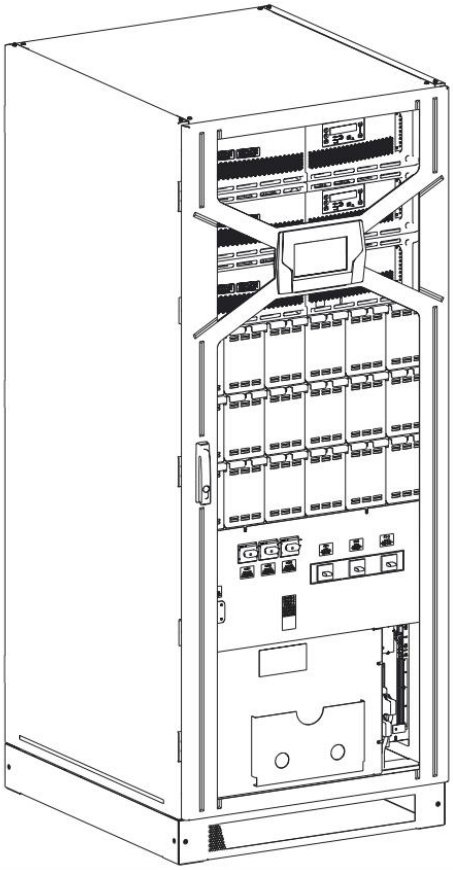
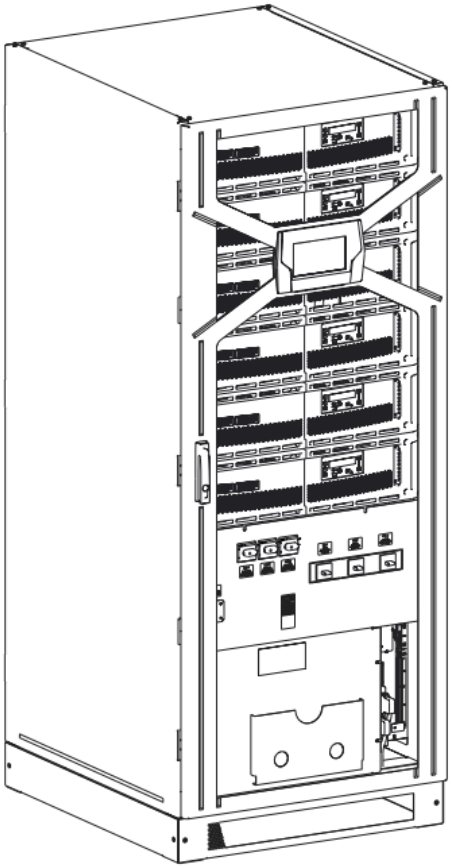
OPERATING MANUAL

DPA 60 and 120 UPS
20 – 120kW, 208V, 60Hz UL





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About this document

Document information

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Foreword

The UPS System operates with mains, battery or bypass power. It contains components that carry high currents and voltages. The properly installed UPS System is grounded to earth and NEMA-1 rated against electrical shock and foreign objects.

COMMISSIONING AND OPERATIONS INSIDE THE UPS MUST BE PERFORMED BY A CERTIFIED SERVICE ENGINEER FROM THE MANUFACTURER OR FROM AN AGENT CERTIFIED BY THE MANUFACTURER.

BY NOT FULFILLING THIS OBLIGATION, THE PRODUCT MAY VOID ITS WARRANTY.

This user manual contains guidelines to check delivery, installing and commissioning of the UPS and is intended for people who plan the installation, install, commission and use or service the UPS. The reader is expected to know the fundamentals of electricity, wiring, electrical components and electrical schematic symbols.

THE INSTRUCTIONS IN THIS MANUAL MUST BE FOLLOWED TO PERFORM ANY OPERATION ON THE UPS.

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Safety instructions

1 Important safety instructions

1.1 Using this manual

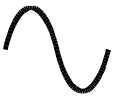
This manual contains important instructions for models DPA 60 UL and DPA 120 UL that should be followed during installation and maintenance of the UPS.

It also gives guidelines to check delivery and is intended for people who plan the installation, install, commission and use or service the UPS system and/or the battery cabinet. The reader is expected to know the fundamentals of electricity, wiring, electrical components and electrical schematic symbols

READ ALL SAFETY AND OPERATING INSTRUCTIONS BEFORE OPERATING THE UPS SYSTEM AND/OR THE BATTERY CABINET. ADHERE TO ALL WARNINGS ON THE UNIT AND IN THIS MANUAL.

1.1.1 List of symbols

	SAFETY ALERT SYMBOL This is the safety alert symbol. It is used to alert you to potential physical injury hazards. Obey all safety messages that follow this symbol to avoid possible injury or death.
	DANGER Indicates a hazardous situation which, if not avoided, will result in death or serious injury.
	WARNING Indicates a hazardous situation which, if not avoided, could result in death or serious injury.
	CAUTION Indicates a hazardous situation which, if not avoided, could result in minor or moderate injury.
	NOTICE Is used to address situations not related to physical injury, but could result in property damage.
	ELECTRICAL HAZARD SYMBOL Indicates the presence of an electrical hazard.

		ARC FLASH HAZARD SYMBOL Indicates the presence of an arc flash hazard.
		IMPORTANT INFORMATION SYMBOL This symbol indicates operator tips and/or important information for the use of the product. This symbol is not used to indicate information regarding potential hazards or property damage.
		PROTECTIVE EARTH (PE) TERMINAL A terminal which must be connected to earth ground prior to making any other connection to the equipment.
		**ALTERNATING CURRENT (AC) TERMINAL** A terminal to which or from which alternating current or voltage is applied or supplied.
		DIRECT CURRENT (DC) TERMINAL A terminal to which or from which direct current or voltage is applied or supplied.
		BATTERY SYMBOL Indicates a battery which can be either internal or external to the UPS system and accessories (battery cabinet).
		POWER ON / POWER OFF SYMBOL
		RECYCLE SYMBOL
		DO NOT DISCARD SYMBOL Indicates that you should not discard waste electrical or electronic equipment (WEEE) in the trash. For proper disposal, contact your local recycling/reuse or hazardous waste center.

1.2 Safety rules

The UPS system and the battery cabinet operates with mains, batteries or bypass power that carry high currents and voltages. The properly installed UPS system and battery cabinet is grounded to earth and NEMA-1 rated against electrical shock and foreign objects when all dead fronts are in place. Installation and service must be performed by a manufacturer's qualified technicians or a certified service partner.

OPERATIONS INSIDE THE UPS AND/OR THE BATTERY CABINET MUST BE PERFORMED BY A SERVICE ENGINEER FROM THE MANUFACTURER OR FROM AN AGENT CERTIFIED BY THE MANUFACTURER.

NOTE

INSTALLATION SHALL BE IN COMPLIANCE WITH ALL APPLICABLE NATIONAL, STATE, AND LOCAL CODES

WARNING

- SERVICING THE UNIT SHOULD BE PERFORMED OR SUPERVISED BY PESONNEL KNOWLEDGEABLE ABOUT BATTERIES AND REQUIRED PRECAUTIONS.
- RISK OF ELECTRIC SHOCK - THIS UNIT RECEIVES POWER FROM MORE THAN ONE SOURCE - DISCONNECTION OF AC SOURCE(S) (AND THE DC SOURCE) IS REQUIRED TO DE-ENERGIZE THIS UNIT BEFORE SERVICING
- THERE IS DANGER OF AN ELECTRICAL IMPACT.
- RISK OF EXPLOSION IF USING AN INCORRECT BATTERY TYPE.
- WHEN REPLACING BATTERIES, REPLACE WITH THE SAME TYPE AND NUMBER OF BATTERIES OR BATTERY TRAY.
- DO NOT DISPOSE OF BATTERIES IN A FIRE. THE BATTERY MAY EXPLODE
- DO NOT OPEN OR MUTILATE BATTERIES. RELEASED ELECTROLYTE IS HARMFUL TO THE SKIN AND EYES. IT MAY BE TOXIC.

Do not exceed UPS and/or battery cabinets rating labels.
As the battery life depends on the ambient temperature, for the UPS system it is recommended to have a location with climate-controlling system to maintain the conditions as follow:

Follow all operating and user instructions.

NOTE

READ THE INFORMATION, IN ORDER TO AVOID EQUIPMENT DAMAGES

WARNING

KEEP OUT OF BATTERY POLES WHICH CONTAIN DANGEROUS DC-VOLTAGES CAUSING FATAL ACCIDENTS. NOTE: MANIPULATION ON THE BATTERY SYSTEM SHOULD ONLY BE DONE BY TRAINED SERVICE AND MAINTENANCE PERSONEL OF THE MANUFACTURER OR HIS CERTIFIED SERVICE PARTNERS. INAPPROPRIATE MANIPULATIONS OF THE BATTERIES CAN CAUSE LIGHTNING SPARKS.

A BATTERY CAN PRESENT A RISK OF ELECTRICAL SHOCK AND HIGH SHORT CIRCUIT CURRENT. THE FOLLOWING PRECAUTIONS SHOULD BE OBSERVED WHEN WORKING ON BATTERIES:

a) REMOVE WATCHES, RINGS OR OTHER METAL OBJECTS.
b) USE TOOLS WITH INSULATED HANDLES.

c) WEAR RUBBER GLOVES AND BOOTS.

d) DO NOT LAY TOOLS OR METAL PARTS ON TOP OF BATTERIES.

e) DISCONNECT THE CHARGING SOURCE PRIOR TO CONNECTING OR DISCONNECTING BATTERY TERMINALS.

f) DETERMINE IF BATTERY IS INADVERTENTLY GROUNDED. IF INADVERTENTLY GROUNDED, REMOVE SOURCE FROM GROUND. CONTACT WITH ANY PART OF A GROUNDED BATTERY CAN RESULT IN ELECTRAL SHOCK. THE LIKELIHOOD OF SUCH SHOCK CAN BE REDUCED IF SUCH GROUNDS ARE REMOVED DURING INSTALLATION AND MAINTENANCE (APPLICABLE TO EQUIPMENT AND REMOTE BATTERY SUPPLIES NOT HAVING GROUNDED SUPPLY CIRCUIT.

NOTE

THE UNIT IS NOT PROVIDED WITH AN INTERNAL INPUT SWITCH. TO SHUTDOWN THE UNIT YOU MUST PROVIDE A BREAKER IN THE INSTALLATION BUILDING.

NOTE

THE EQUIPMENT IS PROVIDED WITHOUT INPUT AND OUTPUT BREAKERS, A READILY ACCESSIBLE DISCONNECT DEVICE SHALL BE INCORPORATED EXTERNAL TO THE EQUIMPENT.

NOTE

THE UNIT, THE BATTERY CABINET AND THE BATTERIES ARE HEAVY AND MAY TIP DURING TRANSPORTATION CAUSING SERIOUS INJURY IF UNPACKING INSTRUCTIONS ARE NOT CLOSELY FOLLOWED.

NOTE

SEALED BATTERIES MUST NEVER BE STORED IN A DISCHARGED OR PARTIALLY DISCHARGED STATE.

EXTREME TEMPERATURE, UNDER- AND OVERCHARGE AND OVERDISCHARGE WILL DESTROY BATTERIES.

The only user operations permitted are:

- Use of the LCD control panel (DPA Display) and of the Maintenance Bypass
- Start up and shutdown of the UPS of the user field (excluding the commissioning start up)
- Operation of additional connectivity modules:
    - SNMP adapters and their software
    - Modem/GSM or Modem/Ethernet adapters and their software

The user must follow the precautions and only perform the described operations. Also in these measures the operator of the UPS System must adhere to the instructions in this manual. Any deviations from the instructions could be dangerous to the user or cause accidental load loss.

THE MANUFACTURER DOES NOT TAKE ANY RESPONSIBILITY FOR DAMAGES CAUSED THROUGH INCORRECT MANIPULATIONS OF THE UPS SYSTEM.

WARNING	IT IS PROHIBITED TO REMOVE ANY SCREWS FROM THE UPS SYSTEM OR FROM ANY OPTIONAL PART (E.G. BATTERY CABINET). THERE IS A DANGER OF ELECTRICAL SHOCK.

WARNING	HIGH LEAKAGE CURRENTS: BEFORE CONNECTING THE MAINS YOU MUST ENSURE THAT THERE IS A PROPER EARTH CONNECTION.

WARNING	THE USER MUST DISPLAY A WARNING SHIELD ON ALL PRIMARY UPS CIRCUIT BREAKERS. THE SERVICE PERSONNEL HAS TO BE INFORMED ABOUT DANGEROUS VOLTAGES. THE WARNING PANELS MUST CONTAIN THE FOLLOWING TEXT (OR SIMILAR): “BEFORE STARTING WITH THE MAINTENANCE WORK ON THE CIRCUIT BREAKERS MAKE SURE THE UPS IS ISOLATED”.
WARNING	ALL THE INPUT/OUTPUT PORTS ARE CLASS 2 (SELV CIRCUITS). PLEASE MAINTAIN SECURITY WHEN CONNECTING TO OTHER DEVICES.

2 General information

NOTICE	THIS IS A PRODUCT FOR COMMERCIAL AND INDUSTRIAL APPLICATION IN THE SECOND ENVIRONMENT AS DEFINED IN IEC/EN 62040-2 CHAPTER 4 INSTALLATION RESTRICTIONS OR ADDITIONAL MEASURES MAY BE NEEDED TO PREVENT DISTURBANCES.

The UPS must be installed according to the recommendations in this manual. To operate the UPS at peak efficiency, your installation site should meet the environmental parameters outlined in this manual. Excessive amount of dust in the operating environment of UPS may cause damage or lead to malfunction. The UPS should be always protected from the outside weather and sunshine. If you intend to operate the system at an altitude higher than 3,281 feet [1000 meters] above sea level, contact your local sales or service office for important information about high altitude operation. The operating environment must meet the weight, airflow, size and clearance requirements specified in the technical datasheet.

Under no circumstances the UPS should be installed in an airtight room, in the presence of flammable gases, or in an environment exceeding the specification.
The basic environmental requirements of the UPS system are:

- Ambient Temperature Range: 32 – 104 ˚F [0 to +40 ˚C]
- Recommended Operating Range: 68 – 77 ˚F [+20 to +25 ˚C]
- Maximum Relative Humidity: 95% (non-condensing)

The UPS cabinet uses forced air cooling to regulate internal component temperature. Air inlets are in the bottom sides and front of the cabinet, and outlets in the rear of the cabinet. You must allow clearance at the rear of the cabinet for proper air circulation. Refer to the chapter 7.3: UPS and battery location.

2.1 Declaration of safety conformity

The product has the CE marking in compliance with the following European directives:

- Low Voltage Directive: 2006/95/EC
- EMC Directive: 2004/108/EC

Declaration of conformity with UPS harmonized standards and directives EN 62040-1-1 (Safety) and EN 62040-2 (EMC) are available as separate document.

	Product Standards	Standards
Safety Standard:	IEC/EN 62040-1	IEC/EN 60950-1 UL 60950-1 UL 1778-5, 5th edition
Electromagnetic Compatibility Standard (EMC):	IEC/EN 62040-2 Emission cat. C3 Immunity cat. C3	IEC/EN 61000-6-2 IEC/EN 61000-6-4 IEC/EN 61000-4-2 IEC/EN 61000-4-3 IEC/EN 61000-4-4 IEC/EN 61000-4-5 IEC/EN 61000-4-6
Performance Standard:	IEC/EN 62040-3	

The DPA will provide your critical equipment with a steady and reliable power supply for many years.

The unique and modular UPS DPA belongs to the newest generation of midrange 3-phase UPS-Systems. High reliability, low operating cost and excellent electrical performance are only some of the highlights of this innovative UPS solution.

The criteria and methods implemented at ABB for the design and manufacture correspond to the most stringent quality standards.

The manufacturer is certified successfully in every area according to the model of the International Standard:
ISO 9001/EN 29001. The Certification of UPS with the operating performance according to the standard IEC 62040-3 and VDE 0558 Part 530 is accomplished.

With it the ABB UPS has the **Classification Code VFI-SS-111.**

2.2 Nameplate and identification

The technical specifications of the Equipment are provided on the nameplate, which is situated at the front of the UPS. Check if it corresponds to the purchased material mentioned in the delivery note.

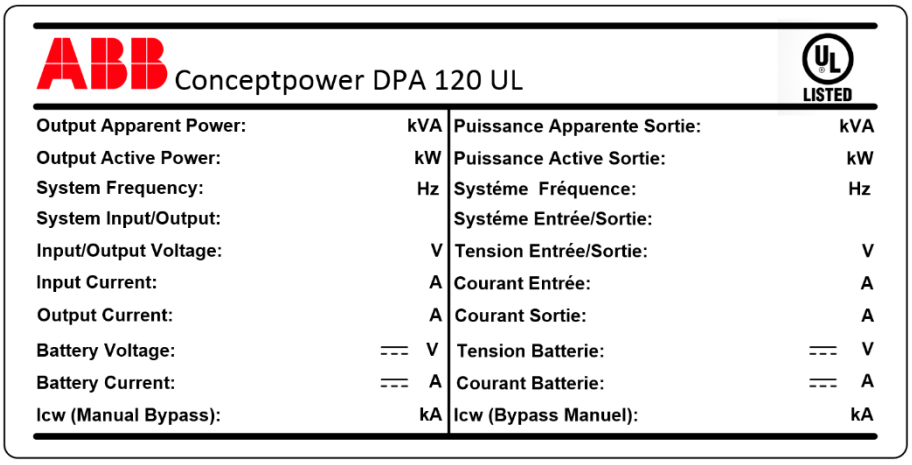


ABB Conceptpower DPA 120 UL

UL LISTED

Output Apparent Power:		kVA	Puissance Apparente Sortie:		kVA
Output Active Power:		kW	Puissance Active Sortie:		kW
System Frequency:		Hz	Systéme Fréquence:		Hz
System Input/Output:			Systéme Entrée/Sortie:		
Input/Output Voltage:		V	Tension Entrée/Sortie:		V
Input Current:		A	Courant Entrée:		A
Output Current:		A	Courant Sortie:		A
Battery Voltage:	⎓	V	Tension Batterie:	⎓	V
Battery Current:	⎓	A	Courant Batterie:	⎓	A
Icw (Manual Bypass):		kA	Icw (Bypass Manuel):		kA

Fig. 2.2-1: Nameplate of the DPA 120 UL

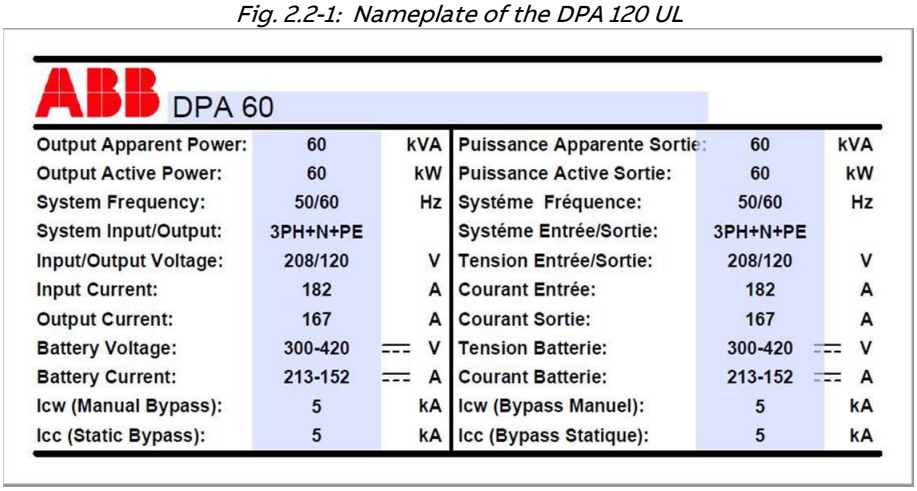


ABB DPA 60

Output Apparent Power:	60	kVA	Puissance Apparente Sortie:	60	kVA
Output Active Power:	60	kW	Puissance Active Sortie:	60	kW
System Frequency:	50/60	Hz	Systéme Fréquence:	50/60	Hz
System Input/Output:	3PH+N+PE		Systéme Entrée/Sortie:	3PH+N+PE	
Input/Output Voltage:	208/120	V	Tension Entrée/Sortie:	208/120	V
Input Current:	182	A	Courant Entrée:	182	A
Output Current:	167	A	Courant Sortie:	167	A
Battery Voltage:	300-420 ⎓	V	Tension Batterie:	300-420 ⎓	V
Battery Current:	213-152 ⎓	A	Courant Batterie:	213-152 ⎓	A
Icw (Manual Bypass):	5	kA	Icw (Bypass Manuel):	5	kA
Icc (Static Bypass):	5	kA	Icc (Bypass Statique):	5	kA

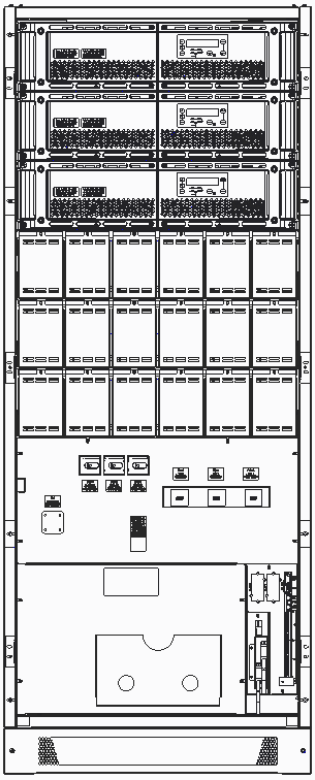
Fig. 2.2-2: Nameplate of the DPA 60 UL

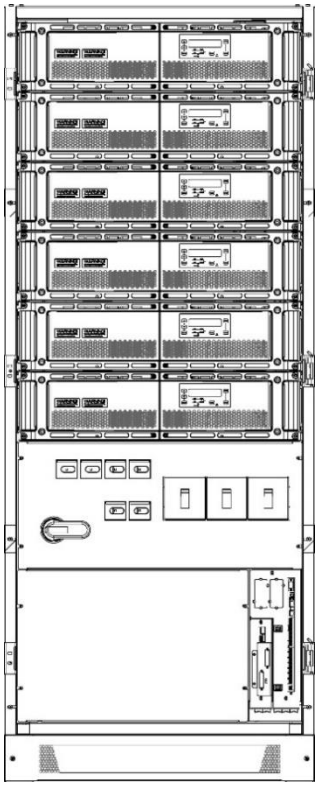
TYPE	PRODUCT DESCRIPTION	DIMENSIONS (width × height × depth)
CPLXXX	DPA 60	31.0 x 77.8 x 36.4 in [791 x 1975 x 923 mm]
CPLXXXX	DPA 120	31.0 x 77.8 x 36.4 in [791 x 1975 x 923 mm]

3 System description

The DPA 60 and DPA 120 UL are 3 phase transformerless Uninterruptible Power Systems (UPS). They are true modular on-line double conversion UPS systems providing quality power for sensitive equipment. Modular UPS systems consisting of:

- DPA UPS modules, rated power 20 kW
- Maintenance bypass switch (optional)
- Incoming, outcoming and battery terminals
- Internal batteries (DPA 60 are optional, limited to (3) 20kW modules)
- System graphical display (only on the master frame)
- Parallel interface and customer interfaces
- Various options (see chapter 10 for details)





Model	**DPA 60 UL**	**DPA 120 UL**
Rated power	60 kW / 60 kVA	120 kW / 120 kVA
Max number of DPA UPS modules	3	6
Weight	empty frame 672 lbs. [305 kg] frame + 3 modules + 6 battery strings 2256 lbs. [1025kg]	empty frame 672 lbs. [305 kg] frame + 6 modules 1466 lbs. [665 kg]
Dimensions (WxHxD)	31.0 x 77.8 x 36.4 in [791 x 1975 x 923 mm]	31.0 x 77.8 x 36.4 in [791 x 1975 x 923 mm]

Two frames are identical, only the product nameplate changes.

3.1 System architecture

The DPA 60 and DPA 120 UPS systems are designed with decentralized parallel architecture (DPA). Each DPA module has its own:

- Power converters (rectifier and inverter)
- DC booster
- Static bypass
- Battery charger & connection (for separate battery connection))
- Control logic
- LCD control panel

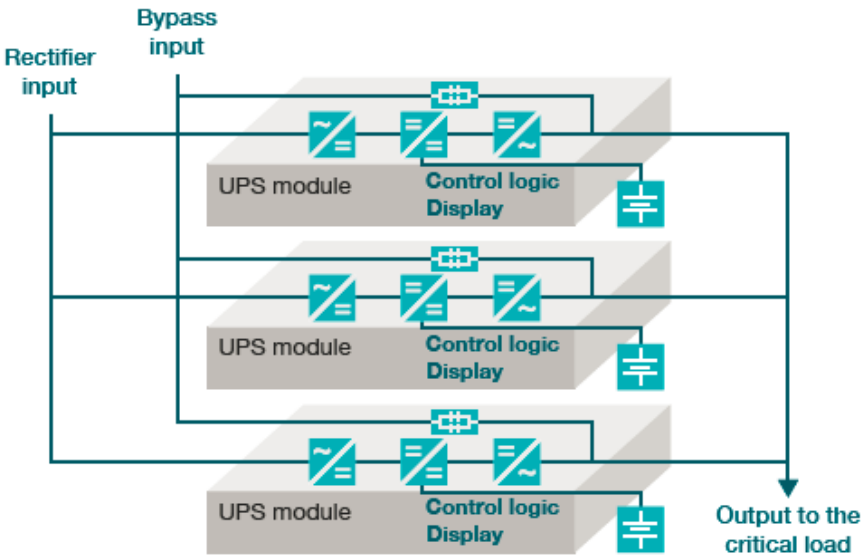


Fig. 3.1-1: System architecture

Therefore, the UPS system doesn't have common components offering high availability and no single point of failure.

3.2 Basic Module

The ratings of the DPA modules are as follows:	
Module type	20 kW
Rated output power	20 kW
Weight	132 lbs. [60 kg]
Dimensions (WxHxD)	28.0 x 7.0 x 29.5 in [710x178x750 mm]
The DPA Modules are "online-swappable" causing no disturbance to the operation of the load by inserting or extracting an isolated module from a system while the system is powered (hot).	

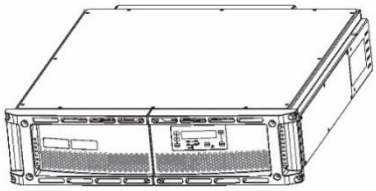


Fig. 3.2.1-1: Front view of the module

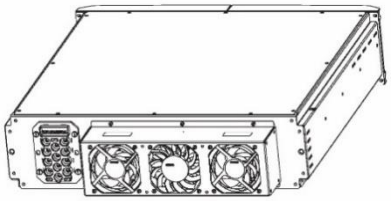


Fig. 3.2.1-2: Rear view of the module

3.3 Main elements description

3.3.1 Single line diagram

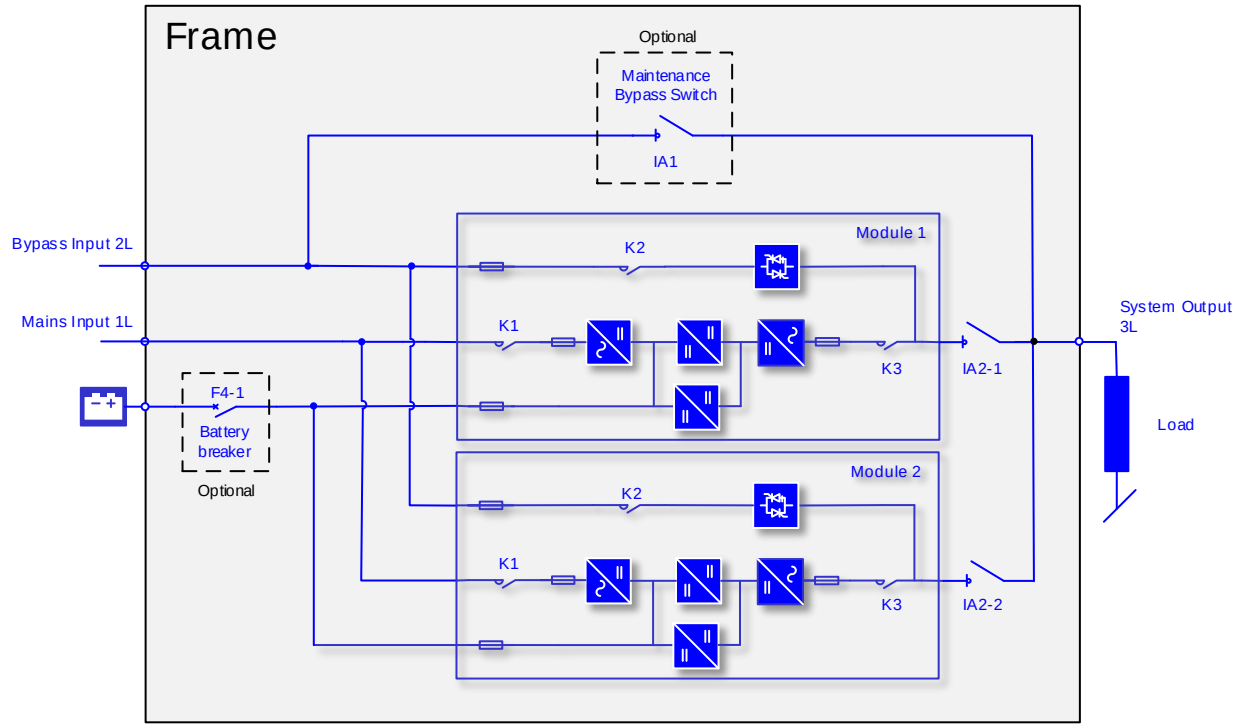


Fig. 3.3.1-1: Single line diagram

3.3.2 Functional description

Section	Component	Functional Description
Main input terminals		
1-L1	Rectifier input terminal, phase 1	Provides a connection between the utility supply and the rectifier input
1-L2	Rectifier input terminal, phase 2	
1-L3	Rectifier input terminal, phase 3	
1-N	Neutral terminal	
GND (PE)	Ground (earth) terminal	
Bypass input terminals		
2-L1	Bypass input terminal, phase 1	Provides a connection between the bypass supply and UPS bypass input
2-L2	Bypass input terminal, phase 2	
2-L3	Bypass input terminal, phase 3	
2-N	Neutral terminal	
System output terminals		
3-L1	System output terminal, phase 1	Provide a connection between the UPS system and the load
3-L2	System output terminal, phase 2	
3-L3	System output terminal, phase 3	
3-N	Neutral terminal	
GND (PE)	Ground (earth) terminal	
Battery terminals		
+ BATT	Positive pole (+) of the battery terminal	Provides a connection between the external battery and the UPS system. Not available for systems with internal batteries.
- BATT	Negative pole (-) of the battery terminal	

Battery circuit breaker		
F3-1	Battery circuit breaker modules 1 and 2	Battery overcurrent-protective device (MCB). Each couple of modules has a battery breaker
F3-2	Battery circuit breaker modules 3 and 4	
F3-3	Battery circuit breaker modules 5 and 6	
Battery circuit breaker (Systems with Internal Batteries)		
F3-1	Battery circuit breaker module 1	Battery overcurrent-protective device (MCB). Each module has a dedicated battery breaker
F3-2	Battery circuit breaker module 2	
F3-3	Battery circuit breaker module 3	
Battery drawers		
1-1,2,3	Battery String 1	Each battery string is comprised of 3 battery drawers (e.g. 1-2, 1-2, 1-3) connected in series. Each battery drawer is comprised of 10 batteries connected in series. Total string voltage is 360Vd.c. nominal.
2-1,2,3	Battery String 2	
3-1,2,3	Battery String 3	
4-1,2,3	Battery String 4	
5-1,2,3	Battery String 5	
6-1,2,3	Battery String 6	
Maintenance bypass switch		
IA1	Maintenance bypass switch	The manual bypass switch connects the load direct to the bypass input supply when it is closed (ON). The UPS is isolated for services or maintenance work
Power modules		
A001	UPS module 1	The UPS module has a rated power of 20 kW. It has a decentralized parallel architecture (DPA) as described in chapter 3.1. The DPA 60 with internal batteries are limited to 3 UPS modules.
A002	UPS module 2	
A003	UPS module 3	
A004	UPS module 4	
A005	UPS module 5	
A006	UPS module 6	
Parallel isolator		
IA2-1	Parallel isolator module 1	Allows to isolate the corresponding module (UPS) from the parallel system and hence from the load. Especially useful when swapping modules or inserting new modules into the system because with the switch open it is possible to power the modules, configure it and perform functional tests before connecting it to the rest of the system and to the load. The module parallel isolator is a mechanical 3-pole switch of the same rating as the module.
IA2-2	Parallel isolator module 2	
IA2-3	Parallel isolator module 3	
IA2-4	Parallel isolator module 4	
IA2-5	Parallel isolator module 5	
IA2-6	Parallel isolator module 6	
Backfeed protection		
K1	Mains backfeed contactor	Prevents the occurrence of any hazard voltage at the rectifier mains terminal in the case the AC failure due to the backfeed from the rectifier modules sourced by the battery
K2	Bypass backfeed contactor	Prevents the occurrence of any hazard voltage at the bypass input terminal in the case the AC failure due to the backfeed from the inverter modules sourced by the battery

3.3.3 Control & monitoring

Customers and parallel interfaces. For more detail see the Technical datasheet (Attachment).

Section	Component	Functional Description
Customer interface		
X1	Interlock function	This function allows a secure transfer from inverter (normal operation) to external maintenance bypass and vice-versa.
X2	Customer output dry ports	Up to 5 output dry contacts used for signalization of the status of the UPS system (e.g. Mains failure, load on inverter, battery low, etc.)
X3	Customer input dry ports	Up to 5 input dry contacts used for remote Shutdown and Generator Operation facilities, battery temperature sensor or customer function.
JD1	RS232 Smart Port Computer Interface	RS-232 serial port to monitor the UPS system by using the Wavemon software
JR2	Multidrop	Connections for connectivity signals between cabinets
JR3	Remote panel / Graphical display	Connection for graphical display or remote panel.
USB	Computer Interface	USB port to monitor the UPS by using the Wavemon software
SLOT1	SNMP	Optional slot for SNMP card
SLOT2	Modem	Optional slot for Modem/Ethernet card
SW2	Multi cabinet configuration switch	Determine if the cabinet is “master” or “slave” in a Multi-Cabinet configuration. (information needed for multi-drop)
Parallel interface		
JD8	Parallel Interface	The parallel interface is used to connect frames in parallel (see 10.6 Multi cabinet configuration).
SW1-6	Multi cabinet configuration switch	Determine the “position of the cabinet” in a Multi-Cabinet Chain.

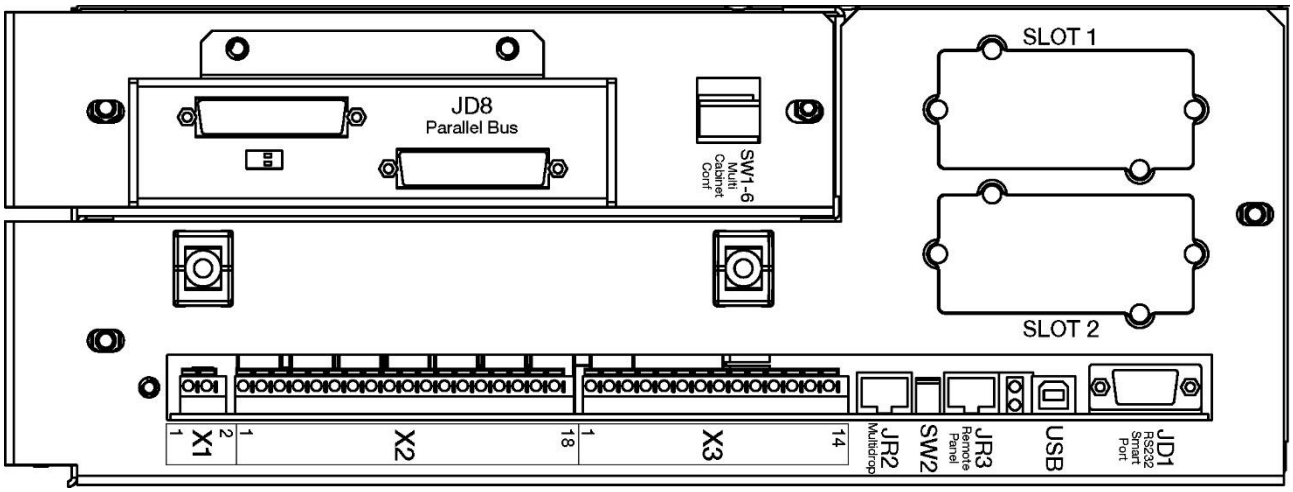


Fig. 3.3.3-1: Customer and Parallel interfaces

Multi cabinet configuration
The DPA may be paralleled to increase the power capacity up to 600 kW. A maximum of 6 cabinets (30 modules) can be paralleled.

Multiple cabinet system, with N cabinets requires:

- N UPS cabinets with at least 1 module in each cabinet. Only the Master (first) cabinet will have the System graphical display.
- N parallel interfaces (included as basic configuration on each frame)
- N parallel adapters (this is an option and must be ordered separately)

00-2907	Parallel adapter

- N-1 parallel cable kits. The kit includes parallel and Multidrop cables (this is an option and must be ordered separately)

04-3630	Parallel Cable Kit 5m
04-3631	Parallel Cable Kit 10m
04-3632	Parallel Cable Kit 15m
04-3633	Parallel Cable Kit 20m
04-3634	Parallel Cable Kit 25m

	FRAME 1	FRAME 2	...	FRAME N-1	FRAME N
System graphical display	•	-		-	-
Parallel interface	•	•		•	•
Parallel adapter	•	•		•	•
Parallel Cable Kit	•	•		•	-

The start-up of a multiple cabinet systems is an operation which can be performed by a service engineer form the manufacturer or by a service engineer from an agent certified by the manufacturer. Please refer to the service manual to perform this operation.

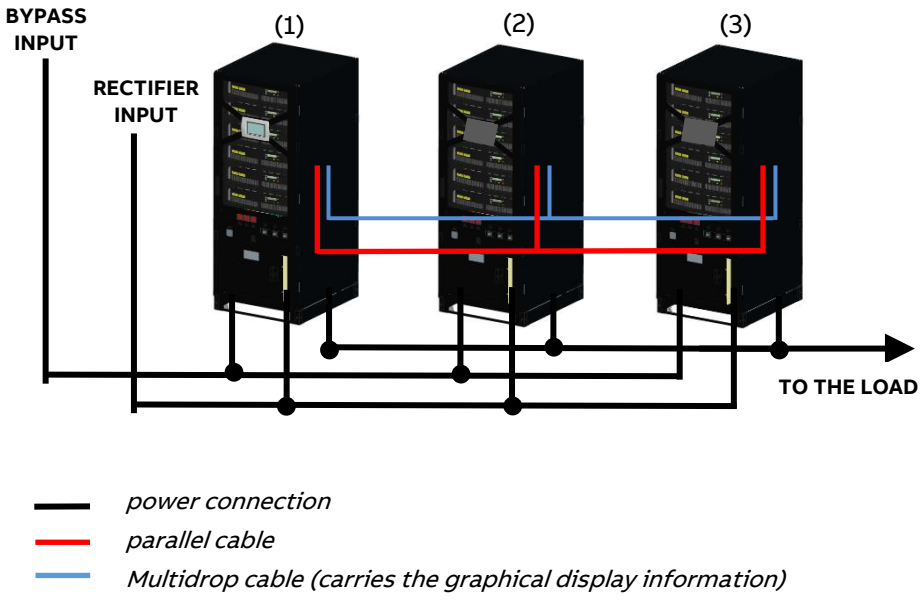


Fig. 3.3.3-2: Multi cabinet configuration example

3.4 Operating modes

3.4.1 Mode “ON-LINE”

In On-Line Mode, the load is connected to the Inverter (INV) and the rectifier (Line1) is supplied by the main utility supply. The On-Line mode protect the load from any utility main disturbance or failure.

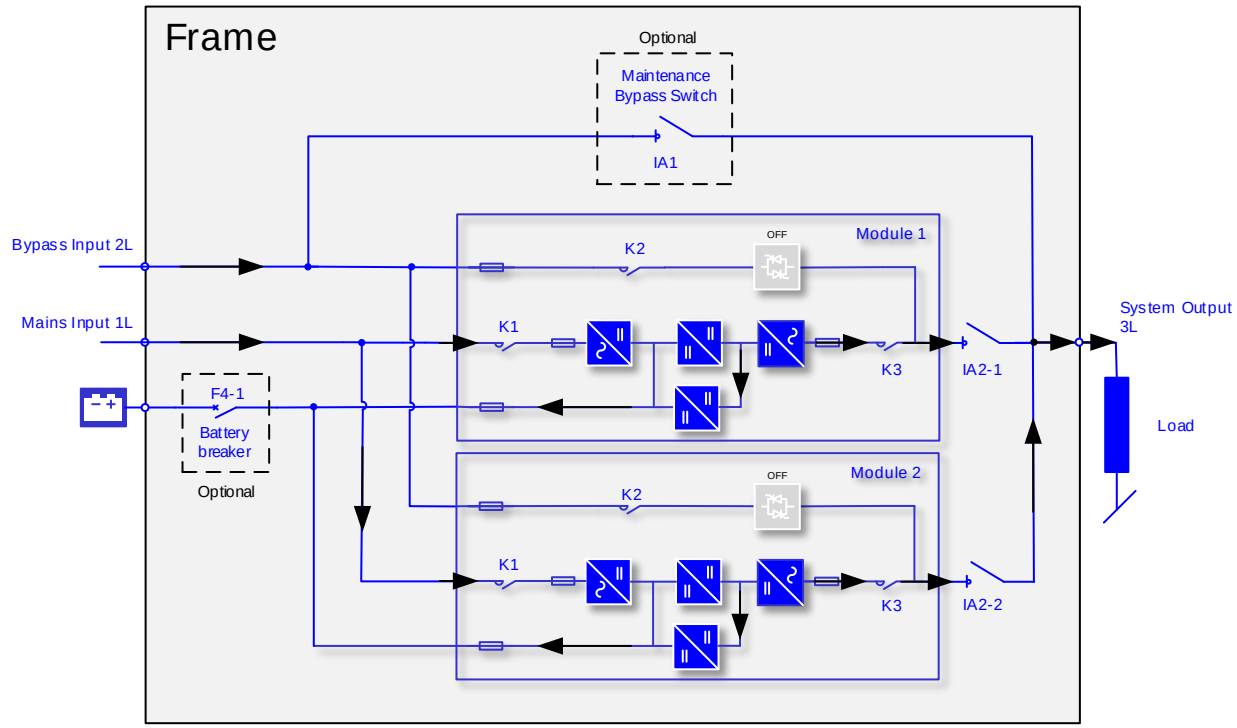
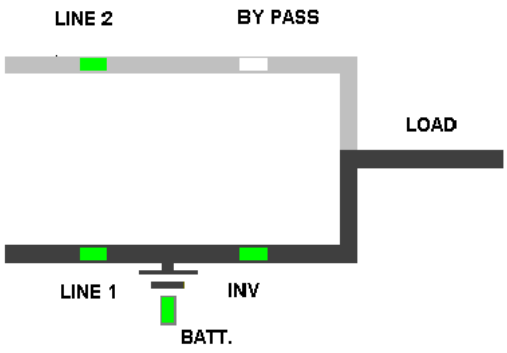


Fig. 3.4.1-1: “ON LINE” operating mode

The On-Line mode status is shown in the mimic of control panel per module as follow:



LED Indicator	Color
LINE 1	Green
LINE 2	Green
BYPASS	OFF
INVERTER	Green
BATTERY	Green

Fig. 3.4.1-2: “ON LINE” control panel mimic

In the unlikely event of an inverter fault or overload condition the UPS will transfer the load automatically and without interruption to the static bypass (transfer time = 0).

3.4.2 Mode “OFF-LINE” (Eco or bypass mode)

In "OFF-Line Mode”, the load is supplied from the bypass mains (LINE 2) through the static bypass (BY PASS). The Inverter is OFF.

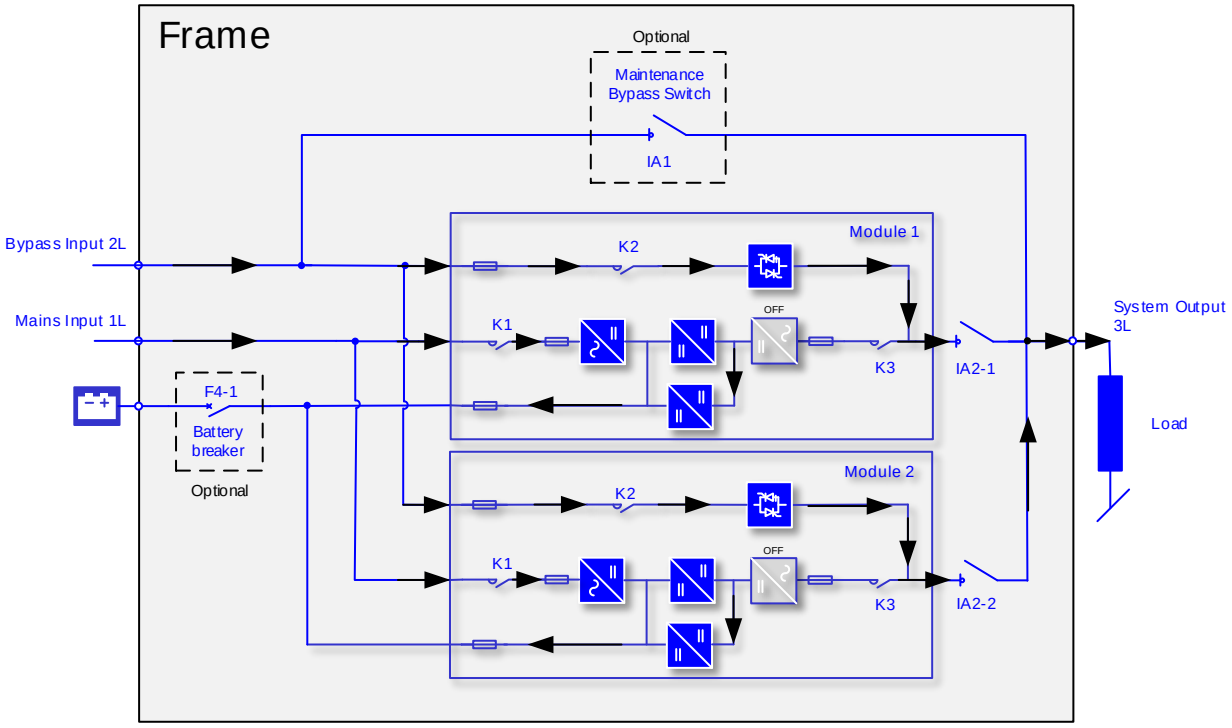
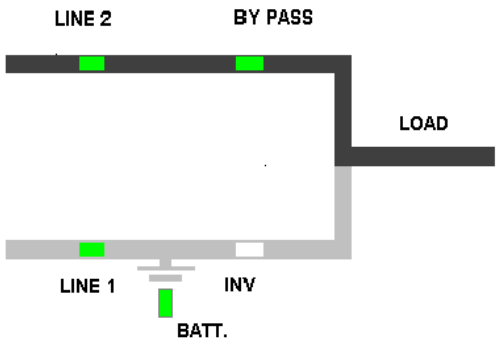


Fig. 3.4.2-1: “OFF LINE” operating mode

The OFF-Line mode status is shown in the mimic of the control panel per module as follow:



LED Indicator	Color
LINE 1	Green
LINE 2	Green
BYPASS	Green
INVERTER	OFF
BATTERY	Green

Fig. 3.4.2-2: “OFF LINE” control panel mimic

In OFF Line Mode the battery charger remains active. In the event of a bypass mains (LINE 2) failure, the load will automatically be transferred from mains to inverter within 5ms (this is valid for single and parallel systems). If the Utility Mains supply (LINE 1) is not available, the energy is supplied by the battery.

NOTICE	In order to provide the load with maximum protection, the manufacturer always recommends that the load be supplied by the inverter (ON-LINE Mode). OFF-LINE Mode should only be used if the loads can tolerate interruptions of 3-5ms as the UPS transfers to ON-LINE Mode.

3.4.3 Mode “ON-BATTERY” (Battery mode)

In ON-Battery Mode, the load is connected to the inverter (INV) and the inverter is supplied by the battery. The utility main supply is not available (LINE 1)

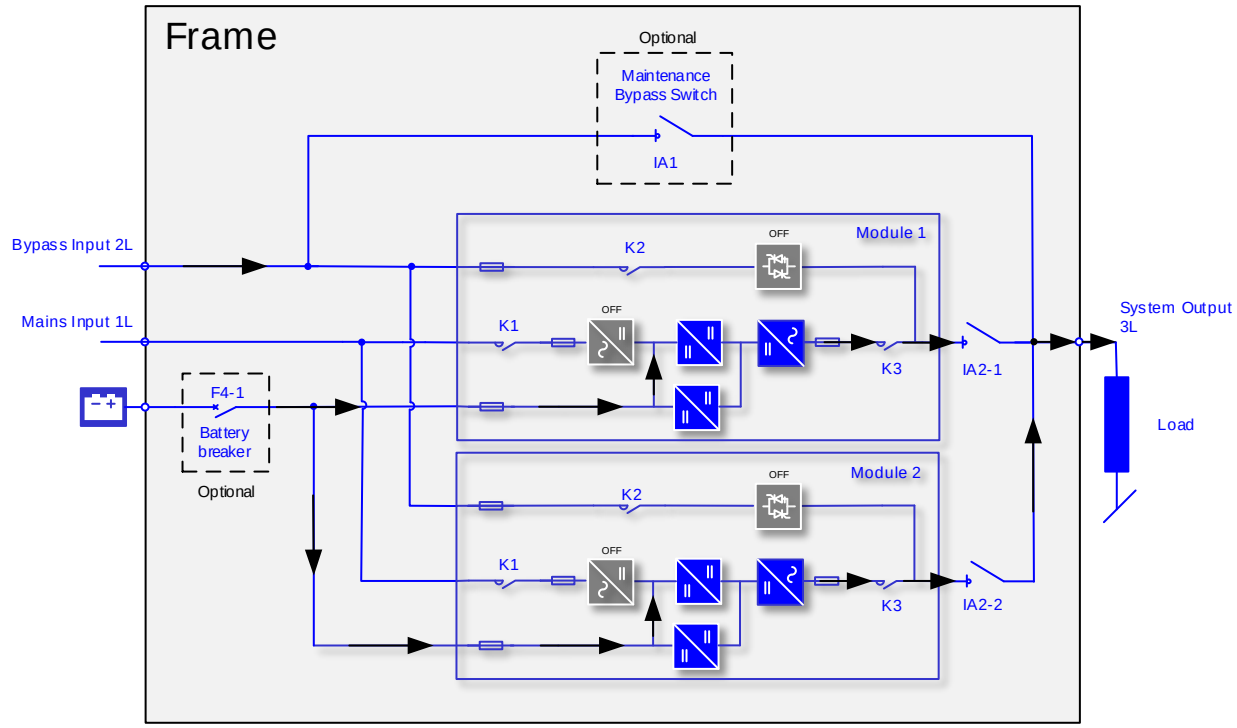


Fig. 3.4.3-1: “ON BATTERY” operating mode

The ON-Battery Mode status is shown in the mimic of the control panel per module as follow:

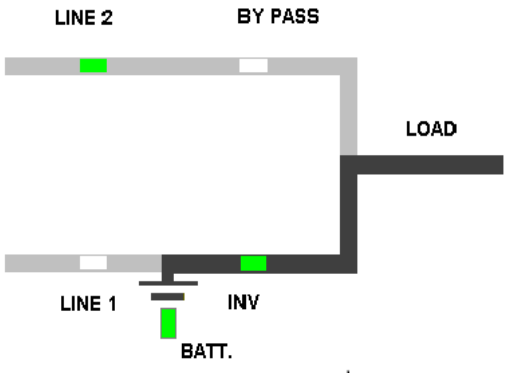


Fig. 3.4.3-2: “ON BATTERY” control panel mimic

LED Indicator	Color
LINE 1	OFF
LINE 2	Green
BYPASS	OFF
INVERTER	Green
BATTERY	Green

3.4.4 Maintenance bypass

The Maintenance Bypass Mode is performed by means of the IA1 BYPASS SWITCH on the front of the UPS:

POSITION OF SWITCH	EFFECT
ON	Bypass-Switch Closed (Load supplied directly from bypass mains)
OFF	Bypass-Switch Open – Normal operating condition (Load supplied by inverter)

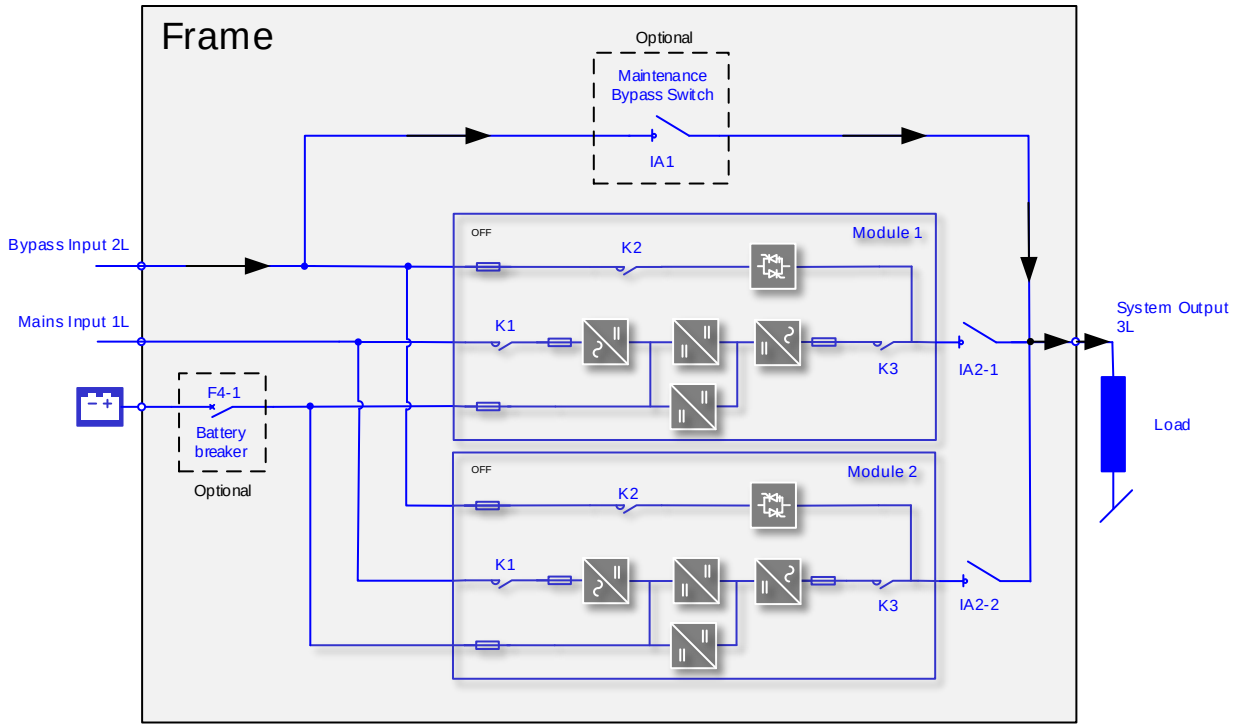


Fig. 3.4.4-1: "Maintenance bypass" operating mode

NOTICE	While in Maintenance Bypass Mode, the load is not protected against mains failures or disturbances.

4 Control & monitoring

4.1 Control panel module

⚠CAUTION	**ONLY PERSONS TRAINED BY A SERVICE ENGINEER FROM THE MANUFACTURER OR AN AGENT CERTIFIED BY THE MANUFACTURER SHALL BE ALLOWED TO OPERATE THE CONTROL PANEL WITH THE DOORS CLOSED.** **ALL OTHER OPERATIONS SHALL ONLY BE PERFORMED BY A SERVICE ENGINEER FROM THE MANUFACTURER.**

The user-friendly control panel is composed of three parts:

- Power management LCD display (PMD);
- Led indicators;
- Keys.

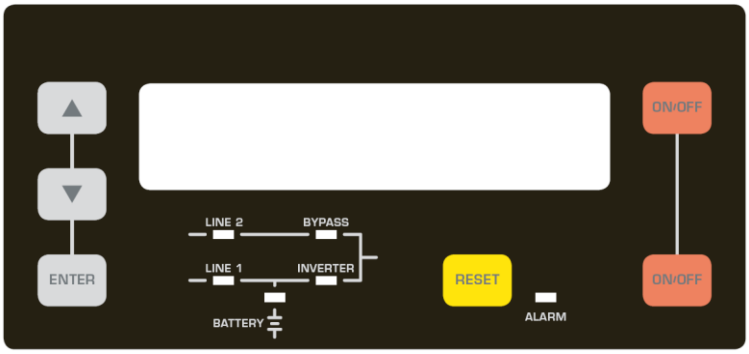


Fig. 4.1-1: Control Panel

The 2 x 20 character LCD simplifies the communication with the UPS and provides the necessary monitoring information about the UPS. The menu driven LCD enables the access to the:

- Event register;
- Monitor the input and output U, I, F, P,
- Battery runtime;
- To perform commands like start-up and shutdown of ups and
- Load transfer from inverter to bypass and vice-versa;
- Diagnosis (service mode);
- Adjustments and testing.

4.1.1 Status & alarm indication

The mimic diagram serves to indicate the general status of the UPS. The LED-indicators show the power flow status and in the event of mains failure or load transfer from inverter to bypass and vice-versa. The corresponding LED-indicators will change colors from green (normal) to red (warning).

The LED's LINE 1 (rectifier) and LINE 2 (bypass) indicate the availability of the mains power supply. The LED's INVERTER and BYPASS if green indicate which of the two is supplying power to the critical load. When the battery is supplying the load due to mains failure the LED-indicator BATTERY is flashing.

The LED-indicator ALARM is a visual indication of any internal or external alarm condition. At the same time an audible alarm will be activated.

INDICATOR	INDICATOR STATUS	MEANING
ALARM	OFF	No alarm condition
	RED	Alarm condition
LINE 1	GREEN	Mains rectifier available
	RED	Mains rectifier not available
LINE 2	GREEN	Mains bypass available
	RED	Mains bypass not OK or not available
	OFF	UPS is turned off
BYPASS	GREEN	Load on bypass (Bypass-or Eco-Mode)
	OFF	Bypass not operating (switched-off)
INV	GREEN	Load on inverter
	RED	Inverter fault or load not transferable to inverter
	OFF	Inverter not operating (switched-off)
BATTERY	OFF	UPS is turned off
	GREEN	Battery connected and OK
	RED	Fault condition of the battery (alarm)
	Flashing GREEN	Battery in discharge
	Flashing RED	Battery low or disconnected

4.1.2 Buttons

The keys allow the user to operate the UPS to perform settings and adjustments, to start-up and shutdown the UPS, to monitor on the LCD display the voltages, currents, frequencies and other values.

KEYS	FUNCTION
ON/OFF ON/OFF	Serve to switch-on (press both keys simultaneously), or shutdown the UPS (press both keys simultaneously)
UP (↑)	Move upwards through the menu
DOWN (↓)	Move downwards through the menu.
RESET	Cancel the audible alarm. If the alarm condition was only transient the LED-indicator ALARM would also extinguish otherwise it will remain on (red).
ENTER	Confirms a chosen menu item.

NOTE

IN THE CASE THAT THE PARALLEL UPS SYSTEM HAS TO BE TURNED OFF, THEN BOTH ON/OFF BUTTONS ON ALL UPS MODULES HAVE TO BE PUSHED. IN THIS CASE THE POWER SUPPLY TO THE LOAD WILL BE INTERRUPTED

4.2 LCD description

4.2.1 Status

	DESCRIPTION	LCD-DISPLAY	
1	Load is protected by UPS power. Load is supplied by inverter (Normal Operation) and the batteries are connected and o.k.	LOAD PROTECTED	S
2	Load is not protected by UPS power. Load is supplied by mains power (load on bypass) or it is supplied by the inverter (Normal operation) and the batteries are not o.k.	LOAD NOT PROTECTED	P1
3	Load not supplied. UPS is switched off To start the UPS press the two ON/OFF push buttons simultaneously	LOAD OFF SUPPLY FAILURE	P4
4	The UPS is not supplying load anymore.	LOAD DISCONNECTED	P6

NOTE:

- On the right-hand side of the LCD there is the indication of single /parallel UPS.
- If the UPS is configured as single the indication will be “S”
- If the UPS is configured as parallel the indication will be “P” followed by the UPS number
- The maximum number of modules per units are:
    - DPA 60 = 3 modules
    - DPA 120 = 6 modules

EXAMPLES:

S stands for Single UPS. The system consists of ONLY one UPS

P1 stands for Parallel UPS in a Multi-UPS system and 01 stands for the first Module (MASTER) in the Multi-UPS system.

P4 stands for Parallel UPS in a Multi-UPS system and 04 stands for the fourth Module (SLAVE) in the Multi- UPS system.

P6 stands for Parallel UPS in a Multi-UPS system and 06 stands for the sixed Module (SLAVE) in the Multi- UPS system.

The configuration of the single / parallel UPS is achieved in the Menu “SET UP SERVICE”. See Service Manual Section E

4.2.2 Main menu

	DESCRIPTION	LCD-DISPLAY
1	Logging Control. A log of the last 64 events is stored in the Power Management Display.	→ **EVENT LOG** **MEASUREMENTS**
2	In Menu Measurements: monitor voltages, power, frequencies, currents, autonomy etc.	→ **MEASUREMENTS** **COMMANDS**
3	The Command Menu enables to perform the commands “Load to inverter”, Load to bypass, battery test.	→ **COMMANDS** **UPS DATA**
4	The UPS Data are the UPS personalized information “serial number”	→ **UPS DATA** **SET-UP USER**
5	Various settings can be performed by the user: Date/Time, automatic battery test, etc.	→ **SET-UP USER** **SET-UP SERVICE**
6	Various adjustments can be performed by the service staff	→ **SET-UP SERVICE** **NO MORE MENU**

4.2.3 Commands

	DESCRIPTION	LCD-DISPLAY
1	Transfer Load to inverter	→ **LOAD TO INVERTER** **LOAD TO BYPASS**
2	Transfer Load to bypass.	→ **LOAD TO BYPASS** **PERFORM BATT.TEST**
3	Battery Test	→ **PERFORM BATT.TEST** **NO MORE COMMANDS**

4.3 Metering

4.3.1 Measurements

	DESCRIPTION	LCD-DISPLAY
1	Battery Runtime	**BATT. RUN TIME (MIN)** **00h 00m**
2	UPS-Output Frequency	**OUTPUT FREQUENCY (HZ)** **50.00**
3	Bypass Frequency.	**BYPASS FREQUENCY (HZ)** **50.00**
4	Battery Voltage	**BATTERY VOLTAGE (V)** **+ 0.0 - 0.0**
5	Battery Charger Current	**BATT. CHARGE CUR. (A)** **+ 0.0 - 0.0**

6	Discharge Current (when working on battery mode)	**DISCHARGE CURRENT (A)** 00.00
7	Rectifier Voltage (Phases L1, L2, L3)	**RECTIFIER VOLTAGE (V)** 230 230 230
8	Bypass Voltage (Phases L1, L2, L3)	**BYPASS VOLTAGE (V)** 230 230 230
9	Output Voltage (Phases L1, L2, L3)	**OUTPUT VOLTAGE (V)** 230 230 230
10	Output Current (Phases L1, L2, L3)	**OUTPUT CURRENT (A)** 00.00 00.00 00.00
11	Active Output Power (Phases L1, L2, L3)	**ACTIVE POWER (KW)** 00.00 00.00 00.00
12	Reactive Output Power (Phases L1, L2, L3)	**REACTIVE POWER (kVAr)** 00.00 00.00 00.00
13	Apparent Output Power (Phases L1, L2, L3)	**APPARENT POWER (KVA)** 00.00 00.00 00.00
14	Output Power (Phases L1, L2, L3)	**OUTPUT POWER (%)** 00.00 00.00 00.00
15	Battery capacity	**BATT. CAPACITY (%)** 00.00
16	Battery temperature (only when the option battery probe is connected.)	**BATT. CAPACITY (%)** 00.00
17	Module temperature Booster (°C), Inverter (°C), fans speed duty cycle	**MODULE TEMP. BST/INV** 24.5 28.3 13.8
18	End of measurements	**NO MORE MEASUREMENTS**

4.3.2 Event log

DESCRIPTION		**LCD-DISPLAY**
1	Logging Control; a log of the last 64 events is stored in the Power Management Display.	**01** 05-10-00 14-38-59 **LOAD TO INV.**
2	Every stored event is identified with a sequential number and time stamp.	**02** 05-10-00 14-38-56 **LOAD TO BYP.**
3	All events and alarms are indicated with their date and time of appearance.	**03** 05-10-00 14-37-14 **LOAD OFF**

4.3.3 UPS Data

	DESCRIPTION	LCD-DISPLAY
1	These general UPS Data are installed at the manufacturing plant	**UPS SERIAL NUMBER** **NW-nnnnn**
2	Manufacturing date	**DATE OF MANUFACTURE** **15-01-2003**
3	EPROM Version	**EPROM VERSION** **V-000**
4	Actual Date and Time	**DATE** **TIME** dd-mm-yyyy hh:mm:ss

4.3.4 Set-up user

	DESCRIPTION	LCD-DISPLAY
1	Set-up Language	→ **SET LANGUAGE** **SET DATE AND TIME**
		ENGLISH **FRANCAIS**
2	Set-up Date and Time	→ **SET-UP DATE/TIME** **SET-UP BATT. TEST**
		DD-MM-YY HH-MM-SS
3	Set-up battery test	→ **SET BATTERY TEST** **SET GENERATOR OP.**
		DAY OF MONTH **(1-31)**
		HOUR OF DAY **(1-24)**
		REPETITIVE (Y/N) **YES/NO**
4	Set-up operation with Gen-Set	→ **SET GENERATOR OP.** **NO MORE SETTINGS**
		BATT.CHARGE LOCK **YES/NO**
		BYPASS LOCK **YES/NO**

4.3.5 Set-up service

	DESCRIPTION	LCD-DISPLAY
1	Battery Runtime	**BATT. RUN TIME (MIN)** **00h 00m**
2	UPS-Output Frequency	**OUTPUT FREQUENCY (HZ)** **60.00**

Password is necessary to enter: Service Manual

5 Maintenance & troubleshooting

WARNING!

THE OPERATIONS DESCRIBED IN THIS CHAPTER MUST BE PERFORMED BY A SERVICE ENGINEER FROM THE MANUFACTURER OR FROM AN AGENT CERTIFIED BY THE MANUFACTURER.

5.1 General maintenance

5.1.1 User responsibilities

There are no parts within the UPS which need to be serviced by the user, so the maintenance responsibilities of the user are zero. To maximize the useful working life and reliability of the UPS and its batteries, the environment in which the UPS operates should be kept cool 68°F – 77°F [20°C - 25°C], dry, dust free and vibration free. The batteries should be hold fully charged.

5.1.2 Preventive maintenance

The UPS system needs a regular and constant maintenance (preventive inspections) at least once a year, even during the warranty period.

Please refer to your authorized service partner for the recommended maintenance plan (including the specific scheduled replacement of fans and power capacitors). Performing regular and preventive maintenance not only keeps the performance stable and extends the life of the equipment, but also decreases the risk of failure. In case these activities not performed, the correct functioning of the equipment may be affected.

Maintenance inspections are essential to ensure a correct functionality and reliability of the UPS system. When the UPS is commissioned, the commissioning field service engineer will attach a service record book to the front of the UPS, and this will be used to record the full service history of the UPS.

During maintenance the field service engineer might carry out some or all of following checks:

- Status and function check of UPS and batteries
- UPS and batteries visual inspection (dust, mechanical damages)
- Visual inspection of screws and cable connections
- Check of air ventilation and room temperature
- Check the operation and function (commutations, remote monitoring and Signaling)
- Current, voltage and frequencies measures
- Measure and record the current load conditions
- Check the load sharing (only in parallel systems)
- Battery voltage check
- Battery discharge test
- Check transfer of the load from UPS to mains operation via static bypass
- Unit cleaning

5.1.3 Deep battery test

The battery test takes approximately 3 minutes and should be performed only if:

- There are no alarm conditions
- The battery is fully charged
- Mains are present.

The battery testing can be carried out independently of the operation mode (OFF-LINE or ON-LINE) and whether or not the load is connected. The battery test procedure can be performed from the UPS display, in the service setup mode.

5.1.4 Battery maintenance, disposal and recycling

Battery maintenance shall be done by a certified Service Partner.

To ensure an optimum operation of the UPS system and a continuous and efficient protection of the connected load it is recommended to check the batteries every 12 months.

Batteries contain dangerous substances that will harm the environment if thrown away. If you change the batteries yourself, call qualified organizations for battery disposal and recycling.

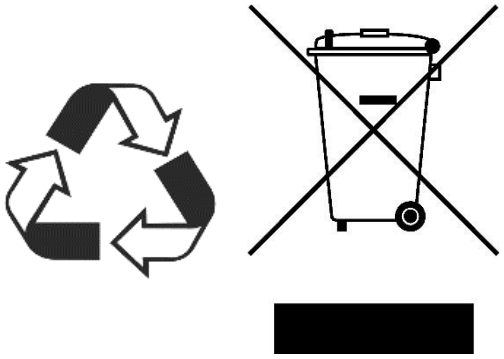


Fig. 6.1.4-1: Battery maintenance, disposal and recycling

5.2 Troubleshooting

5.2.1 Alarms

In the event of an alarm condition the red LED-Indicator “Alarm” and the audible alarm will turn on. In this case proceed as follows:

1. Silence the audible alarm by pressing the button "Reset".
2. Identify the cause of the alarm condition by means of the EVENT LOG in the MAIN menu.
3. In case of doubts please contact the nearest Service center.
4. Fault identification and troubleshooting information is provided on the following pages.

5.2.2 Menu, commands, event log and measurements

In section 4 there is a detailed description of the Menu, Commands, Event Log and Measurements that can be operated and displayed on the LCD. The List of Alarms and Messages are shown below.

5.2.3 Fault identification and rectification

The major alarm conditions that will be encountered are:

ALARM CONDITION	MEANING	SUGGESTED SOLUTION
MAINS RECT. FAULT	*Mains power supply is outside prescribed tolerance.*	The input power to UPS is too low or missing. If site power appears to be OK, check the input circuit breakers etc. supplying the UPS.
MAINS BYP FAULT	*Mains power supply is outside prescribed tolerance.*	The input power to UPS is too low or missing. If site power appears to be OK, check the input circuit breakers etc. supplying the UPS.
OUTPUT SHORT	*There is a short circuit at the output of UPS (on load side).*	Check all output connections and repair as required.
OVERLOAD	*Load exceeds the UPS rated power.*	Identify which piece of equipment is causing the overload and remove it from the UPS. Do not connect laser printers, photocopiers, electric heaters, kettles etc. to the UPS.
TEMPERATURE HIGH	*UPS temperature has exceeded the allowed value.*	Check that the ambient temperature of the UPS is less than 40° C. If the ambient temperature is normal call the certified service center for assistance.
INV. PHASE FAULT	*Inverter is faulty.*	Call the certified service center for assistance.
SYNCHRON. FAULT	*The inverter and mains are not synchronized.*	The frequency of the input voltage to the UPS is outside operational limits and the UPS static bypass has been temporarily disabled.
BATTERY IN DISCHARGE	*Battery is near end of autonomy.*	Shutdown load connected to UPS before the UPS switches itself off to protect its batteries.
MANUAL BYP IS CLOSED	*Maintenance Bypass closed. Load supplied by mains.*	This alarm is only displayed if the UPS is on Maintenance Bypass.

In case of alarms not included in the list above, please contact the nearest certified service center for assistance.

6 Packing, transportation & storage

This chapter contains all the necessary information for the correct packing, transportation and unpacking of the UPS.

NOTE!

IF THE UPS IS NOT IMMEDIATELY INSTALLED THE FOLLOWING GUIDELINES MUST BE FOLLOWED:

TRANSPORT:

UPS CABINETS AND/OR BATTERY CABINET CAN FALL OVER. USE THE SHIPPING BRACKETS ON THE REAR AND FRONT TO SECURE THE CABINETS. DO NOT TILT THEM MORE THAN 10° FROM VERTICAL, OTHERWISE CABINETS MAY TIP OVER.

POTENTIAL DANGERS:

- TILTING THE CABINET MIGHT DAMAGE THE SYSTEM AND THEREFORE SHOULD NO LONGER BE CONNECTED TO THE MAINS.
- WEIGHT OF THE UPS SYSTEM COULD CAUSE SERIOUS INJURIES TO PERSONS OR ANYTHING IN THE SURROUNDING AREA.

STORAGE:

- THE UPS SHOULD BE STORED IN THE ORIGINAL PACKING AND SHIPPING CARTON
- THE RECOMMENDED STORING TEMPERATURE FOR THE UPS SYSTEM AND BATTERIES IS BETWEEN 68°F – 77°F [20°C – 25°C].
  INDOOR AREA THAT IS RELATIVELY FREE OF CONDUCTIVE CONTAMINANTS
- THE UPS SYSTEM AND THE BATTERY SETS MUST BE PROTECTED FROM HUMIDITY < 95% (NON-CONDENSING)

6.1 Packing & transportation

The UPS and accessories are delivered on a specifically designed pallet that is easy to move with a forklift or a pallet jack. Keep the UPS always in upright position and do not drop the equipment. Do not either stack the pallets because of high-energy batteries involved and the heavy weight.

Check before transporting the surface loading and use an adequate forklift to move the equipment to the final position.

For the weights refer to the technical data sheet

Fig. 6.1-1: Forklift for transportation

HEAVY!

BE CAREFUL OF THE HEAVY WEIGHT OF THE UNIT

6.2 Unpacking

Upon receiving the goods, make sure that they correspond to the material indicated in the delivery note.
Carefully examine the packed unit(s) for any sign of physical damage. Two TiltWatch indicators (see Figure 6.2-1) are placed on two sides of the packed unit, in a well visible position. They should both be intact and not red color. If tipping has occurred the white arrow becomes red, like shown on the Figure 6.2-1 below.
In case of damaged unit(s) or even only suspect of damaged (TiltWatch is red) inform immediately:

- The carrier
- The manufacturer

NOTE!

VISIBLE TRANSPORT DAMAGES MUST BE CLAIMED TO THE CARRIER IMMEDIATELY AFTER RECEIPT.
OTHER CLAIM FOR SHIPPING DAMAGE MUST BE FILED IMMEDIATELY TOO AND THE CARRIER MUST BE INFORMED WITHIN 7 DAYS OF RECEIPT OF THE EQUIPMENT. THE PACKING MATERIALS SHOULD BE STORED FOR FURTHER INVESTIGATION.

Fig. 6.2-1: TiltWatch

6.2.1 Standard package (film)

Perform the following steps to unpack the UPS equipment from the standard packaging:

1. Remove the plastic film from the UPS, by cutting it where there is the cardboard underneath (on one edge),
2. Remove the 4x cardboard edges carefully by paying attention that the accessory box placed on top of the UPS does not fall down. Lower the accessory box with the help of a stool or ladder; make sure you are safe by doing that. The std. content of the accessory box is: user manual, 2x painted sockets, screws, 4x feet and keys.
3. Remove the bubble-film by removing the small type pieces by hand.
4. Remove pallet from the UPS.
5. Open the UPS-door and make sure that all the UPS-Modules are appropriately fitted in their UPS-Compartment and if the UPS system is provided

   Without a UPS-module make sure that the empty UPS-compartment is correctly covered with the UPS compartment protection cover

6.2.2 Sea freight light package (cartboard box)

Perform the following steps to unpack the UPS equipment from the light packaging:

1. Cut the two green straps that are locking down the carton bow. Remove the carton box by pulling up the upper part of it, and then slide up the rest of the carton box starting from the bottom to the top.
2. Cut the tape from the four pieces of polystyrene, and the remove them from the unit.
3. By paying extreme attention and without damage the cabinet, unwrap the plastic film and remove by pulling up the upper part of the bag that cover the unit, the edges are not protected.
4. Mount the 4x adjustable feet (feet are in the accessory box, or at the bottom of the unit).
5. After having placed the UPS in its final position, disassemble the left and right socket and mount the front and back painted sockets.
6. Keep the packaging materials to ship the unit back.

Fig. 6.2.2-1: Sea freight light package unpacking sequence

6.2.3 Sea freight cases (wooden box)

Perform the following steps to unpack the UPS equipment from the sea freight package:

1. Disassemble the wooden box by removing all screws.
2. Remove the plastic film and bag from the UPS, by cutting it without causing damage to the cabinet; the edges are not protected.
3. Remove the accessories from its location. The std. set of accessories is: user manual, 2x painted sockets, screws, 4x feet and keys.
4. Tear out the 2x humidity-absorber. One is inside the front part of the UPS: open the door using the keys and then tear out the absorber. The other one is at the back.

1) 2)

Fig. 6.2.3-1: Sea freight cases unpacking sequence (Wooden box)

6.3 Storage

6.3.1 UPS

If you plan to store the UPS prior to use, keep the UPS unpacked in a dry, clean and cool storage room with an ambient temperature between 68°F – 77°F [20°C – 25°C] and humidity of less than 95% non-condensing.

If the packing container is removed protect the UPS from dust.

NOTE!

THE UPS SYSTEM, THE BATTERY CABINET AND THE BATTERIES ARE HEAVY AND MAY TIP DURING TRANSPORTATION CAUSING SERIOUS INJURY IF UNPACKING INSTRUCTIONS ARE NOT CLOSELY FOLLOWED.

6.3.2 Batteries

The battery life depends very much on the ambient temperature. It is therefore important to follow the storage instructions/recommendations of the battery manufacturer. For long-term storage make sure that the battery is fully recharged every 6 months. Before and after storing, charge the battery. Always store the batteries in a dry, clean, cool environment in their original packaging. If the packing container is removed protect the batteries from dust and humidity.

NOTE!

SEALED BATTERIES MUST NEVER BE STORED IN A DISCHARGED OR PARTIALLY DISCHARGED STATE.
EXTREME TEMPERATURE, UNDER- AND OVERCHARGE AND OVERDISCHARGE WILL DESTROY BATTERIES

HEAVY!

BE CAREFULL OF THE HEAVY WEIGHT OF THE BATTERIES

Fig. 6.3.2-1: Batteries

7 Installation

7.1 Environmental condition

The UPS is designed to be installed indoor, in temperature-controlled rooms and in restricted access locations. Heating, cooling, forced ventilation and humidification are used to maintain the conditions as follow in the next subchapters:

7.1.1 Climatic conditions

Ambient temperature	32 to 104°F [0 to +40°C]
Relative Humidity	95%
Conditions of condensation	no
Condition of wind-driven rain, snow, hail, etc.	no
Conditions of water from sources other than rain	no
Condition of icing	no

The climate-controlling system could be periodically switched on or off, but extremely high or low temperature shall be prevented.

7.1.2 Biological conditions

Flora (presence of mold, fungus)	no
Fauna (presence of rodents and other animals)	no

7.1.3 Mechanical active substance

The UPS shall not be placed in proximity to source of sand or dust

7.1.4 Chemical active substance

Location with normal level of contaminants experienced in urban areas over the whole area

7.1.5 Mechanical conditions

The UPS shall not be placed in location with insignificant vibration and shock.

7.2 Environmental condition for UPS with inside battery modules or external battery cabinet

As VRLA batteries need air-exchange for exhausting gases and their life-time depends on the ambient temperature, for the UPS system with inside battery modules it is recommended to exchange the air and to have a location with climate-controlling system to maintain the conditions as follow.

7.2.1 Climatic conditions

Ambient temperature	68°F [20°C]

7.3 UPS location

The minimum needed clearances to allow proper airflow on the UPS system and to allow proper service and maintenance shall be respected as reported below:

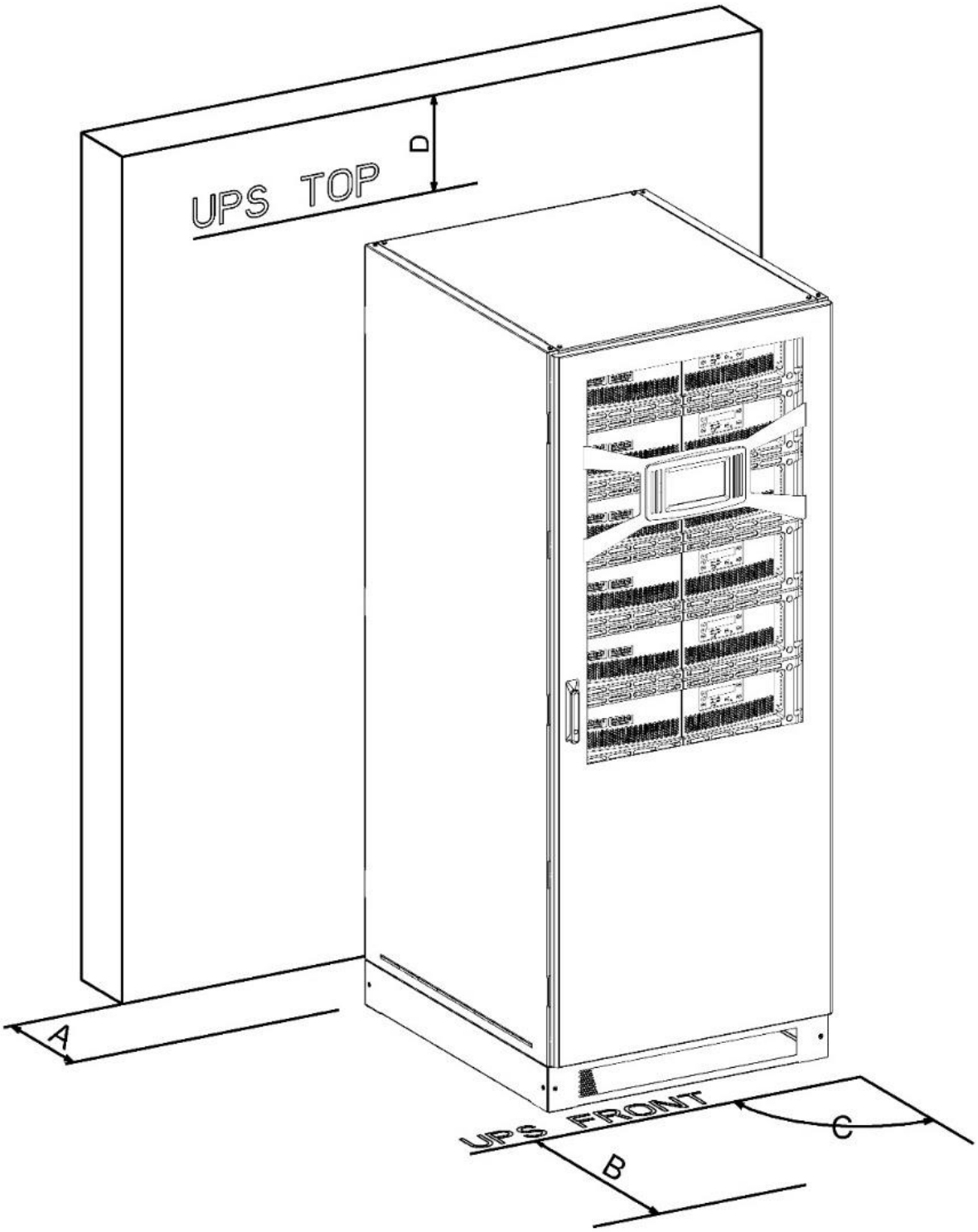


Fig. 7.3-1: UPS and battery location (Clearances)

A	Back clearance for ventilation (forced air outlet)	11.8 in [300 mm]
B	Front clearance needed to allow a correct door opening	39.4 in [1000 mm]
C	Maximum door opening angle	115°
D	Top Clearance *(Top clearance is only needed if there is no side clearance)*	15.7 in [400 mm]

Battery cabinet location

In most of the cases the battery cabinet is positioned at the side of the UPS cabinet (unless the UPS cabinet required side access) and takes advantage of the seam clearances. The minimum needed clearances of the battery cabinet depend on the design of the cabinet (especially the openings). As VRLA batteries need natural ventilation, it is always recommended to keep a certain clearance from the openings. How much that clearance needs to be is highly depended on the installation, a good rule is to keep a minimum of 3.94" [100mm] clearance at the walls with opening.

7.3.1 Fixing of the UPS to the building structure

NOTE!

THE EQUIPMENT IS INTENDED TO BE SECURED TO THE BUILDING STRUCTURE BEFORE OPERATION.

To fix the unit on the floor use the hole on each foot as shown on the drawing below. The quotes are in inches and [mm].

The fixing elements must be chosen in relation to the type of floor/support where the unit will be fixed.

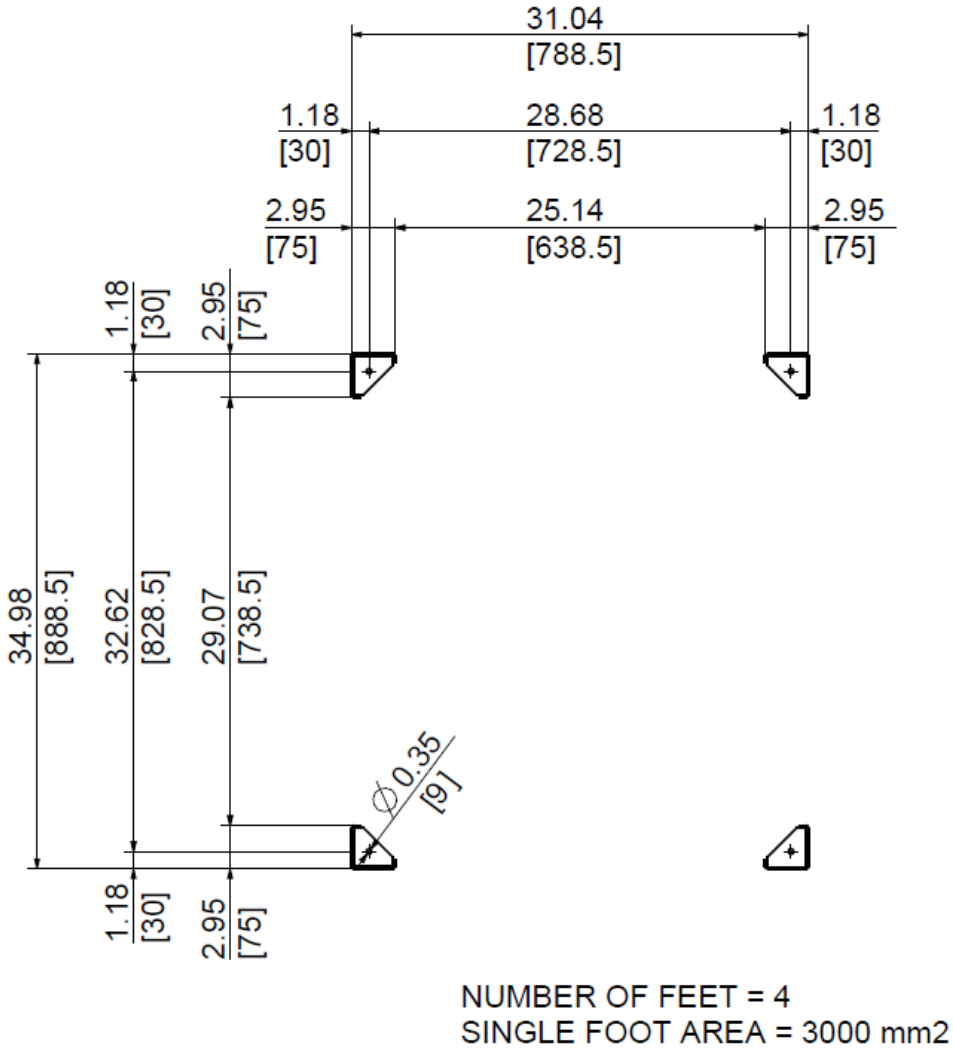


Fig. 7.3.2-1: Fixing of the UPS to the building structure

7.4 Heat Dissipation per module

Number of Modules		1	2	3	4	5	6
UPS Power Rating	kW	20	40	60	80	100	120
Heat Dissipation with 100% linear load	W	1390	2780	4170	5561	6950	8340
	BTU	4743	9485	14229	18970	23715	28458
Heat Dissipation with 100% non-linear load (according to IEC 62040-3)	W	1600	3200	4800	6400	8000	9600
	BTU	5460	10920	16380	21840	27300	32760

7.5 UPS connections

The customer shall supply the wiring to connect the UPS to the local power source (see section 7.6.1.1). The electrical installation procedure is described in the following text. The installation inspection and initial start-up of the UPS and extra battery cabinet must be carried out by a qualified service personnel such as a licensed service engineer from the manufacturer or from an agent certified by the manufacturer.

WARNING!

INSTALLATION SHALL COMPLY WITH ALL APPLICABLE NATIONAL, STATE, AND LOCAL CODES

THE INSTRUCTION IN THIS USER MANUAL HAVE ALWAYS TO BE FOLLOWED IN ORDER TO AVOID INJURIES FROM ELECTRICAL IMPACTS

ALL THE OPERATIONS IN THIS MANUAL MUST BE PERFORMED BY CERTIFIED ELECTRICIANS OR BY QUALIFIED INTERNAL PERSONNEL.

DO NOT OPERATE IN CASE OF PRESENCE OF WATER OR MOISTURE.

BY OPENING OR REMOVING THE UPS-COVERS YOU RUN RISK OF EXPOSURE TO DANGEROUS VOLTAGES

PHYSICAL INJURY OR DEATH MAY FOLLOW, OR DAMAGE MAY OCCUR TO THE UPS, OR THE LOAD EQUIPMENT IF THESE INSTRUCTIONS ARE IGNORED

THE EQUIPMENT IS PROVIDED WITHOUT INPUT AND OUTPUT BREAKERS, A READILY ACCESSIBLE DISCONNECT DEVICE SHALL BE INCORPORATED EXTERNAL TO THE EQUIMPENT.

To ensure correct operation of the UPS and its ancillary equipment it is necessary to provide the mains cables with appropriate fuse protection. See section 7.6.2.2.

The UPS unit has the following power connections:

Rectifier (In): **Three-phase** (1-L1, 1-L2, 1-L3), Neutral (1N) and ground (GND) or protective earth (PE) connection for the rectifier input

Bypass (In): **Three-phase** (2-L1, 2-L2, 2-L3), Neutral (2N) connection for the bypass if used as Dual Feed input

Load (Out): **Three-phase** (3-L1, 3-L2, 3-L3), Neutral (3N) and ground (GND) or protective earth (PE) connection for the load output

External Battery: **Plus (+) and Minus (-)** and ground (GND) or protective earth (PE) connection for the external batteries

IMPORTANT NOTE

INPUT NEUTRAL IS REQUIRED TO OPERATE THE RECTIFIER.

In TN-S Systems, no 4-pole input switches or circuit breakers should be used. If you have to use for other reason a 4-pole switch, you have to be aware that, when open, the system - UPS and all downstream equipment - are floating against the PE.

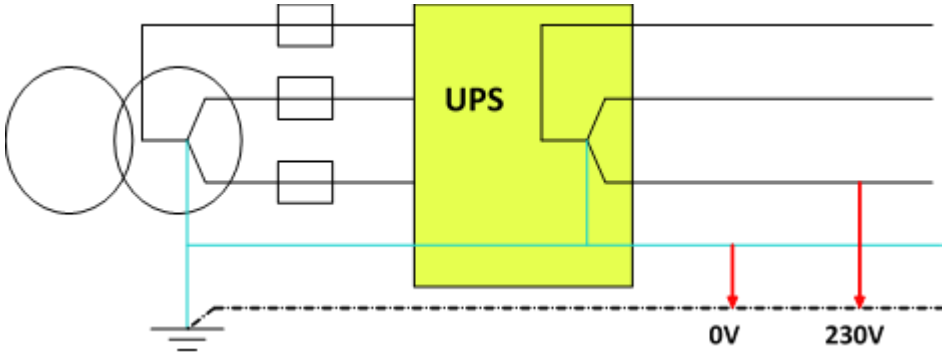
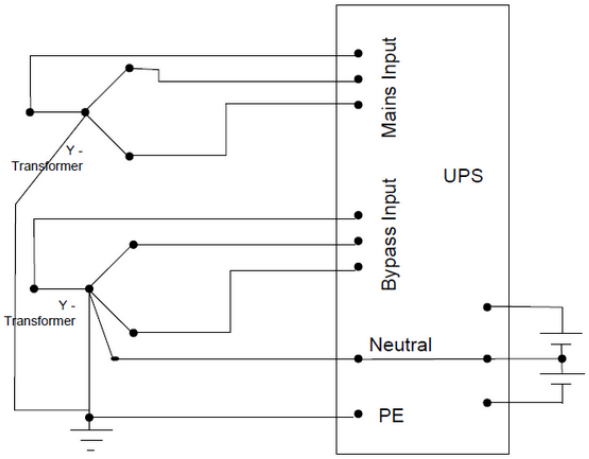


Fig. 8.4-1: Wiring scheme showing the Neutral connection at input and output sides of the UPS.

IMPORTANT NOTE

AVOID THE CONNECTION OF TWO SEPARATE DERIVED NEUTRAL IN THE DISTRIBUTION AS SHOWN IN THE PICTURE ABOVE.



7.5.1 Input connections

NOTE

BEFORE PROCEEDING, REVIEW THE ELECTRICAL INSTALLATION CHAPTER BEFORE CONNECTING THE CABLE TO THE UPS. CONFIRM THE FOLLOWING:

- Mains voltage (INPUT VOLTS) and frequency (FREQUENCY) correspond to the values indicated on the Nameplate of the UPS.
- Earth connection is performed in accordance with the prescribed US Standards or with local regulations;
- UPS is connected to the mains through a Low Voltage (LV)-Distribution Board with a separate mains line (protected with a circuit breaker or fuse) for the UPS.

Provide input fuses and cables according to the section 7.6.2.2 or in accordance with the prescribed US Standards or with the local regulations.
The input of the UPS must be fitted with circuit breakers or other kind of protection. The circuit breakers will be connected between the mains supply and the UPS and will provide additional protection to the UPS in the event of overloads and short circuits.

7.5.1.1 Mains supply and earth connection

To ensure protection of personnel during the installation of UPS make sure that the connections are performed under the following conditions:

- No mains voltage is present
- All Loads are shut down and disconnected

- UPS is shut down and voltage-free
- UPS-Module is fitted in its correct position
- Maintenance Bypass IA1 is open and in position OFF;
- Remove Terminal cover of the UPS
- Connect first the ground-wire coming from the Low Voltage-Distribution Board to the terminal GND (PE).
- Connect the input power cable coming from the Low Voltage-Distribution Board to the terminals of the UPS shown in section 7.6.1

Keep the phase rotation in clock-wise sense.

NOTE

INPUT NEUTRAL IS REQUIRED TO OPERATE THE RECTIFIER

Under the connection terminal of the UPS there is a cable-fixing rail to ensure that the cables have been fastened properly.

NOTE: The UPS is provided with facilities for both single feed (one common input cable for rectifier and bypass) and dual feed (separate input cable for rectifier and bypass).

7.5.1.2 Single input feed

For proper cable landing locations refer to section 7.6.1.
For single input feed connect the mains input cable to UPS terminal block according to the following table:

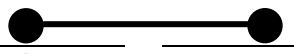
MAINS INPUT CABLE	UPS TERMINAL
Phase L1	1-L1
Phase L2	1-L2
Phase L3	1-L3
NEUTRAL	1-N
GROUND (EARTH)	GND (PE)

For minimum recommended Input Cable Sections and Fuse Ratings refer to section 7.6.1.1.
Under the connection terminal of the UPS there is a cable-fixing rail to ensure that the cables have been fastened properly.

7.5.1.3 Dual input feed

For proper cable landing locations refer to section 7.6.1..
NOTE: The UPS is supplied (as standard version) with facilities for a single cable feed (for rectifier and bypass). If dual feed is required remove the busbar terminal bridges between L1, L2 and L3.

UPS TERMINAL Rectifier		UPS TERMINAL Bypass
1L1		2-L1
1L2		2-L2
1L3		2-L3
1N		2-N
GND (PE)		



For dual input feed connect the mains input cables to UPS Terminal, and the according to following tables:

MAINS INPUT CABLE	UPS TERMINAL Rectifier
Phase L1	1-L1
Phase L2	1-L2
Phase L3	1-L3
GROUND (EARTH)	GND (PE)

BYPASS INPUT CABLE	UPS TERMINAL Bypass
Phase L1	2-L1
Phase L2	2-L2
Phase L3	2-L3
NEUTRAL	1-N / 2-N

For minimum recommended Input Cable Sections and Fuse Ratings refer to section 7.6.2.2.
Under the connection terminal of the UPS there is a cable-fixing rail to ensure that the cables have been fastened properly.

7.5.1.4 External Common Battery Connection

For proper cable landing locations refer to section 7.6.1.
For systems configured for external batteries connect the DC input cable to UPS terminal block according to the following table:

DC INPUT CABLE	UPS TERMINAL
DC (+)	DC+ BATT
DC (-)	DC- BATT
GROUND (EARTH)	GND (PE)

For minimum recommended Input Cable Sections and Fuse Ratings refer to section 7.6.2.2.
Under the connection terminal of the UPS there is a cable-fixing rail to ensure that the cables have been fastened properly.

7.5.1.5 External Separate Battery Connection

For proper cable landing locations refer to section 7.6.4.
For systems configured for external batteries connect the DC input cable to UPS terminal block according to the following table:

DC INPUT CABLE	UPS TERMINAL
DC Source 1 (+)	F3-1 (+)
DC Source 2 (+)	F3-2 (+)
DC Source 3 (+)	F3-3 (+)

DC INPUT CABLE	UPS TERMINAL
DC Source 1 (-)	F3-1 (-)
DC Source 2 (-)	F3-2 (-)
DC Source 3 (-)	F3-3 (-)
GROUND (EARTH)	GND (PE)

For minimum recommended Input Cable Sections and Fuse Ratings refer to section 7.6.1.1.
Under the connection terminal of the UPS there is a cable-fixing rail to ensure that the cables have been fastened properly.

7.5.1.6 Internal Battery Connection

A system configured for internal batteries will be shipped with the batteries installed. The DC bus will be broken at each individual battery drawer in order to maintain a maximum 120Vdc nominal during shipping. Before commissioning the system, each battery drawer will need to be reconnected. Begin by opening each of the battery breakers (F3-1, F3-2, and F3-3). Remove the screw retaining each drawer, slide the drawer out 6-12", reconnect the red and blue leads (see figure below) using insulated gloves, slide the drawer back into position, and replace the screw to retain the drawer. Repeat this procedure for each battery drawer populated with batteries.

Fig. 7.4.1.6-1: Battery Drawer Reconnect

7.5.2 Output connections

Before you start connecting the loads, ensure that the sum of the indicated UPS-module rated powers (OUTPUT POWER) on the nameplates (on the side of the UPS-modules) is equal to or larger than the total load requirements.

The output of the UPS must be fitted with circuit breakers or other kind of protection. These circuit breakers will be connected between the loads and the UPS and will provide additional protection to the UPS in the event of overloads and short circuits.

These circuit breakers will enable the protection of each load separately.

The size of the circuit breakers depends on the load rating of the load sockets.

The circuit breakers must comply with the prescribed US Standards. It is recommended to provide a separate output distribution board for the load.
The following values should be indicated on the output distribution board:

Maximum total load rating;

Maximum load rating of the load sockets.

If a common distribution board is used (sockets for Mains and UPS voltage), ensure that on each socket there is an indication of the applied voltage (“Mains” or “UPS”).

Output power cable ratings should be in accordance with the recommended cable sections and fuses ratings or in accordance with the prescribed US Standards or with the local regulations.

Under the connection terminal of the UPS there is a cable-fixing rail to ensure that the cables have been fastened properly.

Ensure that the earthing is performed in accordance with the prescribed US Standards or with the local regulations.

7.5.2.1 Load connection

To ensure protection of the personnel during the installation of the UPS make sure that the connections are performed under the following conditions:

No mains voltage is present;

All loads are shut down and disconnected;

PMC is shut down and voltage-free.

Before connecting the output, power cables make sure that:

UPS-Module is fitted in its correct position;

Maintenance bypass is in position OFF;

Remove the terminal cover of the UPS.

Connect the output power cable coming from the LV-Distribution Board to the terminals of the UPS.

7.6 Electrical wirings

The customer shall supply the wiring to connect the UPS to the local power source. The installation inspection and initial start-up of the UPS and extra battery cabinet must be carried out by a qualified service personnel such as a licensed service engineer from the manufacturer or from an agent certified by the manufacturer.

NOTE

USE ONLY LISTED TERMINAL LUGS FOR CONNECTION!

TERMINALS PART NUMBER 54113 or 54114 ARE SUGGESTED FOR WIRING:

7.6.1 Terminals overview

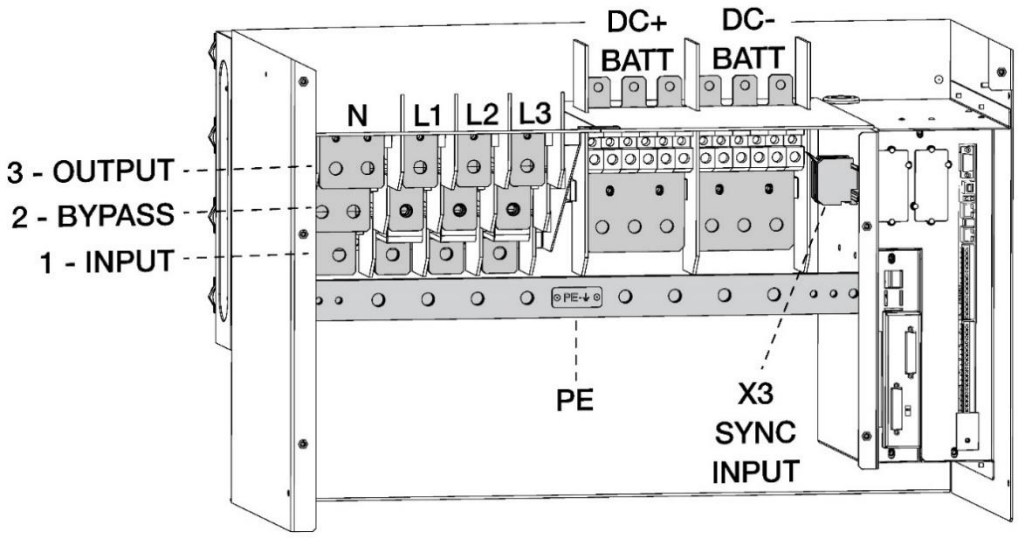


Fig. 7.6.1-1: Terminal overview

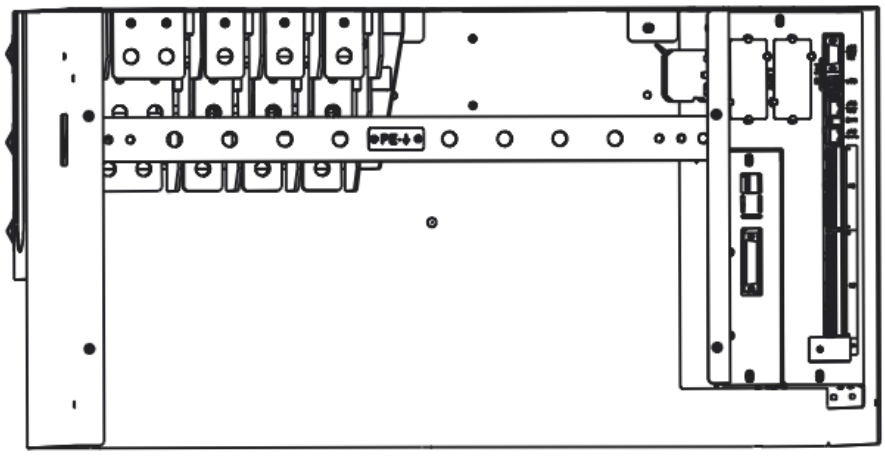


Fig. 7.6.1-2: Terminal overview; 60 kW Frame with Internal Batteries. Same as 120kW frame but without DC terminals

SYNC INPUT

THE “X3” SYNC INPUT ALLOWS TO SYNCHRONIZE THE CABINET (OUTPUT) WITH ANY OTHER SYSTEM.

NOTE

FOR A CORRECT WIRING CONNECTION, REFER TO THE CHAPTER “CABLE SECTIONS & FUSE RATINGS”.

Single input feed and separate batteries configuration Block diagram

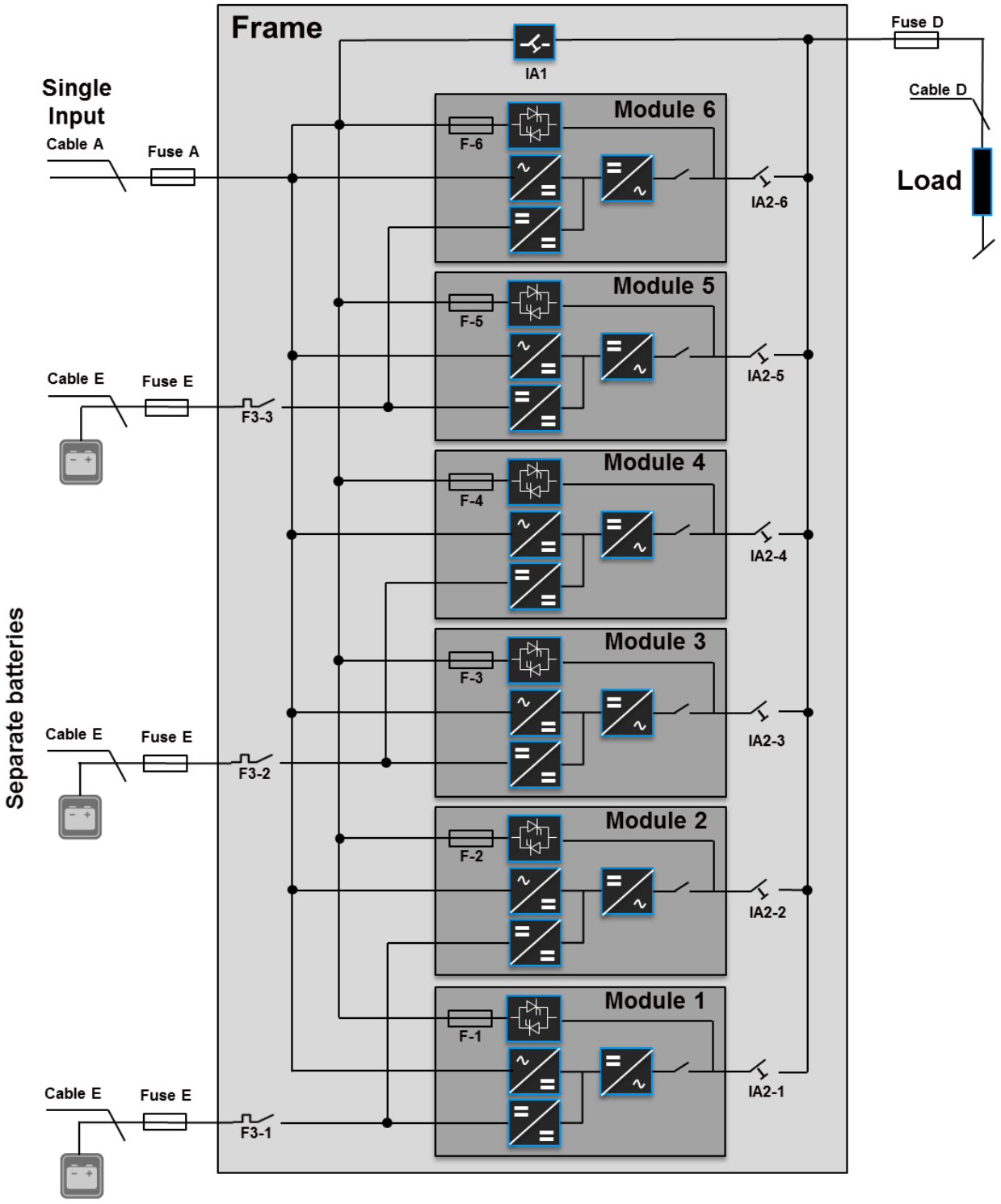


Fig. 7.6.2.1-1: Block diagram for single input feed and separate batteries

7.6.1.1 Cable sections & fuse ratings

Cable sections and fuse ratings recommended according to UL 60950-1. Alternatively, local standards to be respected!

CAUTION

CAUTION - TO REDUCE THE RISK OF FIRE, CONNECT ONLY TO A CIRCUIT PROVIDED WITH MAXIMUM BRANCH CIRCUIT OVERCURRENT PROTECTION OF NO MORE THAN 120% OF RATED INPUT CURRENT IN ACCORDANCE WITH THE NATIONAL ELECTRIC CODE, NSI/NFPA 70 AND THE *CANADIAN ELECTRICAL CODE, PART I*, C22.1

Recommended AC wiring (copper wires) according to current normative, recommended fuse ratings for slow line fuses (gL) or circuit breakers (CB), connection terminal size and max. tightening torque.

Rated power (kW)	Single input Max. rectifier input current with charging batt. 363A at 120V		Output Rated output current in normal conditions 333A at 120V	
	Fuse A Type: gL or CB (quantity x A)	Cable A (quantity x Kcmils)	Fuse D Type: gL or CB (only needed in parallel system) (quantity x Kcmils)	Cable D (quantity x Kcmils)
120	3 x 450A (3 pole, bolded N)	3x(2x250) PH + 4x250 N[1)] + 2x250 PE	3 x 450A (3 pole, bolded N)	3x(2x250) PH + 4x250 N + 2x250 PE
60	3 x 225A (3 pole, bonded N)	3x(250) PH + 2x250 N[1)] + 1x250 PE	3x 225A (3 pole, bonded N)	3x(250) PH + 2x250 N + 1x250 PE
	All connection points are bus-bar, M12. Max. tightening torque 84.8 Nm			

Recommended DC wiring (copper wires) according to current normative, recommended fuse ratings for fast acting fuses (gR) or circuit breakers (CB), connection terminal size and max. tightening torque.

Separate batteries

Rated power (kW)	Fuse E Type: gR or CB (quantity x A)	Cable E (quantity x AWG)
20 (one module)	3 x 125A (3 pole)	2x(1x1) + 1x1 PE
	All connection points are terminal blocks, Max. tightening torque 5 Nm	

[1)] Four neutral cables are required for full non-linear load operation only

7.6.2 Dual input feed and common battery configuration

7.6.2.1 Block diagram

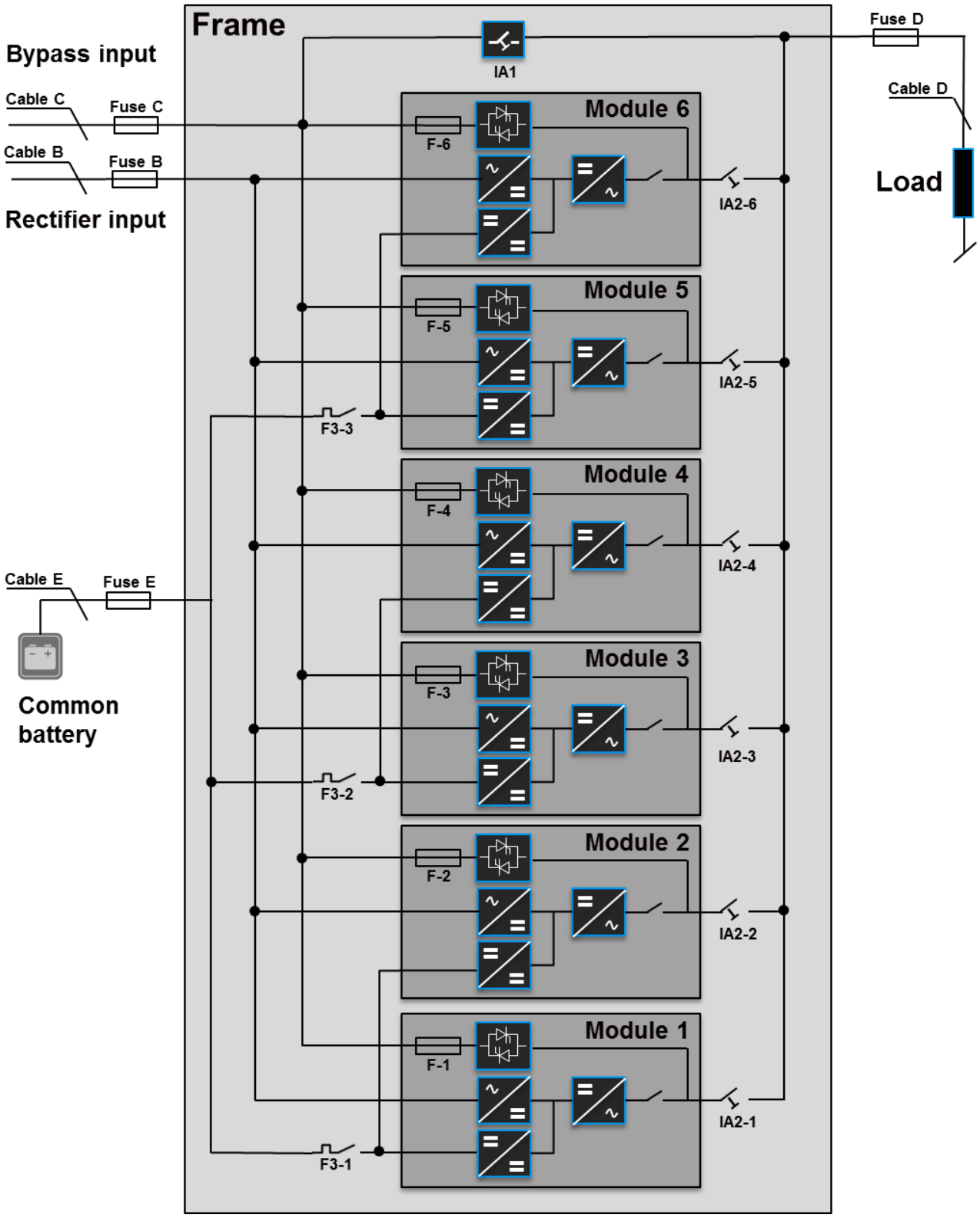


Fig. 7.6.3.1-1: Dual input feed block diagram

7.6.2.2 Cable sections & fuse ratings

Cable sections and fuse ratings recommended according to UL 60950-1. Alternatively, local standards to be respected!

NOTE

75°C COPPER CONDUCTORS OR HIGHER IS RECOMMENDED

CAUTION

CAUTION - TO REDUCE THE RISK OF FIRE, CONNECT ONLY TO A CIRCUIT PROVIDED WITH MAXIMUM BRANCH CIRCUIT OVERCURRENT PROTECTION OF NO MORE THAN 120% OF RATED INPUT CURRENT IN ACCORDANCE WITH THE NATIONAL ELECTRIC CODE, NSI/NFPA 70 AND THE *CANADIAN ELECTRICAL CODE, PART I*, C22.1

Recommended AC wiring (copper wires) according to current normative, recommended fuse ratings for slow line fuses (gL) or circuit breakers (CB), connection terminal size and max. tightening torque.

Rated power (kW)	Rectifier input Max. rectifier input current with battery charging 363A at 120V		Bypass input Max. bypass input current 333A at 120V		Output Rated output current in normal conditions 333A at 120V	
	Fuse B Type: gL or CB (quantity x A)	Cable B (quantity x Kcmils)	Fuse C Type: gL or CB (quantity x A)	Cable C (quantity x Kcmils)	Fuse D Type: gL or CB (only needed in parallel system) (quantity x A)	Cable D (quantity x Kcmils)
120	3 x 450A (3 pole, bolded N)	3x(2x250) PH + 4x250 N[1)]	3 x 450A (3 pole, bolded N)	3x(2x250) PH + 4x250 N + 2x250 PE	3 x 450A (3 pole, bolded N)	3x(2x250) PH + 4x250 N + 2x250 PE
60	3 x 225A (3 pole, bonded N)	3x250 PH + 2x250 N[1)]	3 x 225A (3 pole, bonded N)	3x250 PH + 2x250 N[1)]	3x 225A (3 pole, bonded N)	3x(250) PH + 2x250 N + 1x250 PE
	All connection points are bus-bar, M12. Max. tightening torque 84.8 Nm					

Recommended DC wiring (copper wires) according to current normative, recommended fuse ratings for fast acting fuses (gR) or circuit breakers (CB), connection terminal size and max. tightening torque.

Common battery

Rated power (kW)	Fuse E Type: gR or CB (quantity x A)	Cable E (quantity x Kcmils)
120	2x630A (2 pole)	2x(3x250) + 2x250 PE
	All connection points are bus-bar, M12. Max. tightening torque 84.8 Nm	

[1)] Four neutral cables are required for full non-linear load operation only

7.6.3 Internal battery

For a DPA 60 system configured for internal batteries, all wiring is provided by the factory. The batteries will be wired in the common battery configuration (see section 7.6.2).

7.6.4 External battery cabinet

For a system configured for external batteries, the DC source may be used for either a common battery configuration (see section 7.6.2) or a separate battery configuration (see section 0). In the case of a separate battery configuration, the common DC tie bus must be removed from the separate terminal blocks. Refer to the system wiring schematic and the figure below for more information.

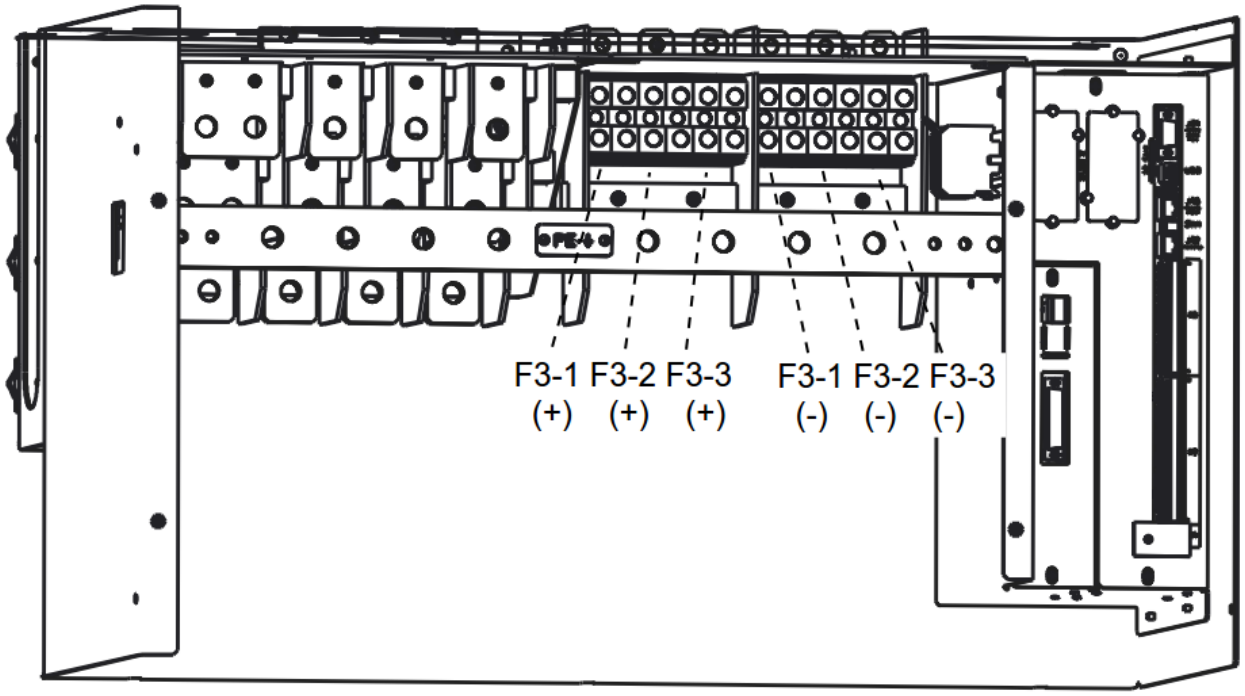


Figure 7.65-1: DC Terminals Configured for Separate Battery Configuration

8 Communication interfaces

ALL THE INPUT/OUTPUT PORTS ARE CLASS 2 (SELV CIRCUITS). PLEASE MAINTAIN SECURITY WHEN CONNECTING TO OTHER DEVICES.

WARNING!

The UPS cabinet is provided with communication card which provides the system information

Communication card (next to the distribution):

- Interlock interface — X1 (Interlock function)
- Input Interfaces — X3 (Phoenix terminals)
- Output Interfaces: terminals) — X2 DRY PORTs, volt-free contacts (Phoenix
- Smart Port JD1 / RS232 Sub D9 / female: — Interface (UPS system to computer)
- USB — Interface (UPS system to computer)

On the Interface board are located two LED's:

1. Green LED — showing the status of the Interface:
   - Fast Blinking: 2 times/sec = Interface is OK
2. Red LED — Board Alarm (indicates a possible replacement of the board)

8.1.1 Customer Interface and DRY PORTs

All the input and output interfaces are connected to phoenix terminals (cable 0.5 mm2).

8.1.1.1 Output Interfaces: Terminal blocks X2 (DRY PORTs)

Provision of signals for the automatic and orderly shutdown of servers, AS400 or Automation building systems

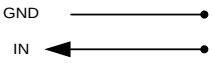
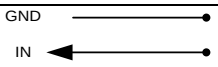
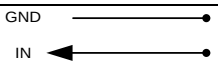
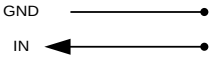
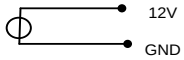
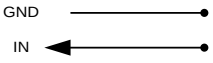
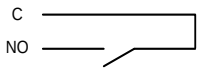
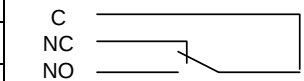
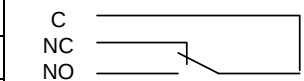
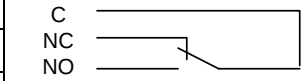
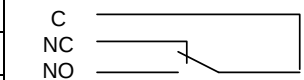
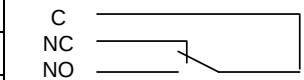
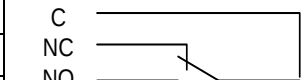
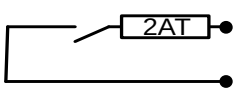
8.1.1.2 Input interfaces: Terminal blocks X3

Connection of Remote Shutdown facilities, Generator Operation, Customers specials
Refer to the chapter 9.3.1.

8.1.1.3 Interlock interface: Terminal blocks X1

This function allows a secure transfer from inverter (normal operation) to external maintenance bypass and vice-versa. During normal operation the external bypass is locked in position OFF. Only when the UPS is/are transferred to static bypass mode, the lock on the external bypass is released and it possible to switch to position ON. The transfer from maintenance bypass back to normal operation happens exactly the other way around. The release signal is closed (ON) when the maintenance bypass is closed and open (OFF) when the maintenance bypass is open locked.

All Terminals X1-X3 can hold Cable from AWG 24 to AWG 15.
X1 is a dry contact for monitoring an external output switch and can be used as interlock function.
All X2 are potential free contacts and are rated: 30Vdc/2A; 60Vdc/0.7A
All X3 (except X3 5/6 which is a 12VDC source) are inputs, cable max. R 50Ω at 20mA

Block	Terminal	Contact	Signal	On Display	Function
X3	X3 / 14		GND	-	Battery Temperature (only the optional battery sensor from ABB is compatible)
	X3 / 13		+3.3VDC	-	
	X3 / 12		GND	GENERATOR_ OPER_ON	Generator Operation (N.O.) Min. contact load 12V / 1mA
	X3 / 11		+12Vdc		
	X3 / 10		GND	PARRALEL_SW_OPEN PARRALEL_SW_CLOSE	External Output Breaker (N.O.) Min. contact load 12V / 20mA.
	X3 / 9		+12Vdc		
	X3 / 8		GND	EXT_MAN_BYP	External Manual Bypass (Ext. IA1) (N.O.) Min. contact load 20mA
	X3 / 7		+12Vdc		
	X3 / 6		+12Vdc	-	+ 12 VDC source (UPS protected) (Max. 200mA)
	X3 / 5		GND	-	
	X3 / 4		GND	REMOTE_ SHUTDOWN-	RSD (Remote Shutdown) for external switch Default setting: disabled. Possibility to enable and set NO or NC via NewSet.
	X3 / 3		+12Vdc		
	X3 / 2		-	REMOTE_ SHUTDOWN-	RSD (Remote Shutdown) output signal Max. 250Vac/8A ;30Vdc/8A ;110Vdc/0.3A ;220Vdc/0.12A
	X3 / 1		-		
X2	X2 / 18		-	-	Common
	X2 / 17		-	-	Relais AUX (function on request, to be defined)
	X2 / 16		-	-	
	X2 / 15			COMMON_ALARM	Common
	X2 / 14		ALARM		No Alarm Condition
	X2 / 13				Common Alarm (System)
	X2 / 12			LOAD_ON_MAINS	Common
	X2 / 11		Message		No Load on Bypass
	X2 / 10				Load On Bypass (Mains)
	X2 / 9			BATT_LOW	Common
	X2 / 8		ALARM		Battery Ok
	X2 / 7				Battery Low
	X2 / 6			LOAD_ON_INV	Common
	X2 / 5		Message		No Load on Inverter
	X2 / 4				Load on Inverter
	X2 / 3			MAINS_OK	Common
	X2 / 2		ALARM		Mains Failure
	X2 / 1				Mains Present
X1	X1 / 2		-	EXT_MAN_BYP	Interlock Function Max. 30Vdc/2A; 60Vdc/0.7A (Ext Manual Bypass) / 2AT
	X1 / 1		-		

8.1.2 JD1 / RS232 smart port computer interface

The **Computer Interface JD1** (4) located on the distribution part is an intelligent RS 232 serial port that allows the UPS system to be connected to a computer. The connector JD1 is a standard D-Type, 9-pin, female.

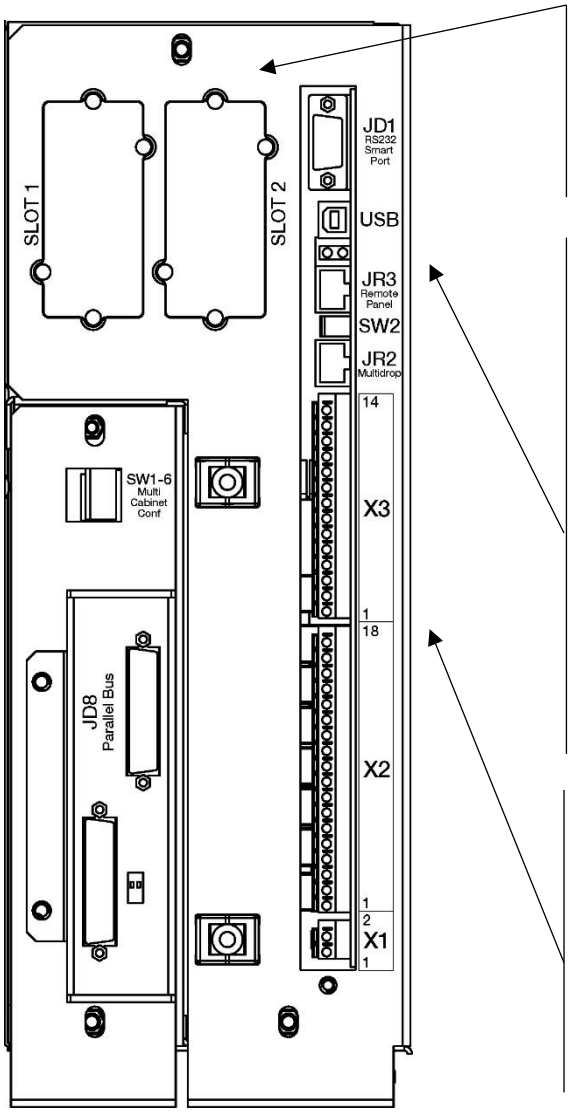
When installed the **Computer Interface**, the optional WAVEMON software allows the computer to monitor the mains voltage and the UPS system status continuously.
In the event of any changes the computer terminal will display a message.
(For details see our optional Monitoring Package: ***WAVEMON***)

8.1.3 USB computer interface

The **Computer Interface USB** (5) located on the distribution part and is in parallel with the intelligent RS 232 serial port **JD1**.

When installed the **USB Computer Interface** trough, the optional WAVEMON software allows the computer to monitor the mains voltage and the UPS system status continuously.

In the event of any changes the computer terminal will display a message.
(For details see our optional Monitoring Package: ***WAVEMON*).**



SLOT 1 (SNMP)
Slot for optional SNMP card ONLY

SLOT 2 (MODEM)
Slot for optional Modem/Ethernet card ONLY

JD1
Smart Port RS232 / Sub D9/ female,
PC interface

USB
PC Interface

JR3
Remote panel / Graphical display

SW2
DIP switch for multi-cabinet configuration

JR2
Multidrop (connections for connectivity signals between cabinets)

X3
Customer inputs (detail see section 8.1.2)

X2
Customer outputs (dry contacts)

X1
Interlock function (external manual bypass)

Fig. 8.1.3-1: Distribution Interfaces

9 Commissioning

9.1 LED colors legend

The following table summarizes and explains the meaning of the LED-indicators, colors and behavior.

Color/behavior	Meaning
OFF	inactive
Green	in operation
Flashing green (only for BATTERY)	battery in discharge
Red	fault condition
Flashing red (only for BATTERY)	battery low or disconnected

9.2 Start-up procedure

THE OPERATIONS DESCRIBED IN THIS CHAPTER MUST BE PERFORMED BY A SERVICE ENGINEER FROM THE MANUFACTURER OR FROM AN AGENT CERTIFIED BY THE MANUFACTURER

WARNING!

Situation of UPS-system before switching it on:

1. Make sure the fuses for the supply of UPS-System in the input distribution board on site are open.
2. Make sure all the input and output cabling has been performed correctly and check the input phase rotation.
3. Verify that the maintenance switch IA1 is open and in position OFF.
4. Verify that all Parallel Isolator Switches IA2-1, IA2-2, IA2-3, IA2-4, IA2-5, IA2-6 are all open (Position OFF).
5. Make sure all the internal battery fuses in the UPS (if any) and in the external battery cabinets are open.
6. Verify that the DIP switch configuration on each frame in the system is correct.

Startup procedure of the DPA:

1. Insert rectifier fuses for the supply of the UPS-system in the input distribution
   - The LED-indicators LINE 1 on UPS-module is lit – green
   - On LCD-display “LOAD OFF, SUPPLY FAILURE” will appear.

2. Check if the parameters are correctly set in all modules. In particular verify:
   - The battery type, the number of blocks/cells, and the autonomy time. Other parameters will be automatically set by the UPS (if no particular battery floating or minimal voltage is required)
   - Check if the battery are connected as «Common» or separate (Common Battery «Yes» or «No»)
   - Verify the setting for output voltage and frequency
   - Correctly set the identification number of all modules on the installation (All modules on the same installation must have a different Id. number)

3. Last UPS-Module (in the upper slot of the last frame):

   Press both “ON/OFF” main buttons to switch on the UPS. Check if the starting sequence is correctly executed and the UPS switches to Inverter Mode (Inverter led Green) LED-indicator will appear as shown below:

LED Indicator	Color
LINE 1	Green
LINE 2	Green (if single input feed)
BYPASS	OFF
INVERTER	Green
BATTERY	Flashing Red

4. Close the relative Bypass fuses or switch, and verify that the “Line 2” led on the keyboard becomes green (dual input feed only)

5. Check command: LOAD TO BYPASS

   LED indicator will appear as shown below:

LED Indicator	Color
LINE 1	Green
LINE 2	Green
BYPASS	Green
INVERTER	OFF
BATTERY	Flashing Red

6. Check command: LOAD TO INVERTER

   Switch the system back to INVERTER operation

   LED indicator will appear as shown below:

LED Indicator	Color
LINE 1	Green
LINE 2	Green
BYPASS	OFF
INVERTER	Green
BATTERY	Flashing Red

7. Scroll through the menu measurement and check their correctness

8. If all is OK Load-OFF the UPS by means of the two ON-OFF buttons

9. Close now the “parallel isolator” IA2 of the UPS in test and Load-ON again pressing the “ON/OFF” main buttons on the control panel
   - Wait until the starting sequence is completed and Check that the message “UPS now is Master” is present on the display
   - On output terminal block there is now UPS power
   - (The load fuses in output distribution board are still open i.e. the loads are disconnected!).

10. Let this UPS working in Inverter mode and repeat the same sequences of operations with the previous UPS in the installation (proceed with the module on the slot below, or in the previous frame with the module on the highest slot)
    - Verify that the next UPS is now slave. Message “UPS now is Slave” present on the display.

11. Transfer now the load from Inverter to Static Bypass by means of the control panel of this module.
    - Both modules must now switch together from Inverter to Static Bypass mode. Switch back to Inverter mode and verify again that both modules switch on the same time.

12. Continue with the same series of operation with all the UPS modules present on the installation.
    - Verify always that the messages “UPS now is master” and “UPS now is slave” are present on the right time on all UPSs!
    - Verify always that the load transfer from inverter to static bypass and vice versa happens on the same time on all the modules

13. Check battery polarity and voltage.
    - If the battery polarity and voltage is correct insert internal (if any) and external battery fuses (breakers).

      LED indicator will appear as shown below:

LED Indicator	**Color**
LINE 1	Green
LINE 2	Green
BYPASS	OFF
INVERTER	Green
BATTERY	Green

14. If possible open the general Mains (Rectifier) fuses or switch and verify that the complete system starts working on battery mode for some minutes (depending on the battery autonomy).
    - Then Close the Mains fuses or switch/s and verify that the complete system switch is back to normal operation and the battery are charging.

15. Transfer now the load from Inverter to Static Bypass by means of the control panel

16. Close on all frames the “Manual Bypass switch” IA1 (all inverter LEDs turn to red and buzzers sound)

17. Close now the system “Main External Output Isolator” (the power is now supplied through the “External Maintenance Bypass”, the UPS/s “Internal manual Bypass” and the “Static Bypass” line)

18. Open the “External Maintenance Bypass” (if any) and lock it
    - If the “External Maintenance Bypass” is equipped with an auxiliary switch, its terminals can be connected as a feed back to the UPS Interface board NW22085.
      In this way the Inverter on all UPS remain locked while the External Maintenance Bypass is closed.

19. Open all the UPS internal “Manual Bypass” IA1

20. Transfer by means of the control panel the load to “Inverter Mode”
    THE LOAD IS NOW PROTECTED BY THE DPA.

9.3 Shutdown procedure

WARNING!

THE OPERATIONS DESCRIBED IN THIS CHAPTER MUST BE PERFORMED BY A SERVICE ENGINEER FROM THE MANUFACTURER OR FROM AN AGENT CERTIFIED BY THE MANUFACTURER

The UPS may be shutdown completely, if the load does not need input power for an extended period of time. It may be switched to maintenance bypass mode for service or maintenance purposes, or transferred to the OFF-LINE mode (ECO-mode), if the load does not need the highest degree of protection.
The load may be disconnected by means of the two ON/OFF (LOAD-OFF) buttons for security reasons.

Complete shutdown procedure of the DPA:

Only in case there is no need to supply the load, the UPS system can be completely shutdown. The following procedures can only be executed after the load has completely been de-energized

NOTE

IN THE CASE THAT THE PARALLEL UPS SYSTEM HAS TO BE TURNED OFF, THEN BOTH ON/OFF BUTTONS ON ALL UPS MODULES HAVE TO BE PUSHED. IN THIS CASE THE POWER SUPPLY TO THE LOAD WILL BE INTERRUPTED

1. Verify that the **loads are shutdown** and that there is no need for power supply to the load.
2. Open now the system “Main External Output Isolator” or output fuses/breakers
3. If the loads are all disconnected, press simultaneously both ON/OFF-Buttons on UPS-Control Panel and turn OFF the relative IA2 output breaker on each module.
   On the LCD: “LOAD OFF, SUPPLY FAILURE” will appear and the LED-indicator will indicate as shown below:

LED Indicator	Color
LINE 1	Green
LINE 2	OFF
BYPASS	OFF
INVERTER	OFF
BATTERY	Green

4. Open battery fuses/breakers on internal (if any) and external battery cabinets or racks.
5. Open the mains fuses/breaker (bypass and rectifier fuses in case of dual input feed configuration) in the building distribution panel.

CAUTION

CAUTION - RISK OF ELECTRIC SHOCK, CAPACITOR STORES HAZARDOUS ENERGY.

BEFORE SERVICING THE MODULE, ENSURE THE INTERNAL DC-CAPACITORS HAVE BEEN DISCHARGED BY WAITING AT LEAST 5 MINUTES AFTER SHUTDOWN.

THE DPA IS NOW VOLTAGE FREE.

9.3.1 Remote Shutdown

The REMOTE SHUTDOWN **must** use a normally closed contact, which opens to operate the remote shutdown sequence.
The remote shutdown on terminal port X3/3... X3/4 is located at the bottom-front of the frame on communication card with terminal blocks X3. See chapter 8.1.3 for details.
In order to allow removal, maintenance or testing of any remote shutdown facility without disturbing the normal operation of the UPS, it is recommended that a terminal block, with linking facilities, be installed between the UPS and the stop button.

1. *Use a screened cable with 1 pair (section of wires 0.5 mm^2) and maximum length of 100 m.*
2. *Connect the cable as shown in Fig. 9.3.1-1*

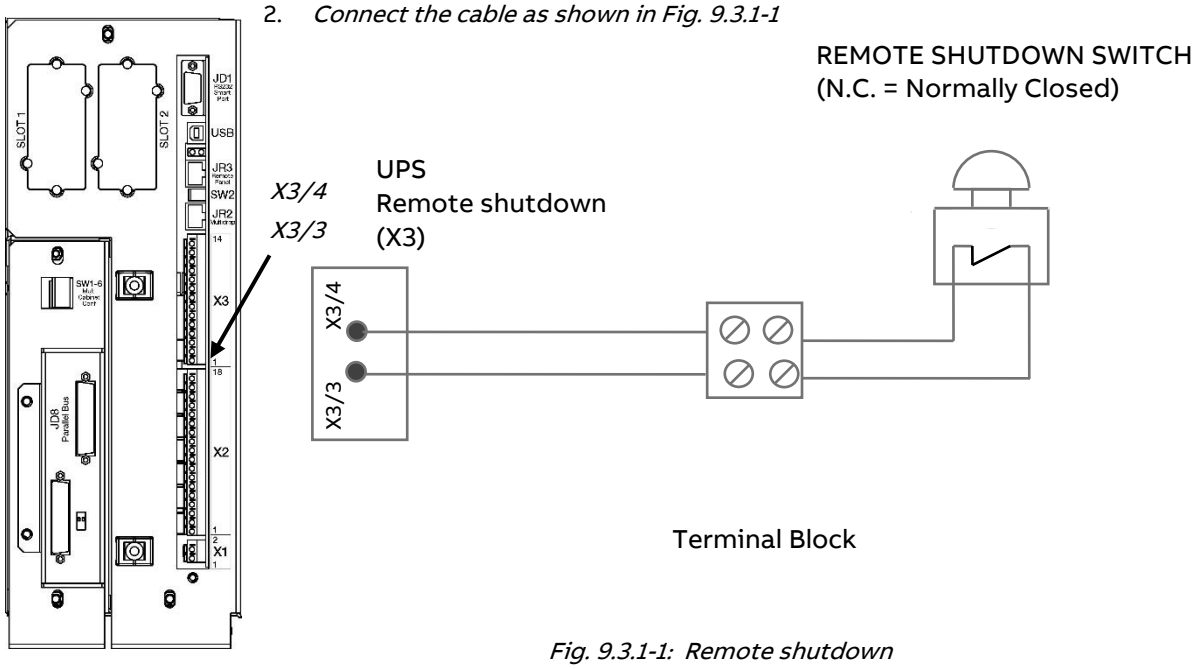


Fig. 9.3.1-1: Remote shutdown

9.3.2 Generator ON facilities

The Generator ON facility must use a normally open contact that closes to indicate that a generator is running and supplying input power to UPS. It is located at the bottom-front of frame on communication card with terminal blocks X3/11 …X3/12. See chapter 8.1.3 for details.
When used, this facility disables the UPS static bypass and prevents the UPS from transferring the load onto the generator power supply.

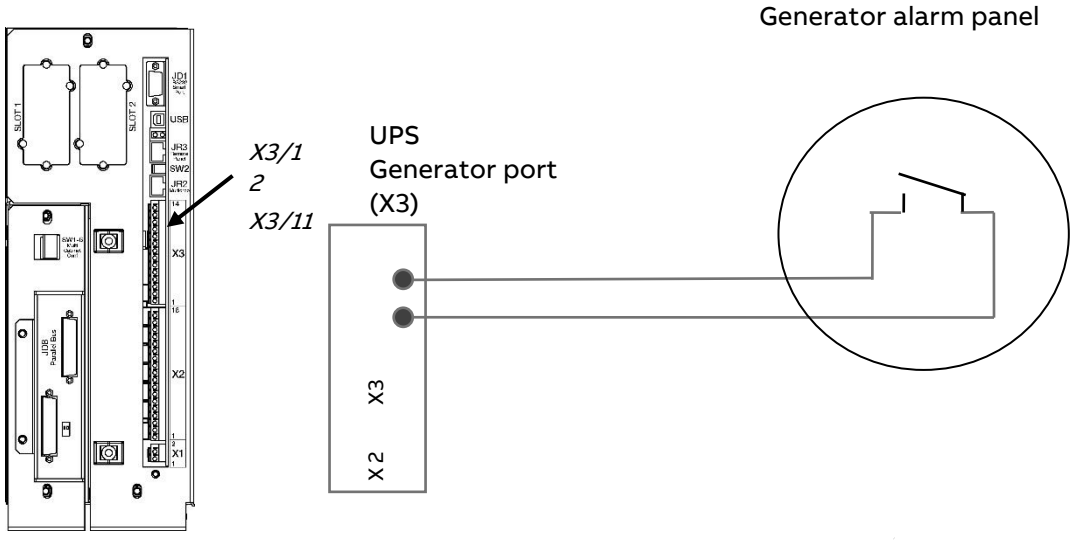


Fig. 9.3.2-1: Generator ON facilities

9.4 Manual bypass

9.4.1 From inverter to bypass

If it is necessary to perform service or maintenance on the UPS, it is possible to transfer the UPS to MAINTENANCE BYPASS.

THE OPERATIONS DESCRIBED IN THIS CHAPTER MUST BE PERFORMED BY A SERVICE ENGINEER FROM THE MANUFACTURER OR FROM A AGENT CERTIFIED BY THE MANUFACTURER

WARNING!

Situation of UPS-System before starting the Transfer Procedure to Maintenance Bypass:

The load is protected by the DPA running in normal operation. (The UPS-Module is operating on inverter).

1. Using LCD panel, select the COMMANDS menu and choose command “LOAD TO BYPASS” and transfer the load to static bypass.
   - Verify if all the modules in the system transfer from inverter to static bypass
   - On LCD panel “LOAD NOT PROTECTED” will appear.

2. Close maintenance bypass switch IA1 on all cabinets (position ON).
   On LCD: “MANUAL BYP IS CLOSED” will appear and the mimic panel will show:

LED Indicator	Color
LINE 1	Green
LINE 2	Green
BYPASS	Green
INVERTER	RED
BATTERY	Green

3. Press simultaneously the two ON/OFF buttons on the UPS-control panel (PMD) and turn OFF the relative IA2 output breaker on each module in the system.

   On the LCD’s message “LOAD OFF, SUPPLY FAILURE” will appear and the mimic panel will show:

LED Indicator	Color
LINE 1	Green
LINE 2	OFF
BYPASS	OFF
INVERTER	OFF
BATTERY	Green

4. Open battery fuses/breakers on the internal (if any) and the external battery cabinets or racks.

THE UPS SYSTEM IS STILL POWERED (DANGEROUS VOLTAGE)

THE LOAD IS NOW SUPPLIED BY MAINS AND IS THEREFORE NOT PROTECTED THROUGH THE UPS.

WARNING!

From bypass to inverter
This procedure describes the sequence of operations to be done in order to restart the UPS and restore ON-LINE mode (load on inverter).

THE OPERATIONS DESCRIBED IN THIS CHAPTER MUST BE PERFORMED BY A SERVICE ENGINEER FROM THE MANUFACTURER OR FROM AN AGENT CERTIFIED BY THE MANUFACTURER

WARNING!

Situation of UPS-System before starting the Transfer Procedure to ON-LINE mode:

The load is supplied directly by Input Mains power and the UPS is OFF.

1. Close the “parallel isolator” and Load-ON pressing the “ON/OFF” main buttons on the control panel on all the modules in the system.
   - Wait until the starting sequence is completed
   - The mimic on all modules panel will show:

LED Indicator	Color
LINE 1	Green
LINE 2	Green
BYPASS	Green
INVERTER	RED
BATTERY	Flashing RED

2. Close battery fuses/breakers on the internal (if any) and the external battery cabinets or racks.
   LED indicator will appear as shown below:

LED Indicator	Color
LINE 1	Green
LINE 2	Green
BYPASS	Green
INVERTER	RED
BATTERY	Green

3. Open all the UPS internal “Manual Bypass” IA1

4. Transfer by means of the control panel the load to “Inverter Mode”

THE LOAD IS NOW SUPPLIED BY INVERTER POWER AND IS PROTECTED

9.5 Adding & replacement of a power module

9.5.1 In a single-module system

WARNING!

THE OPERATIONS DESCRIBED IN THIS CHAPTER MUST BE PERFORMED BY A SERVICE ENGINEER FROM THE MANUFACTURER OR FROM AN AGENT CERTIFIED BY THE MANUFACTURER

9.5.1.1 How to extract a ups-module in single module systems

WARNING!

THE WEIGHT OF A UPS MODULE CAN REACH 139 LBS [63KG], THEREFORE, WE RECOMMEND TWO PERSONS FOR CARRYING THE MODULE.

POTENTIAL DANGERS:
THE UPS MODULE DUE TO ITS WEIGHT, IF REMOVED INAPPROPRIATELY, CAN CAUSE SERIOUS INJURY OR DAMAGE SHOULD THE MODULE FALL DOWN.

NOTE:
WE RECOMMEND THAT THE MODULES ARE HANDLED BY TWO PERSONS.

SUITABLE LIFTING TOOLS RESPECTIVELY SAFEGUARD PLATFORMS AGAINST FALLING DOWN ARE TO BE PLANNED

If your DPA consists of only one single UPS-module then perform following steps to extract the module:

1. Reset the alarm on faulty Module. The audible noise will stop.
   If the alarm condition persists (the LED-indicator ALARM will remain red) it means that there is a fault in the UPS-module.

2. If the load is supplied by the bypass-mode the maintenance bypass (IA1) can be closed by turning it to position “ON”.
   NOTE: If the load is on inverter, then before closing the maintenance bypass IA1, transfer load to static bypass by means of the command “LOAD TO BYPASS” in submenu COMMANDS.

3. Close maintenance bypass switch IA1 (position ON)
   On LCD: “MANUAL BYP IS CLOSED” will appear and the LED-indicator will indicate as shown below:

LED Indicator	Color
LINE 1	Green
LINE 2	Green
BYPASS	Green
INVERTER	RED
BATTERY	Green

NOTE

THE LOAD IS NOW DIRECTLY SUPPLIED BY MAINS AND IS NOT PROTECTED

4. Press both ON/OFF buttons on UPS-module simultaneously;
5. Open battery fuses/breakers on the internal (if any) and the external battery cabinet or rack;
6. Open the output isolator switch IA2.
7. Unscrew the four screws on the front side of the module that are fixing it to the UPS-frame;
8. Pull module only partly horizontally by means of the 2 black handles until the rear connectors are disconnected.

WARNING!

THE LOAD IS NOW DIRECTLY SUPPLIED BY MAINS AND IS NOT PROTECTED.

BEFORE DRAWING THE UPS-MODULE COMPLETELY OUT, WAIT 5 MINUTES UNTIL THE INTERNAL DC-CAPACITORS ARE DISCHARGED.

9. To extract the module completely out, press down the two yellow tabs top-right and top-left of the module (as shown in the figure here below) and then draw the UPS-module out by pulling it out horizontally.

10. Draw UPS-module by pulling it out horizontally:
    NOTE: We recommend 2 persons for pulling out the module from the frame. The weight of one module is 139 lbs [63 kg]. Insert new UPS-module or cover the opening (UPS-module compartment) with appropriate protection cover immediately and fix with four screws

NOTE

WHILE THE UPS IS OPERATING IN THE MAINTENANCE BYPASS-MODE, THE LOAD IS NOT PROTECTED BY THE UPS.

9.5.1.2 How to insert the ups-module in single-module-systems

If your DPA consists of only one single UPS-module then perform following steps to fit back the new module:

1. Remove UPS-Module compartment protection cover by unscrewing four screws on the front.
2. Make sure that the parallel switch “IA2” of the slot where the module need to be inserted is OFF
3. Make sure that the “battery breakers” of the slot where the module need to be inserted are OFF
4. Slide two thirds of UPS-Module into dedicated UPS-compartment (make sure not to plug the UPS-module into the rear connector).
   Push UPS-module to its final position and push firmly to assure good contact on the rear plugs.

   NOTE: We recommend 2 persons for insert the module into the frame. The weight of one module is 139 lbs [63 kg].
5. Tighten the four screws on the front of module with a tighten torque of 6 Nm.
6. Check if the LED LINE1 and LINE2 lit green. If yes, mains voltage is OK;
7. Load-on the module by pushing the two ON/OFF keys at the same time
8. Check if the starting sequence is correctly executed, with the module running in inverter mode at the end
9. Give the command “LOAD TO BYPASS” to switch the module in static bypass mode
   - Check if the command is correctly executed, with the module running in static bypass mode at the end
10. Give the command “LOAD TO INVERTER” to switch the module in inverter mode
    - Check if the command is correctly executed, with the module running in inverter mode at the end
11. Close internal and external battery fuses/breaker (if available);
    - Wait until the BATTERY LED on the module’s control panel is green, this means that the batteries are connected and are ok
12. Load-off the module by pushing the two ON/OFF keys at the same time
13. Connect the module to the parallel system by turning ON the parallel switch “IA2”
14. Press simultaneously both “ON/OFF” Buttons to start-up UPS.
    LCD panel must display: LED-indicator will appear as shown below:

LED Indicator	Color
LINE 1	Green
LINE 2	Green
BYPASS	Green
INVERTER	RED
BATTERY	Green

15. Open maintenance bypass (IA1) by turning it to position “OFF”. The load is now supplied by the static bypass.
16. Transfer load to inverter-mode by means of COMMAND “LOAD TO INVERTER”. On LCD: “LOAD PROTECTED” will appear.

THE LOAD IS NOW PROTECTED BY THE DPA.

9.5.2 In a redundant multi-module system

WARNING!

THE WEIGHT OF A UPS MODULE REACH 139 LBS [63KG], THEREFORE IT IS RECOMMENDED TO BE LIFTED BY TWO PERSONS. THE MODULE SHALL NEVER BE CARRIED BY ONE PERSON ONLY.

MAKE SURE THE INTERNAL DC-CAPACITORS HAVE BEEN DISCHARGED WAITING AT LEAST 5 MINUTES.

9.5.2.1 How to extract a module in redundant multi-module system

If in a redundant parallel system, the UPS-module is faulty, the load will continue to be protected by the operating modules on-line-mode (inverter-mode) and the faulty module may be replaced without having to transfer the load to bypass.
To extract the faulty module from the UPS-Frame in a Redundant Multi- Module Configuration proceed as follows:

1. Identify the faulty Module with the Alarm condition and RESET the Alarm. The audible noise will stop. If the Alarm conditions persists (the LED-Indicator ALARM is red) there is a fault in the UPS-Module.

2. Verify that load is supplied by inverter of the other modules running by checking the LCD indication LOAD PROTECTED. Verify load measures on the operating modules.

3. Turn the faulty module OFF by pressing simultaneously both “ON/OFF” buttons.
   On the LCD: “LOAD OFF, SUPPLY FAILURE” should appear and the LED-indicator will indicate as shown below:

LED Indicator	Color
LINE 1	Green
LINE 2	OFF
BYPASS	OFF
INVERTER	OFF
BATTERY	Green

4. Turn OFF the relative output isolator IA2

5. Remove the four fixing screws and pull the module only partially out, horizontally by means of the 2 black handles until the rear connectors are disconnected.

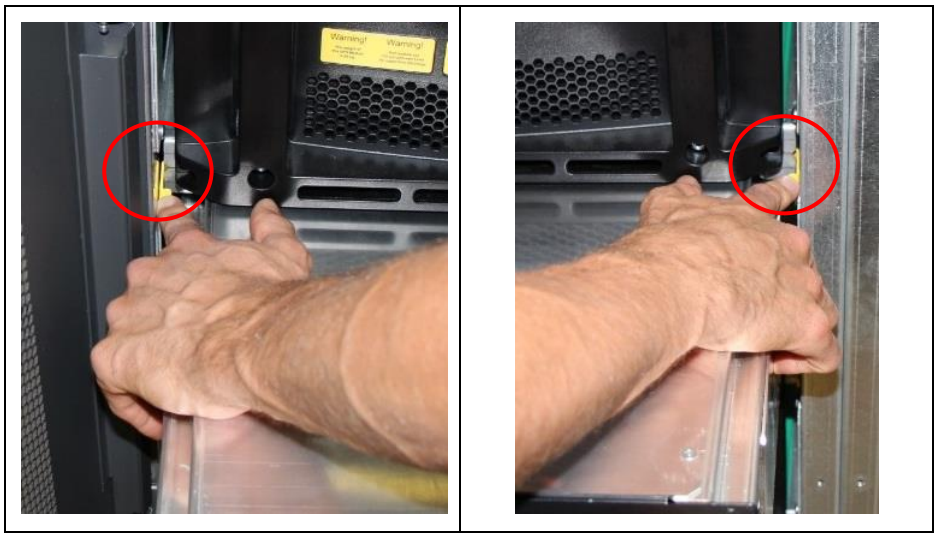
WARNING!

BEFORE DRAWING THE UPS-MODULE COMPLETELY OUT, WAIT 5 MINUTES UNTIL THE INTERNAL DC-CAPACITORS ARE DISCHARGED

NOTE

WE RECOMMEND 2 PERSONS FOR PULLING OUT THE MODULE FROM THE UPS-FRAME. THE WEIGHT OF A MODULE REACH 139 LBS [63KG].

6. To extract the module completely out, press down the two yellow tabs top-right and top-left of the module (as shown in the figure here below) and then draw the UPS-module out by pulling it out horizontally.



7. Screw the protection cover on the empty area left empty by the module with the two fixing screws using a tighten torque of 6 Nm.

9.5.2.2 How to insert a module in a redundant multi module system

WARNING!

BEFORE DRAWING THE UPS-MODULE COMPLETELY OUT, WAIT 5 MINUTES UNTIL THE INTERNAL DC-CAPACITORS ARE DISCHARGED

In a redundant parallel system one module can be re-introduced on its original location without affecting normal system operation. Load will be protected by the other modules running ON-LINE.

Module must be previously set according to system personalization. Please make sure with your nearest service center for correct settings.

1. Remove the protection cover by unscrewing the two fixing screws on the front.

2. Make sure that the parallel switch “IA2” of the slot where the module need to be inserted is OFF

3. Lift the module to its destination position. See above note concerning weights.

4. Slide two thirds of UPS module into dedicated compartment (make sure not to plug the UPS-Module into the rear connector).
   Push UPS-module to its final position and push strongly to assure good contact on the rear plugs. Tighten the four screws on the front of module;

5. Check if LED LINE1 and battery is green. If yes, mains voltage is OK;
   On the LCD: “LOAD OFF, SUPPLY FAILURE” will appear and the LED-indicator will indicate as shown below:

LED Indicator	Color
LINE 1	Green
LINE 2	OFF
BYPASS	OFF
INVERTER	OFF
BATTERY	Green

6. Press both “ON/OFF” buttons simultaneously to start-up UPS.
    - Check if the starting sequence is correctly executed, with the module running in inverter mode at the end

7. Give the command “LOAD TO BYPASS” to switch the module in static bypass mode
    - Check if the command is correctly executed, with the module running in static bypass mode at the end

8. Give the command “LOAD TO INVERTER” to switch the module in inverter mode
    - Check if the command is correctly executed, with the module running in inverter mode at the end

9. Load-off the module by pushing the two ON/OFF keys at the same time

10. Connect the module to the parallel system by turning ON the parallel switch “IA2”

11. Load-on the module by pushing the two ON/OFF keys at the same time

12. The module will execute the starting procedure and it will run in inverter mode protecting the load in parallel with the other modules in the system. LCD panel must show LOAD PROTECTED indication.

THE LOAD IS NOW PROTECTED BY THE DPA.

9.5.3 In capacity multi-module system

WARNING!

THE WEIGHT OF A UPS MODULE CAN REACH 139 LBS [63KG], THEREFORE IT IS RECOMMENDED TO BE LIFTED BY 2 PERSONS. THE MODULE SHALL NEVER BE CARRIED BY ONE PERSON ONLY

9.5.3.1 How to extract a module in a capacity multi-module system

If in capacity parallel system a UPS-Module experiences a fault and there is not enough capacity left to protect the load by the remaining operating UPS-Modules, the load will automatically be transferred to static bypass and will continue to be supplied by the mains power supply.

To extract the faulty module from the UPS-frame in a Capacity Multi-Module System proceed as follows:

1. Identify the faulty module with the alarm condition and RESET the Alarm. The audible noise will stop. If the Alarm conditions persists (the LED-indicator alarm is RED) there is a fault in the UPS-module.

2. Verify that the load is on bypass and is supplied by the mains power (bypass-mode or eco-mode) on all UPS-modules (if not please give the command “LOAD TO BYPASS” to switch the module in static bypass mode); in the majority of the events the LED-indicators on control panel of the faulty module will show:

LED Indicator	Color
LINE 1	Green
LINE 2	Green
BYPASS	Green
INVERTER	RED
BATTERY	Green

3. Close maintenance bypass switch IA1 (position ON)
4. On LCD: “MANUAL BYP IS CLOSED” will appear and the LED-indicator will indicate as shown below:

LED Indicator	Color
LINE 1	Green
LINE 2	Green
BYPASS	Green
INVERTER	RED
BATTERY	Green

5. Press both ON/OFF buttons and switch off the IA2 output breakers on UPS-module to be replaced;

6. Remove the four fixing screws and slide out the UPS-module about 4” [10cm].
This operation will disconnect module by the power connection located on the back of the cabinet.

WARNING!

BEFORE DRAWING THE UPS-MODULE COMPLETELY OUT, WAIT 5 MINUTES UNTIL THE INTERNAL DC-CAPACITORS ARE DISCHARGED

7. Draw UPS-module by pulling it out horizontally.

8. Insert new UPS-module or cover the opening (UPS-module compartment) with appropriate protection cover immediately and fix with four screws using a tighten torque of 6 Nm.

CAUTION

CAUTION - RISK OF ELECTRIC SHOCK, CAPACITOR STORES HAZARDOUS ENERGY.

MAKE SURE THE INTERNAL DC-CAPACITORS HAVE BEEN DISCHARGED WAITING AT LEAST 5 MINUTES.

THE LOAD IS NOW DIRECTLY SUPPLIED BY MAINS AND IS NOT PROTECTED.

THE LOAD IS NOW DIRECTLY SUPPLIED BY MAINS AND IS NOT PROTECTED

9.5.3.2 How to insert a module in a capacity multi-module system

To replace a Faulty Module in a **Capacity Multi-Module System** perform following steps:

1. Make sure that the parallel switch “IA2” of the slot where the module need to be inserted is OFF

2. Remove UPS-Module compartment protection cover by unscrewing two screws on the front.
   Slide two thirds of UPS-Module into dedicated UPS-compartment (make sure not to plug the UPS-Module into the rear connector).
   Push UPS-module to its final position and push strongly to assure good contact on the rear plugs.

NOTE

WE RECOMMEND 2 PERSONS FOR PULLING OUT THE MODULE FROM THE UPS-FRAME. THE WEIGHT OF A MODULE CAN REACH 139 LBS [63KG].

3. Tighten the four screws on the front of module with a tighten torque of 6 Nm;

4. Check if LED LINE1 and battery are green.
   On the LCD: “LOAD OFF, SUPPLY FAILURE” will appear and the LED-indicator will indicate as shown below:

LED Indicator	Color
LINE 1	Green
LINE 2	OFF
BYPASS	OFF
INVERTER	OFF
BATTERY	Green

5. Press both “ON/OFF” Buttons simultaneously to start-up UPS module.
    - Check if the starting sequence is correctly executed, with the module running in inverter mode at the end

6. Give the command “LOAD TO BYPASS” to switch the module in static bypass mode
    - Check if the command is correctly executed, with the module running in static bypass mode at the end
7. Give the command “LOAD TO INVERTER” to switch the module in inverter mode
    - Check if the command is correctly executed, with the module running in inverter mode at the end

8. Load-off the module by pushing the two ON/OFF keys at the same time

9. Connect the module to the parallel system by turning ON the parallel switch “IA2”

10. Press both “ON/OFF” Buttons simultaneously to start-up UPS module.

11. All modules shall show to be in

LED Indicator	Color
LINE 1	Green
LINE 2	Green
BYPASS	Green
INVERTER	RED
BATTERY	Green

12. Open Maintenance Bypass (IA1) by turning it to position “OFF”. The load is now supplied by the static bypass of the Modules. Check LED-indicators on control panels.

13. Transfer load to Inverter-Mode by means of COMMAND “LOAD TO INVERTER” on any one of control panels. On LCD: “LOAD PROTECTED” will appear and the LED-indicator will indicate as shown below:

LED Indicator	Color
LINE 1	Green
LINE 2	Green
BYPASS	OFF
INVERTER	Green
BATTERY	Green

THE LOAD IS NOW PROTECTED BY THE DPA.

9.6 Multi-cabinet configuration (option)

As its name implies, this feature enables to work with more UPS (modules) in parallel for power capacity or redundancy.
This means having a load protected simultaneously by all the UPS on the parallel system with the required current equally shared between them.
To accomplish this, the “Master” UPS Inverter IGBT gate signals and other important information, such as, synchronization, control etc., must be transferred to all UPS working in parallel.
This feature is available as standard so that up to 6 modules can work in parallel inside the same frame without the need to perform any particular operation (just set the correct parallel parameters on each single module).
If more frames are present on a parallel system, installation of the “parallel cable” between them (through which the mentioned signals are transferred) is also required.
To correctly implement the “Parallel” feature in one or more frames working in parallel (regardless the numbers of installed modules), the following operations must be carried out:

1. Set the 6 Dip switches on the parallel board NW28140
2. Set the 2 Dip switches on the parallel adapter NW4019
3. Connect the parallel cable in case of parallel system (Two or more frames in parallel)

9.6.1 NW28140 configuration

	SW1 1	SW1 2	SW1 3	SW1 4	SW1 5	SW1 6	JP1
First frame	OFF	OFF	OFF	OFF	OFF	ON	ON *(See info ⓘ)*
Other frame	OFF	OFF	OFF	OFF	OFF	OFF	ON *(See info ⓘ)*
Last frame	OFF	OFF	OFF	OFF	ON	OFF	ON *(See info ⓘ)*
Single frame	ON	ON	ON	OFF	ON	ON	ON *(See info ⓘ)*

SW1-6 Dip Switches

Only **6** Dip switches are mounted on it and the setting for the parallel configuration must be done according to the above table.

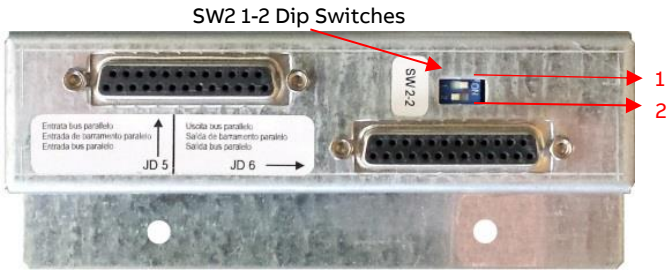
ⓘ The Jumper **JP1** must be always present (inserted) on all boards inside the parallel system (single or more frames working in parallel)

9.6.2 Parallel adapter setting

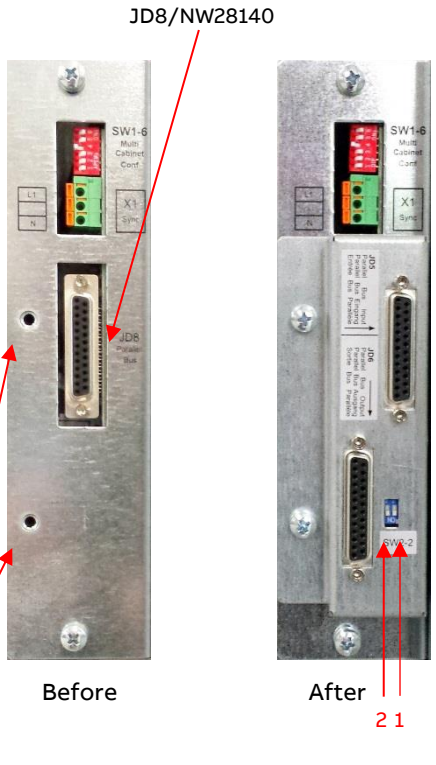
The parallel adapter NW4019 is required to connect together all frames working in parallel, and must be installed on each of them.
Insert the adapters in to **JD8** of all the parallel boards NW28140 present on the frames and fix them with the two screws (See example below with NW28140).
In case the adapter is installed in one frame working alone (no parallel cable connected) the Dip switches must be set as “Single”.

DIP Switch SW2-2 settings (parallel adapter PCB NW4019)

	SW 2.1	SW 2.1
First frame	OFF	ON
Other frame	OFF	OFF
Last frame	ON	OFF
Single frame	ON	ON



NW4019



9.6.3 Parallel cable connection

Connect the parallel cable between all frames working in parallel.

1. Start connecting one end of the parallel cable to **JD6** of the parallel adapter NW4019 mounted on the first frame.
   ⓘ Although the parallel cable is a “straight-thru” (un-crossed) type, it is recommended to connect it according to the labels present on the two ends.
2. Connect the other end of the parallel cable to **JD5** of the parallel adapter NW4019 mounted on the second frame.
3. If more frames are present on the parallel system, continue connecting the additional parallel cables on the same way until the last one.
4. As in the below example, connect the second parallel cable to **JD6** of the parallel adapter NW4019 mounted on the second frame and the other ends to **JD5** of the third frame.
5. The parallel cables connections ends on **JD5** of the last frame

ⓘ The module inserted on the lower position of the first frame is the “**Master**” UPS of the complete installation.
(The “Master” assignment applies only if the UPS is running in Inverter mode with IA2 closed!

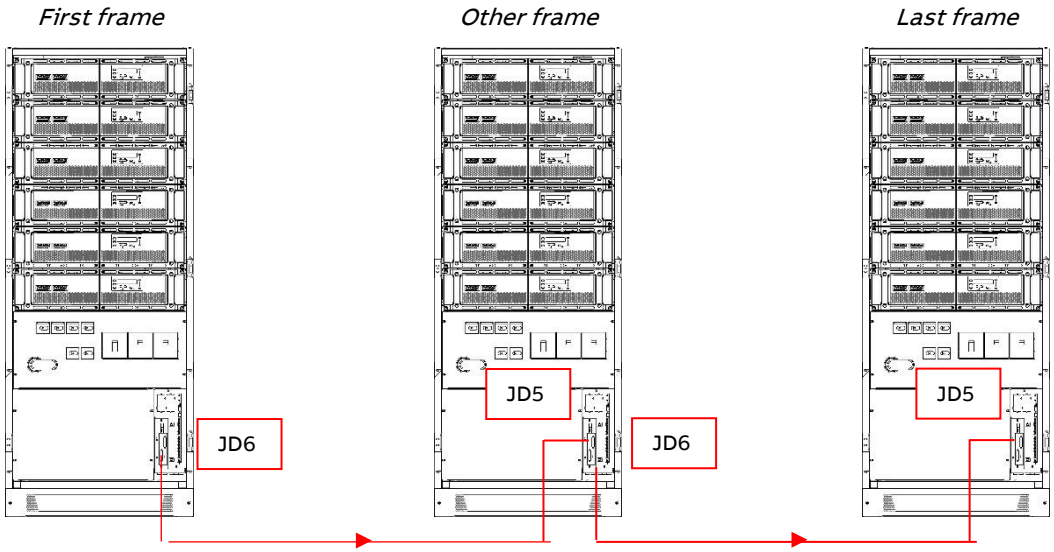


Fig 9.6.3-1 represents DPA 120

ⓘTo complete the parallel installation, the correct “id.” number (P01, P02, P03, etc.) must be assigned to each UPS (module).

9.7 Multidrop configuration

The “Multidrop” connection enables the collection of data/messages of all the UPS in the parallel system in a single point. All data from all single UPS are transferred through the multidrop cable/s to the “**Master**” customer interface board installed inside the master frame (As standard the first UPS on the parallel installation). The collected data are then available for the user directly on the serial connection RS232 of the “**Master**” customer interface board, and transmitted to the SNMP/USHA card if inserted on the relative slot.

Even if the “Multidrop” cable is given with the parallel cable kit, the “Multidrop” feature is completely independent from the “Parallel installation”, its implementation depends exclusively on the customer needs.

To correctly implement the Multidrop feature, the following operation must be carried out on the installation:

- Set the customer interface board in the master frame as "**Master**"
- Set all remaining board/s present in the parallel system as "**Slave**"
- Connect the "Multidrop" cable/s between the different frames in the parallel system

9.7.1 Customer interface board Input-output contacts

When the "Multidrop" feature is implemented, the input/output ports management follow the following rules:

	CUSTOMER INPUT PORTS (X3)	OUTPUT DRY PORT (X2)	INTERLOCK CASTELL FUNCTION (X1)
Master Board	Enabled	Enabled	Enabled
Slave Board	Disabled[1)]	Disabled	Enable[2)]

[1)] *Exception: "External Output Breaker" (X3 9/10) and "External Manual Bypass" (X3 7/8) are **enabled** because managed directly via hardware*
[2)] *The "Interlock Castel Function" is disable in case of NW22085≤D with special project **203** (Dry contact "LOAD_ON_MAINS" not active)*

All information concerning the input/output ports connection can be found on the UPS user manual

ⓘ In case it is required the use of the customer interface input or output ports, installed in all UPS of the parallel system, the multidrop feature cannot be implemented!

E.g.: When the "Battery temperature probe" is connected to each single UPS, all customer interface boards must be set as "**Master**".

9.7.2 Customer interface configuration

1) Verify that the Dip Switches on the board are correctly configured.

	WITH MULTIDROP			NO MULTIDROP
	FIRST UPS	MIDDLE UPS	LAST UPS	SINGLE UPS
SW2 - 1	OFF	OFF	OFF	OFF
SW2 - 2 *(Master/Slave)*	OFF	ON	ON	OFF

On the board NW22085 the "**Master**", "**Slave**" configuration is done with the Dip switch "**2**".
(The board is "**Master**" when the Dip switch "**2**" is set to "**OFF**" and "**Slave**" when it is set to "**ON**")

2) Verify that the jumpers on the board are correctly configured. Please note that some jumpers can be ON or OFF also according to the UPS installation (E.g.: Remote shutdown button installed or not)

	NW22085			
JUMPERS ON PCB	JUMPER	JP2	JP4 (EPO)	JP8 (Ext. IA2)
	STATUS	ON (See details)	OFF (See details)	OFF (See details)

Let the jumper JP2 always present in order to correctly detect the status of the "External Manual Bypass" auxiliary contact (connection on **X3 7/8**)

The jumper JP4 must be always **OFF** in order to correctly detect the status of the "Remote shutdown button" (**EPO** function) (connection to **X3 3/4**).

The jumper JP8 must be removed (**OFF**) in case an **External output breaker** (IA2) is installed and the relative **auxiliary contact** connected to **X3 9/10** on the interface board.

9.7.3 Led Blinking status

The customer interface board NW22085 can operate on the following 4 different modes:

1. *Master* — *"Master" board (only the first one on a parallel system with "Multidrop" connection installed) or single frame*
2. *Slave* — *"Slave" board/s on a parallel system with "Multidrop" connection installed*
3. *BootLoader* — *Operation mode active during customer interface board FIRMWARE upgrade (via RS232 or USB)*
4. *Pass-Through* — *Operation mode active during electronic board NW28010 FIRMWARE upgrade via RS232 or USB*

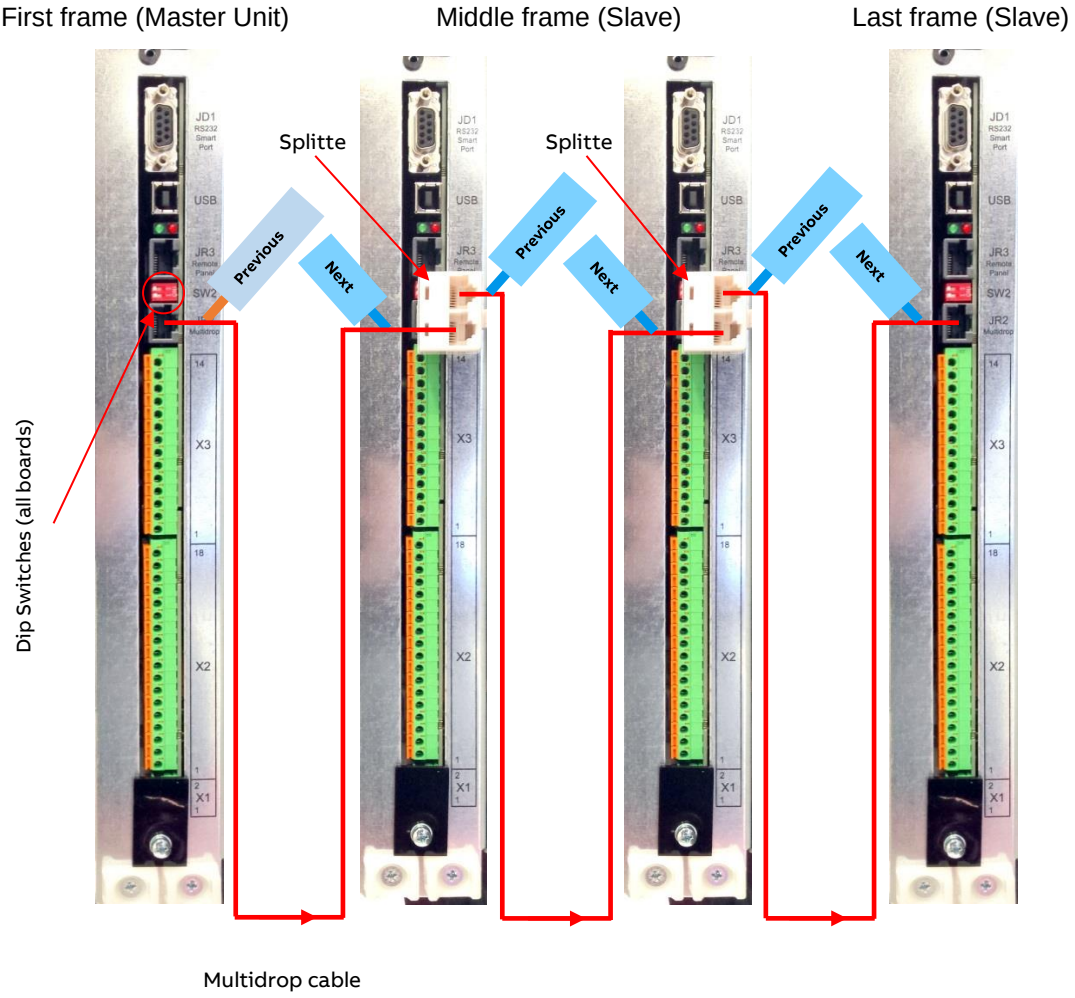
ⓘ The NW28010 FIRMWARE upgrade can be carried out directly on the NW22085 only when it is set as "Master" or through the multidrop connection (via the Master board) if it is set as "Slave"

The board operating mode change according to its setting (Jumper or Dip switches) and the installed FIRMWARE version. It can be visually identified by the status of the Green and Red LEDs mounted on it.

LED	FIRMWARE VERSION LD3 NW22085	ON/OFF/BLINKING (NR. OF BLINKS PER SECONDS)	LED "OFF" TIME (IN SECONDS)	BOARD MODE
RED	All	OFF	N.A.	**CHECK GREEN LED STATUS**
RED	All	ON	N.A.	**BOARD ERROR**
GREEN	≥2.6	1	1	***MASTER***
GREEN	≥2.6	2	2	***SLAVE***
GREEN	≥2.6	3	3	***BOOTLOADER***
GREEN	≥2.6	Continuous	Fast	***PASS-THROUGH***

9.7.4 Multidrop cable connection

1. If more than two frames are in parallel insert the splitter on all the "Middle" units
2. Connect together all the frames using the supplied Multidrop cable respecting the correct cable direction
3. Start inserting the cable ends labelled "**Previous**" on the first frame and the second ends labelled "**Next**" on the second frame
4. Continue on the same way with the remaining cables until the last frame



9.7.5 Interface board parameters

The interface boards NW22085 mounted on DPA500 UPS is set on the factory with the default parameters.
Through the NewSet tool, some of these parameters can be adapted to the customer needs.
A certified service engineers can easily carry out this operation directly on customer site.

The list of all available parameters is present on a “pmdl” file inside the NewSet tool working directory and it is different for each interface board type. Moreover, with the introduction of the new µProcessor, other specific parameter sets (new “pmdl” file) have been generated for the last boards versions.

On the table below, you can find the list of the most used parameters (with the relative address numbers) which can be modified with the standard NewSet tool license.
Other parameters, available only on special project, can be modified with particular NewSet license that are provided on request directly by ABB after Sales department (the special license have usually a limited validity time).

Parameter file name on NewSet tool directory: NW22085≥E “pmdl2287.pds”

PARAMETERS NAME	PARAMETER ADDRESS NUMBER	DRY CONTACT	
	NW22085≥E	**NAME**	**CONNECTION**
UPS Interface collects system info	5	N.A.	N.A.
Input Drycontact Remote shutdown polarity	221	Remote Shutdown	X3 3/4
Input Drycontact Customer_1 (Generator operation) polarity	222	Generator Operation	X3 11/12
Input Drycontact External Man Bypass polarity	223	External Manual Bypass	X3 7/8

10 Service options

10.1 Field installable kits

ABB modular system is provided with several features that allow to easily adapt it to the needed sites conditions. Following the “field installable kits”:

- Additional module
- Parallel Kit
- Network interface cards (SNMP)
- Battery Temperature Sensor

Some of the features are designed to be installed only during the assembling on the factory and for a safety reasons cannot be added on the field:

- Manual Bypass
- Battery breaker
- Cold start
- TVSS

Please be sure to mention these options when placing an order.

10.1.1 Additional Module

An additional module can be easily added on the system by proceeding as described in the chapter 9.5 “*Adding & replacement of a power module”*.

If everything is OK, you can consider the upgrade of the system successful.

10.1.2 Parallel kit

To parallel more than one cabinet together refer to the chapter 9.6 “Multi-cabinet configuration”.

10.1.3 Network interface cards (SNMP)

ALL THE INPUT/OUTPUT PORTS ARE CLASS 2 (SELV CIRCUITS). PLEASE MAINTAIN SECURITY WHEN CONNECTING TO OTHER DEVICES.

WARNING!

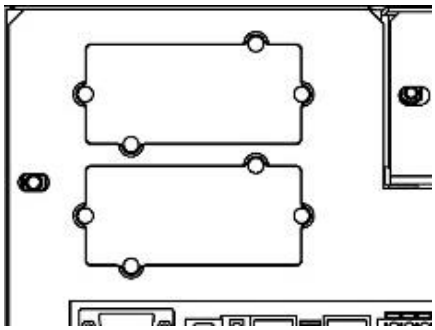


ABB offers network interface cards to connect ABB UPS system to the network.
The network interface card provides:

- Remote monitoring via Web
- Environmental monitoring
- Extensive alarm handling and dispatching
- Redundant UPS monitoring
- Integration into network or building management system
- Integration into multivendor and multiplatform environments

To install the SNMP card please follow the instructions below:
The **S**imple **N**etwork **M**anagement **P**rotocol (SNMP) is a worldwide-standardized communication-protocol. It is used to monitor any device in the network via simple control language. The UPS-Management Software also provides its data in this SNMP format with its internal software agent.

The operating system you are using must support the SNMP protocol. We offer our software with SNMP functionality for Novell, OS/2, all Windows running on INTEL and ALPHA, DEC VMS, Apple. Two types of SNMP interfaces with identical functionality are available: an external SNMP-Adapter (Box) and an internal SNMP-Card. Both can manage a parallel system (N modules) and return either global values - which are consistent for the whole parallel system - or specific values from the single modules.

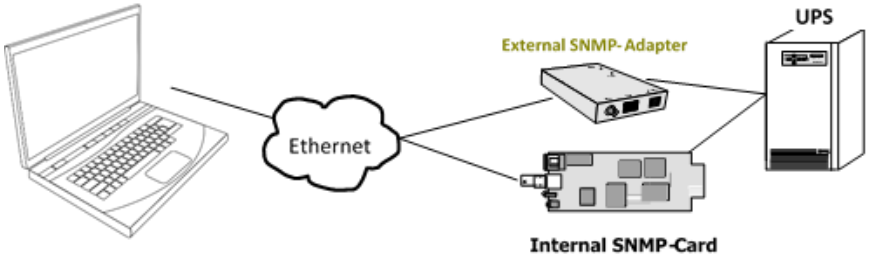


Fig. 10.1.3-1: SNMP

The adapter may be configured via Telnet, HTTP (Web-Browser) or serial connection (Terminal). For normal operation at least one network connection (Ethernet) is required.

The SNMP adapter can be used, utilizing the RCCMD send function, for an automatic network wide shutdown or just for informing connected users. The shutdown procedure can be initiated on a low residual battery autonomy time (downtime) or by a countdown timer which is started at the beginning of the alarm. A shutdown is therefore possible without extra input from the operator, and is fully software controlled.

The small (125x70 mm) External SNMP adapter comes with following interfaces:

1. RJ-45 connector for 10/100 Base-T (autoswitchable)
2. Serial Port for configuration (COM2) or optional ModBus interface.
3. Error/Link LED for UPS status
4. Aux Port
5. DIP Switch
6. Serial Port to the UPS (COM1)
7. DC Supply (9 VDC or 9-36 VDC supply, depending on model);

Fig. 11.1.3-2: External SNMP Adapter

The Internal SNMP-Card can be inserted into an appropriate extension slot of the **PMC.** This adapter communicates via the serial port of the UPS and makes a direct multiple server shutdown possible without additional SNMP management software.

Fig. 11.1.3-3 Internal SNMP Adapter

For detailed information please see Software Manual provided with the PMC-Software CD ROM.**RCCMD - Remote Console Command module** for a multi-server shutdown. This stand-alone software module is designed to receive and execute a command issued by a remote device. Thanks to RCCMD it is possible to execute a shutdown in a heterogeneous multiplatform network. The new release RCCMD2 is an application available for all Operating Systems, analogous to PMC-Software. Our SNMP Interfaces are compatible to RCCMD

10.1.3.1 CS121 Basic

For interfacing the UPS with the network without the need for additional sensors or interfaces. Available in slot and box formats.

Supports the following protocols
SNMP, Modbus TCP, HTTP ModBus TCP, Telnet FPT, SMTP (e-mail)

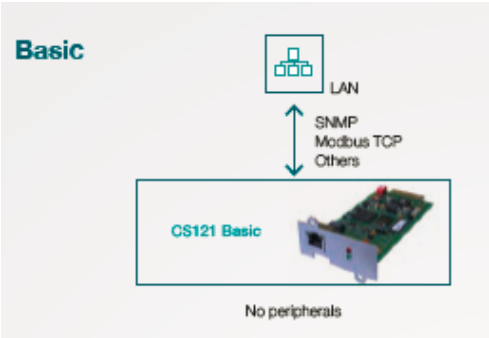


Fig.10.1.3.1-1: CS121 Basic

10.1.3.2 CS121 Advanced

For interfacing UPS with the network and allowing users to connect additional sensors and I / O options either directly to the card or with sensor manager. Available in slot and box formats

Supports the following protocols
HTTP, ModBus TCP, SNMP Telnet FPT, SMTP (e-mail), ModBus RS-485

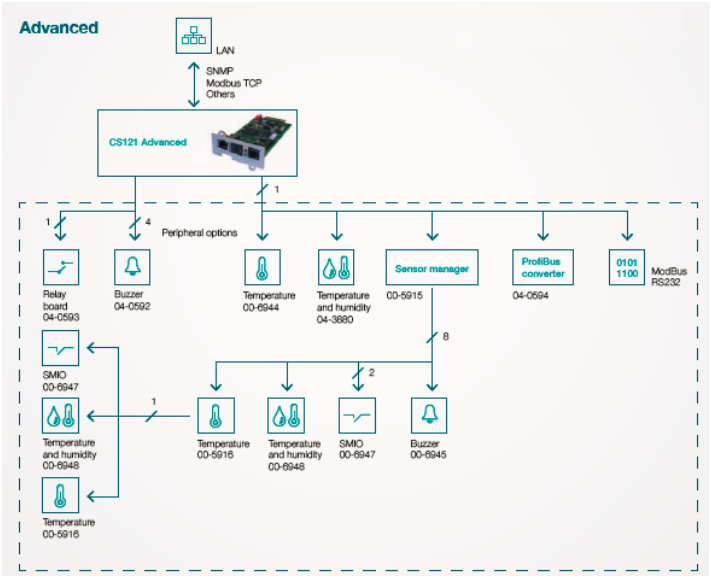


Fig. 10.1.3.2-1: CS121 Advanced

10.1.3.3 CS121 Modbus

For interfacing UPS with the network and the ModBus RS485 with option to connect alarms buzzers or additional relay board. Available in slot and box formats.

Supports the following protocols
HTTP, ModBus TCP, SNMP Telnet FPT, SMTP (e-mail), ModBus RS-485

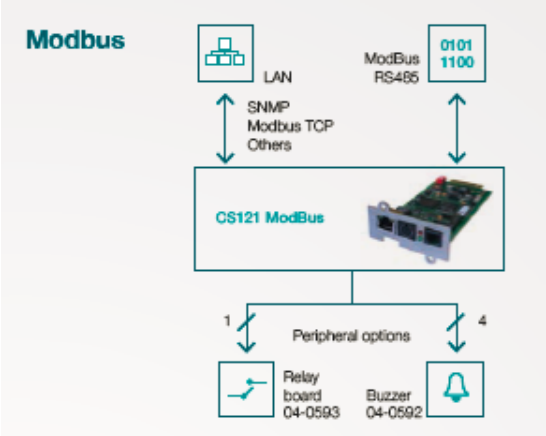
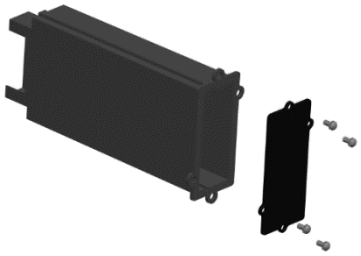


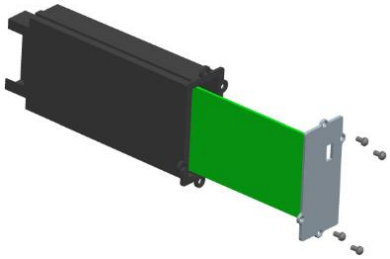
Fig. 10.1.3.3-1: CS121 Advanced

10.1.3.4 Installation of the SNMP board

1. Remove the 4 plastic lids from the unit



2. Insert the SNMP card inside the slot



10.1.4 Battery Temperature Sensor

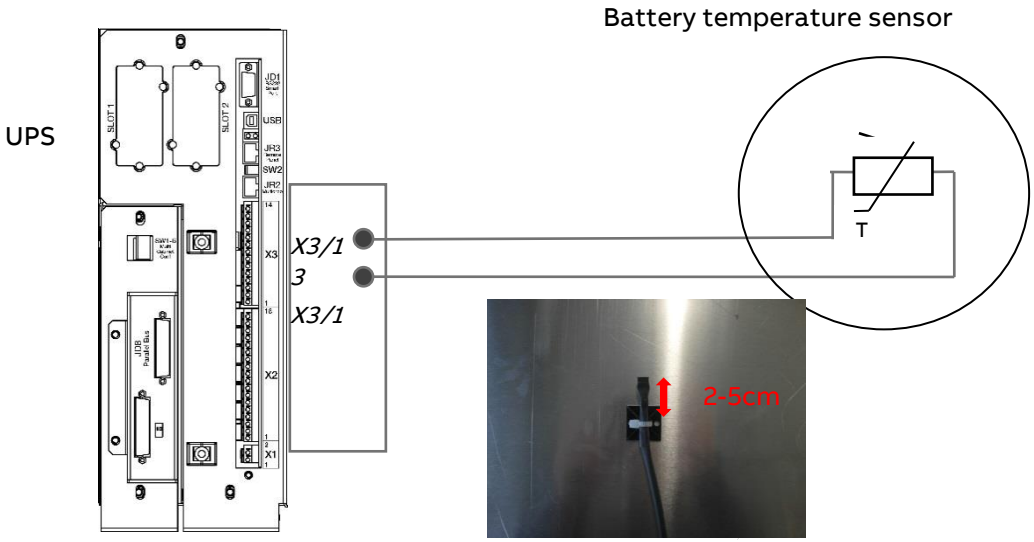
The option Battery Temperature Sensor, if correctly installed has the following two functions:

1. allows the battery temperature to be shown in the menu of the LCD display (see chapter 4.3.1)
2. allows the battery charger to automatically and continuously compensate the charging voltage according to the values as per the table here below.

2.30 V/cell @ 59°F [15°C]
Linearly to …
2.23 V/cell @ 95°F [35°C]

10.1.4.1 Installation of the Battery Temperature Probe.

The sensor comes with a 5.9” [1.8m] cable, in case a longer cable is needed, it can be extended up to 49’ [15m]. First define the position of the sensor, it is recommended to put it where the temperature gets higher (typically it’s on the top of a battery cabinet or UPS internal battery (or even battery room). Then, thread the wire by fixing it along the way and connect the two ends of the cable by plugging them into the customer interface (see 8.1.3) on the pin X3/13 and X3/14. The polarity does not matter (not important which end is connected at X3/13 and which at X3/14).



WARNING!

THE BATTERY TEMPERATURE PROBE IS A CLASS 2 DEVICE (SELV CIRCUITS). PLEASE ROUTE THE CABLE TO MAINTAIN A MINIMUM OF .24” [6MM] FROM PRIMARY CIRCUITS.

NOTE

ONLY THE OPTIONAL BATTERY SENSOR FROM ABB IS COMPATIBLE

THE ADHESIVE OF THE BATTERY SENSOR IS SUITABLE FOR USE ON ALUMINUM, STAINLESS STEEL AND ENAMELED STEEL ONLY

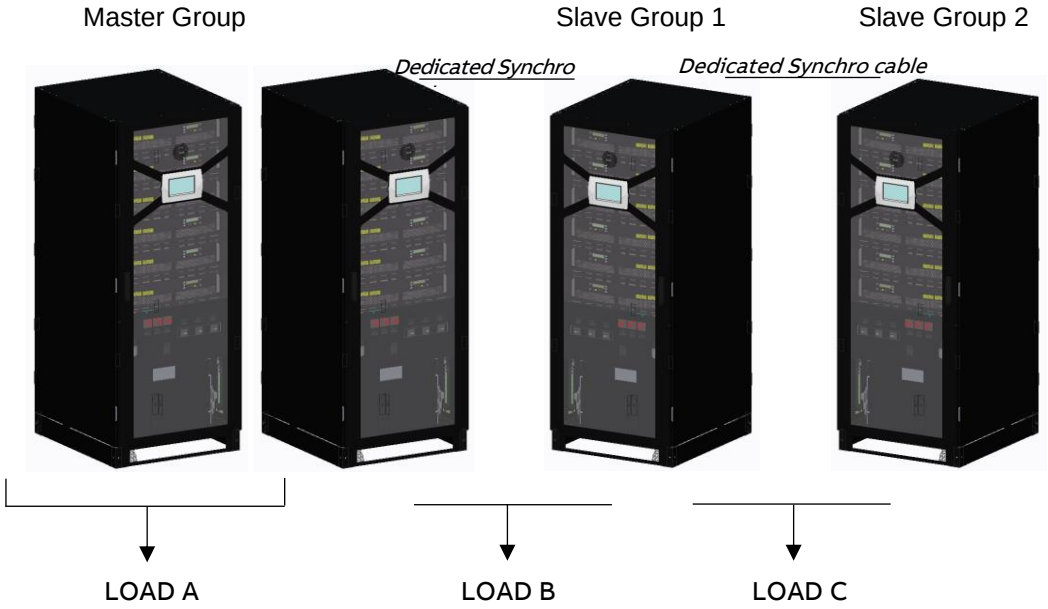
THE EQUIPMENT IS PROVIDED WITHOUT INPUT AND OUTPUT BREAKERS, A READILY ACCESSIBLE DISCONNECT DEVICE SHALL BE INCORPORATED EXTERNAL TO THE EQUIMPENT.

10.1.5 Synchronization kit

This option allows to synchronize the output voltage from two or more UPS systems.
The system is provided with 3 x different synchronization possibilities by which on each solution a special FIRMWARE has to be installed:

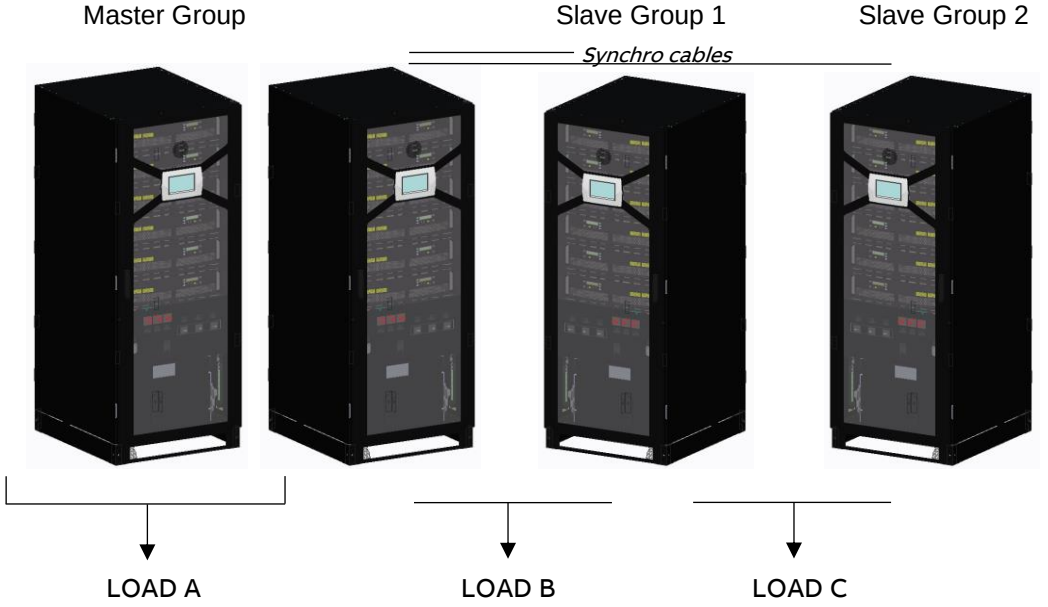
1. With dedicated synchronization cables which allows to synchronize up to 3 x different cabinets or groups of cabinet together in a maximum distance of 328' [100m].
   The needed cable has to be ordered separately.

Example of installation method 1



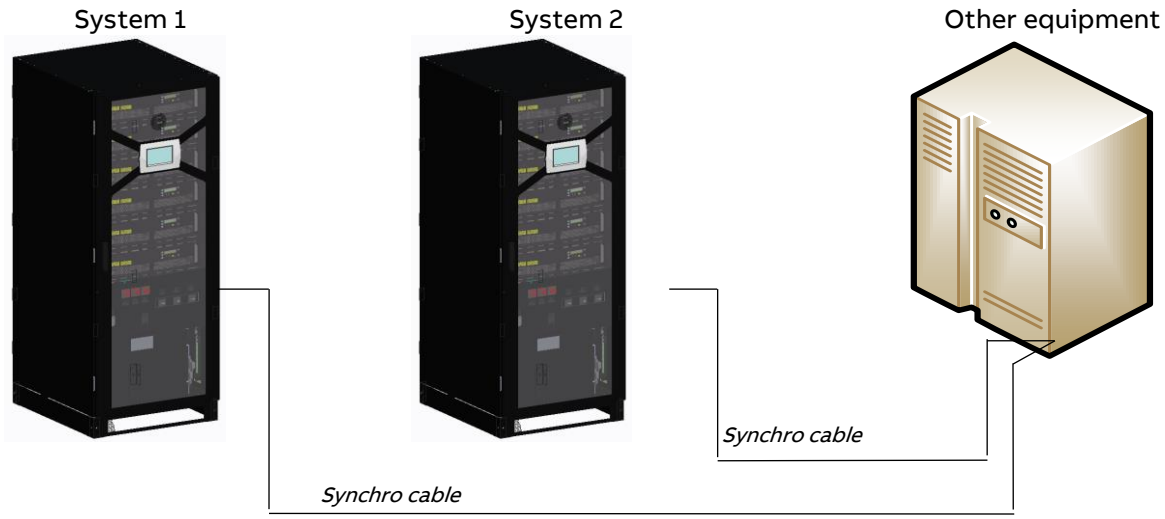
2. Without dedicated cables but the customer have to provide a twisted cable of 2 x 0.2mm^2 – 1.5mm^2
   This solution offers the possibility to synchronize the output of a DPA120 slave grout to the output of the master

Example of installation method 2



3. Based on method 2, the system is also able to synchronize the outputs to whichever grid with voltages within the range of 208V to 480V (both phase to phase and phase to neutral configuration are possible)

Example of installation

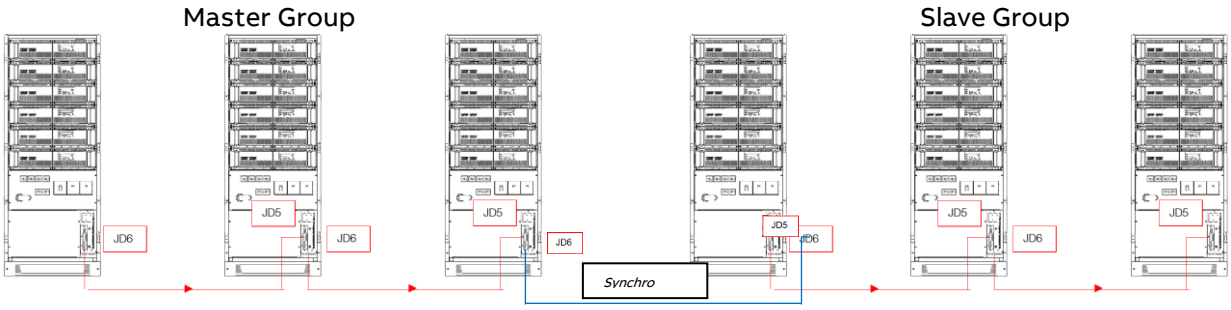


10.1.6 Synchronization kit method 1

This procedure describes the sequence of operations to be done in order to install the synchronization kit. The kit contains the following items:

- Synchronization cable
- Installation manual

1. Make sure that the UPS system is equipped with the correct Synchro kit firmware version
2. Set all the modules as **"Master group"** by mans of the control panel (Set-UP service -> UPS model)
3. Check the functionality of each individual UPS system following the commissioning procedure (chapter 9.2)
4. Turn off all the modules following the shutdown procedure (chapter 9.3)
5. Connect the Synchro cable between the UPS system as shown in the following illustration:



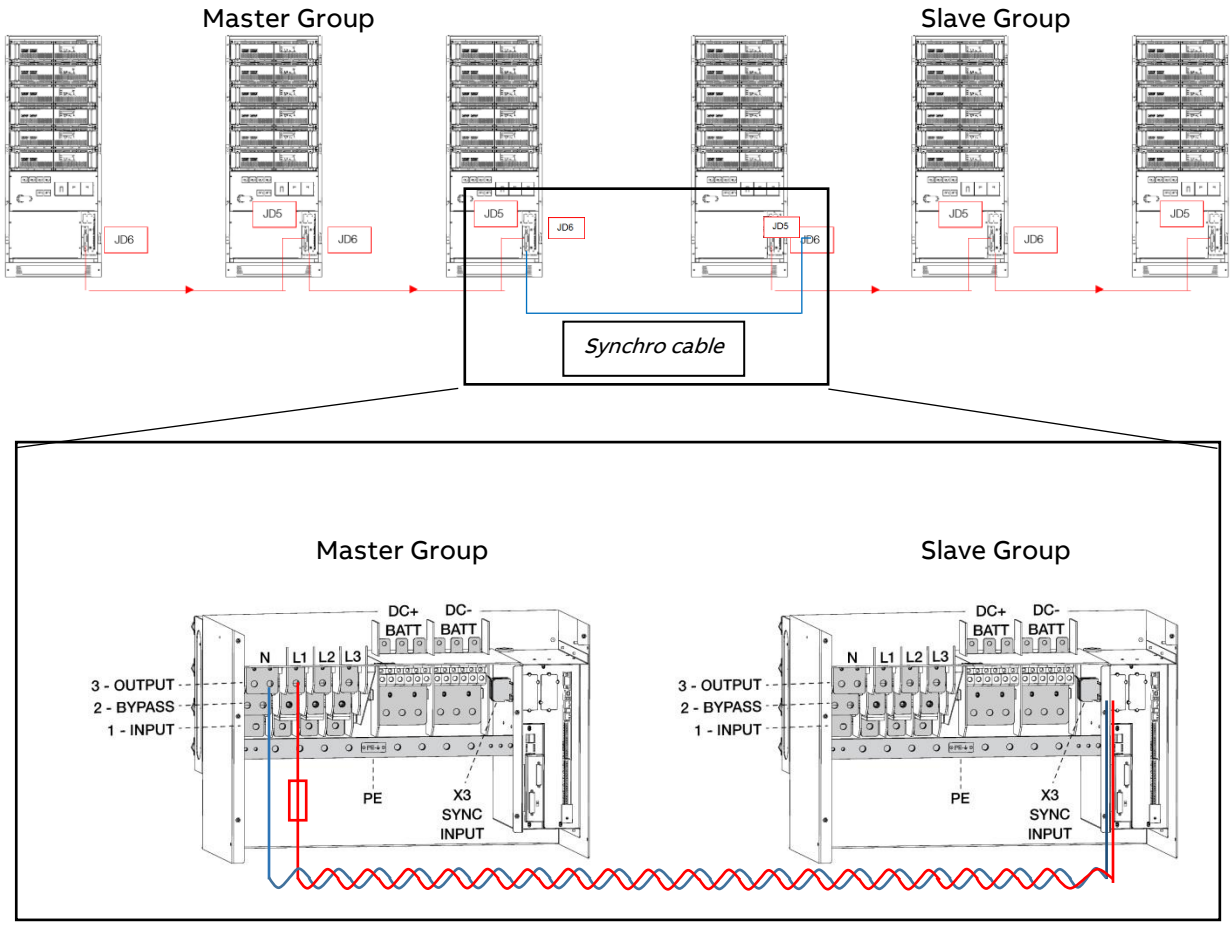
6. Set all the modules in the slave groups as **"Slave group"** by means of the control panel
7. Start up the "Master Group" following the commissioning procedure (chapter 9.2)
8. Start up all the "Slave Group" following the commissioning procedure (chapter 9.2)

9. Check the output phase synchronization measuring the voltage across the phase of each groups as described below:
    - Verify that the voltage between output L1 of the **“Master group”** and output L1 of all the **“Slave group”** is less than **5Vac**.
    - Verify that the voltage between output L2 of the **“Master group”** and output L2 of all the **“Slave group”** is less than **5Vac**.
    - Verify that the voltage between output L1 of the **“Master group”** and output L1 of all the **“Slave group”** is less than **5Vac**.

10.1.7 Synchronization kit method 2

This procedure describes the sequence of operations to be done in order to synchronize the outputs among different UPSs groups.

1. Make sure that the UPS system is equipped with the correct Synchro kit firmware version
2. Set all the modules as **“Master group”** by means of the control panel (Set-UP service -> UPS model)
3. Check the functionality of each individual UPS system following the commissioning procedure (chapter 9.2)
4. Turn off all the modules following the shutdown procedure (chapter 9.3)
5. Using a twisted cable of 2 x 0.2mm^2 – 1.5mm^2 and a 1A fuse connect the output phase L1 and N of the master group to the input terminals X3 of the slaves as shown in the below illustration:



NOTE

THE TWISTED CABLE OF 2 x 0.2mm^2 – 1.5mm^2 IS NOT PROVIDED IN THE KIT.

INSTALLATION SHALL COMPLY WITH THE *NATIONAL ELECTRICAL CODE*, ANSI/NFPA 70 AND THE *CANADIAN ELECTRICAL CODE, PART I*, C22.1

6. Set all the modules in the slave system as **“Slave group”** by means of the control panel

7. Start up the “Master Group” following the commissioning procedure (chapter 9.2)

8. Start up all the “Slave Group” following the commissioning procedure (chapter 9.2)

9. Check the output phase synchronization measuring the voltage across the phase of each groups as described below:

   - Verify that the voltage between output L1 of the **“Master group”** and output L1 of all the **“Slave group”** is less than **5Vac**.

   - Verify that the voltage between output L2 of the **“Master group”** and output L2 of all the **“Slave group”** is less than **5Vac**.

   - Verify that the voltage between output L1 of the **“Master group”** and output L1 of all the **“Slave group”** is less than **5Vac**.

10.1.8 Synchronization kit method 3

This procedure describes the sequence of operations to be done in order to synchronize the outputs of different UPSs groups to whichever grid.

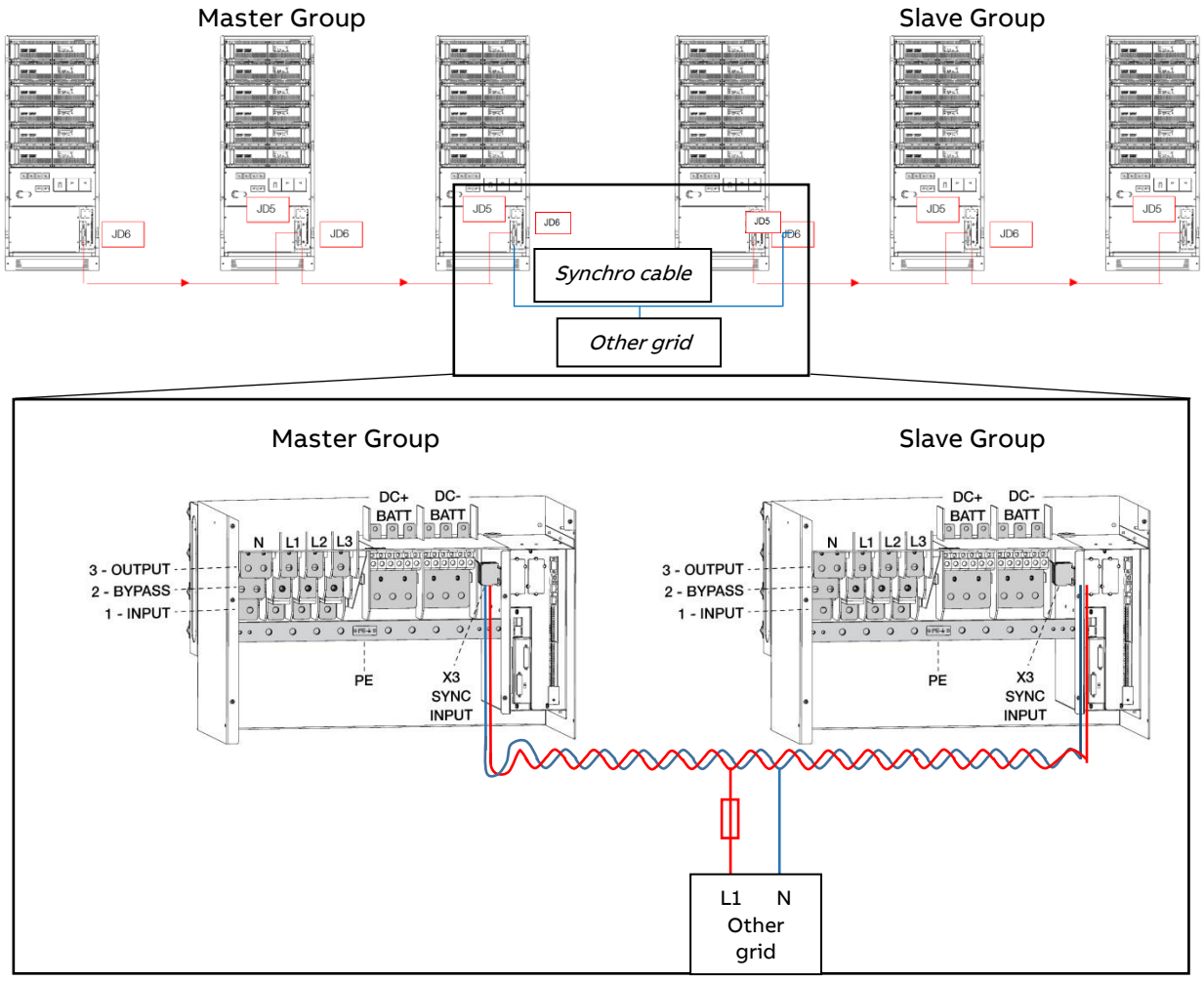
1. Make sure that the UPS system is equipped with the correct Synchro kit firmware version

2. Set all the modules as **"Master group"** by means of the control panel (Set-UP service -> UPS model)

3. Check the functionality of each individual UPS system following the commissioning procedure (chapter 9.2)

4. Turn off all the modules following the shutdown procedure (chapter 9.3)

5. Using a twisted cable of 2 x 0.2mm^2 – 1.5mm^2 and a 1A fuse connect the phase L1 and N of the grid to synchronize with to the input terminals X3 of the UPS systems as shown in the below illustration:



NOTE

THE TWISTED CABLE OF 2 x 0.2mm^2 – 1.5mm^2 IS NOT PROVIDED IN THE KIT.

INSTALLATION SHALL COMPLY WITH THE *NATIONAL ELECTRICAL CODE*, ANSI/NFPA 70 AND THE *CANADIAN ELECTRICAL CODE, PART I*, C22.1

6. Set all the modules in the slave system as **“Slave group”** by means of the control panel

7. Start up the “Master Group” following the commissioning procedure (chapter 9.2)

8. Start up all the “Slave Group” following the commissioning procedure (chapter 9.2)

9. Check the output phase synchronization measuring the voltage across the phase of each groups as described below:

   - Verify that the voltage between output L1 of the **“Master group”** and output L1 of all the **“Slave group”** is less than **5Vac**.

   - Verify that the voltage between output L2 of the **“Master group”** and output L2 of all the **“Slave group”** is less than **5Vac**.

   - Verify that the voltage between output L1 of the **“Master group”** and output L1 of all the **“Slave group”** is less than **5Vac**.

11 Attachments

11.1 Technical data sheet

Technical data sheets for the DPA 60 and DPA 120 can be found by visiting the ABB Library, reference the following links:

Technical Data Sheet: DPA 60
https://search.abb.com/library/Download.aspx?DocumentID=TS-DPA-MK-0122&LanguageCode=en&DocumentPartId=&Action=Launch

Technical Data Sheet: DPA 120
https://search.abb.com/library/Download.aspx?DocumentID=4NWD003251&LanguageCode=en&DocumentPartId=&Action=Launch

www.abb.com/ups

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