Multiplied by 10	Voltage	V	Input register
91	30521	No Conversion - Signed Short	Power	kW	Input register
91	30522	Multiplied by 10	Voltage	V	Input register
91	30523	Multiplied by 10	Current	A	Input register
91	30531	No Conversion - Signed Short	Power	kW	Input register
91	30532	Multiplied by 10	Voltage	V	Input register
91	30533	Multiplied by 10	Current	A	Input register
31	30101	Multiplied by 10	Voltage	V	Input register
31	30102	Multiplied by 10	Current	A	Input register
31	30103	Divided By 100	Active Power	W	Input register
31	30104	Divided By 100	Apparent Power	VA	Input register
31	30105	Multiplied by 10	Frequency	Hz	Input register
31	30121	Multiplied by 10	Voltage	V	Input register
31	30122	Multiplied by 10	Current	A	Input register
31	30123	Divided By 100	Active Power	W	Input register
31	30124	Divided By 100	Apparent Power	VA	Input register
31	30125	Multiplied by 10	Frequency	Hz	Input register

31	30131	Divided By 100	Installed Active Power	W	Input register
31	30132	Divided By 100	Installed Apparent Power	VA	Input register
31	30133	Divided By 100	Available Active Power	W	Input register
31	30134	Divided By 100	Available Apparent Power	VA	Input register
31	30135	Multiplied by 100	Power Factor		Input register
31	30141	Multiplied by 10	Voltage	V	Input register
31	30142	Multiplied by 10	Current	A	Input register
31	30143	Divided By 100	Active Power	W	Input register
31	30144	Divided By 100	Apparent Power	VA	Input register
31	30145	Multiplied by 10	Frequency	Hz	Input register
31	30151	Divided By 100	Installed Active Power	W	Input register
31	30152	Divided By 100	Installed Apparent Power	VA	Input register
31	30153	Divided By 100	Available Active Power	W	Input register
31	30154	Divided By 100	Available Apparent Power	VA	Input register
31	30155	Multiplied by 100	Power Factor		Input register
31	30161	Multiplied by 10	Voltage	V	Input register
31	30162	Multiplied by 10	Current	A	Input register
31	30163	Divided By 100	Active Power	W	Input register
31	30164	Divided By 100	Apparent Power	VA	Input register
31	30165	Multiplied by 10	Frequency	Hz	Input register
31	30171	Divided By 100	Installed Active Power	W	Input register
31	30172	Divided By 100	Installed Apparent Power	VA	Input register
31	30173	Divided By 100	Available Active Power	W	Input register
31	30174	Divided By 100	Available Apparent Power	VA	Input register
31	30175	Multiplied by 100	Power Factor		Input register
31	30301	Multiplied by 10	Voltage	V	Input register
31	30303	Divided By 100	Active Power	W	Input register
31	30304	Divided By 100	Apparent Power	VA	Input register
31	30305	Multiplied by 10	Frequency	Hz	Input register
31	30306	No Conversion - Signed Short	Status		Input register
31	30321	Multiplied by 10	Voltage	V	Input register
31	30322	Multiplied by 10	Current	A	Input register
31	30323	Divided By 100	Active Power	W	Input register
31	30324	Divided By 100	Apparent Power	VA	Input register
31	30325	Multiplied by 10	Frequency	Hz	Input register
31	30331	Divided By 100	Installed Active Power	W	Input register
31	30332	Divided By 100	Installed Apparent Power	VA	Input register
31	30333	Divided By 100	Available Active Power	W	Input register
31	30334	Divided By 100	Available Apparent Power	VA	Input register
31	30341	Multiplied by 10	Voltage	V	Input register
31	30342	Multiplied by 10	Current	A	Input register

31	30343	Divided By 100	Active Power	W	Input register
31	30344	Divided By 100	Apparent Power	VA	Input register
31	30345	Multiplied by 10	Frequency	Hz	Input register
31	30351	Divided By 100	Installed Active Power	W	Input register
31	30352	Divided By 100	Installed Apparent Power	VA	Input register
31	30353	Divided By 100	Available Active Power	W	Input register
31	30354	Divided By 100	Available Apparent Power	VA	Input register
31	30361	Multiplied by 10	Voltage	V	Input register
31	30362	Multiplied by 10	Current	A	Input register
31	30363	Divided By 100	Active Power	W	Input register
31	30364	Divided By 100	Apparent Power	VA	Input register
31	30365	Multiplied by 10	Frequency	Hz	Input register
31	30371	Divided By 100	Installed Active Power	W	Input register
31	30372	Divided By 100	Installed Apparent Power	VA	Input register
31	30373	Divided By 100	Available Active Power	W	Input register
31	30374	Divided By 100	Available Apparent Power	VA	Input register
31	30501	Multiplied by 10	Voltage	V	Input register
31	30502	Multiplied by 10	Current	A	Input register
31	30503	Divided By 100	Power	W	Input register
1	30011	Multiplied by 10	Voltage	V	Input register
1	30012	Multiplied by 10	Current	A	Input register
1	30013	Divided By 100	Power	W	Input register
1	30014	Divided By 100	Available Power	W	Input register

7.2. Alarm Table

Device ID	Modbus Address	Modbus Id	Name	Register type function 01	Remarks
100	10010	10	Missing Devices	Input status	1=Active, 0=Inactive
100	10300	300	Weak Password Detected	Input status	1=Active, 0=Inactive
91	10510	510	Not connected to any equipment	Input status	1=Active, 0=Inactive
91	10520	520	Not connected to any equipment	Input status	1=Active, 0=Inactive
91	10530	530	Not connected to any equipment	Input status	1=Active, 0=Inactive
31	10002	2	Firmware Version	Input status	1=Active, 0=Inactive
31	10228	228	Main source lost	Input status	1=Active, 0=Inactive
31	10229	229	Secondary source lost	Input status	1=Active, 0=Inactive
31	10050	50	Communication Failure	Input status	1=Active, 0=Inactive
31	10112	112	OFF manual	Input status	1=Active, 0=Inactive
31	10200	200	Incorrect time configuration in T4S	Input status	1=Active, 0=Inactive
31	10233	233	Aux power supply fail	Input status	1=Active, 0=Inactive

31	10238	238	DigIn 3	Input status	1=Active, 0=Inactive
31	10239	239	DigIn 4	Input status	1=Active, 0=Inactive
31	10240	240	DigIn 5	Input status	1=Active, 0=Inactive
31	10241	241	DigIn 6	Input status	1=Active, 0=Inactive
31	10242	242	DigIn 7	Input status	1=Active, 0=Inactive
31	10243	243	DigIn 8	Input status	1=Active, 0=Inactive
31	10245	245	Log full	Input status	1=Active, 0=Inactive
31	10248	248	DigIn 1	Input status	1=Active, 0=Inactive
31	10249	249	DigIn 2	Input status	1=Active, 0=Inactive
31	10251	251	Missing SBP	Input status	1=Active, 0=Inactive
31	10253	253	SBP engaged	Input status	1=Active, 0=Inactive
31	10255	255	MBP procedure	Input status	1=Active, 0=Inactive
1	10149	149	Source- too low - stop	Input status	1=Active, 0=Inactive
1	10152	152	Source+ no voltage	Input status	1=Active, 0=Inactive