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User Manual

DPA UPScale™ ST S2

10 – 200 kW



Document information

File name : 4NWP101759R0001_OPM_ABB_DPA_UPSCALE_ST_S2-10-200kW_EN_REV-C.docx
UPS model : DPA UPScale ST S2
Date of issue : 10.12.2015
Article number : 4NWP101759R0001
Document number : 4NWD002986
Revision : C

Foreword

This UPS operates with mains, battery or bypass power. It contains components that carry high currents and voltages. The properly installed UPS is grounded to earth and IP20 rated against electric shock and foreign objects. Installation and service have to be performed by the manufacturer's qualified technicians or their certified service partners.

**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 LOSE ITS WARRANTY**

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

**CAREFULLY READ THE USER MANUAL BEFORE
OPERATING THE UPS OR WORKING ON IT.**

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1 Safety regulation

1.1 Safety rules

This UPS operates with mains, battery or bypass power. It contains components that carry high currents and voltages. The properly installed UPS is grounded to earth and IP20 rated against electric shock and foreign objects. Installation and service have to be performed by the manufacturer's qualified technicians or their certified service partners.



THERE IS DANGER OF ELECTRICAL SHOCK

WARNING!

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



READ THE INFORMATION IN ORDER TO AVOID EQUIPMENT DAMAGE

NOTE!

The only user operations permitted are:

- Use of the LCD control panel (LCD) and of the maintenance bypass
- Start-up and shut-down of the UPS user field (except during 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 take the precautions set out in this manual and only perform the operations described. The UPS operator must adhere to the instructions in this manual. Any deviations from the instructions could be dangerous to the user or could cause accidental load loss.

THE MANUFACTURER DOES NOT TAKE ANY RESPONSIBILITY FOR DAMAGE CAUSED BY INCORRECT USE OF THE UPS.



IT IS PROHIBITED TO REMOVE ANY SCREWS FROM THE UPS OR FROM THE BATTERY CABINET. THERE IS A DANGER OF ELECTRIC SHOCK.

WARNING!



WARNING!

**HIGH FAULT CURRENTS (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: “ BEFORE STARTING WITH MAINTENANCE WORK
ON THE CIRCUIT BREAKERS, MAKE SURE THE UPS IS ISOLATED.”**

1.2 Safety symbols and warnings



PROTECTIVE GROUNDING TERMINAL

A terminal which must be connected to earth ground prior to making any other connection to the equipment.



A terminal to which or from which a direct current or voltage may be applied or supplied.



This symbol indicates the word “phase”.



ON The principal power switch is in the “ON” position



OFF The principal power switch is in the “OFF” position.



CAUTION: REFER TO MANUAL

Refer to the Operator’s manual for more information



DANGER: RISK OF ELECTRIC SHOCK

There is a risk of electric shock present, and you should observe associated warnings. The UPS contains high voltages.

2 General information



WARNING!

**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 amounts of dust in the operating environment of the UPS may cause damage or lead to malfunction. The UPS should always be protected from weather and sunshine. If you intend to operate the system at an altitude higher than 1000 m, 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 should the UPS 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 are:

- Ambient temperature Range: 0 to +40°C (32 – 104°F)
- Recommended operating Range: +20 to +25°C (68 – 77°F)
- Maximum relative Humidity: 95% (non-condensing)

The UPS cabinet uses forced air cooling to regulate internal component temperature. Air inlets are sited in the sides and front of the cabinet, at the bottom, and air outlets are sited in the rear of the cabinet. You must allow clearance at the back of the cabinet for proper air circulation. Refer to chapter 5.3: UPS and battery location.

2.1 Declaration of safety conformity and CE marking

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 in the annex 1



	Product Standards	Standards
Safety Standard:	IEC/EN 62040-1	IEC/EN 60950-1
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 UPScale™ will provide your critical equipment with a steady and reliable power supply for many years.

The unique and modular UPS DPA UPScale belongs to the newest generation of midrange three-phase UPS systems. High reliability, low operating costs 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 required by the international standard ISO 9001/EN 29001. The UPS is certified according to the norm IEC 62 040-3 and VDE 0558 Part 530 is also accomplished.

The 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 DPA UPScale	 Made in Switzerland	Input Voltage: _____ V	Output Voltage: _____ V	Serial No. <input type="text"/>
		Current in/out: _____ A	Output Power: _____ kVA/kW	
		ICW: _____ kA	Input/Output Freq.: _____ Hz	

Fig 2.2-1: Nameplate

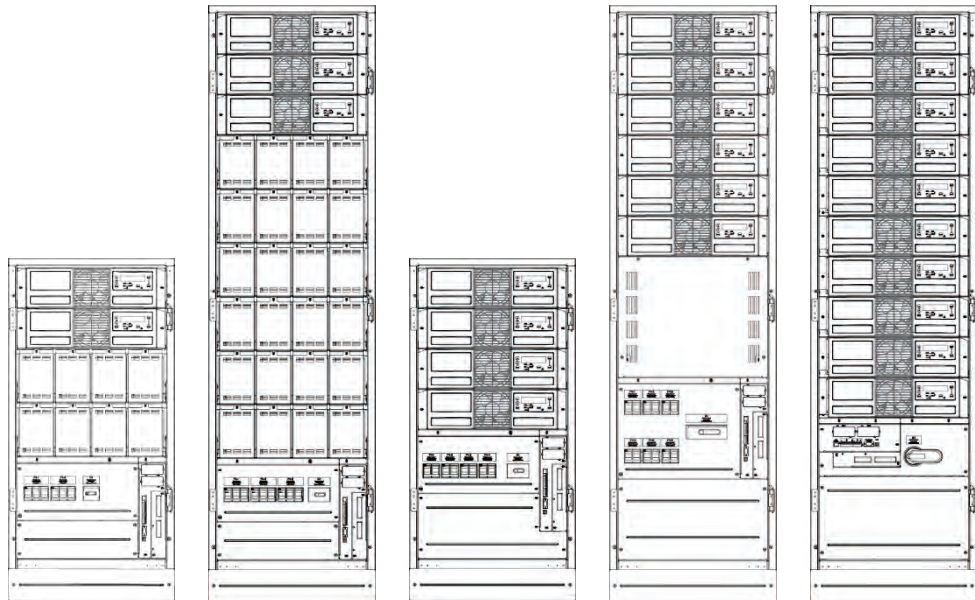
TYPE	PRODUCT DESCRIPTION	DIMENSIONS
S2UPxxx	<i>DPA UPScale ST 40</i>	<i>Cabinet (550x1135x770mm)</i>
S3UPxxx	<i>DPA UPScale ST 60</i>	<i>Cabinet (550x1975x770mm)</i>
S4UPxxx	<i>DPA UPScale ST 80</i>	<i>Cabinet (550x1135x770mm)</i>
S6UPxxx	<i>DPA UPScale ST 120</i>	<i>Cabinet (550x1975x770mm)</i>
S0UPxxx	<i>DPA UPScale ST 200</i>	<i>Cabinet (550x1975x770mm)</i>

3 System description

The DPA UPScale ST S2 is a three-phase transformerless uninterruptible power supply (UPS). It is a true on-line double conversion UPS providing quality power for sensitive equipment. It is a modular UPS consisting of:

- DPA UPScale modules, rated power 10kW or 20kW
- Maintenance bypass switch
- Incoming and outgoing terminals
- Communication interfaces
- Parallel interface (option)
- System graphical display (option)
- Internal battery modules (option)

The DPA UPScale ST S2 family has five models available:



DPA UPScale S2	ST40	ST60	ST80	ST120	ST200
Max rated power	40 kW	60 kW	80 kW	120 kW	200 kW
Max number of DPA UPS modules	2	3	4	6	10
Internal battery modules	Yes	Yes	No	No	No

3.1 System architecture

The DPA UPScale ST S2 System has a decentralized parallel architecture (DPA). Each DPA UPScale module has its own:

- Rectifier and inverter
- DC booster
- Static bypass
- Battery connection
- Control logic
- LCD control panel

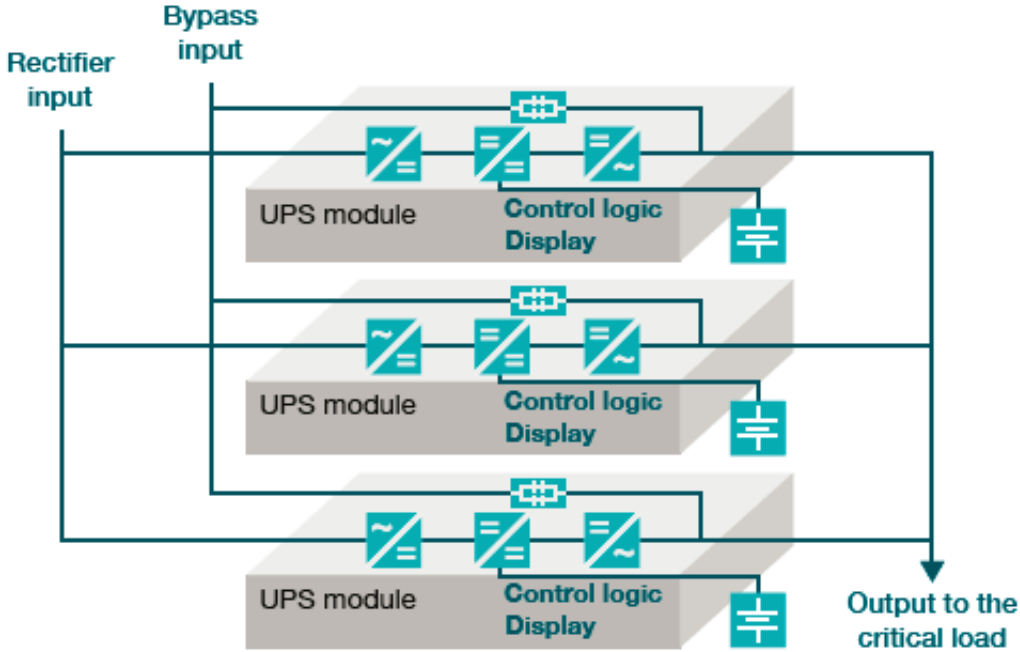
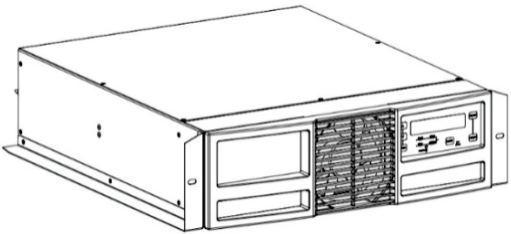


Fig 3.1-1: System architecture

Therefore, the UPS does not have common components. This offers high availability and no single point of failure.

There are two types of DPA Upscale modules, as follows:

Module type	UPSscale M 10	UPSscale M 20
Rated output power	10 kW	20 kW
Weight	18.6 kg	21.5 kg
Dimensions (WxHxD)	488x132x540	



The DPA UPScale Modules are “safe-swappable” - no disturbance to the operation of the load is caused by inserting or extracting a module from a system while it is powered.

3.2 Main elements description

3.2.1 Single line diagram

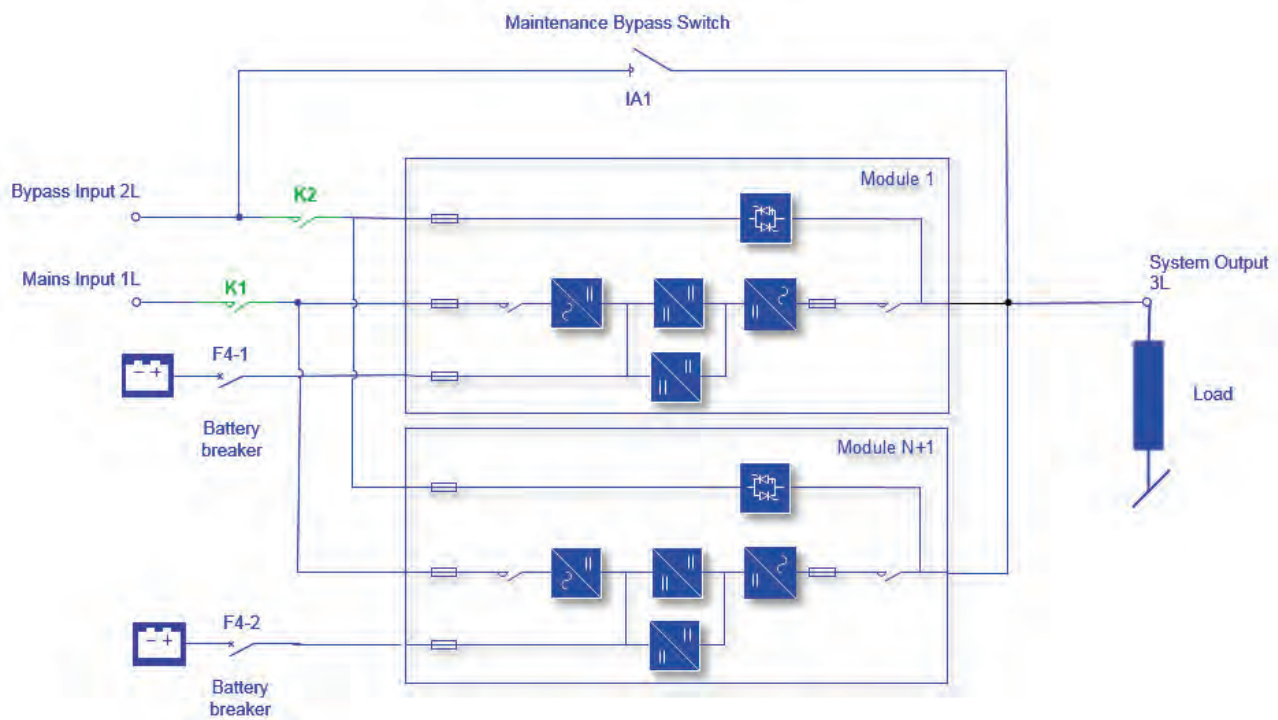


Fig 3.2.1-1: Single line diagram

3.2.2 Functional description

Section	Component	Functional Description
Main input terminals		
1L1	Rectifier mains terminal, Phase 1	Provides a connection between the utility supply and the rectifier input
1L2	Rectifier mains terminal, Phase 2	
1L3	Rectifier mains terminal, Phase 3	
1N	Neutral terminal	
PE	Earth terminal	
Bypass input terminals		
2L1	Bypass Main Input Terminal, Phase 1	Provides a connection between the bypass supply and UPS bypass input
2L2	Bypass Main Input Terminal, Phase 2	
2L3	Bypass Main Input Terminal, Phase 3	
2N	Neutral terminal	
System output terminals		
3L1	System Output Terminal, Phase 1	Provides a connection between the UPS system and the load
3L2	System Output Terminal, Phase 2	
3L3	System Output Terminal, Phase 3	
3N	Neutral terminal	
PE	Earth terminal	

Battery terminals

+,N,-	Battery Terminal	Provides a connection between the external battery and the UPS
-------	------------------	--

Battery circuit breaker

FX-1	Battery circuit breaker Module 1	Battery overcurrent protective device (MCB). Each power module has a battery breaker
FX-2	Battery circuit breaker Module 2	
FX-3	Battery circuit breaker Module 3	
FX-4	Battery circuit breaker Module 4	
FX-5	Battery circuit breaker Module 5	
FX-6	Battery circuit breaker Module 6	
FX-7	Battery circuit breaker Module 7	
FX-8	Battery circuit breaker Module 8	
FX-9	Battery circuit breaker Module 9	
FX-10	Battery circuit breaker Module 10	

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	Power Module 1	The power module has a rated power of 10kW or 20kW. It has a decentralized parallel architecture (DPA) consisting of -Rectifier - DC boost converter - Inverter - Static bypass - Control logic -LCD control panel The max number of modules inside the frame, depends of the chosen cabinet.
A002	Power Module 2	
A003	Power Module 3	
A004	Power Module 4	
A005	Power Module 5	
A006	Power Module 6	
A007	Power Module 7	
A008	Power Module 8	
A009	Power Module 9	
A010	Power Module 10	

Internal battery modules

	Battery Module	Each battery module has the capacity to take up to 10 VLRA battery blocks of 12 V 7/9 Ah. Max number of battery blocks per power module is 50. The internal battery modules are only available for ST40 and ST60 UPS model
--	----------------	--

Backfeed protection

K1	Mains backfeed contactor (option)	Prevents the occurrence of any hazardous voltage at the rectifier mains terminal in the event of an AC failure due to backfeed from the rectifier modules powered by the battery
K2	Bypass backfeed contactor (option)	Prevents the occurrence of any hazardous voltage at the bypass input terminal in the event of an AC failure due to backfeed from the inverter modules powered by the battery

3.2.3 Control and monitoring

Section	Component	Functional Description
Customer interface		
X1	Customer input dry ports	Up to 5 input dry contacts used for remote shut down and generator operation facilities, battery temperature sensor or customer function
X2	Customer output dry ports	Up to 5 output dry contacts used for signaling UPS status (eg, mains failure, load on inverter, battery low, common alarm, etc.)
JD1	RS232 Smart Port Computer Interface	RS-232 serial port to monitor the UPS using the Wavemon software
USB	Computer Interface	USB port to monitor the UPS using the Wavemon software
SLOT1	Modem	Optional slot for modem/Ethernet card
SLOT2	SNMP	Optional slot for SNMP card
Parallel interface (optional)		
JD8	Parallel Interface	The parallel interface is used to connect up to 4 UPS frames in parallel (max number of modules: 20)
SW1-6	Multi cabinet configuration switch	Determine the “position of the cabinet” in a multi-cabinet chain
X1	Sync input	Allows to synchronize the output of a UPS system (single UPS or parallel system) with another UPS system, another electrical equipment (AC) or an external grid.
X2	External manual bypass / External output breaker input	Auxiliary signals from external manual bypass switch and external output breaker providing information of the status (open/closed) for parallel system configuration

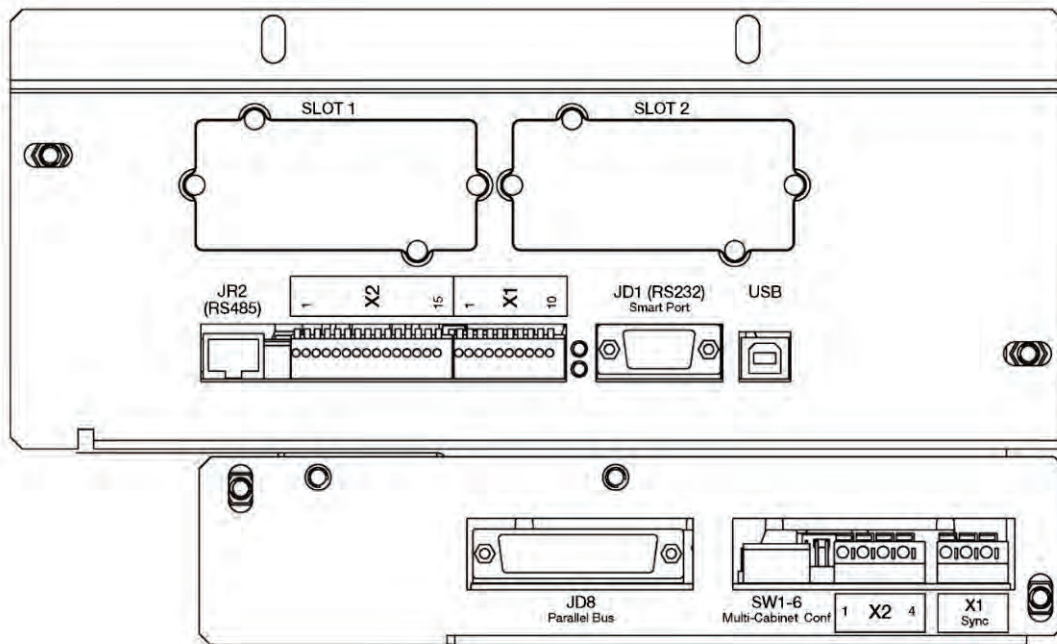


Fig 3.2.3-1: Customer and Parallel interfaces

3.3 Multi cabinet configuration

The DPA UPScale ST S2 may be paralleled to increase the power capacity up to 400 kW in steps of 10 or 20 kW. A maximum of 20 modules can be paralleled. The following system configurations are available:

DPA UPScale S2	ST40	ST60	ST80	ST120	ST200
Number of modules per frame	2	3	4	6	10
Parallel frames per system	4	4	4	3	2
Max number of modules per system	8	12	16	18	20
Max. total system capacity w/o redundancy	160 kW	240 kW	320 kW	360 kW	400 kW

The multiple cabinet systems are delivered with:

	UPS A	UPS B	UPS C
System graphical display	●	-	-
Parallel interface	●	●	●
Parallel cable	●	●	-

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

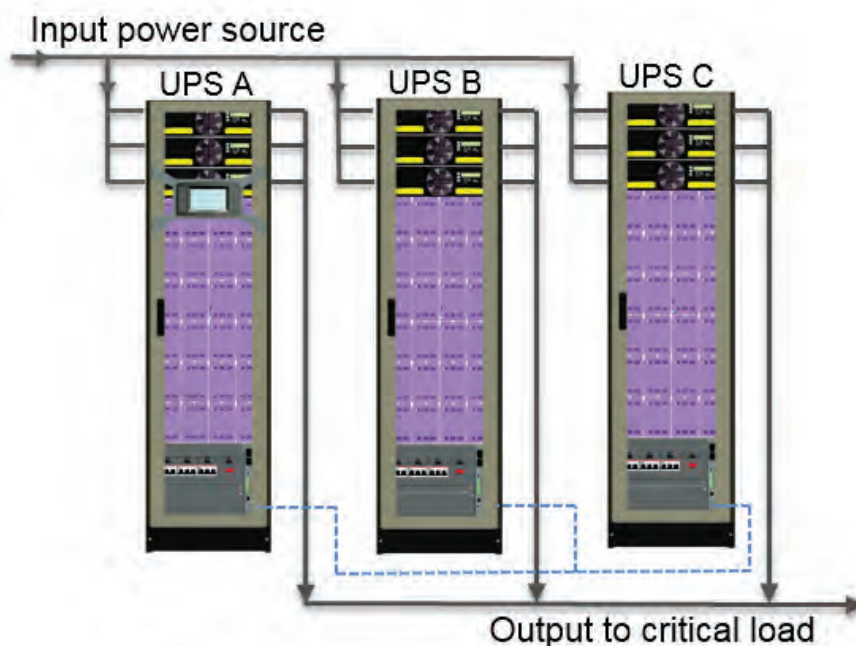


Fig 3.3-1: Multi cabinet configuration

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 protects the load from any utility main disturbance or failure.

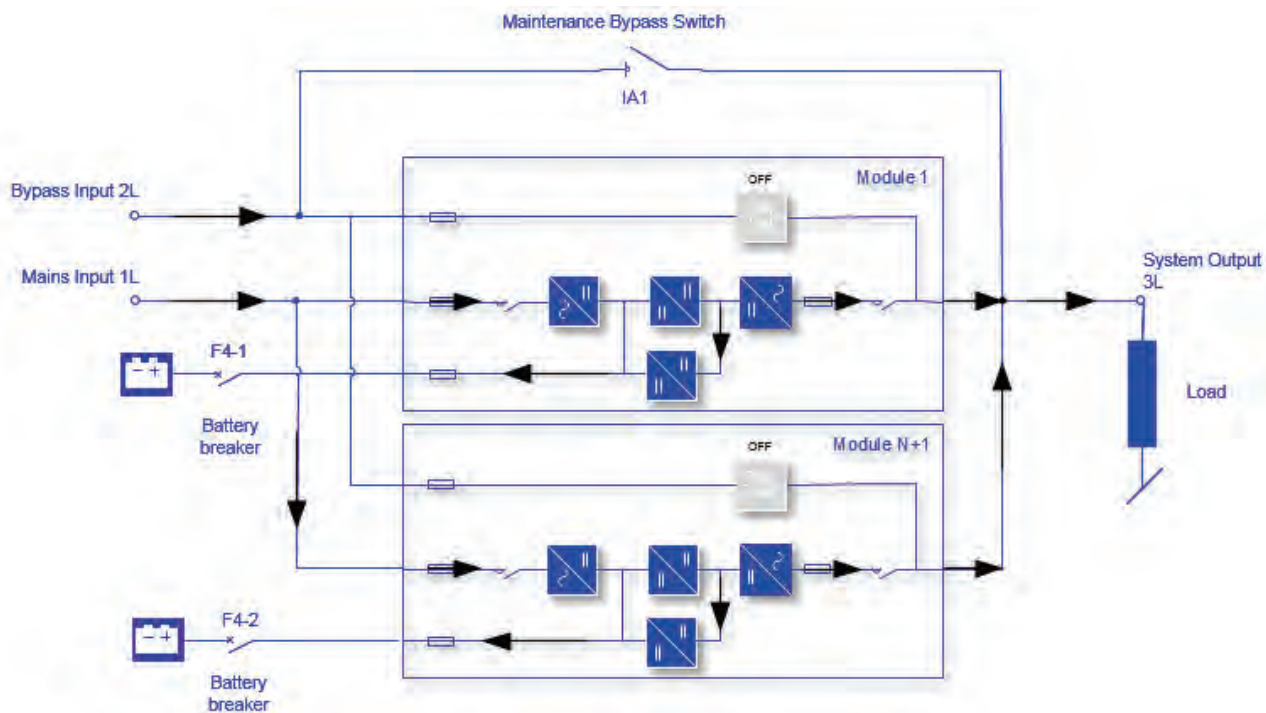


Fig 3.4.1-1: "ON LINE" operating mode

The on-line mode status is shown in the mimic of control panel per module as follows:

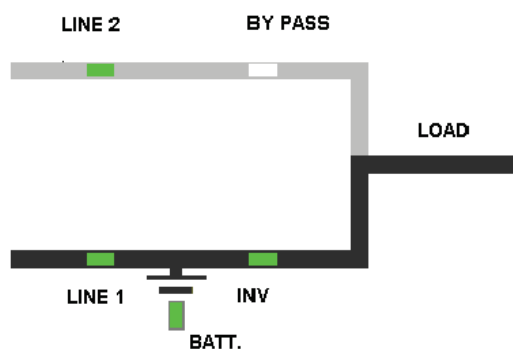


Fig 3.4.1-2: "ON LINE" control panel mimic

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

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 s).

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 (BYPASS). The Inverter is OFF.

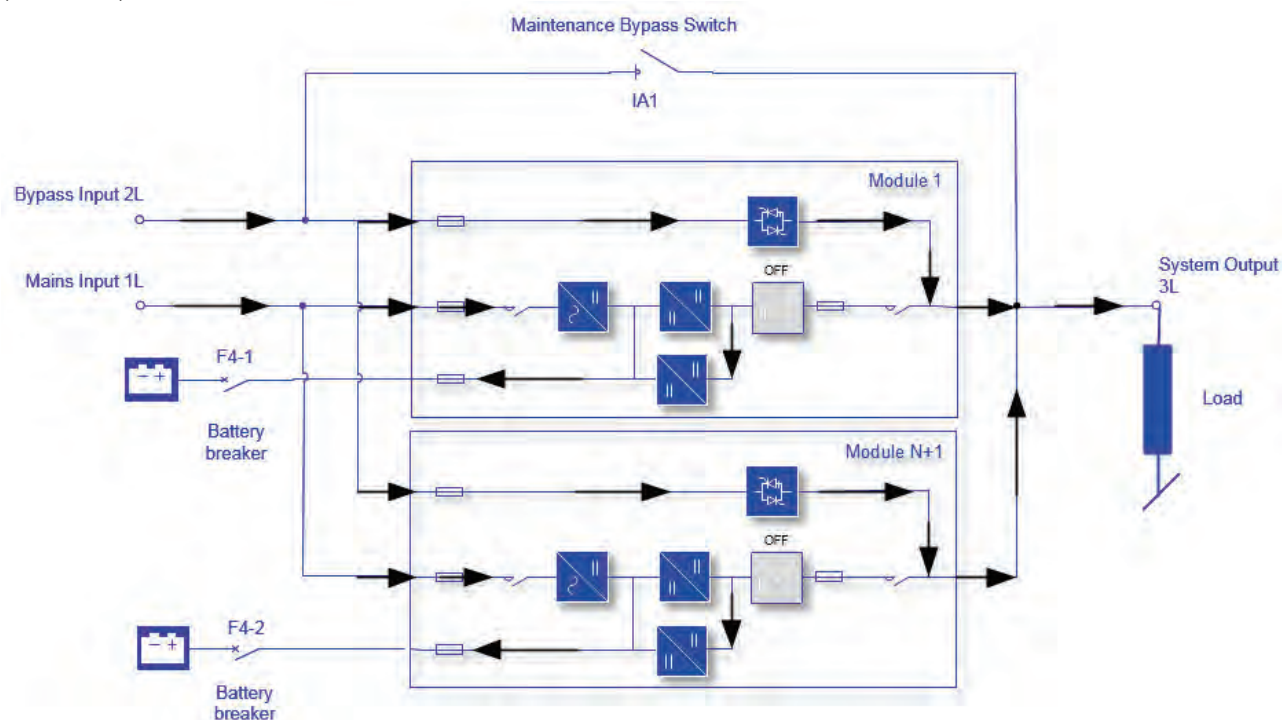


Fig 3.4.2-1: "OFF LINE" operating mode

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

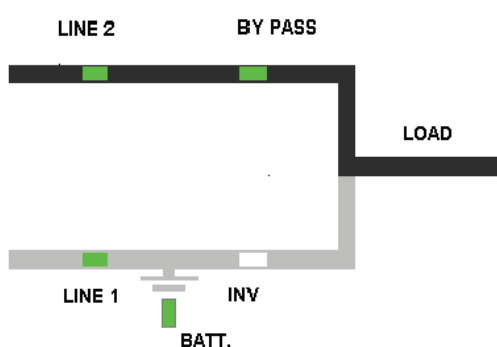



Fig 3.4.2-2: "OFF LINE" control panel mimic

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

In off-line mode, the battery charger remains active. In the event of a bypass mains (LINE 2) failure, the load will be automatically transferred from mains to inverter within 5 ms (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.

Bypass mode is recommended only if the loads can tolerate interruptions of 3-5 ms (transfer time from bypass mode to on-line mode)



NOTE!

TO OBTAIN THE BEST POWER SECURITY, IT IS RECOMMENDED TO RUN THE UPS ON NORMAL OPERATION MODE, IE, UPS MODE (MODE "ON-LINE")

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)

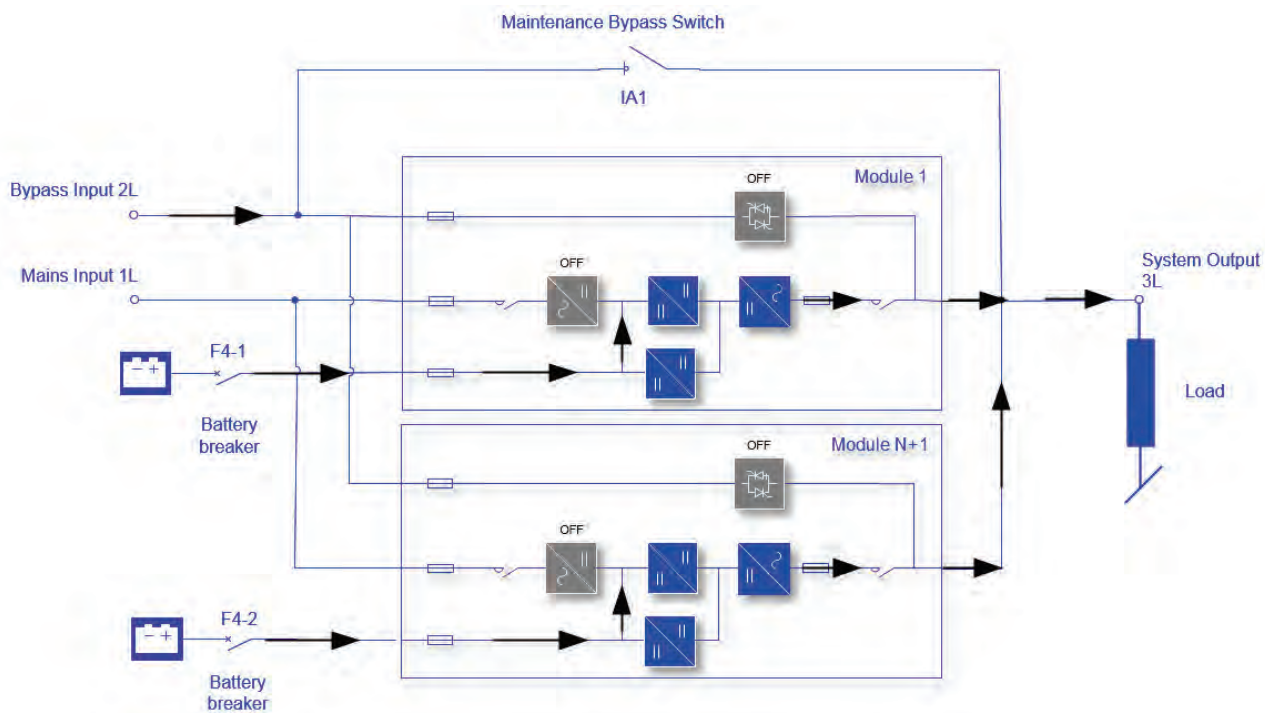


Fig 3.4.3-1: “ON BATTERY” operating mode

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

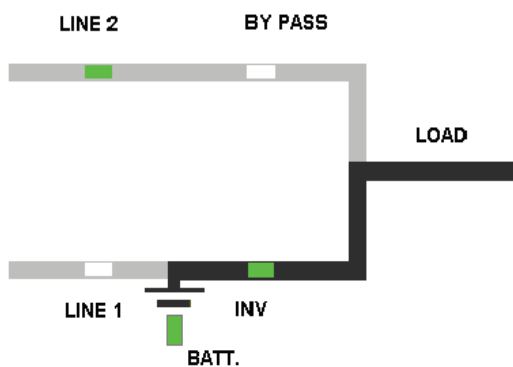


Fig 3.4.3-2: “ON BATTERY” control panel mimic

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 achieved using 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)

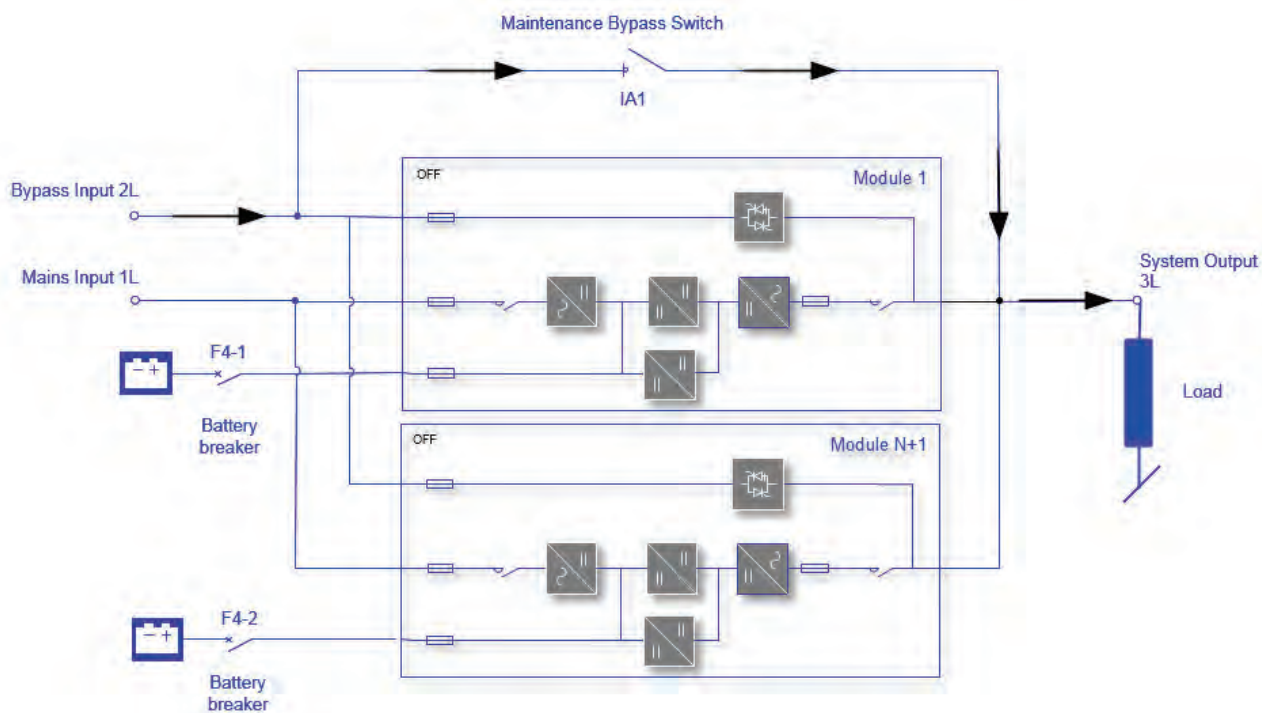


Fig 3.4.4-1: "Maintenance bypass" operating mode



IN OPERATION MODE "MANUAL BYPASS," THE LOAD IS NOT PROTECTED AGAINST ANY MAINS FAILURES OR MAINS DISTURBANCES.

NOTE!

4 Packing, transportation & storage

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

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

TRANSPORT:

UPS CABINETS AND/OR BATTERY CABINETS 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 THE CABINETS MAY TIP OVER.

POTENTIAL DANGERS:

- TILTING THE CABINET MIGHT DAMAGE THE SYSTEM AND THEREFORE IT SHOULD NOT BE CONNECTED TO THE MAINS.
- IF IT TIPS, THE WEIGHT OF THE UPS COULD CAUSE SERIOUS INJURIES TO PERSONS OR DAMAGE TO EQUIPMENT IN THE VICINITY.



NOTE!

STORAGE:

- THE UPS SHOULD BE STORED IN THE ORIGINAL PACKING AND SHIPPING CARTON.
- THE RECOMMENDED STORING TEMPERATURE FOR THE UPS AND BATTERIES IS BETWEEN +20°C AND +25°C.
- THE UPS AND THE BATTERY SETS MUST BE PROTECTED FROM HUMIDITY > 95% (NON-CONDENSING).

4.1 Packing & transportation

Usage policy of ABB packing solutions for the UPS:

Transport type	Standard package (Film)	Sea freight light package (Cardboard box)	Sea freight cases (wooden box)
Sea freight	DO NOT USE¹⁾	MANDATORY	Optional
Air freight	Standard	Optional	Optional
Transportation on well-developed roads without transshipment	Standard	Optional	Optional
Transportation on well-developed roads with transshipment	DO NOT USE¹⁾	MANDATORY	Optional
Transportation on rough roads or trains	DO NOT USE¹⁾	DO NOT USE¹⁾	MANDATORY

¹⁾ If inappropriate packaging is the cause of damages, ABB reserves the right to cancel the warranty.

The UPS and accessories are delivered on a specially designed pallet that is easy to move with a forklift or a pallet jack. Always keep the UPS in an upright position and do not drop the equipment. Do not stack the pallets (because of the high-energy batteries involved and their heavy weight.)

Before transporting, check surface loading capability and use an adequate forklift to move the equipment to the final position.

For specific weights, refer to the technical data sheet.

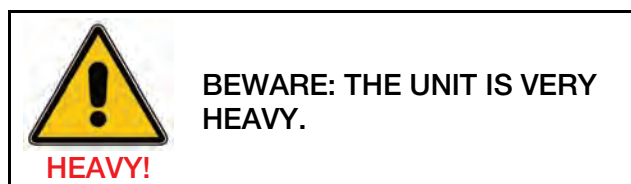


Fig 4.1-1: Forklift for transportation


4.2 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 4.2-1) are placed on two sides of the packed unit, in a visible position. They should both be intact and not colored red. If tipping has occurred, the white arrow becomes red, as shown in Figure 4.2-1 below.

In case of a damaged unit(s) or even only suspicion of damage (TiltWatch is red) inform immediately:

- The carrier
- The manufacturer



NOTE!

VISIBLE TRANSPORT DAMAGE MUST BE REPORTED TO THE CARRIER IMMEDIATELY AFTER RECEIPT. OTHER CLAIMS FOR SHIPPING DAMAGE MUST ALSO BE FILED IMMEDIATELY AND THE CARRIER MUST BE INFORMED WITHIN SEVEN DAYS OF RECEIPT OF THE EQUIPMENT. THE PACKING MATERIALS SHOULD BE STORED FOR FURTHER INVESTIGATION.



Fig 4.2-1: Tiltwatch

4.2.1 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 cardboard underneath (on one edge).
2. Remove the four cardboard edges carefully, while paying attention that the accessory box placed on top of the UPS does not fall. Carefully lower the accessory box with the help of a stool or ladder. The standard contents of the accessory box is: user manual, 2x painted sockets, screws, 4x feet and keys.
3. Remove the bubble film (remove the smaller pieces by hand).
4. Remove pallet from the UPS.

Open the UPS door and make sure that all the UPS modules are fitted appropriately in their UPS compartment. If the UPS has been supplied without a UPS module, make sure that the empty UPS compartment is correctly covered with the UPS compartment protective cover.

4.2.2 Sea freight light package (cardboard box)

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

1. Cut the two green straps that lock down the cardboard box. Remove the 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 then remove them from the unit.
3. While paying close attention and without damaging the cabinet, unwrap the plastic film and remove, by pulling up, the upper part of the bag that covers the unit. Note that 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 in case the unit has to be shipped back.



Fig 4.2.2-1: Sea freight light package unpacking sequence

4.2.3 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, taking care not to damage the cabinet; the edges are not protected.
3. Remove the accessories from their location. The standard set of accessories is: user manual, 2x painted sockets, screws, 4x feet and keys.
4. Tear out the 2x humidity absorbers. One is inside the front part of the UPS: open the door using the keys to remove the absorber. The second absorber is at the back.

1)



2)



Fig 4.2.3-1: Sea freight cases unpacking sequence (Wooden box)

4.3 Storage

4.3.1 UPS

If you plan to store the UPS prior to use, keep it packed in a dry, clean and cool storage room with an ambient temperature between -25°C to +70°C and humidity below 95% non-condensing. If the packing container is removed, protect the UPS from dust.



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

NOTE!

4.3.2 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 six 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.



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

NOTE!



CAUTION: THE BATTERIES ARE HEAVY

HEAVY!



Fig 4.3.2-1: Batteries

5 Installation

5.1 Environmental condition

The UPS is designed for indoor location, in a restricted access location only and should be located as follows:

5.1.1 Climatic conditions

Ambient temperature	°C	0 to +40
Relative humidity	%	95
Conditions of condensation		no
Presence of wind-driven rain, snow, hail, etc		no
Conditions of water from sources other than rain		no
Icing conditions		no

The climate control system could be periodically switched on or off, but extremely high or low temperatures should be avoided.

5.1.2 Biological conditions

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

The location should not have a particular risk of biological attacks.

5.1.3 Mechanical active substance

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

5.1.4 Chemical active substance

The location can have a normal level of contaminants experienced in urban areas over the whole area.

5.1.5 Mechanical conditions

The UPS shall be placed in a location with no significant exposure to vibration and shock.

5.2 Environmental condition for UPS with inside battery modules

As the battery life depends on the ambient temperature, for the UPS with internal battery modules it is recommended to have a location with a climate-controlled system to maintain the conditions as follows:

5.2.1 Climatic conditions

Ambient temperature	°C	20
---------------------	----	----

5.3 UPS and battery location

The minimum clearances needed to allow proper airflow around the UPS, and to allow proper service and maintenance, must be observed. They are detailed below:

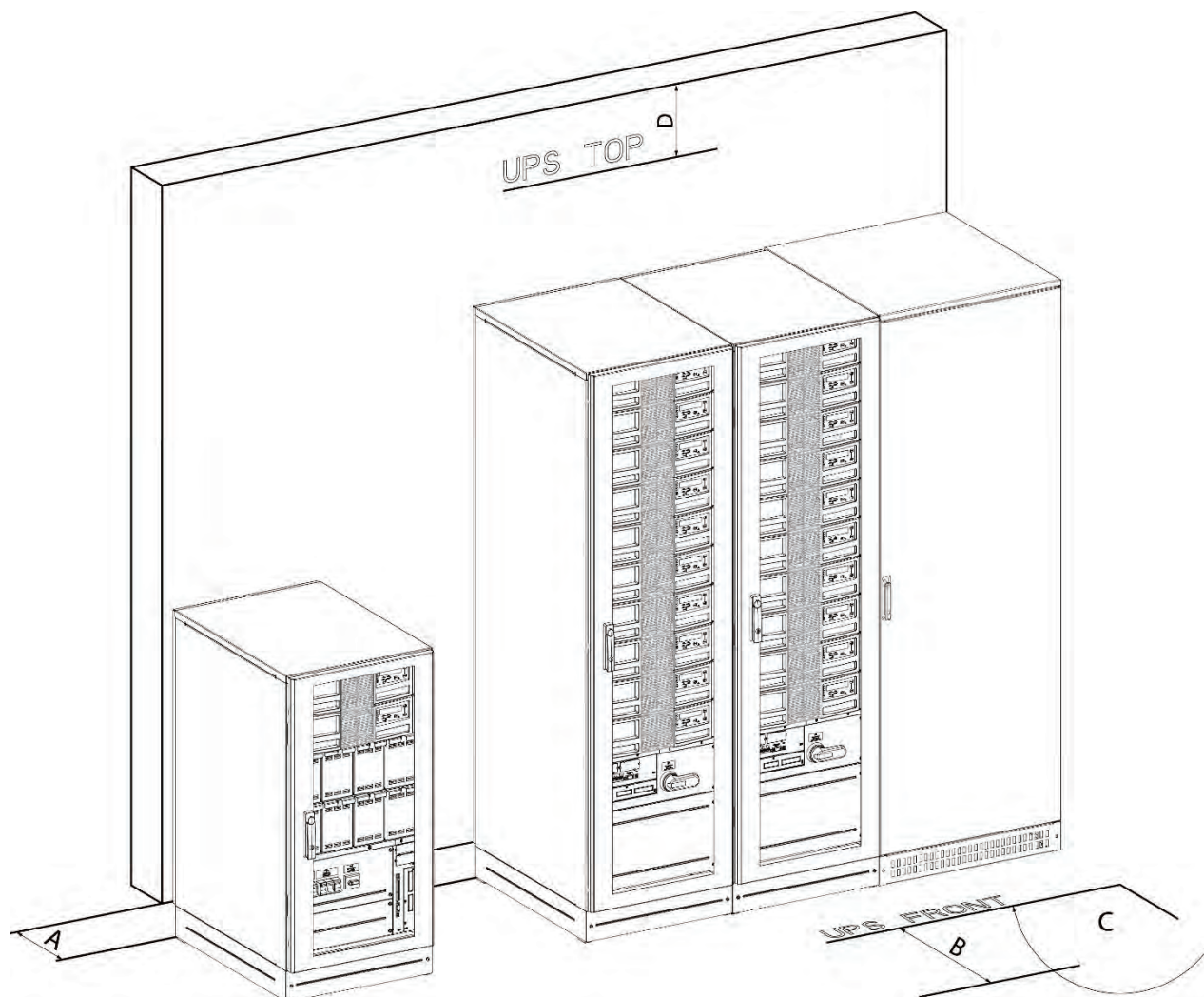


Fig 5.3-1: UPS and battery location (Clearances)

<i>DPA UPScale S2 Cabinets</i>		<i>ST40, ST60, ST80, ST120</i>	<i>ST200</i>	<i>UPS + battery cabinets in row.</i>
A	Back clearance for ventilation (forced air outlet)	200 mm	300 mm	
B	Front clearance needed to allow a correct door opening	1000 mm		
C	Maximum door opening angle	115°		
D	Top Clearance (Top clearance is only needed if there is no side clearance)	400 mm		

5.4 UPS connections

The customer has to supply the wiring to connect the UPS to the local power source (see chapter 5.7). 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 qualified service personnel, such as a licensed service engineer from the manufacturer or from an agent certified by the manufacturer.



THE INSTRUCTIONS IN THIS USER MANUAL HAVE TO BE FOLLOWED ALWAYS IN ORDER TO AVOID INJURIES FROM ELECTRICAL SHOCK.

WARNING!



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

DO NOT OPERATE IF WATER OR MOISTURE IS PRESENT.

BY OPENING OR REMOVING THE UPS COVERS YOU RUN THE 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.

WARNING!

To ensure correct operation of the UPS and its ancillary equipment, it is necessary to provide the mains cables with appropriate fuse protection. See chapter 5.7.1.

The UPS unit has the following power connections:

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

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

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

External Battery : **Plus (+), Common (N), Minus (-)** and protective earth (PE)
connection for the *external batteries*

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 a 4-pole switch for another reason, you have to be aware that, when open, the system - UPS and all downstream equipment - are floating against the PE.

i
IMPORTANT NOTE

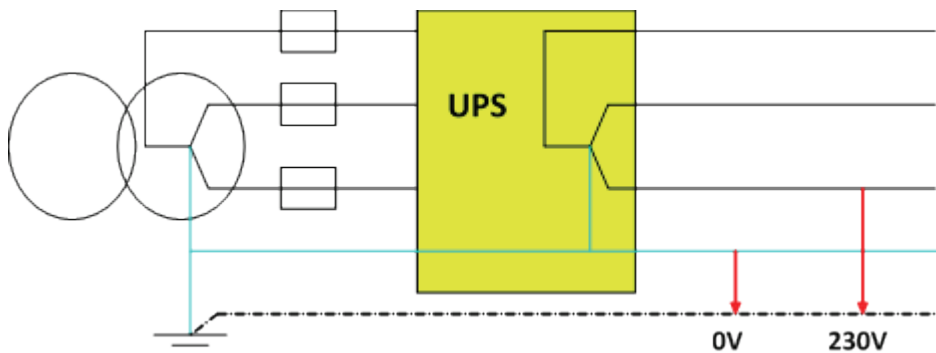


Fig 5.4-1: Input neutral

5.4.1 Input connections



NOTE

BEFORE PROCEEDING READ THE CHAPTER ELECTRICAL INSTALLATION (CHAPTER 5.4) AND ENSURE BEFORE STARTING CONNECTING THE CABLE TO THE UPS THAT:



NOTE!

TO ENSURE CORRECT OPERATION OF THE UPS, THE VOLTAGE TOTAL HARMONIC DISTORTION (THDU) OF THE MAINS SHALL NOT EXCEED THE 75% ACCORDING TO THE LEVELS OF THE STANDARD IEC 61000-2-2. IN CASE OF EXCEEDING THE INDICATED VALUES, PLEASE CONTACT THE MANUFACTURER

- Mains voltage (INPUT VOLTS) and frequency (FREQUENCY) correspond to the values indicated on the ups nameplate.
- Earth connection is performed in accordance with the prescribed IEC Standards or with local regulations.
- The 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 chapter 5.7.1 or in accordance with the prescribed IEC standards or with the local regulations.

The input of the UPS must be fitted with circuit breakers or some 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.

5.4.1.1 Mains supply and earth connection

To ensure protection of 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
- The UPS is shut down and voltage-free
- The UPS module is fitted in its correct position
- Maintenance bypass IA1 is open and in the OFF position
- The UPS terminal cover is removed
- First connect the earthing wire coming from the low-voltage distribution board to the terminal "PE"
- Connect the input power cable coming from the low-voltage distribution board to the terminals of the UPS, as shown in chapter 5.7.1
- Keep the phase rotation in a clockwise sense



NOTE

INPUT NEUTRAL IS REQUIRED TO OPERATE THE RECTIFIER

Under the connection terminal of the UPS there is a cable-fixing rail to facilitate the proper fastening of the cables.

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).

5.4.1.2 Single input feed

To achieve correct input cabling refer to chapter 5.7.1. For single input feed, connect the mains input cable to the UPS terminal block according to the following table:

MAINS INPUT CABLE	UPS TERMINAL
Phase L1	1L1
Phase L2	1L2
Phase L3	1L3
NEUTRAL	1N
EARTH	PE

For minimum recommended input cable sections and fuse ratings refer to chapter 5.7.1.

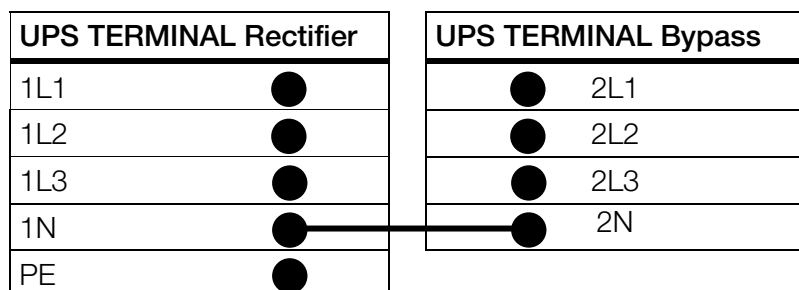
Under the connection terminal of the UPS there is a cable-fixing rail to facilitate the proper fastening of the cables.

5.4.1.3 Dual input feed

To achieve correct input cabling, please refer to chapter 5.7.1.

NOTE: The UPS is supplied (in the standard version) with facilities for a single cable feed (for rectifier and bypass).

If dual feed is required, unscrew the terminal bridges between (L1, L2, L3, only).



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

MAINS INPUT CABLE	UPS TERMINAL Rectifier
Phase L1	1L1
Phase L2	1L2
Phase L3	1L3
NEUTRAL	1N
EARTH	PE

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

For minimum recommended input cable sections and fuse ratings refer to chapter 5.7.1. Under the UPS connection terminal there is a cable-fixing rail to facilitate the proper fastening of the cables.

5.4.2 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 front side” of the UPS modules) the side is equal to or larger than the total load requirements.

The output of the UPS must be fitted with circuit breakers or some other kind of protection. These circuit breakers should 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 breaker will enable the protection of each load separately and shall isolate all poles.

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

The circuit breakers must comply with the prescribed IEC 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 fuse ratings or in accordance with the prescribed IEC standards or with the local regulations.

Under the connection terminal of the UPS there is a cable-fixing rail to facilitate the proper fastening of the cables.

Ensure that the earthing is performed in accordance with the prescribed IEC standards or with the local regulations.

5.4.2.1 Load connection

To ensure protection of 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:

- The UPS module is fitted in its correct position
- The maintenance bypass is in the OFF position
- The terminal cover of the UPS is removed

The output power cable coming from the LV distribution board is connected to the terminals of the UPS.

5.5 Internal batteries

5.5.1 Internal battery modules DPA UPScale ST S2 40

There is space for up to 80x 7/9Ah internal batteries in the **DPA UPScale ST S2 40 FRAME**. Different battery and system configurations are shown in the drawing below.

NOTE:

For DPA UPScale M-10 kW UPS systems, it is permissible to use 20-50 (only even numbers) 12 V battery blocks depending the power sourced on the output

For DPA UPScale M-20 kW UPS systems, it is permissible to use 30-50 (only even numbers) 12 V battery blocks depending the power sourced on the output

IMPORTANT:

For maximum battery autonomies with the corresponding output power range and number of battery blocks per string, refer to the “battery characteristics” chapter in the technical data sheet.

NOTE: Set up the correct number of battery blocks in the control panel (menu: Service-Set-Up).

DPA UPScale ST S2 40

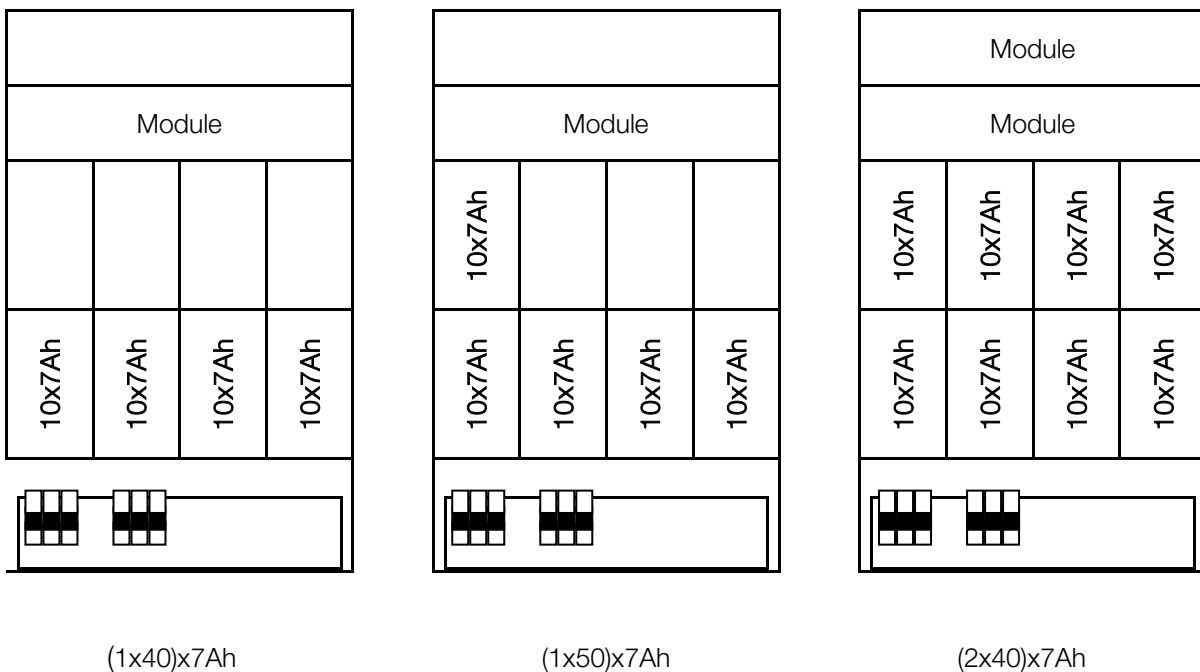


Fig 5.5.1-1: Internal Battery Modules DPA UPScale ST S2 40

Other combinations are possible - refer to the technical data sheet.

5.5.2 Internal battery modules DPA UPScale ST S2 60

There is space for up to 240 x 7/9Ah internal batteries in the DPA UPScale ST S2 60 frame. Different battery and system configurations are shown in the drawing below.

NOTE:

For DPA UPScale M-10 kW UPS systems, it is permissible to use 20-50 (only even numbers) 12 V battery blocks depending the power sourced on the output.

For DPA UPScale M-20 kW UPS systems, it is permissible to use 30-50 (only even numbers) 12 V battery blocks depending the power sourced on the output.

(For more information refer to chapter 6 of the technical data sheet).

IMPORTANT:

For maximum battery autonomies with the corresponding output power range and number of battery blocks per string, refer to the “battery characteristics” chapter in the technical data sheet.

NOTE:

Set up the correct number of battery blocks in the control panel (menu: Service-Set-Up).

DPA UPScale ST S2 60 FRAME

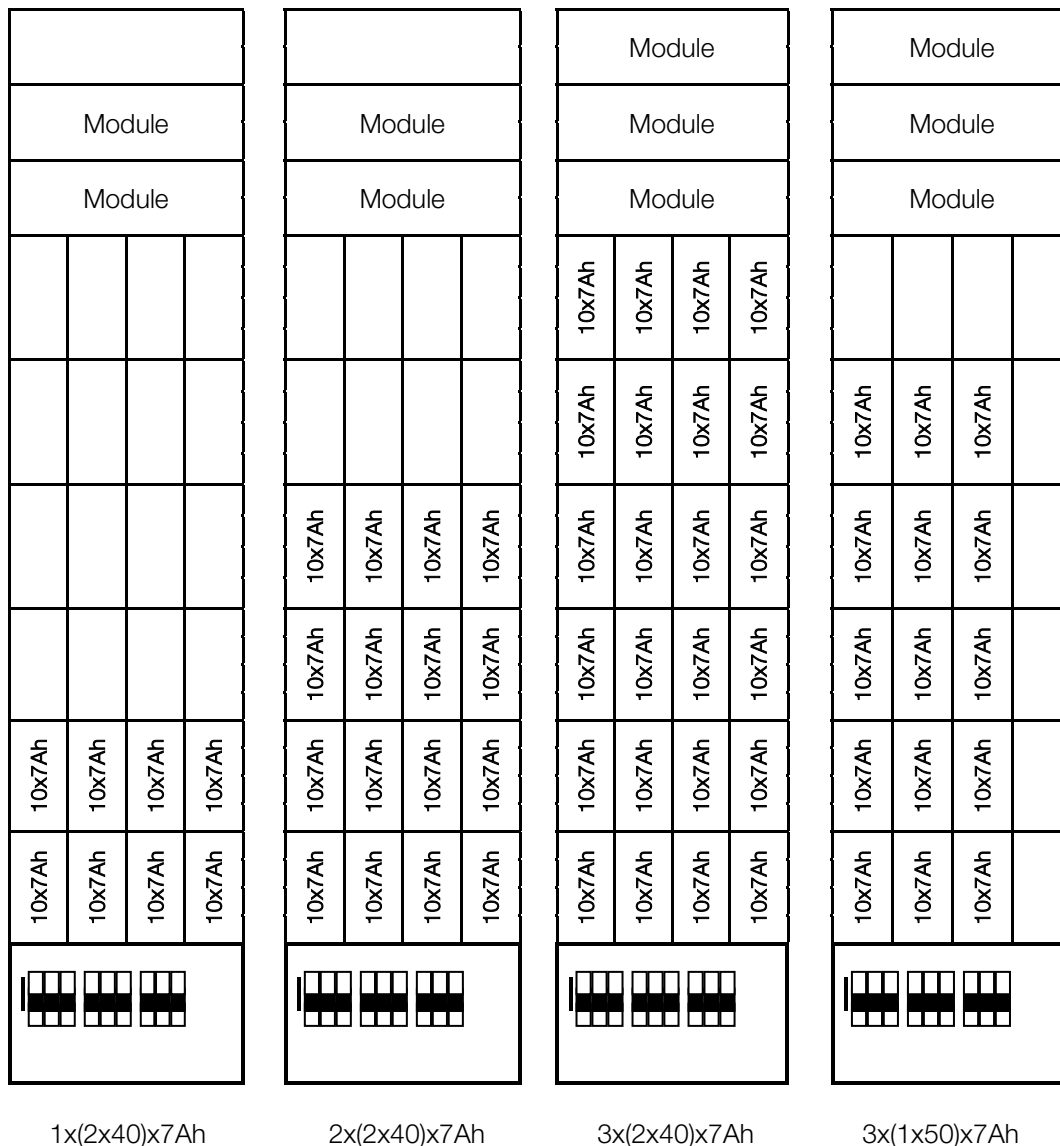


Fig 5.5.2-1: Internal Battery Modules DPA UPScale ST S2 60

Other combinations are possible - refer to the technical data sheet.

5.6 External batteries



WARNING!

KEEP AWAY FROM BATTERY POLES AS THESE CARRY DANGEROUS DC VOLTAGES THAT CAN CAUSE FATAL ACCIDENTS.

NOTE:

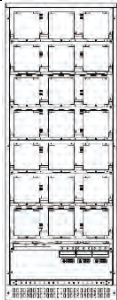
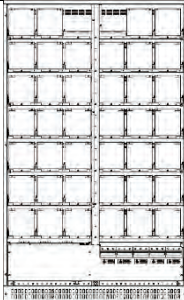
MANIPULATION OF THE BATTERY SYSTEM SHOULD ONLY BE PERFORMED BY TRAINED SERVICE AND MAINTENANCE PERSONNEL FROM THE MANUFACTURER OR HIS CERTIFIED SERVICE PARTNERS. INAPPROPRIATE MANIPULATIONS OF THE BATTERIES CAN CAUSE SPARKS. WHILE WORKING ON BATTERY SYSTEMS IT IS MANDATORY TO WEAR PROTECTIVE GLASSES

5.6.1 External battery configuration

In the DPA UPScale™ ST 80, ST 120 and ST 200 UPS cabinets there is no space provided for batteries.

There are two external matching battery cabinets available:

- CBAT UPScale -120 for Separate or Common battery configurations of 24Ah or 28Ah blocks (max. 120 Blocks)
- CBAT UPScale-200 for Separate or Common battery configurations for 24Ah or 28Ah blocks (max. 200 Blocks)

S-type = For Separate. Battery C-type = For Common. Battery		CBAT-UPSscale-120 S-type or C-type	CBAT-UPSscale-200 S-type or C-type
Battery frames			
Configuration accommodates:	Max.	<i>120 Batt. block x 24Ah/28Ah on 8 shelf 3x5=15 blocks/shelf</i>	<i>200 Batt. blocks x 24Ah/28Ah on 7 shelf 6x5=30 blocks/shelf</i>
Battery fuses / Max. Batt. Strings : Terminals :	S-type	<i>9 / 3 (Terminal 9 x 16/25mm²)</i>	<i>15 / 5 (Terminal 15 x 16/25mm²)</i>
Battery fuses / Max. Batt. Strings Terminals :	C-type	<i>9 / 3 + Com. Connection Bar 3 x (2xM8) +PE 2xM8</i>	<i>15 / 5 + Com. Connection Bar 3 x (2xM10) +PE 2xM10</i>
Fuse Type (Very Fast acting)	A	<i>3x100 A</i>	<i>5x100A</i>
Dimensions (WxHxD)	mm	<i>730x1975x800</i>	<i>1200x1975x800</i>
Weight with trays and w/o batteries	kg	<i>290</i>	<i>410</i>

For detailed information on, and layout of, the battery cabinets please refer to the “external battery cabinets” chapter in the technical data sheet.

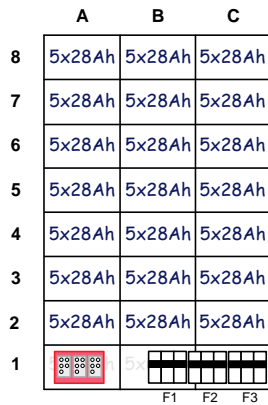
NOTE: For UPS-Systems DPA UPScale M-10kW, M-20kW it is permissible to use 40-50 (only even numbers) of 12V-battery blocks.

For UPS-System UPScale M-20kW use only 48-50 (only even numbers) of 12V-battery blocks.

NOTE: Set-up the correct number of battery blocks on control panel (menu: service-set-up).

Frame: DPA UPScale ST S2 80 or ST 120 frames with Modules M 10 or M 20

CBAT UPScale-120

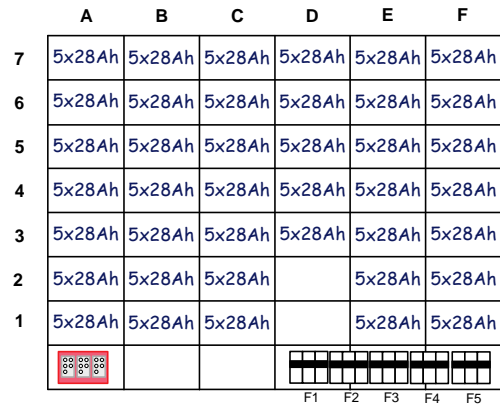


Battery Cabinet 120

(3x40)x28Ah

*Fig 5.6.1-1: External battery configuration
CBAT UPScale-120*

CBAT UPScale-200



Battery Cabinet 200

(5x40)x28Ah

*Fig 5.6.1-2: External battery configuration
CBAT UPScale-200*

		CBAT UPSCALE-120	CBAT UPSCALE-200
Dimensions (WxHxD)	mm	730x1975x800	1200x1975x800
Weight with trays and w/o batteries	kg	290	410

For detailed information on, and layout of, the battery cabinets, please refer to the “external battery cabinets” chapter of the technical data sheet.

Examples:

On drawing “CBAT UPScale-120” (3x40)x 28 Ah battery blocks are fitted. The lower batch of 40x 24 Ah belong to the UPS 1, the middle batch of 40x 24 Ah belong to the UPS 2 and the top batch of 40x 24 Ah belong to the UPS 3.

On drawing “CBAT UPScale-200” (5x40)x 28 Ah battery blocks are fitted in the battery cabinet and each UPS module is provided with 40x 28 Ah.

Depending on the configuration requested, the batteries may be connected separately for each module or paralleled into one common battery for five UPS modules.

5.6.2 Connection of external battery cabinet for DPA UPScale™

For redundant multi-module systems, it is normally recommended to provide each UPS module with its own separate battery. In this way, the redundancy is extended to the batteries. Figures 5.6.3-1 and 5.6.4-1 show how to connect the batteries in the external battery cabinet and in the DPA UPScale frames ST 80 or ST 120.



NOTE

ALL THE OPERATIONS IN THIS MANUAL MUST BE PERFORMED BY CERTIFIED ELECTRICIANS OR BY QUALIFIED INTERNAL PERSONNEL. DO NOT OPERATE IF WATER OR MOISTURE IS PRESENT. BY OPENING OR REMOVING THE UPS COVERS YOU RUN THE RISK OF EXPOSURE TO DANGEROUS VOLTAGES!

If the five battery units are to be used as one common battery for all five UPS modules then battery links may be connected as shown below.



NOTE

TO ENSURE PROTECTION OF PERSONNEL DURING THE UPS INSTALLATION MAKE SURE THAT THE CONNECTIONS ARE PERFORMED UNDER THE FOLLOWING CONDITIONS:

- **NO MAINS VOLTAGE IS PRESENT IN THE UPS**
- **ALL THE LOADS ARE DISCONNECTED**
- **THE UPS AND THE EXTERNAL BATTERY ARE VOLTAGE-FREE**

To verify the complete shutdown of the DPA UPScale, perform the following steps:

1. Make sure that the fuses feeding the UPS in the input distribution board are all open and no power is being fed to the UPS.
2. Make sure the "MAINTENANCE BYPASS" (IA1) is open (position "OFF").
3. Make sure the battery fuses in the external battery cabinet and on the UPS are open.
4. Connect earth (**PE**) between the UPS and external battery cabinet.
5. Connect the corresponding **+**, **N**, **-** terminals between UPS and external battery cabinet, according to the drawing.

5.6.3 Connection of external separate battery for DPA UPScale™

External battery cabinet UPScale for separate batteries per module

Frame : DPA UPSCALE ST S2 120

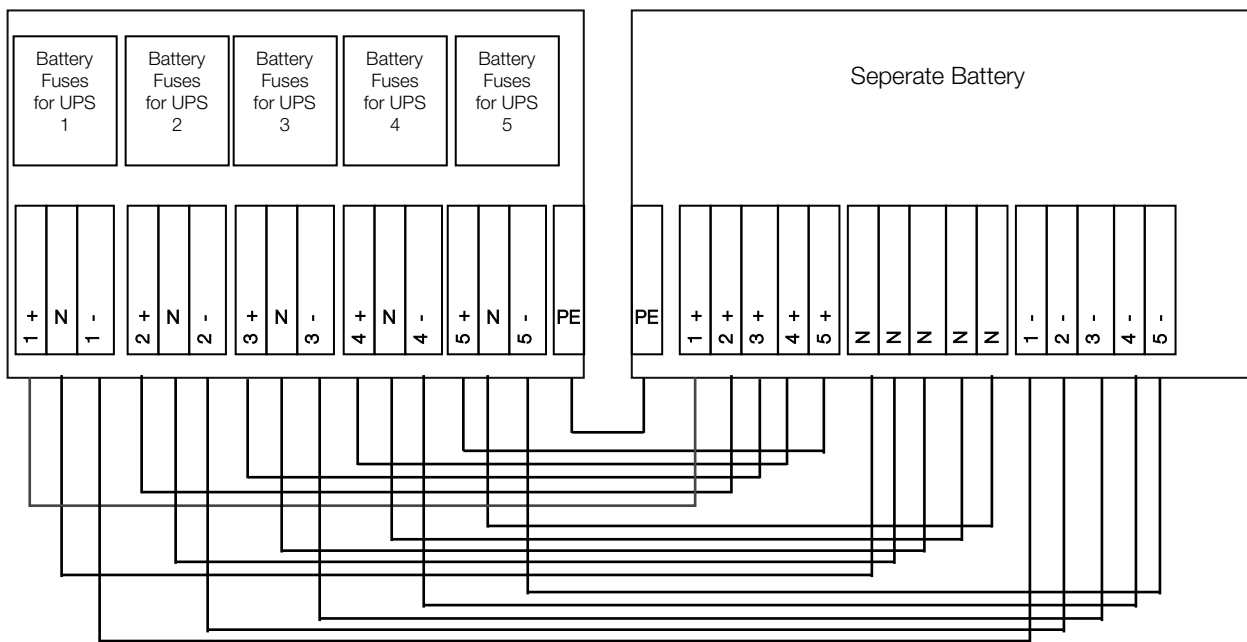


Fig 5.6.3-1: Connection of external separate batteries

5.6.4 Connection of external common battery for DPA UPScale™

External battery cabinet UPScale for common batteries

Frame : DPA UPSCALE ST S2 120

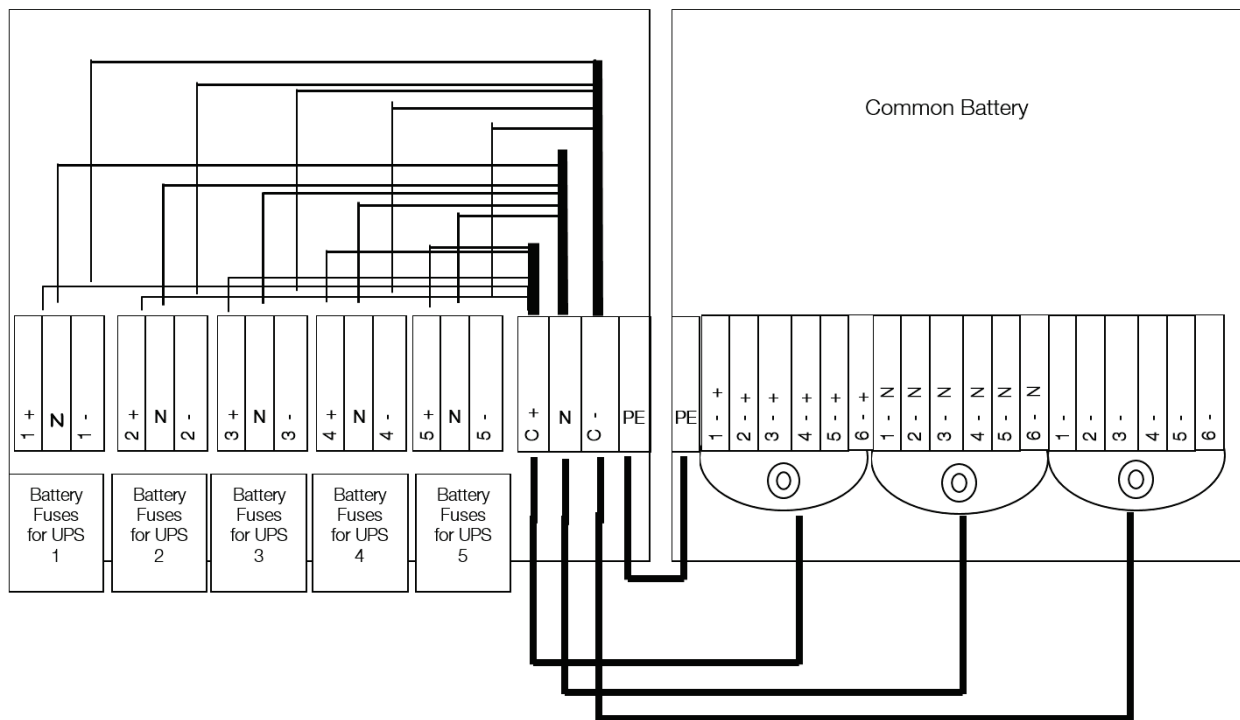


Fig 5.6.4-1: Connection of external common batteries

5.7 Electrical wiring

The customer has to 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 qualified service personnel such as a licensed service engineer from the manufacturer or from an agent certified by the manufacturer.

5.7.1 Cable sections and fuse ratings

Frame type (T) Compression type Terminals (B) Bolted Terminals	Battery earth PE	Separate battery (+ / N / -)	Common battery (+ / N / -)	Input bypass 3+N	Input rectifier 3+N+PE	Output load 3+N+PE
UPScale ST 40	NOT ALLOWED			4 x 16/25mm ² (T)	5 x 16/25mm ² (T)	
UPScale ST 60				4 x 35mm ² (T)	4 x 35mm ² (T) + PE 50mm ² (T)	
UPScale ST 80	50mm ² (T)	4x (3 x 10/16mm ²) (T)	3 x M6 (B)	3 x 50mm ² (T) + N 50mm ² (T)	3 x 50mm ² (T) + N 50mm ² (T) + PE 50 mm ² (T)	
UPScale ST 120	1xM10 (B)	6x (3 x 10/16mm ²) (T)	3 x 2xM5 (B) or 3 x M10 (B)	4 x 95mm ² (T)	4 x 95mm ² (T) + PE M10 (T)	
UPScale ST 200	1xM10 (B)	5x (3 x 35mm ²) (T) 2 modules have common battery	2 x (3 x M10) (B)	3 x M12 (B) + PE 1 x M12	4 x M12 (B) + PE 1 x M12	

5.7.2 Terminal connections

Fig 5.7.2-1: UPScale ST 40 & ST 60

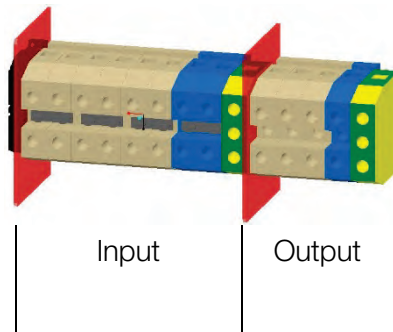


Fig 5.7.2-2: UPScale ST 80

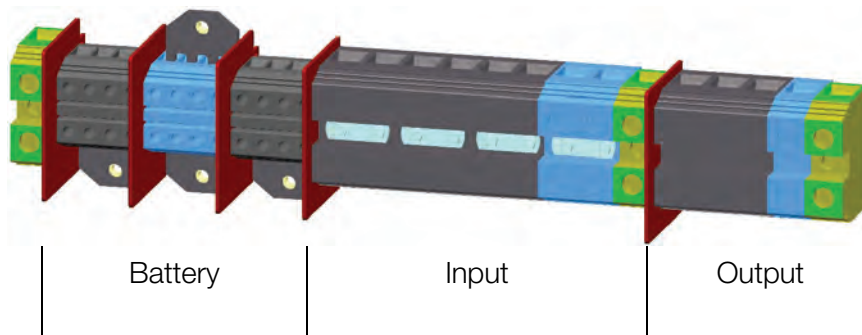


Fig 5.7.2-3: UPScale ST 120

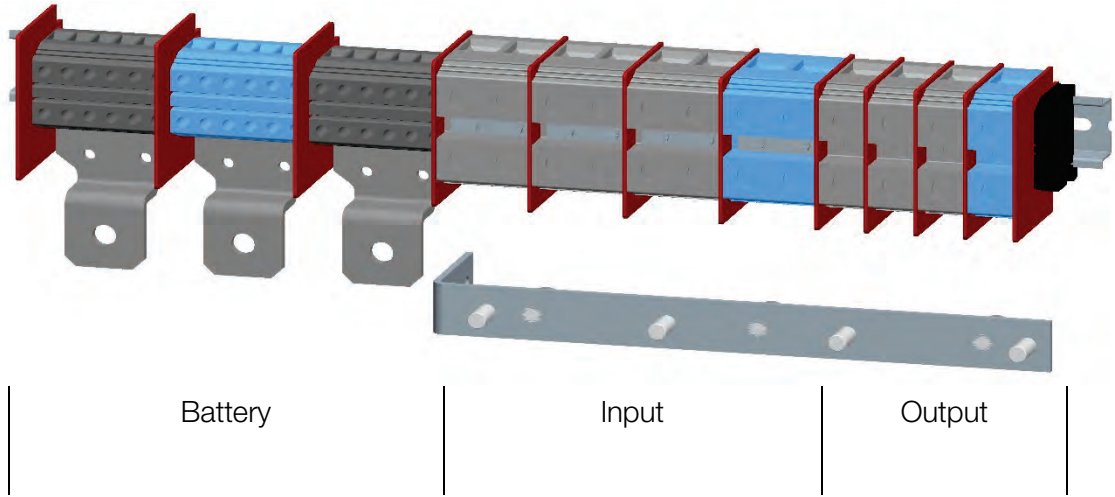
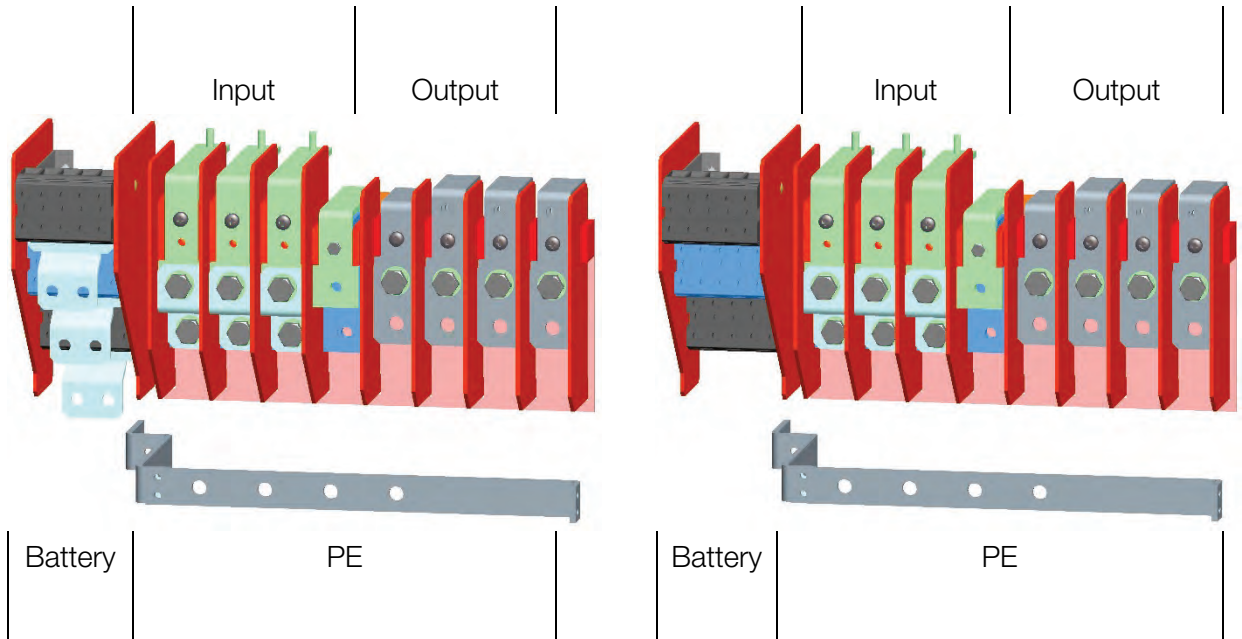


Fig 5.7.2-4: UPScale ST 200



5.7.3 Single input feed (standard version)

5.7.3.1 Block diagram

Cable sections and fuse ratings recommended. Alternatively, local standards to be respected.

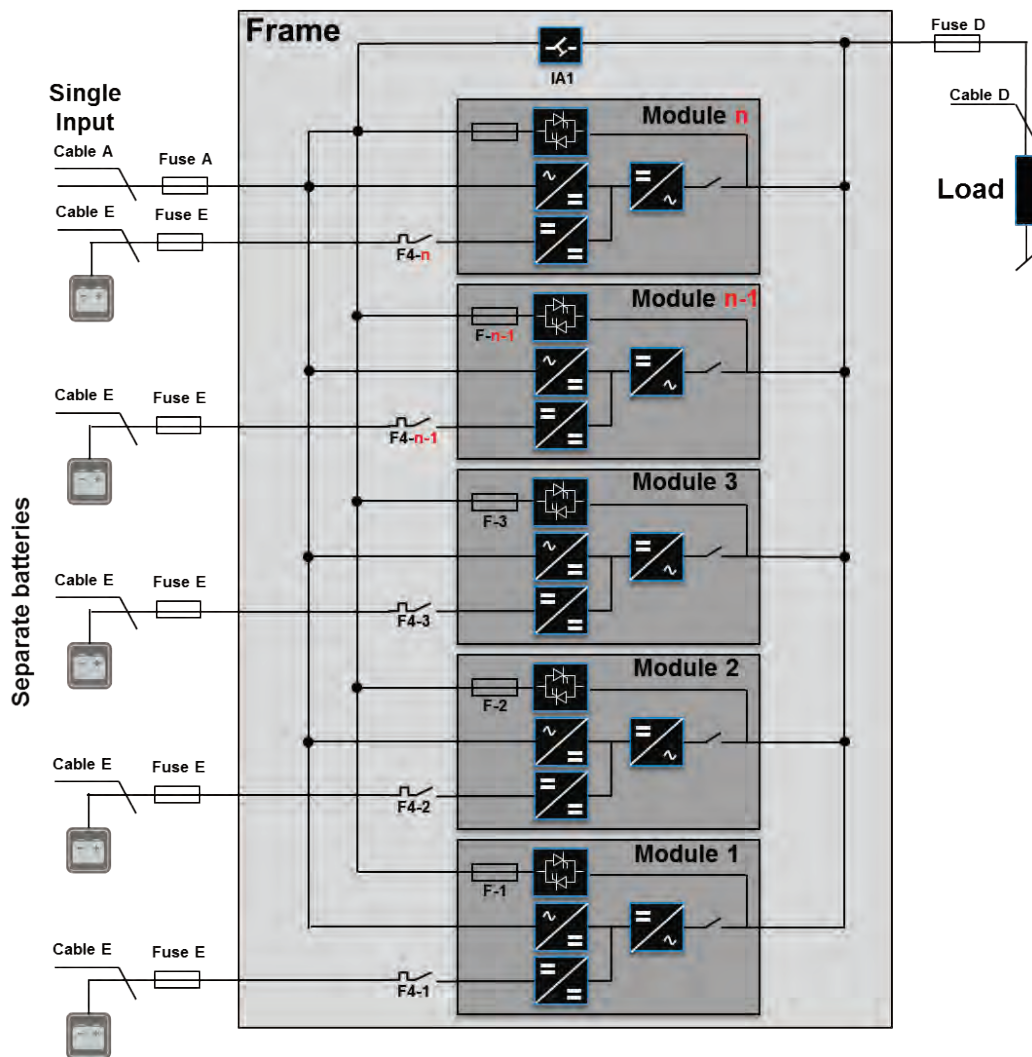


Fig 5.7.3.1-1: Single input feed block diagram

5.7.3.2 Cable sections

Frame type	Load in kW	Input 3x400V/230V			Output 3x400V/230V @ cosphi 1.0		Battery		
		Fuse A (Agl/CB)	Cable A (mm ²) (IEC 60950-1)	Max. Input Current with battery charging [A]	Cable D (mm ²) (IEC 60950-1)	I _{nom} [A]	Fuse E + / N / - (Agl/CB)	Cable E (mm ²) for CBAT UPScale 120 or 200 ONLY + / N / -	
								Com. Battery	Sep. Battery
UPSscale ST 40	40	3x80A	5x16	68 A	5x16	58 A	NOT ALLOWED		
UPSscale ST 60	60	3x125A	5x35	102 A	5x35	87 A	NOT ALLOWED		
UPSscale ST 80	80	3x160A	5x50	136 A	5x50	116 A	3x224A*1	3x95 *1	4x (3x10)
UPSscale ST120	120	3x224A	4x95+1x50 (PE)	208 A	5x70	174 A	3x300A*1	3x150 *1	6x (3x10)
UPSscale ST 200	200	3 x 350 A	5 x 185	333 A	5 x 185	290 A	3 x 450 *1	3 x (2 x 95)*1	5 x (3x25)

*1 only valid for common battery use

5.7.4 Dual input feed (optional version)

5.7.4.1 Block diagram

Cable sections and fuse ratings recommended. Alternatively, local standards to be respected

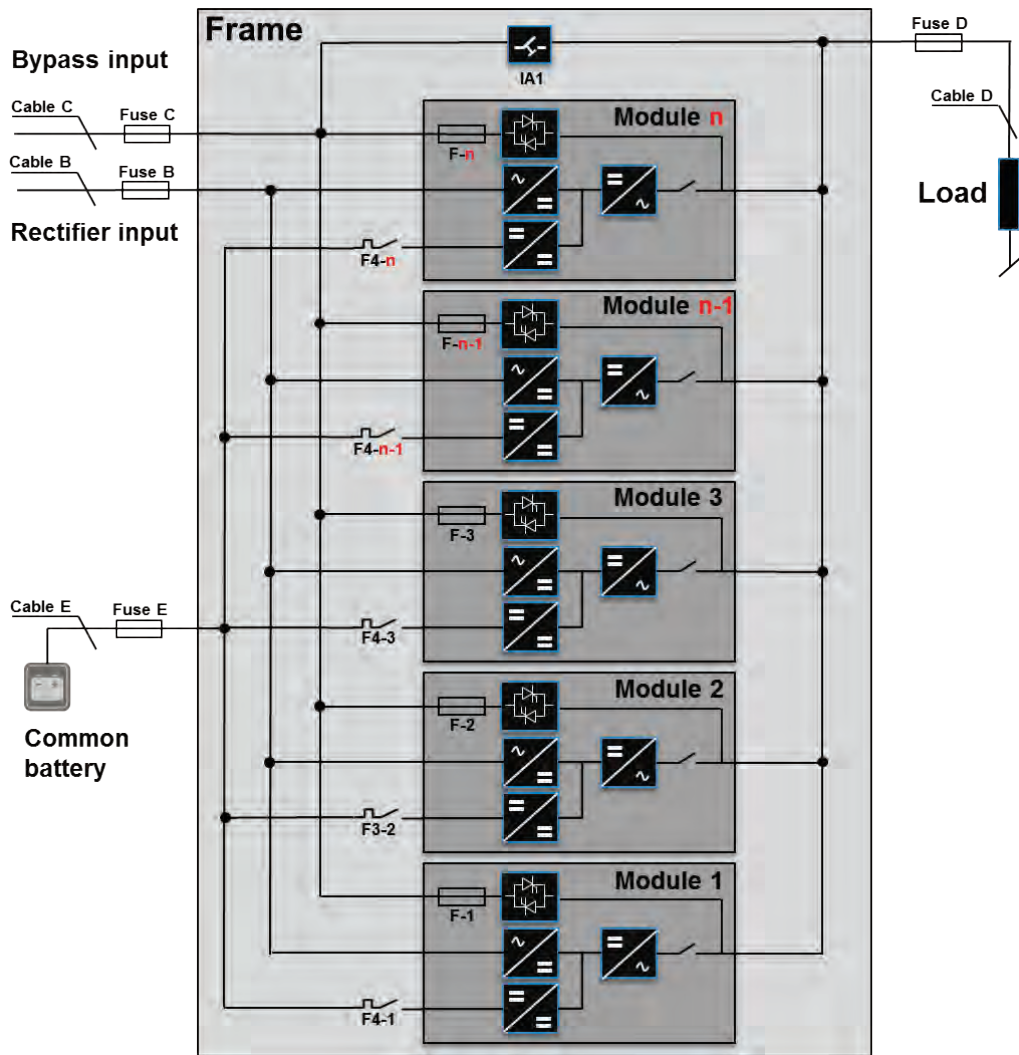


Fig 5.7.4.1-1: Dual input feed block diagram

5.7.4.2 Cable sections

Frame type UPScale ST	Load in kW	Input 3x400V/230V			Bypass 3x400V/230V		Output 3x400V/230V @ cosphi 1.0			Battery	
		Fuse B (Agl/CB)	Cable B (mm ²) (IEC 60950-1)	Max. Input Current with battery charging [A]	Fuse C (Agl/CB)	Cable C (mm ²) (IEC 60950-1)	Cable D (mm ²) (IEC 60950-1)	I _{nom} [A]	Fuse E + / N / - (Agl/CB)	Com. Battery	Sep. Battery
40	40	3x80A	5x16	68 A	3x80A	4x16	5x16	58 A	NOT ALLOWED		
60	60	3x125A	5x35	102 A	3x125A	4x35	5x35	87 A	NOT ALLOWED		
80	80	3x160A	5x50	136 A	3x160A	4x50	5x50	116 A	3x224A*1	3x95 *1	4x (3x10)
120	120	3x224A	4x95+1x50 (PE)	208 A	3x224A	4x95	5x70	174 A	3x300A*1	3x150 *1	6x (3x10)
200	200	3 x 350 A	5 x 185	333 A	3 x 350 A	4 x 185	5 x 185	290 A	3 x 450 *1	3 x (2 x 95)*1	5 x (3x25)

*1 only valid for common battery use

6 Control and monitoring

6.1 Control panel module



WARNING!

ONLY PERSONS TRAINED BY THE MANUFACTURER'S SERVICE TECHNICIANS OR HIS CERTIFIED SERVICE PARTNERS ARE ALLOWED TO OPERATE THE CONTROL PANEL WITH CLOSED DOORS. ALL OTHER INTERVENTIONS ON THE UPS HAVE TO BE PERFORMED BY THE MANUFACTURER'S SERVICE TECHNICIANS ONLY

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

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

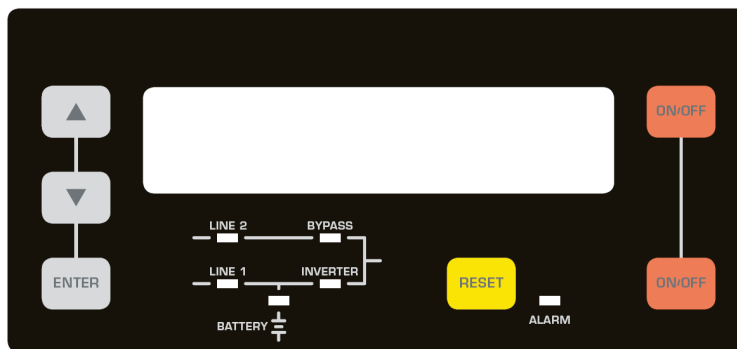


Fig 6.1-1: Control Panel

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

- Access the event register
- Monitor the input and output U, I, F and P
- Check battery runtime
- Perform commands like start-up and shut-down of the UPS, and load transfer from the inverter to the bypass and vice-versa
- Perform a diagnosis (service mode)
- Carry out adjustments and testing

6.1.1 Status and 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) load transfer from the inverter to bypass and vice-versa. The corresponding LED indicators will change color from green (normal) to red (warning).

The LEDs LINE 1 (rectifier) and LINE 2 (bypass) indicate the availability of the mains power supply.

The INVERTER and BYPASS LEDs, 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 will flash.

The ALARM LED indicator 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

6.1.2 Buttons

The keys allow the user to perform settings and adjustments, to start up and shut down the UPS and, using the LCD, to monitor voltages, currents, frequencies and other values.

KEYS	FUNCTION
ON/OFF ON/OFF	Serves to switch-on (press both keys simultaneously), or shut down 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.



IF A PARALLEL UPS 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

NOTE

6.2 LCD description

6.2.1 Status

DESCRIPTION

LCD-DISPLAY

1	The load is protected by UPS power The load is supplied by the inverter (normal operation) and the batteries are connected and are operational.	LOAD PROTECTED	S
2	The load is not protected by UPS power. The load is supplied by mains power (load on bypass) or it is supplied by the inverter (normal operation) and the batteries are not operational.	LOAD NOT PROTECTED	P1
3	The load not supplied. The 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 no longer supplying the load.	LOAD DISCONNECTED	P6

NOTE:

- UPS single/parallel configuration is indicated on the right-hand side of the LCD
- 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 module units is 6 per system

EXAMPLES:

- S** stands for single UPS. The system consists of ONLY one UPS.
- P1** stands for a parallel UPS in a multi-UPS and 01 stands for the first module (MASTER) in the multi-UPS.
- P4** stands for parallel UPS in a multi-UPS and 04 stands for the fourth module (SLAVE) in the multi-UPS.
- P6** stands for parallel UPS in a multi-UPS and 06 stands for the sixth module (SLAVE) in the multi-UPS.

The configuration of the single/parallel UPS is achieved in the menu "SET UP SERVICE". See service manual section E.

6.2.2 Main menu

DESCRIPTION

- 1 Logging control. A log of the last 64 events is stored in the power management display.
- 2 In the Measurements menu: monitor voltages, power, frequencies, currents, autonomy, etc.
- 3 The Command menu lets the user perform the commands: load to the inverter, load to bypass, battery test.
- 4 The UPS Data are the UPS personalized information "serial number."
- 5 Various settings can be made by the user: date/time, automatic battery test, etc.
- 6 Various adjustments can be performed by the service staff.

LCD-DISPLAY

→ EVENT LOG MEASUREMENTS
→ MEASUREMENTS COMMANDS
→ COMMANDS UPS DATA
→ UPS DATA SET-UP USER
→ SET-UP USER SET-UP SERVICE
→ SET-UP SERVICE NO MORE MENU

6.2.3 Commands

DESCRIPTION

- 1 Transfer load to inverter
- 2 Transfer load to bypass.
- 3 Battery test

LCD-DISPLAY

→ LOAD TO INVERTER LOAD TO BYPASS
→ LOAD TO BYPASS PERFORM BATT.TEST
→ PERFORM BATT.TEST NO MORE COMMANDS

6.3 Metering

6.3.1 Measurements

DESCRIPTION

- 1 Battery Runtime
- 2 UPS-output frequency
- 3 Bypass frequency.
- 4 Battery voltage
- 5 Battery charger current

LCD-DISPLAY

BATT. RUN TIME (MIN) 00h 00m
OUTPUT FREQUENCY (HZ) 50.00
BYPASS FREQUENCY (HZ) 50.00
BATTERY VOLTAGE (V) + 0.0 - 0.0
BATT. CHARGE CUR. (A) + 0.0 - 0.0

- 6 Discharge current.
- 7 Rectifier voltage of all three phases
- 8 Bypass voltage of all three phases
- 9 Output voltage of all three phases
- 10 Output current of all three phases
- 11 Active output power of all three phases
- 12 Reactive Output power of all three phases
- 13 Apparent output power of all three phases
- 14 Output power of all three phases
- 15 Battery capacity
- 16 Battery temperature
(only when the option battery probe is connected.)
- 17 Module temperature
Booster (°C), Inverter (°C)
- 18 End of measurements

DISCHARGE CURRENT (A) 00.00		
RECTIFIER VOLTAGE (V) 230	230	230
BYPASS VOLTAGE (V) 230	230	230
OUTPUT VOLTAGE (V) 230	230	230
OUTPUT CURRENT (A) 00.00	00.00	00.00
ACTIVE POWER (KW) 00.00	00.00	00.00
REACTIVE POWER (kVAr) 00.00	00.00	00.00
APPARENT POWER (KVA) 00.00	00.00	00.00
OUTPUT POWER (%) 00.00	00.00	00.00
BATT. CAPACITY (%) 00.00		
BATT. TEMPERATURE 00.00		
MODULE TEMP. BST/INV 24.5	28.3	
NO MORE MEASUREMENTS		

6.3.2 Event log

DESCRIPTION

- 1 Logging control; a log of the last 64 events is stored in the power management display.
- 2 Every stored event is identified with a sequential number and time stamp.
- 3 All events and alarms are indicated with their date and time of appearance.

LCD-DISPLAY

01	05-10-00	14-38-59
LOAD TO INV.		
02	05-10-00	14-38-56
LOAD TO BYP.		
03	05-10-00	14-37-14
LOAD OFF		

6.3.3 UPS Data

DESCRIPTION

- 1 These general UPS data are installed at the manufacturing plant

LCD-DISPLAY

UPS SERIAL NUMBER NW-nnnnn

- 2 Manufacturing date
- 3 EPROM Version
- 4 Actual date and time

DATE OF MANUFACTURE 15-01-2003	
EPROM VERSION V-000	
DATE dd-mm-yyyy	TIME hh:mm:ss

6.3.4 Set-up user

DESCRIPTION

- 1 Set-up language
(not active yet)
- 2 Set-up date and time
- 3 Set-up battery test
- 4 Set-up operation with gen-set

LCD-DISPLAY

→ SET LANGUAGE SET DATE AND TIME
ENGLISH FRANCAIS POLISH
→ SET-UP DATE/TIME SET-UP BATT. TEST
DD-MM-YY HH-MM-SS
→ SET BATTERY TEST SET GENERATOR OP.
DAY OF MONTH (1-31)
HOUR OF DAY (1-24)
REPETITIVE (Y/N) YES/NO
→ SET GENERATOR OP. NO MORE SETTINGS
BATT.CHARGE LOCK YES/NO
BYPASS LOCK YES/NO

6.3.5 Set-up service

DESCRIPTION

- 1 Battery runtime
- 2 UPS-output frequency

LCD-DISPLAY

→ SET-UP SERVICE PASSWORD
→ PASSWORD

Password is necessary to enter: Service Manual

6.4 Communication interfaces

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

Communication card (next to the distribution):

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

Two LEDs are located on the interface board (3):

- Green LED showing the status of the Interface:
- Fast blinking: 2 times/sec = interface is OK
- Red LED Board alarm (indicates a possible replacement of the board)

6.4.1 Customer interface and DRY PORTs

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


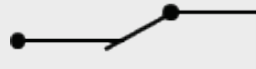
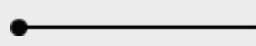






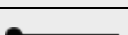

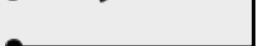

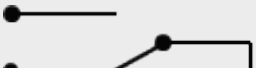





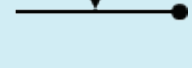
6.4.1.1 Output interfaces: terminal blocks x2 (DRY PORTs)

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

6.4.1.2 Input interfaces: terminal blocks X1

- Connection of remote shut down facilities, generator operation, customer's specials
Refer to the chapter 7.2.

All voltage free contacts are rated 60 VAC max. and 500 mA max.:

Block	Terminal	Contact	Signal	On Display	Function
X2	X2 / 1	NO 	ALARM	MAINS_OK	Mains Present
	X2 / 2	NC 			Mains Failure
	X2 / 3	C 			Common
	X2 / 4	NO 	Message	LOAD_ON_INV	Load on Inverter
	X2 / 5	NC 			(Load on Mains bypass)
	X2 / 6	C 			Common
	X2 / 7	NO 	ALARM	BATT_LOW	Battery Low
	X2 / 8	NC 			Battery OK
	X2 / 9	C 			Common
	X2 / 10	NO 	Message	LOAD_ON_MAINS	Load on bypass (Mains)
	X2 / 11	NC 			(Load on Inverter)
	X2 / 12	C 			Common
	X2 / 13	NO 	ALARM	COMMON_ALARM	Common Alarm (System)
	X2 / 14	NC 			NO Alarm Condition
	X2 / 15	C 			Common
X1	X1 / 1	 IN	+ 12Vdc		Generator Operation
	X1 / 2	GND	GND		(NC = Generator ON)
	X1 / 3	 IN	+ 12Vdc		Customer IN 1
	X1 / 4	GND	GND		(Function on request, to be defined)
	X1 / 5	 IN	+ 3.3Vdc		Temperature Battery
	X1 / 6	GND	GND		(If connected , the battery charger current if depending of the battery temp.)
	X1 / 7	 IN	+ 12Vdc		Remote Shut down
	X1 / 8	GND	GND		(Do not remove the factory mounted bridge until external Remote Shut down is connected)
	X1 / 9	 IN	+ 12Vdc		12 Vdc source
	X1 / 10	GND	GND		(max. 200 mA load)

Phoenix Spring Terminals (X1...X2) Connection

6.4.2 JD1 / RS232 smart port computer interface

The **Computer Interface JD1** (4) located on the distribution part is an intelligent RS232 serial port that allows the UPS to be connected to a computer. The connector JD1 is a standard D-Type, 9-pin, female.

The optional WAVEMON software allows the computer to monitor the mains voltage and the UPS status continuously.

In the event of any changes, the computer terminal will display a message.

(For details see ABB's optional monitoring package: WAVEMON).

6.4.3 USB computer interface

The **Computer Interface USB** (5) is located on the distribution part and is in parallel with the intelligent RS232 serial port **JD1**.

The optional WAVEMON software allows the computer to monitor the mains voltage and the UPS status continuously.

In the event of any changes, the computer terminal will display a message.

(For details see ABB's optional monitoring package: WAVEMON).

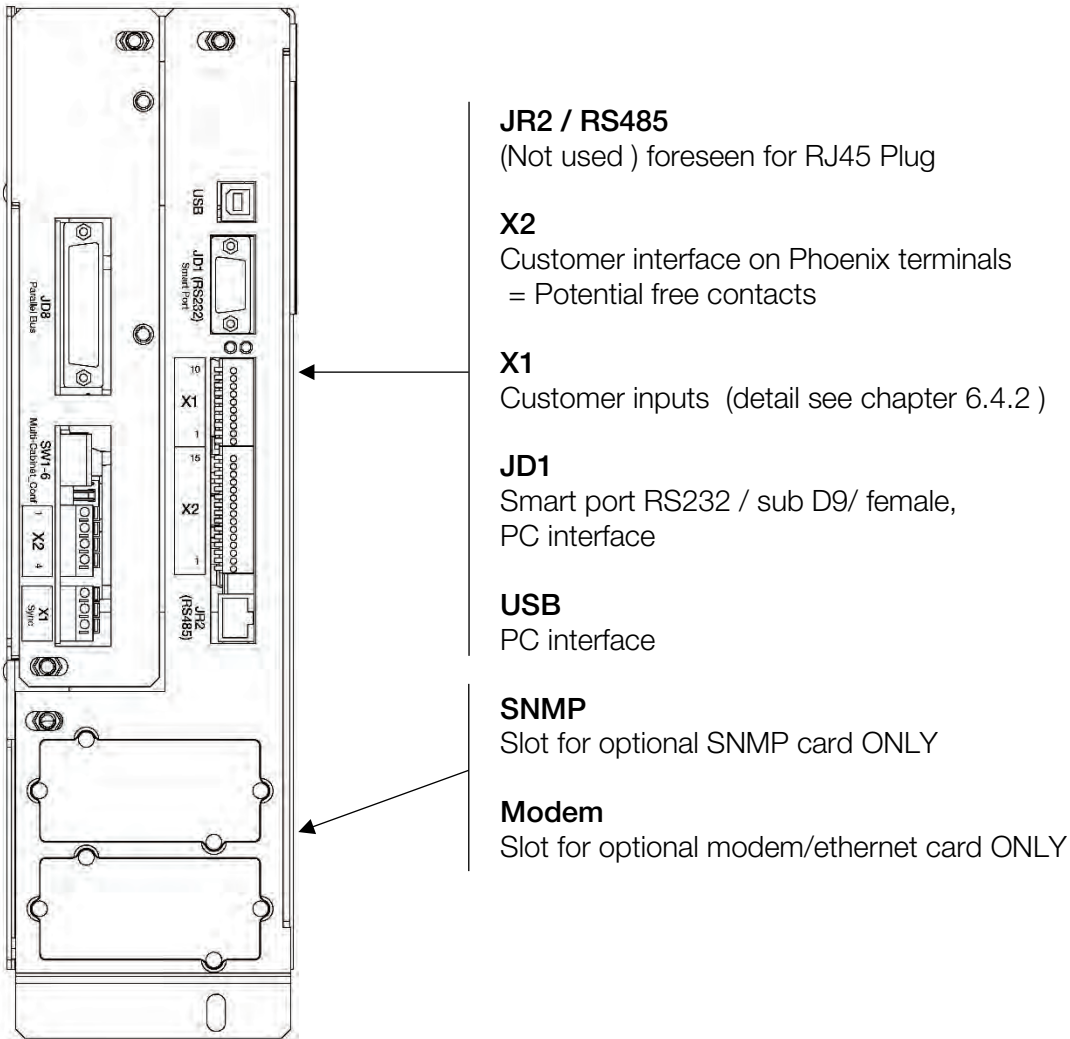


Fig 6.4.3-1: Distribution Interfaces

7 Commissioning

7.1 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!

UPS status before switch-on:

1. Make sure the fuses for the UPS system supply 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 the OFF position.
4. Make sure all the internal battery fuses in the UPS (if any) and the external battery cabinets are open.

Start-up procedure for DPA UPScale:

1. Insert fuses for the UPS system supply in the input distribution unit.
 - The LED-indicator LINE 1 on UPS-Module is lit – green
 - The LED-indicator of the battery on UPS-Module is lit – Flashing red.
 - On the LCD, “LOAD OFF, SUPPLY FAILURE” will appear.

2. UPS module 1:

Press both “ON/OFF” main buttons to switch on the UPS.

The LED indicators will appear as shown below:

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

3. Check command: LOAD TO INVERTER
LED indicator will appear as shown below:

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

4. Scroll through the measurement menu and check the values are correct
5. For the other modules, repeat the same procedure as for module 1:Steps 2)-4).

6. Check battery polarity and voltage.
7. If the battery polarity and voltage is correct insert internal (if any) and external battery fuses (breakers).
8. Testing of parallel functions
(The load fuses in output distribution board are still open i.e. the loads are disconnected!).
All UPS-modules are on INVETER MODE
9. Simultaneously press the two ON/OFF buttons on the UPS control panel (PMD) on each of the module control panels to turn the modules OFF. On the LCDs, the message “LOAD OFF, SUPPLY FAILURE” will appear
10. Simultaneously press the two ON/OFF buttons on the UPS control panel (PMD) on all control panels on the modules to turn the modules ON. On the output terminal block there is now UPS power and on all LCDs, “LOAD PROTECTED” will appear.
11. Load transfer to Maintenance Bypass
Go to the COMMANDS menu, choose the command “LOAD TO BYPASS” and transfer the load to mains on the control panel of any one of the UPS modules.
Close the maintenance bypass switch IA1 (position “ON”)
On the LCD, “MANUAL BYP IS CLOSED” will appear and the LED indicators will indicate as shown below:

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

12. Connect load to the UPS output
Insert fuses in output distribution board
Verify on the control panel that the load is on bypass
13. Open maintenance bypass switch IA1
On LCD: “MANUAL BYP IS OPEN” will appear followed by “LOAD NOT PROTECTED”
14. Check on LCD the output powers, voltages currents and frequencies.
15. Load transfer to Inverter
Go to the COMMANDS menu, choose the command “LOAD TO INVERTER”. Transfer the load to the inverter on the control panel of any one of the three UPS modules.
On all LCD’s: “LOAD PROTECTED” will appear.
16. Check the output voltages and currents once again.

THE LOAD IS NOW PROTECTED BY THE DPA UPScale™

7.2 Shut-down 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!

The **DPA UPScale™** may be shut down completely if the load does not need input power for an extended period.

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.

Complete shutdown procedure for DPA UPScale™:

The UPS should only be shut down when there is no need to supply the load. The following procedures can only be executed after the load has been completely de-energized.



IF A PARALLEL UPS 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

NOTE

1. Verify that the loads are shut down and that there is no need for power supply to the load.
2. If the loads are all disconnected, press simultaneously both ON/OFF-Buttons on UPS-control panel on all control panels 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

3. Open battery fuses/breakers on internal (if any) and external battery cabinets or racks.
4. Open the mains fuses/breaker in the building distribution panel.



MAKE SURE THE INTERNAL DC-CAPACITORS (ELCO) HAVE BEEN DISCHARGED BY WAITING AT LEAST 10 MINUTES AFTER SHUTDOWN.

NOTE

THE DPA UPAScale™ IS NOW VOLTAGE FREE.

7.2.1 Remote shutdown

The REMOTE SHUT DOWN **must** use a normally closed contact, which opens to operate the remote shut down sequence.

The remote shutdown on terminal port X1/7.. X1/8 is located at the bottom of the **DPA UPSCALE™** frame on communication card with terminal blocks X.

In order to allow removal, maintenance or testing of any remote shut down 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 mm²) and maximum length of 100 m.
2. Connect the cable as shown in Fig. 7.2.1-1

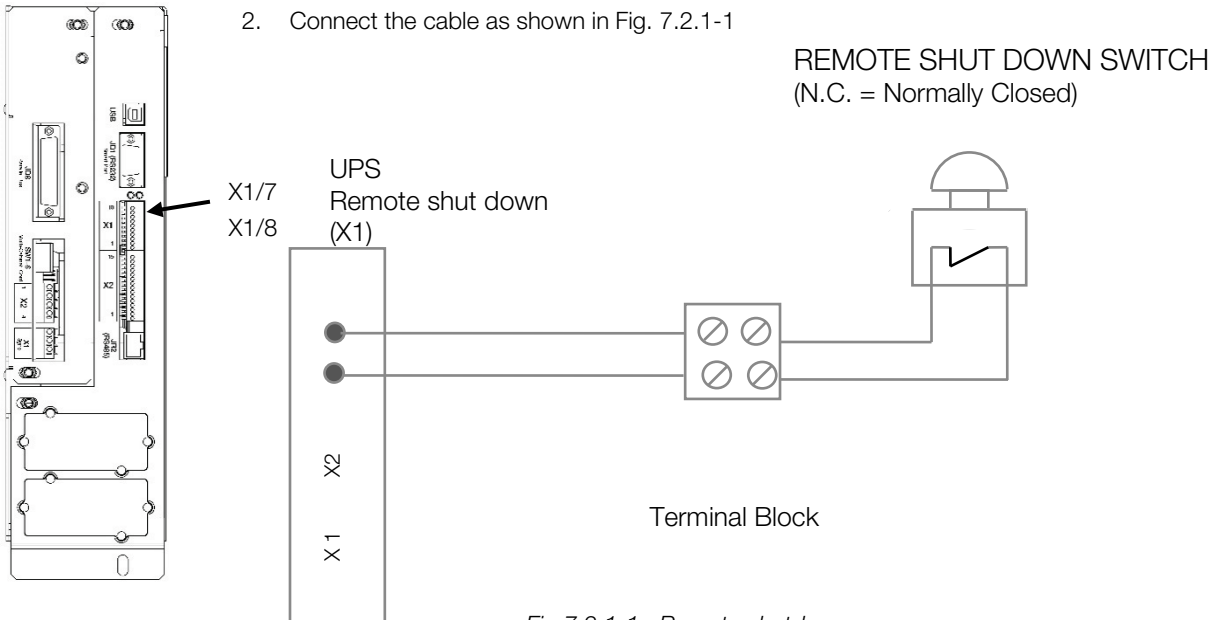


Fig 7.2.1-1: Remote shutdown

7.2.2 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 the UPS. It is located at the bottom of the **DPA UPSCALE™** frame on the communication card with terminal blocks X1 ...X2.

When used, this facility disables the UPS static bypass and prevents the UPS from transferring the load onto the generator power supply.

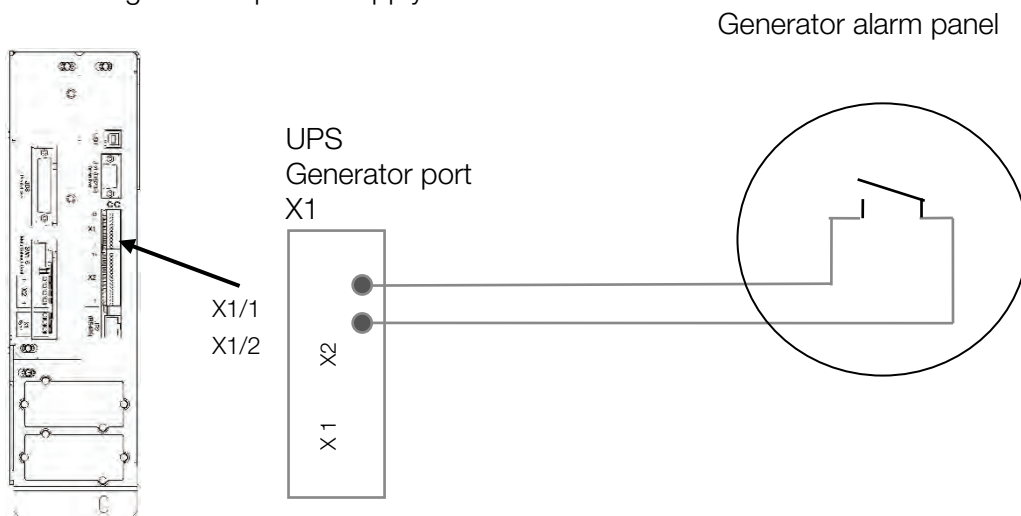


Fig 7.2.2-1: Generator ON facilities

7.3 Manual bypass

7.3.1 From invert 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 AN AGENT CERTIFIED BY THE MANUFACTURER

WARNING!

Status of the UPS system before starting the transfer to maintenance bypass:

The load is protected by the DPA UPScale ST S2 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 mains on control panel of any one of the UPS-modules
On LCD panel “LOAD NOT PROTECTED” will appear.
2. Close maintenance bypass switch IA1 (position ON).
On LCD: “MANUAL BYP IS CLOSED” will appear and the mimic panel will show:

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

3. Simultaneously press the two ON/OFF buttons on the UPS control panel (PMD) on all control panels on the modules.
On the LCD's message “LOAD OFF, SUPPLY FAILURE” will appear and the mimic panel will show:

LED Indicator	Colour
LINE 1	Green
LINE 2	OFF
BYPASS	OFF
INVERTER	OFF
BATTERY	Flashing Green

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



THE UPS IS STILL POWERED (DANGEROUS VOLTAGE)

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

WARNING!

7.3.2 From bypass to inverter

This procedure describes the sequence of operations 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!

Status of the UPS system before starting the transfer to on-line mode:

The load is supplied directly by input mains power and the UPS is OFF.

1. Close battery fuses/breakers in the external battery cabinets or racks.
2. On the LCD's: "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	Flashing/Green

3. Simultaneously press the two ON/OFF buttons on the UPS control panel (PMD) on all control panels of the modules.

The unit will start up and after about 60 seconds the mimic panel will show:

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

4. Make sure that the bypass LED is green, then open the maintenance bypass switch IA1 (position OFF).
5. Using LCD panel, select the COMMANDS menu and choose command "LOAD TO INVERTER". This will transfer the LOAD to inverter on the complete system (all units). On LCD panel "LOAD PROTECTED" will appear.

THE LOAD IS NOW SUPPLIED BY INVERTER POWER AND IS PROTECTED

7.4 Adding & replacement of a power module

7.4.1 In a single-module system



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!

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



THE WEIGHT OF A UPS MODULE CAN REACH 22KG, THEREFORE IT CAN BE LIFTED BY 1 PERSON. WE RECOMMEND TWO PERSONS FOR CARRYING THE MODULE.

POTENTIAL DANGERS:

THE UPS MODULE, DUE TO ITS WEIGHT, CAN CAUSE SERIOUS INJURY OR DAMAGE SHOULD IT BE REMOVED INAPPROPRIATELY AND FALL.

NOTE:

WE RECOMMEND THAT THE MODULES ARE HANDLED BY TWO PERSONS.

WARNING!

SUITABLE LIFTING TOOLS AND SAFETY EQUIPMENT SUCH AS SAFEGUARD PLATFORMS TO HANDLE THE EVENTUALITY OF A MODULE BEING DROPPED SHOULD BE PLANNED

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

1. Reset the alarm on the 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 mains in bypass-mode (eco-mode) the maintenance bypass (IA1) may 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 bypass by means of the command "LOAD TO BYPASS" in submenu COMMANDS. On LCD: "LOAD NOT PROTECTED" will appear.
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

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



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

NOTE

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. Unscrew the two screws on the front side of the module that are fixing it to the UPS frame;
7. Pull module only partly horizontally by means of the 2 black handles until the rear connectors are disconnected.



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

BEFORE DRAWING THE UPS-MODULE COMPLETELY OUT, WAIT 2 MINUTES UNTIL THE INTERNAL DC-CAPACITORS ARE DISCHARGED.

WARNING!

8. Pull the UPS module out fully:
NOTE: ABB recommends two persons pull the module out from the UPS frame; the weight of a of UPScale M10 is 18.5 kg, M20 module is 21.5 kg)
9. Insert new UPS-module or cover the opening (UPS-module compartment) with appropriate protection cover immediately and fix with two screws



WHILE THE UPS IS OPERATING IN THE MAINTENANCE BYPASS-MODE THE LOAD IS NOT PROTECTED AND IN THE EVENT OF A MAINS FAILURE THE LOAD SUPPLY WILL BE INTERRUPTED AND THE LOAD WILL CRASH.

NOTE

7.4.1.2 How to fit back a ups-module in single-module-systems

If your **DPA UPScale™** 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 two screws on the front.
2. Slide two thirds of UPS module into the dedicated UPS compartment (make sure not to plug the UPS module into the rear connector).
Push the UPS module into its final position and push firmly to assure good contact with the rear plugs.
NOTE: We recommend two persons for reinstalling the module into the UPS frame; the weight of a of UPScale M10 is 18.5 kg, M20 module is 21.5 kg)
3. Tighten the two screws on the front of module.
4. Check if the LED LINE1 and battery are green. If yes, mains voltage is operational.
5. Close internal and external battery fuses/breaker (if available);

6. Simultaneously press both “ON/OFF” buttons to start-up UPS.
The LCD panel must display: The LED indicator will appear as shown below:

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

7. Open maintenance bypass (IA1) by turning it to “OFF” position. The load is now supplied by the static bypass.
8. Transfer load to mains and inverter for testing using the COMMANDS submenu.
9. Transfer load to inverter mode by using the COMMAND “LOAD TO INVERTER”. On theLCD: “LOAD PROTECTED” will appear.

THE LOAD IS NOW PROTECTED BY THE DPA UPSCALE ST S2

7.4.2 In a redundant multi-module system



WARNING!

THE WEIGHT OF A UPS MODULE CAN REACH 22KG, 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 (ELCO) HAVE BEEN DISCHARGED WAITING AT LEAST 10 MINUTES.

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

If a UPS module is faulty in a redundant parallel system, 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 the load is supplied by the inverter of the other running modules by checking the LCD indication LOAD PROTECTED. Verify load measurements 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 indicators will indicate as shown below:

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

4. Remove the two fixing screws and slide out the UPS module by about 10 cm. This operation will disconnect the module's power connection at the back of the cabinet.
5. Pull the module out.



WARNING!

BEFORE DRAWING THE UPS-MODULE COMPLETELY OUT, WAIT 2 MINUTES UNTIL THE INTERNAL DC-CAPACITORS ARE DISCHARGED



NOTE

WE RECOMMEND TWO PERSONS FOR PULLING THE MODULE OUT OF THE UPS FRAME. THE WEIGHT OF AN UPSCALE M10 IS 18.5 KG AND AN M20 MODULE IS 21.5 KG).

6. Screw the protective cover on the area left empty by the module with the two fixing screws

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



BEFORE DRAWING THE UPS-MODULE COMPLETELY OUT, WAIT 2 MINUTES UNTIL THE INTERNAL DC-CAPACITORS ARE DISCHARGED

WARNING!

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

The module must be previously set according to system personalization. Please check with your nearest service center for the correct settings.

1. Remove the protective cover by unscrewing the two fixing screws on the front.
2. Lift the module to its destination position. See note above concerning weights.
3. Slide two-thirds of UPS module into the dedicated compartment (make sure not to plug the UPS module into the rear connector).
Push the UPS module into its final position and push firmly to ensure good contact with the rear plugs. Tighten the two screws on the front of the module.
4. Check if LED LINE1 and BATTERY is green. If yes, the 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	RED
BATTERY	Flashing Green

5. Close internal and/or external battery fuses/breaker of the new module
6. Press both "ON/OFF" buttons simultaneously to start-up UPS.
7. The module will restart automatically, connecting the load to the inverter and run in parallel with other on-line modules. The LCD panel must show the LOAD PROTECTED indication.

THE LOAD IS NOW PROTECTED BY THE DPA UPScale™

7.4.3 In capacity multi-module system



THE WEIGHT OF A UPS MODULE CAN REACH 22KG, THEREFORE IT IS RECOMMENDED TO BE LIFTED BY 2 PERSONS. THE MODULE SHOULD NEVER BE CARRIED BY ONE PERSON ONLY

WARNING!

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

If a UPS module experiences a fault in a capacity parallel system and there is not enough capacity in the remaining operating UPS modules to protect the load then the load will automatically be transferred to bypass (bypass mode or ECO-mode) 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 condition 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; in the majority of the events the LED indicators on the control panel of the faulty module will show:

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

3. Whereas the LED-indicators on the control panels of the other operating modules will show:

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

4. Close maintenance bypass switch IA1 (position ON)
5. 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

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

6. On the UPS module to be replaced press both ON/OFF buttons simultaneously;
7. Open the corresponding battery fuses.
8. Remove the two fixing screws and slide the UPS module out by about 10 cm.
This operation will disconnect the module from the power connection located on the back of the cabinet.



BEFORE DRAWING THE UPS-MODULE COMPLETELY OUT, WAIT 2 MINUTES UNTIL THE INTERNAL DC-CAPACITORS ARE DISCHARGED

WARNING!

9. Pull the UPS module out fully.
10. Insert new UPS-module or cover the opening (UPS-module compartment) with the appropriate protection cover immediately and secure with two screws



MAKE SURE THE INTERNAL DC-CAPACITORS (ELCO) HAVE BEEN DISCHARGED WAITING AT LEAST 10 MINUTES.

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

WARNING!

7.4.3.2 How to fit back a module in a capacity multi-module system

To replace a faulty module in a **capacity multi-module system** perform following steps:

1. Remove the UPS module compartment protective cover by unscrewing the two screws on the front.
Slide two-thirds of the UPS module into the dedicated UPS compartment (make sure not to plug the UPS module into the rear connector).
Push the UPS module into its final position and push firmly to ensure good contact with the rear plugs.



WE RECOMMEND 2 PERSONS FOR PULLING OUT THE MODULE FROM THE UPS-FRAME. THE WEIGHT OF A OF UPSCALE M10 IS 18.5 KG, M20 MODULE IS 21.5KG)

NOTE

2. Tighten the two screws on the front of module;
3. 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	Flashing Green

4. Close internal and/or external battery fuses/breaker of the new module
5. Press both “ON/OFF” buttons simultaneously to start up UPS module.
6. All modules shall show to be in

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

7. Open Maintenance Bypass (IA1) by turning it to position “OFF”. The load is now supplied by the static bypass of all three modules. Check the LED indicators on control panels.
8. 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 UPScale™

7.5 Multi cabinet configuration

For the correct performance of different parallel functions and operations, the parallel units communicate continuously between each other. This is achieved using the so-called communication bus lines.

After terminating the input and output cabling of each single UPS, it is necessary to connect the units together to form the parallel system. For this purpose, a communication bus line is connected sequentially between the units. Connect communication bus lines according to Figure 7.5-1.



CONNECT THE BUS CABLES ONLY WITH the UPS SWITCHED OFF AND OPENED PARALLEL ISOLATORS IA2. RESPECT THE FOLLOWING CONNECTION SEQUENCES.

NOTE

1. Fit the parallel adapter over the connector JD8 on all UPS cabinets.
2. Set DIP switch SW2-2 on each parallel adapter depending on the UPS cabinet in the parallel cabinet configuration.
3. Connect port JD6 on the parallel adapter of UPS cabinet 1 and port JD5 of the parallel adapter of UPS Cabinet 2 with the corresponding bus cable.
4. Connect port JD6 on the parallel adapter of UPS cabinet 2 and port JD5 of UPS cabinet 3 with the corresponding bus cable.
5. Continue in the same manner for the remaining UPS cabinets.

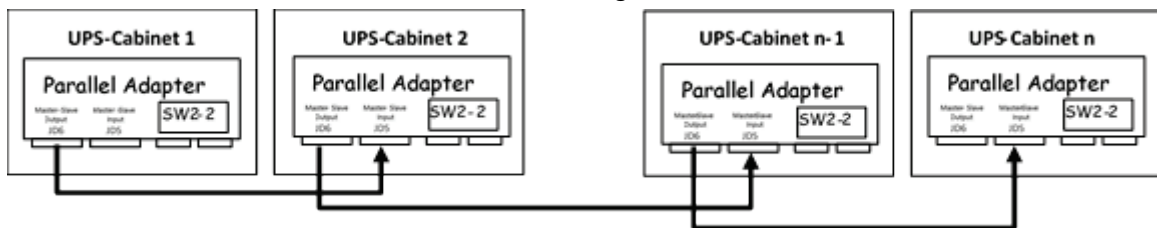



Figure 7.5-1: Connection of the Bus Lines when paralleling UPS-Cabinets by means of Parallel Adapters

If the UPS cabinets are paralleled, the parallel adapter will be placed on the connector JD8 on the distribution panel and the communications cables between the cabinets will be connected through the connectors JD5 and JD6, as we are doing now.



SET THE SWITCH SW2-2 CORRECTLY ACCORDING TO THE CORRESPONDING CABINET CONFIGURATION.

NOTE

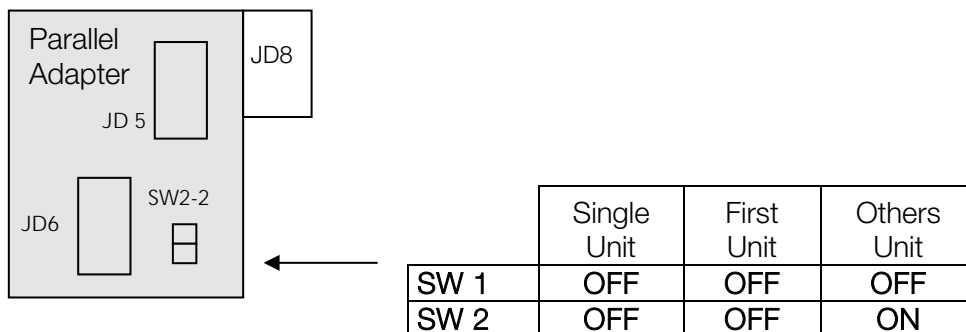


Figure 7.5-2: Parallel Adapter and DIP Switch SW2-2

7.5.1 DIP switch SW1-6

DIP SWITCH SW1-6 is located on every UPS cabinet. With this switch it is possible to determine the “position of the cabinet” in a multi-cabinet chain. Define each DPA UPScale ST S2 cabinet as the “first”, “middle” (there may be more than one) or the “last” cabinet in the multi-cabinet chain by setting the DIP switch SW1-6 on each cabinet according to the table below:

1. The “First”,
2. The “Middle” (there may be more than one) and
3. The “Last”

Cabinet in the multi cabinet chain by setting the DIP Switch SW1-6 on each cabinet according to the Table below:

SWITCH SW1-6					
	1 ST UPS	Other UPS	Last UPS	Single UPS	
SW 1a 1	OFF	OFF	OFF		ON
SW 1b 2	OFF	OFF	OFF		ON
SW 1c 3	OFF	OFF	OFF		ON
SW 1d 4	OFF	OFF	OFF	OFF	
SW 1e 5	OFF	OFF	OFF	OFF	
SW 1f 6	OFF	OFF	OFF	OFF	

8 Options

8.1 System

8.1.1 Backfeed protection

The UPS backfeed protection prevents any hazardous voltage or energy from being present on the UPS input AC terminals after interruption of the input AC power.

The backfeed protection is implemented in the DPA UPScale ST by internal backfeed protection contactors (K1 and K2) as shown in the wiring diagram below.

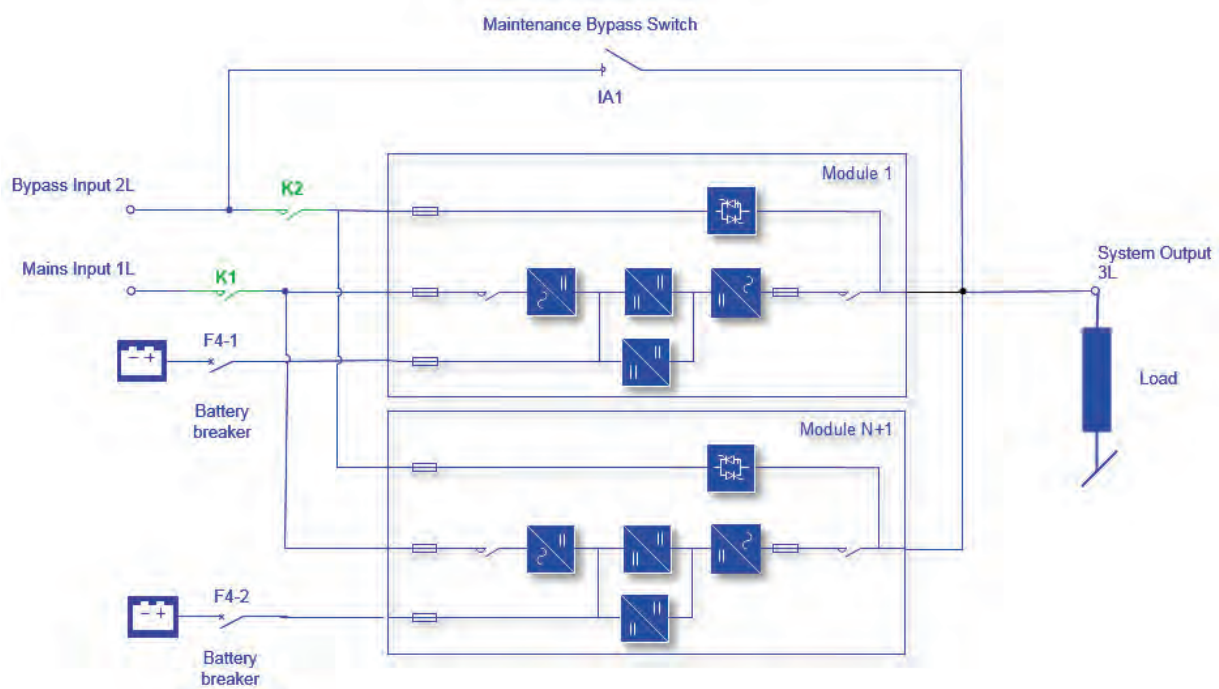


Fig 8.1.1-1: Backfeed protection

K1	<i>Mains backfeed contactor (option)</i>	In the event of an AC failure, prevents the occurrence of any hazardous voltage at the rectifier mains terminal due to backfeed from the power modules sourced by the battery
K2	<i>Bypass backfeed contactor (option)</i>	In the event of an AC failure, prevents the occurrence of any hazard voltage at the bypass input terminal due to backfeed from the power modules sourced by the battery

Order Number

04-0727	Backfeed protection ST40
04-0728	Backfeed protection ST60
04-0729	Backfeed protection ST80
04-0730	Backfeed protection ST120
04-3229	Backfeed protection ST200

8.2 Power module

8.2.1 Battery start

The battery start function allows a UPS to be started from battery power in the absence of the main input supply. It means the inverter is started with energy from the battery only and the load is supplied with the battery energy via the inverter.

This function is typically used to restore the power to the electrical load if there has been a power blackout.

The battery start function is implemented in the DPA UPScale ST family inside each power module M10/M20.

Battery start procedure:

Before the inverter in each power module is started:

1. Disconnect the battery from the UPS by opening the battery circuit breaker. If the battery is decentralized, open the battery circuit breaker per power module.
2. Disconnect the complete load from the UPS.
3. After 30 seconds, close the battery circuit breakers.
4. Once the battery breaker is closed, the power module(s) electronics are supplied and remain powered for 10 minutes.
5. Turn on the power module(s) by pressing the “ON/OFF” buttons simultaneously.
6. The inverter(s) are now fed by the battery and the inverter LED indication is green.
7. Connect the load to the UPS.

Note. The remaining energy stored in the battery is used to feed the inverter to power the vital load for 3 minutes. The autonomy time can be adjusted according to customer needs by a qualified service engineer from the manufacturer or from an agent certified by the manufacturer.

Order Number

02-0180	Battery start DPA UPScale M10 / M20
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8.2.2 Battery enhancement

The battery charger enhancement option increases the battery charger current from 4 A to a maximum of 6 A . This option is implemented inside the DPA UPScale power module M10/M20.

Order Number

02-0092	Battery charger enhancement DPA UPScale M10 / M20
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8.2.3 Output short capability 3 x In

This option increases the output short circuit capability of the DPA UPScale power module M20 to 3 x In for a duration of 40ms.

Order Number

4NWP101746R0001	Output short capability 3 x In
------------------------	--------------------------------

8.3 Wiring

8.3.1 Halogen free cable

Halogen-free cabling is becoming relevant for the public sector (airports, rail/metro infrastructure, etc.) to mitigate the risk of toxic and corrosive gas emissions during a fire or short-circuit fault.

DPA UPScale St S2 can be internally wired by using halogen-free cable.

Order Number

4NWP101680R0001	Kit HF cables Upscale ST40 S2
4NWP101704R0001	Kit HF cables Upscale ST60 S2
4NWP101701R0001	Kit HF cables Upscale ST80 S2
4NWP101702R0001	Kit HF cables Upscale ST120 S2
4NWP101703R0001	Kit HF cables Upscale ST200 S2

8.4 Control and monitoring

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 provides its data in this SNMP format with its internal software agent. The operating system you are using must support the SNMP protocol. ABB offers its software with SNMP functionality for Novell, OS/2, all Windows operating systems running on Intel and ALPHA, DEC VMS and 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.

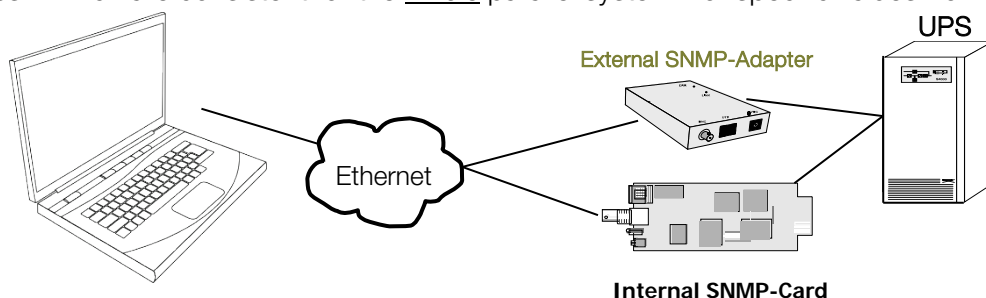


Fig 8.4-1: SNMP

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.

By utilizing the RCCMD send function (see below), the SNMP adapter can be used 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 that 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 8.4-2: 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.

Figure 8.4-3 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.

8.4.1 Network interface cards

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

8.4.1.1 CS141 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)

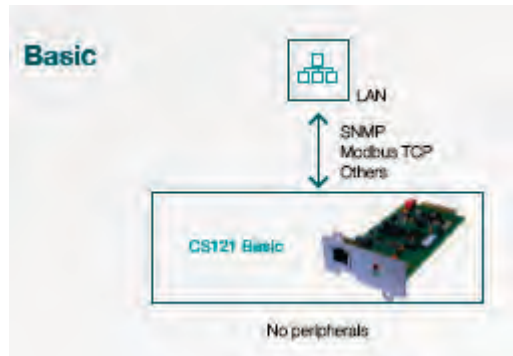


Fig 8.4.1.1-1: CS141 Basic

8.4.1.2 CS141 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

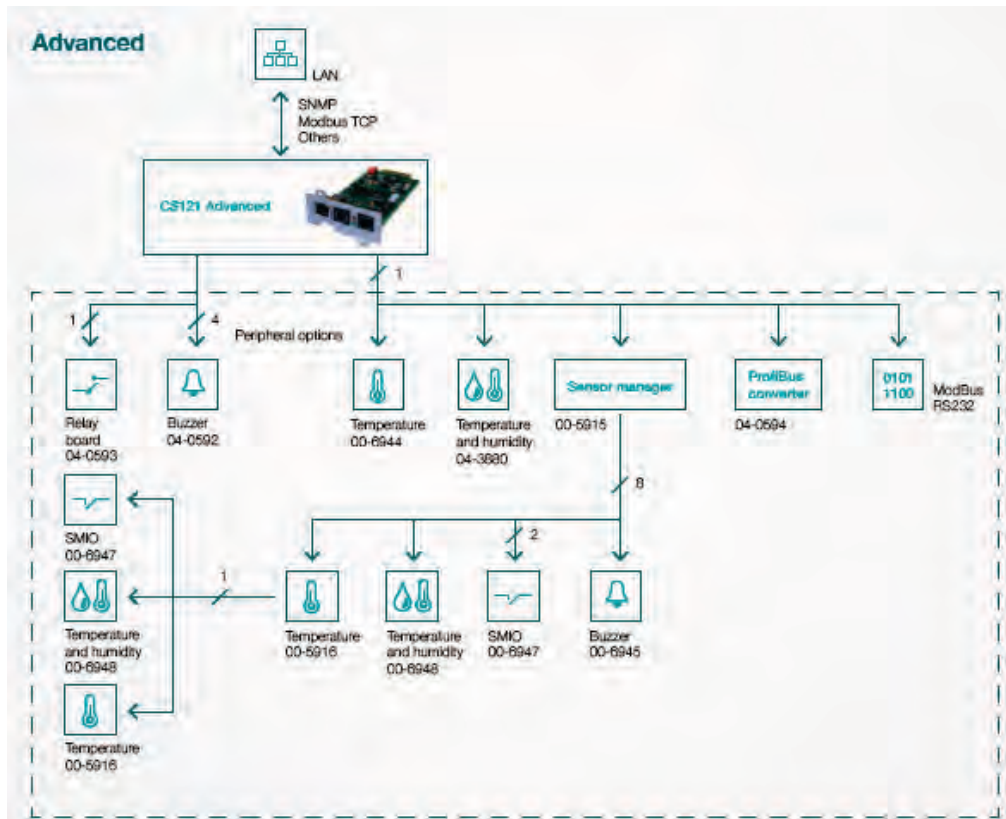


Fig 8.4.1.2-1: CS141 Advanced

8.4.1.3 CS141 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

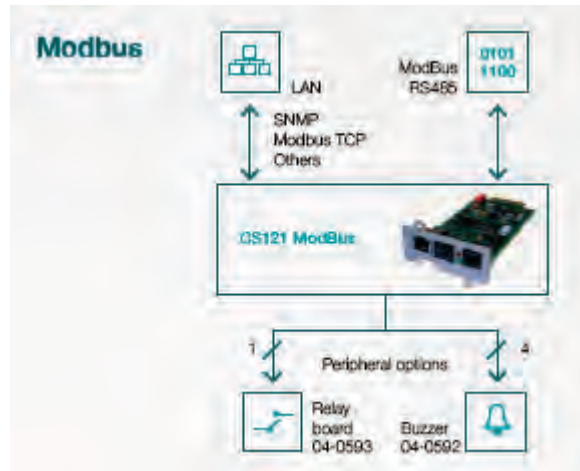


Fig 8.4.1.3-1: CS141 Modbus

9 Maintenance & troubleshooting



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!

9.1 General maintenance

9.1.1 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 (20°C - 25°C), dry, dust free and vibration free. The batteries should be hold fully charged.

9.1.2 Preventative maintenance

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

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
- Preventive replacement of fans and capacitors

9.1.3 Deep battery test

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

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

9.1.4 Battery maintenance, disposal and recycling

The 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.

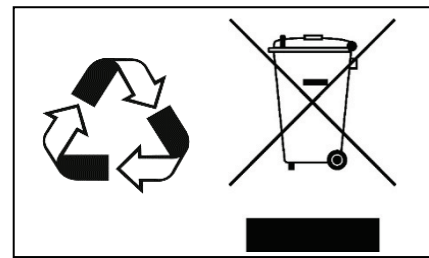


Fig 9.1.4-1: Battery maintenance, disposal and recycling

9.2 Troubleshooting

9.2.1 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 using the EVENT LOG in the MAIN menu.
3. In case of doubt please contact the nearest service center.
4. Fault identification and rectification information is given on the following pages.

9.2.2 Menu, commands, event log and measurements

In the chapter 6 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

9.2.3 Fault identification and rectification

The major alarm conditions that will be encountered are:

ALARM CONDITION	MEANING	SUGGESTED SOLUTION
MAINS RECT. FAULT	<i>Mains power supply is outside prescribed tolerance.</i>	The input power to the 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	<i>Mains power supply is outside prescribed tolerance.</i>	The input power to the UPS is too low or missing. If site power appears to be OK, check the input circuit breakers, etc. supplying the UPS.
OUTPUT SHORT	<i>There is a short circuit at the output of the UPS (on the load side).</i>	Check all output connections and repair as required.
OVERLOAD	<i>Load exceeds the UPS rated power.</i>	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	<i>UPS temperature has exceeded the allowed value.</i>	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	<i>Inverter is faulty.</i>	Call the certified service center for assistance.
SYNCHRON. FAULT	<i>The inverter and mains are not synchronized.</i>	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	<i>Battery is near end of autonomy.</i>	Shutdown load connected to the UPS before the UPS switches itself off to protect its batteries.
MANUAL BYP IS CLOSED	<i>Maintenance bypass closed. Load supplied by mains.</i>	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.

10 Attachments

10.1 Technical data sheet

Contact us

www.abb.com/ups
ups.sales@ch.abb.com

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Technical data sheet

DPA UPScale™ ST S2

10 – 200 kW



Document information

File name : TDS_ABB_DPA_UPSCALE_ST_S2-10-200kW_EN_REV-E.docx
UPS model : DPA UPScale ST S2
Date of issue : 14.10.2015
Article number : N/A
Document number : 4NWD002987
Revision : E

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1 Introduction

In environments that demand zero downtime, continuous power protection availability is essential. In order to respond to today's dynamic IT and process-related environments that experience daily change through new server technologies, migration and centralization, resilient and easily adaptable power protection concepts are required.

DPA UPScale is the foundation for continuous power protection availability of network-critical infrastructures in enterprise data centers where business continuity has paramount importance and in process control environments where manufacturing continuity is essential.

DPA UPScale is a second-generation, high power-density, leading-edge double conversion power protection technology that is standardized on a modular component approach that helps speed deployment, improve adaptability and increase system availability while reducing total cost of ownership.

DPA UPScale is a unique on-demand architecture that integrates the power rack, power distribution unit, backup battery rack and monitoring and management solutions to allow easy selection of optimized configurations.

DPA UPScale's distributed parallel architecture provides the highest availability, unmatched flexibility and, at the same time, lowest cost of ownership in IT environments.

This technical specification provides detailed technical information on the mechanical, electrical and environmental performance of the DPA UPScale model types to support tender and end-user requirements. The DPA UPScale family was designed to respond to the most stringent safety, EMC and other important UPS standards.

The UPS has the **Classification Code VFI-SS-111**.

2 System description

The DPA UPScale ST S2 is a three-phase, transformerless modular uninterruptible power system (UPS). It is a true on-line double conversion UPS providing quality power for sensitive equipment. Its modular design consists of:

- *DPA UPScale modules M10 (10 kW), M20 (20 kW)*
- *Maintenance bypass switch*
- *Incoming, outgoing and battery terminals*
- *Communication interfaces*
- *Parallel interface (option)*
- *System graphical display (option)*
- *Internal battery modules (option)*

The DPA UPScale ST S2 family has five models available:

- *DPA UPScale ST S2 40 (40 kW)*
- *DPA UPScale ST S2 60 (60 kW)*
- *DPA UPScale ST S2 80 (80 kW)*
- *DPA UPScale ST S2 120 (120 kW)*
- *DPA UPScale ST S2 200 (200 kW)*

DPA UPScale modules types:

- *UPSscale M 10 (10 kW)*
- *UPSscale M 20 (20 kW)*

Key features of DPA UPScale ST S2:

99.9999% (6 nines) availability

- Decentralized parallel architecture
- No single points of failure
- Redundant capacity (N+1) per frame
- Replace or add modules with no downtime
- Short mean time to repair (MTTR)

Low total cost of ownership

- Up to 96% true online efficiency
- Eco-mode efficiency $\geq 98\%$
- Unity power factor (kW = kVA)
- Low input harmonic distortion (THDi < 3%)
- Small footprint and high power density (472 kW/m²)

All-in-one solution

- Power range from 10 kW to 200 kW in a single frame
- Internal battery modules for short autonomies and external battery cabinets for long autonomies
- User-friendly interface per module and system level
- Remote control and monitoring options available

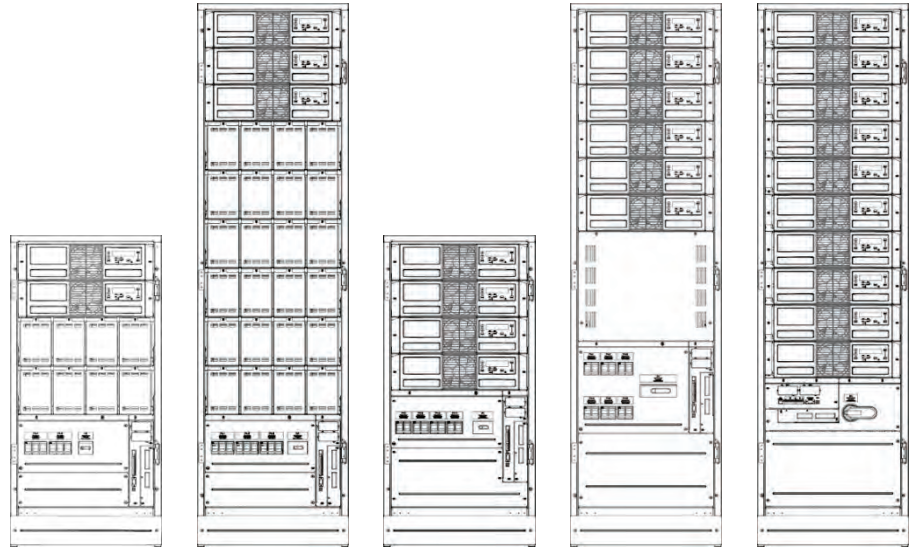
Efficient service concept

- Simple power upgrade
- Fast maintenance
- Full front access
- Fewer spare parts needed

3 Mechanical characteristics

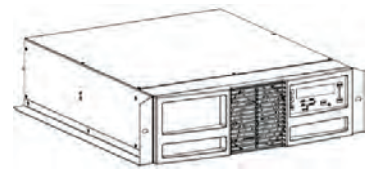
DPA UPScale S2	ST40	ST60	ST80	ST120	ST200
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DPA UPScale ST S2 frames



System power rating	<i>kW</i>	40	60	80	120	200
Max power modules per frame	-	2 modules	3 modules	4 modules	6 modules	10 modules
Internal battery blocks 12 V VRLA		up to 80 x 7 Ah	up to 240 x 7 Ah	-	-	-
Dimensions (WxHxD)	<i>mm</i>	550x1135x775	550x1975x775	550x1135x775	550 x 1975 x 775	
Weight empty frame w/o modules w/o batteries	<i>kg</i>	92	173	82	133	174
Weight of frame with modules and w/o batteries	<i>kg</i>	130 - 136	229 - 238	157 - 169	245 - 263	360 - 389
Audible noise at 1 m from front, 100% / 50% load, 20 kW modules	<i>dBA</i>	66 / 60 ¹⁾ ¹⁾ approx.	66 / 60 ¹⁾	68 / 62 ¹⁾	68 / 62 ¹⁾	70 / 64 ¹⁾
Color	-	RAL 9005				
Access		Front access				
Cable entry		From bottom				
Protection class		IP20				

Module type	UPScale M 10	UPScale M 20
Module rated power	<i>kW</i> 10	20
Dimensions (WxHxD)	<i>mm</i> 488 x 132 x 540 (3HU)	
Weight	<i>kg</i> 18.6	21.5
Colors	RAL 9005	



UPScale M10/M20 module

4 Environmental characteristics

The following data declarations are valid for DPA UPScale M10 and M20 modules.

Ambient temperature range	°C	0 - 40
Relative humidity range		< 95% (non-condensing)
Installation altitude with full rating ASL	m	1000
Derating power factor for installation altitude above 1000 m ASL	m	0.95 @ 1500 m 0.91 @ 2000 m 0.86 @ 2500 m 0.82 @ 3000 m
Storage temperature	°C	-25 - +70

The following are recommended for internal and external batteries:

Ambient temperature range	°C	20 – 25
Battery storage time at ambient temperature		Max. 6 months

5 Input characteristics

Module type	UPSscale M10	UPSscale M20
Module rated power	kW 10	20
Nominal input voltage	V 3 x 380/220 V+N, 3 x 400 V/230 V+N,	3 x 415/240 V+N
Input voltage tolerance (ref to 3 x 400/230 V) for loads in%:	V (-20%/+15%) 3 x 320/184 V to 3 x 460/265 V for <100% load (-26%/+15%) 3 x 296/170 V to 3 x 460/265 V for < 80% load (-35%/+15%) 3 x 260/150 V to 3 x 460/265 V for < 60% load	
Input frequency	Hz 35 – 70	
Input power factor	- 0.99 @ 100% load	
Inrush current	A max. In	
Rated short-time withstand current (I _{scw})	kA 10 for 1.5 seconds	
AC power distribution system: TN-S, TN-C, TN-C-S, TT, 3ph + N		
Total harmonic distortion (THDi)	% < 4.5	< 3.0
Max. input power with rated output power (cosphi = 1.0), rated input voltage and charged battery per module	kW 10.5	21
Max. input current with rated output power (cosphi = 1.0), rated input voltage and charged battery per module	A 15.2	30.4
Max. input power with rated output power (cosphi = 1.0), rated input voltage and discharged battery per module	kW 11.5	23
Max. input current with rated output power (cosphi = 1.0), rated input voltage and discharged battery per module	A 16.6	33.3
Bypass input rated voltage	(-/+15%) 3 x 400 V or 196 V to 264 V ph-N	

6 Battery characteristics

Module type	UPScale M10	UPScale M20
Battery type	- Maintenance-free VRLA or NiCd	
No. VRLA 12 V battery blocks @ max. rated output power	- 30 ²⁾ - 50	40 ²⁾ - 50
Allowed no. of 1.2 V NiCd cells @ max. rated output power	- 300 ²⁾ - 500	400 ²⁾ - 500
Floating voltage	VDC VRLA: 2.25 V/cell - NiCd: 1.4 V/cell	
End of discharge voltage	VDC VRLA: 1.65 V/cell - NiCd: 1.05 V/cell	
Maximum charging current per module	A 4 (6 A charger is optional)	
Battery charging curve	- Ripple-free; IU (DIN 41773)	
Temperature compensation	- Standard (temp. sensor optional)	
Battery test	- Automatic and periodically (adjustable)	

²⁾ Min battery block range allowed under following conditions:

Module type	UPScale M10	UPScale M20
No. VRLA 12 V battery blocks	- 30-32 34-50	40-46 48-50
Max power	<i>kW</i> 6 10 10	16 20 20
Max autonomy	<i>min</i> any 5 any	any 5 any

7 Output characteristics

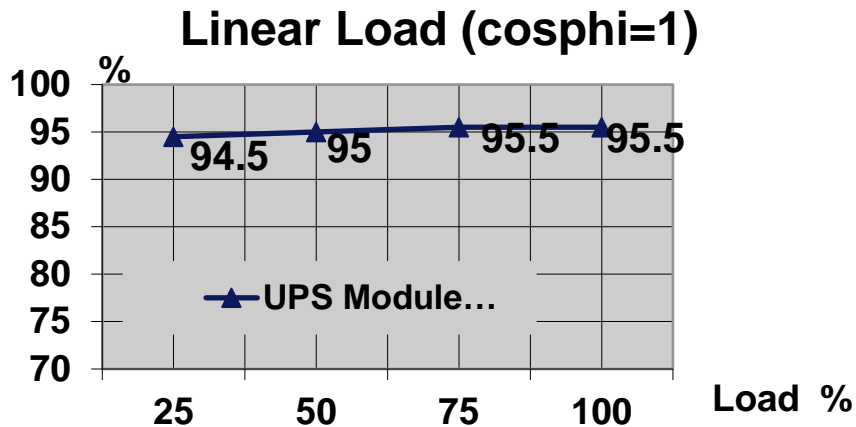
7.1 System output characteristics

DPA UPScale S2	
AC power distribution system	TN-S, TN-C, TN-C-S, TT, 3ph
Output rated voltage	V 3 x 380/220 V or 3 x 400/230 V or 3 x 415/240 V
Output voltage stability	% Static: < +/- 1% Dynamic (step load 0%-100% or 100%-0%) < +/- 4%
Output voltage distortion	% With linear load < 1.5% With nonlinear load (EN62040-3:2001) < 3%
Output frequency	Hz 50 Hz or 60 Hz (selectable)
Output frequency tolerance	% Synchronized with mains < +/- 2% (selectable for bypass operation) or < +/- 4% Free running +/- 0.1%
Efficiency AC-AC (at cosphi 1.0) (tolerance +/- 0.5% applies on all figures)	% Load : 100% 75% 50% 25% : 95.5 95.5 95 94.5
Eco-mode efficiency at 100% load	% 98%
Permissible unbalanced load (All three phases regulated independently)	% 100%
Phase angle tolerance (With 100% unbalanced load)	° < 2°
Crest factor (load supported)	3:1

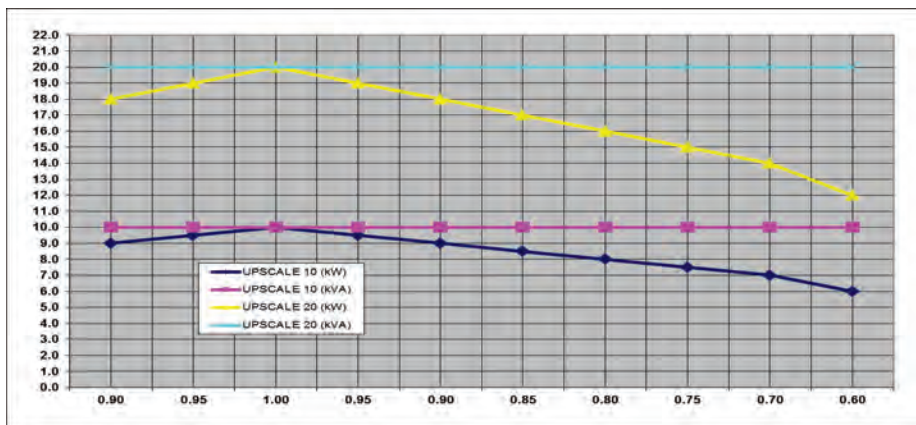
7.2 Module output characteristics

Module type	UPSscale M10	UPSscale M20
Output rated apparent power (cosphi 0.8)	kVA 10	20
Output rated active power (cosphi 1.0)	KW 10	20
Output nominal current (In) at 230 VAC ph-N and cosphi 1.0	A 14.5	29
Overload capability on inverter	% 125% load 150% load	10 min. 60 sec.
Output short capability on static bypass (RMS)	A 10 x In during 20 ms	
Output short capability on inverter (RMS)	A 3.0 x In during 40 ms	2.25 x In during 40 ms (3.0 x In optional)
Static bypass transfer time: inverter → bypass / bypass → inverter / in Eco-mode	ms <1 / <5 / <6	

7.3 Graphic: AC-AC efficiency with linear load @ cosphi 1



7.4 Graph: Output power in kW and kVA versus cosphi



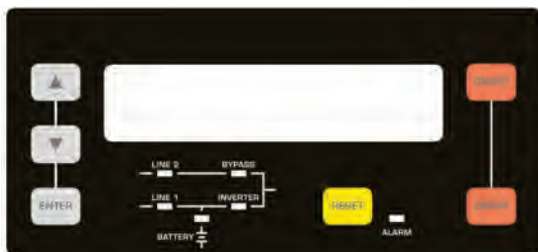
		UPScale module		UPScale module	
		M-10		M-20	
cos(φ)		kW	kVA	kW	kVA
	0.9	9	10	18	20
	0.95	9.5	10	19	20
unity	1	10	10	20	20
Ind.	0.95	10	10	19	20
	0.9	9	10	18	20
	0.85	8.5	10	17	20
	0.8	8	10	16	20
	0.75	7.5	10	15	20
	0.7	7	10	14	20
	0.6	6	10	12	20

8 Standards

Safety	EN 62040-1-1, EN 60950-1
Electromagnetic compatibility	EN 61000-6-4 Prod.standard: EN 62040-2 EN 61000-6-2 Prod.standard: EN 62040-2 EN 61000-4-2, EN 61000-4-3 - EN 61000-4-4 - EN 61000-4-5 - EN 61000-4-6
EMC classification, Emission class	C3
Immunity class	C3
Performance	IEC/EN 62040-3
Product certification	CE

9 Control and monitoring

9.1 DPA display

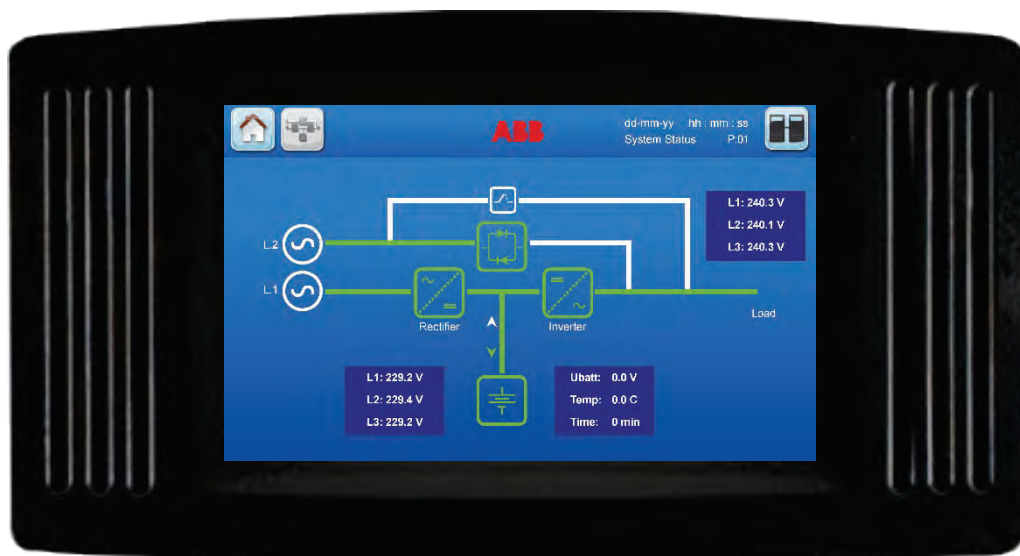


The DPA display and control panel module has three sections:

1. The LCD provides monitoring and measurement information
2. The mimic diagram delivers the general status of the UPS
3. Control keys allow the operator to manipulate UPS settings

9.2 System graphical display



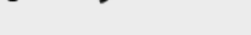





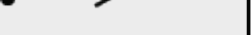


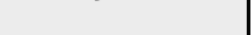


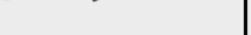





The user-friendly touchscreen graphical display on the system level offers the opportunity to directly monitor the system status as well as the status of each individual module. The graphical display additionally provides all measurements (at module and system level) and the user can transfer from the inverter to bypass and vice-versa. All other commands must be performed on the DPA display. With both displays in place (module and system level), the UPS offers full user friendliness without making compromises on robustness.



9.3 Communication interfaces

Customer interfaces : outputs Dry port X 2	Five voltage-free contacts For remote signaling and automatic computer shutdown
Customer interfaces: inputs Dry port X1	1x remote shutdown [EMERGENCY OFF (normally closed)] 2x programmable customer's inputs (1 st default as GEN-ON (normally open) (2 nd free programmable customer's inputs (normally open) 1x temp. sensor for battery control 1x 12 VDC output (max.)
Serial ports RS232 on Sub-D9	1x system frame For monitoring and integration in network management
USB	1x for monitoring and software management
Network interface card (optional)	SNMP interface, Modbus TCP, Modbus RS-485

9.4 Customer interfaces: input and output dry ports

Block	Terminal	Contact	Signal	On Display	Function
X 2	X 2 / 1	NO 	ALARM	MAINS_OK	Mains present
	X 2 / 2	NC 		Mains failure	
	X 2 / 3	C 		Common	
	X 2 / 4	NO 	Message	LOAD_ON_INV	Load on inverter
	X 2 / 5	NC 		(Load on mains bypass)	
	X 2 / 6	C 		Common	
	X 2 / 7	NO 	ALARM	BATT_LOW	Battery low
	X 2 / 8	NC 		Battery OK	
	X 2 / 9	C 		Common	
	X 2 / 10	NO 	Message	LOAD_ON_MAINS	Load on bypass (Mains)
	X 2 / 11	NC 		(Load on inverter)	
	X 2 / 12	C 		Common	
	X 2 / 13	NO 	ALARM	COMMON_ALARM	Common ALARM (System)
	X 2 / 14	NC 		NO alarm condition	
	X 2 / 15	C 		Common	
X1	X1 / 1	 IN	+ 12 VDC		Generator operation
	X1 / 2	GND	GND		(NC = Generator ON)
	X1 / 3	 IN	+ 12 VDC		Customer IN 1
	X1 / 4	GND	GND		(Function on request, to be defined)
	X1 / 5	 IN	+ 3.3 VDC		Temperature battery
	X1 / 6	GND	GND		(If connected, the battery charger current if depending on the battery temp.)
	X1 / 7	 IN	+ 12 VDC		Remote shutdown
	X1 / 8	GND	GND		(Do not remove the factory mounted bridge until external remote shutdown is connected)
	X1 / 9	 IN	+ 12 VDC		12 VDC source
	X1 / 10	GND	GND		(max. 200 mA load)

All voltage-free contacts are rated 60 VAC max. and 500 mA max.

All the interfaces are connected to Phoenix spring terminals with wires (0.5 mm²)

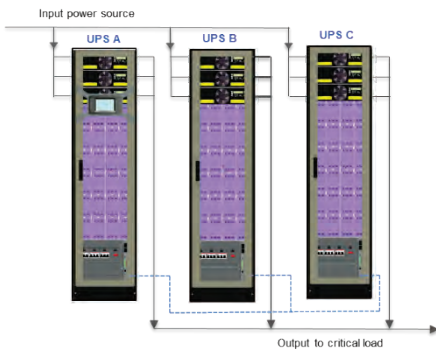
10 Multi-cabinet configuration

The DPA UPScale ST S2 may be paralleled to increase the power capacity up to 400 kW in steps of 10 or 20 kW. A maximum of 20 modules can be paralleled, into four frames.

The following system configurations are available:

DPA UPScale S2	ST40	ST60	ST80	ST120	ST200
Number of modules per frame	2	3	4	6	10
Parallel frames per system	4	4	4	3	2
Max number of modules per system	8	12	16	18	20
Max. total system capacity w/o redundancy	160 kW	240 kW	320 kW	360 kW	400 kW

For a multiple-cabinet system, the following options are necessary:



	UPS A	UPS B	UPS C
System graphical display	X	-	-
Parallel interface	X	X	X
Parallel cable	X	X	-

11 Options

The following table shows different optional UPS features and the DPA UPScale ST S2 models to which they apply.

DPA UPScale S2		Frames					Modules	
Option		ST40	ST60	ST80	ST120	ST200	M10	M20
System	Backfeed protection	●	●	●	●	●	-	-
Power module	Battery start	-	-	-	-	-	●	●
	Battery charger enhancement	-	-	-	-	-	●	●
	Output short capability 3 x In	-	-	-	-	-	-	●
Control & monitoring	SNMP interface	●	●	●	●	●	-	-
	Modbus TCP/IP	●	●	●	●	●	-	-
	Modbus RS-485	●	●	●	●	●	-	-
	System graphical display	●	●	●	●	●	-	-
	Remote graphical display	●	●	●	●	●	-	-
Wiring	Halogen-free cable	●	●	●	●	●	●	●
Mechanics	Back plinth	●	●	●	●	●	-	-
Battery	Internal battery modules	●	●	-	-	-	-	-
	External battery cabinets	-	-	●	●	●	-	-
	Temperature sensor	●	●	●	●	●	-	-
Configuration	Parallel interface	●	●	●	●	●	-	-
	Parallel cable 5/10/15/20/25 m	●	●	●	●	●	-	-
	Synchronization kit	●	●	●	●	●	-	-

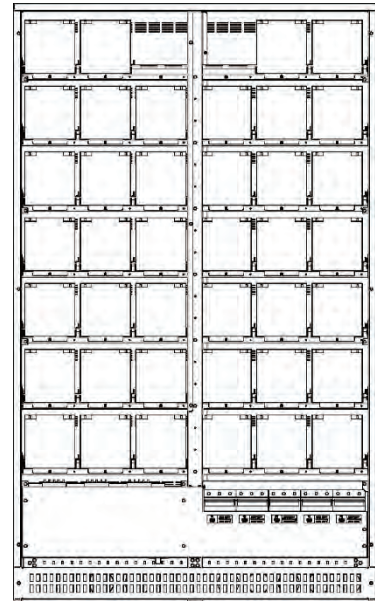
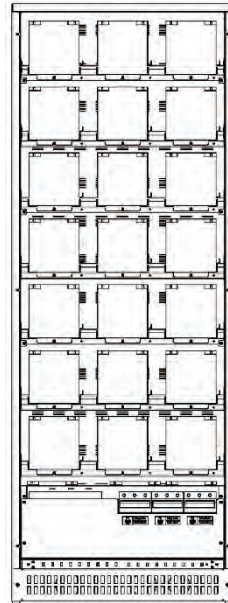
12 External battery cabinets

S-type = For separate battery
 C-type = For common battery

CBAT-UPScale-120
 S-type or C-type

CBAT-UPScale200
 S-type or C-type

Battery frames



Configuration accommodates:	<i>Max.</i>	120 batt. block x 24 Ah/28 Ah on 8 shelves 3 x 5=15 blocks/shelf	200 batt. blocks x 24 Ah/28 Ah on 7 shelves 6 x 5=30 blocks/shelf
Battery fuses / max. batt. strings terminals :	<i>S-type</i>	9 / 3 (Terminal 9 x 16/25mm ²)	15 / 5 (Terminal 15 x 16/25mm ²)
Battery fuses / max. batt. strings terminals :	<i>C-type</i>	9 / 3 + Com. connection bar 3 x (2x M8) +PE 2xM8	15 / 5 + Com. connection bar 3 x (2x M10) +PE 2x M10
Fuse type (very fast-acting)	<i>A</i>	3 x 100 A	5 x 100 A
Dimensions (WxHxD)	<i>mm</i>	730 x 1975 x 800	1200 x 1975 x 800
Weight with trays and w/o batteries	<i>kg</i>	290	410
Possible battery configurations within the battery cabinets		Battery configurations (1x40)x28Ah / (2x40)x28Ah/ (3x40)x28Ah / (2x50)x28 Ah	Battery configurations (1x40)x28Ah / (2x40)x28Ah/ (3x40)x28Ah / (4x40)x28Ah/ (5x40)x28Ah / (2x50)x28Ah/ (4x50)x28Ah

13 Battery autonomy

13.1 Examples of internal battery autonomy of DPA UPScale S2 ST40 and ST 60

Module type		UPSscale M 10		UPSscale M 20 Module needs at least 48 blocks for full power or minimum 40 blocks for 16 kW		
Internal separate battery configuration		Battery autonomy in min. per module				
Frame type	Separate battery / module	8 kW	10 kW	12 kW	16 kW	20 kW
UPSscale ST 40 max. 80 blocks up to 2 modules	(1 x 40) x 7 Ah / Module	8	6	5		
UPSscale ST 40 max. 80 blocks 1 modules ONLY	(1 x50) x 7 Ah / Module	11	8.	7	4	
UPSscale ST 60 max. 240 blocks up to 3 modules	(1 x 40) x 7 Ah / Module	8	6	5		
UPSscale ST 60 max. 240 blocks up to 3 modules	(2x 40) x 7 Ah / Module	21	15	12	8	5

Internal common battery configuration		Battery autonomy in min. for total system power				
With 1 module	Module type	1 x UPSscale M 10		1 x UPSscale M 20		
	Total system power	8 kW	10 kW	12 kW	16 kW	20 kW
UPSscale ST 40 or UPSscale ST 60	1 x (2x 40) x 7 Ah	21	15	12	8	5
UPSscale ST 60	2x (1 x50) x 7 Ah	28	21	16	11	8
UPSscale ST 60	3 x (1 x 40) x 7 Ah	35	26	21	14	5
UPSscale ST 60	3 x (1 x50) x 7 Ah	47	35	28	19	14
UPSscale ST 60	4x (1 x50) x 7 Ah	69	52	41	28	21
UPSscale ST 60	3 x (2x 40) x 7 Ah	88	66	52	35	5
With 2 modules	Module type	2 x UPSscale M 10		2 x UPSscale M 20		
	Total system power	16 kW	20 kW	24 kW	32KW	40 kW
UPSscale ST 40 or UPSscale ST 60	1 x (2x 40) x 7 Ah	8	6	5		
UPSscale ST 60	2x (1 x50) x 7 Ah	11	8	7	4	
UPSscale ST 60	3 x (1 x 40) x 7 Ah	14	11	8	6	5
UPSscale ST 60	3 x (1 x50) x 7 Ah	19	14	11	8	6
UPSscale ST 60	4x (1 x50) x 7 Ah	28	21	16	11	8
UPSscale ST 60	3 x (2x 40) x 7 Ah	35	26	21	14	5
With 3 modules	Module Type	3 x UPSscale M 10		3 x UPSscale M 20		
	Total System Power	24 kW	30 kW	36 kW	48 kW	60 kW
UPSscale ST 60	2x (1 x50) x 7 Ah	7	5	4		
UPSscale ST 60	3 x (1 x 40) x 7 Ah	8	6	5		
UPSscale ST 60	2x (2x 40) x 7 Ah	12	9	7	5	4
UPSscale ST 60	4x (1 x50) x 7 Ah	16	12	10	7	5
UPSscale ST 60	3 x (2x 40) x 7 Ah	21	15	12	8	5

13.2 Examples of external battery autonomy

These configurations are mostly used in combination with the frame DPA UPScale S2 ST 80 or ST 120 or ST 200.

13.2.1 Autonomy table for DPA UPScale ST 80 / 120 / 200 – 10 kW modules

Load power in kW / autonomy in minutes											
	5 min.	6 min.	8 min.	10 min.	12 min.	15 min.	20 min.	25 min.	30 min.	40 min.	60 min.
10 kW	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	1x 34x 24Ah	1x 34x 28Ah	1x 42x 28h	2x 34x 24Ah
20 kW	n.a.	n.a.	n.a.	1x 34x 24Ah	1x 34x 28Ah	1x 40x 28Ah	1x50x 28Ah	2x 34x 24Ah	2x 34x 28Ah	2x 42x 28Ah	3 x 38x 28Ah
30 kW	1x 30x 24Ah	1x 30x 24Ah	1x 34x 28Ah	1x 46x 28Ah	1x50x 28Ah	2x 40x 24Ah	2x 40x 28Ah	2x 46x 28Ah	2x50x 28Ah	3 x 46x 28Ah	4x 46x 28Ah
40 kW	1x 34x 28Ah	1x 36x 28Ah	1x 48x 28Ah	2x 34x 24Ah	2x 36x 24Ah	2x 40x 28Ah	2x50x 28Ah	3 x 40x 28Ah	3 x 44x 28Ah	4x 42x 28Ah	n.a.
50 kW	1x 42x 28Ah	1x 48x 28Ah	1x50x 28Ah	2x 36x 28Ah	2x 42x 28Ah	2x 48x 28Ah	3 x 40x 28Ah	4x 38x 28Ah	5x 34x 28Ah	n.a.	n.a.
60 kW	1x 46x 28Ah	1x50x 28Ah	2x 36x 28Ah	2x 42x 28Ah	2x 48x 28Ah	3 x 40x 24Ah	3 x50x 28Ah	2x 44x 28Ah	4x50x 28Ah	n.a.	n.a.
80 kW	2x 34x 28Ah	2x 36x 28Ah	2x 46x 28Ah	3 x 38x 28Ah	3 x 44x 28Ah	3 x50x 28Ah	4x50x 28Ah	n.a.	n.a.	n.a.	n.a.
100 kW	2x 42x 24Ah	2x 48x 28Ah	3 x 40x 28Ah	3 x 46x 28Ah	4x 44x 28Ah	4x 48x 28Ah	n.a.	n.a.	n.a.	n.a.	n.a.
120 kW	2x 48x 28Ah	3 x 40x 24Ah	3 x 46x 28Ah	4x 44x 28Ah	4x50x 28Ah	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
160 kW	3 x 44x 28Ah	3 x 48x 28Ah	4x 46x 28Ah	4x50x 28Ah	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
200 kW	4x 40x 28Ah	4x 48x 28Ah	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.

Color codes for appropriate battery cabinet:

- CBAT-DPA UPSCALE-120
- CBAT-DPA UPSCALE-200

13.2.2 Autonomy table for DPA UPScale ST 80 / 120 / 200 – 20 kW modules

Load power in kW / autonomy in minutes											
	5 min.	6 min.	8 min.	10 min.	12 min.	15 min.	20 min.	25 min.	30 min.	40 min.	60 min.
20 kW	1x48x24Ah*	1x48x24Ah*	1x48x24Ah*	1x48x24Ah*	1x48x24Ah*	1x48x24Ah*	1x50x28Ah	2x48x24Ah	2x48x24Ah	2x48x24Ah	3x48x24Ah
40 kW	1x48x24Ah*	1x48x24Ah*	1x48x28Ah	2x48x24Ah*	2x48x24Ah*	2x48x24Ah*	2x48x28Ah	3x48x24Ah*	3x48x28Ah	4x48x24Ah	n.a.
60 kW	1x46x28Ah	1x50x28Ah	2x48x24Ah*	2x48x24Ah	2x48x28Ah	3x48x24Ah*	3x50x28Ah	4x48x24Ah	4x50x28Ah	n.a.	n.a.
80 kW	2x48x24Ah*	2x48x24Ah*	2x50x28Ah	3x48x24Ah*	3x48x24Ah	4x48x24Ah*	4x50x28Ah	n.a.	n.a.	n.a.	n.a.
100 kW	2x48x24Ah	2x50x24Ah	3x48x24Ah*	3x48x28Ah*	3x48x28Ah	4x48x28Ah	n.a.	n.a.	n.a.	n.a.	n.a.
120 kW	2x48x28Ah	3x48x24Ah*	3x48x28Ah	3x48x28Ah	4x48x28Ah	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
160 kW	3x48x28Ah	3x48x28Ah	4x48x28Ah	4x48x28Ah	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
200 kW	4x44x28Ah	4x48x28Ah	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
240 kW	5x40x28Ah	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.

Color codes for appropriate battery cabinet:

- CBAT-DPA UPSCALE-120
- CBAT-DPA UPSCALE-200

* Battery configuration gives more autonomy than indicated; the battery blocks may be reduced if the UPS is partially loaded. Refer to the product datasheet.

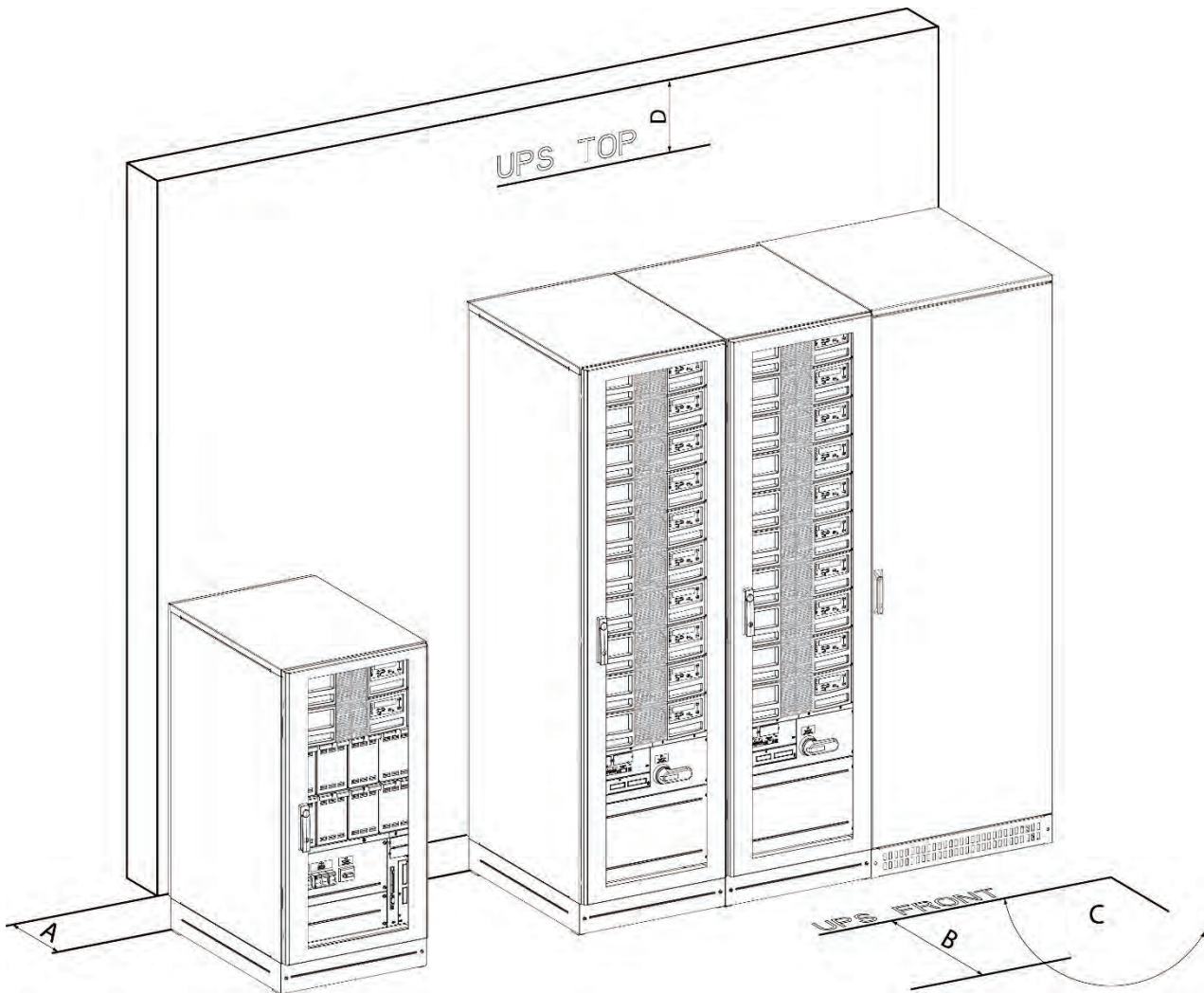
Battery configurations are for example purposes only and calculations are based on an ambient temperature of 20 °C to 25 °C. ABB recommends that the user checks or recalculates configurations according to the battery manufacturer's datasheet.

14 Heat dissipation per module with nonlinear load

Module type		UPScale M10	UPScale M20
Heat dissipation with 100% nonlinear load per module (EN 62040-1-1)	<i>W</i>	550	1100
Heat dissipation with 100% nonlinear load per module (EN 62040-1-1)	<i>BTU/h</i>	1887	3754
Airflow (25° - 30°C) with 100% nonlinear load per module (EN 62040-1-1)	<i>m³/h</i>	150	150
Dissipation at no load	<i>W</i>	120	150

15 Installation planning – UPS positioning

The minimum clearances as described below that are needed to allow proper airflow to the UPS system, and to allow proper service and maintenance, should be respected.



<i>DPA UPScale S2 cabinets</i>		<i>ST40, ST60, ST80, ST120</i>	<i>ST200</i>	UPS + battery cabinets in row.
A	Back clearance for ventilation (forced air outlet)	200 mm	300 mm	
B	Front clearance needed to allow correct door opening	1000 mm		
C	Maximum door opening angle	115°		
D	Top clearance (Top clearance is only needed if there is no side clearance)	400 mm		

16 Wiring and block diagrams for all frames and modules

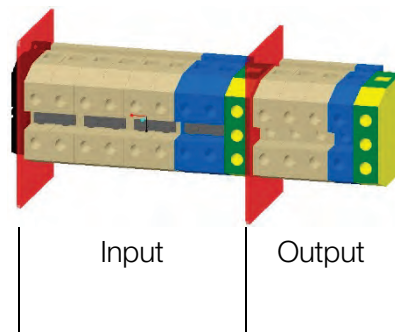
The customer has to supply the wiring to connect the UPS to the local power source. The installation inspection and initial start-up of the UPS and extra battery cabinet must be carried out by a qualified service personnel such as a licensed service engineer from the manufacturer or from an agent certified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

16.1 Terminal connections overview

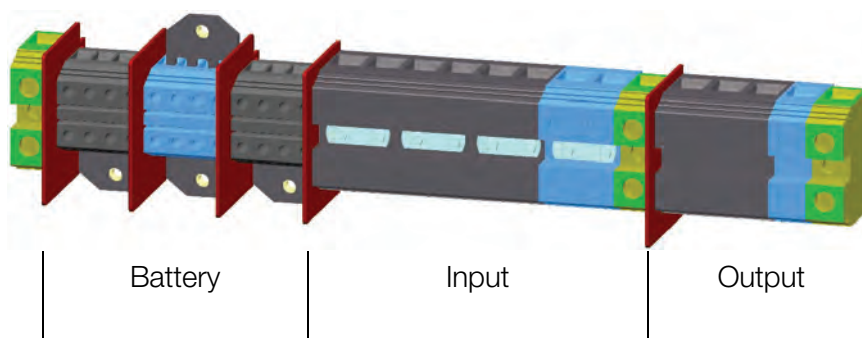
Frame type (T) Compression type Terminals (B) Bolted Terminals	Battery earth PE	Separate battery (+ / N / -)	Common battery (+ / N / -)	Input bypass 3+N	Input rectifier 3+N+PE	Output load 3+N+PE
UPScale ST 40	<i>NOT ALLOWED</i>			4 x 16/25 mm ² (T)	5 x 16/25 mm ² (T)	
UPScale ST 60				4 x 35 mm ² (T)	4 x 35 mm ² (T) + PE 50 mm ² (T)	
UPScale ST 80	50mm ² (T)	4x (3 x 10/16mm ²) (T)	3 x M6 (B)	3 x 50mm ² (T) + N 50mm ² (T)	3 x 50mm ² (T) + N 50mm ² (T) + PE 50 mm ² (T)	
UPScale ST 120	1xM10 (B)	6x (3 x 10/16mm ²) (T)	3 x 2xM5 (B) or 3 x M10 (B)	4 x 95mm ² (T)	4 x 95mm ² (T) + PE M10 (T)	
UPScale ST 200	1x M10 (B)	5x (3 x 35mm ²) (T) 2 modules have common battery	2x (3x M10) (B)	3x M12 (B) + PE 1x M12	4x M12 (B) + PE 1x M12	

16.2 Terminal connections

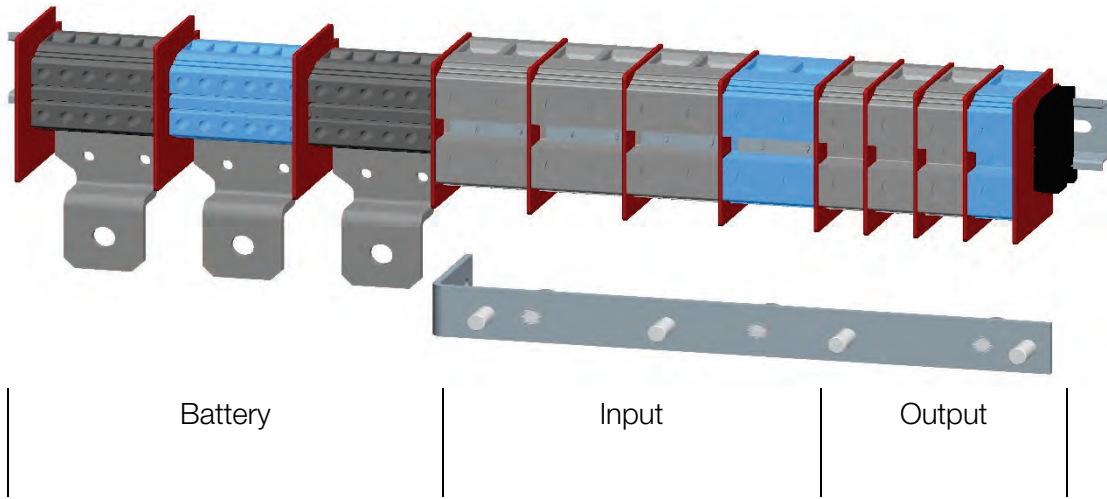
UPScale ST 40 & ST 60



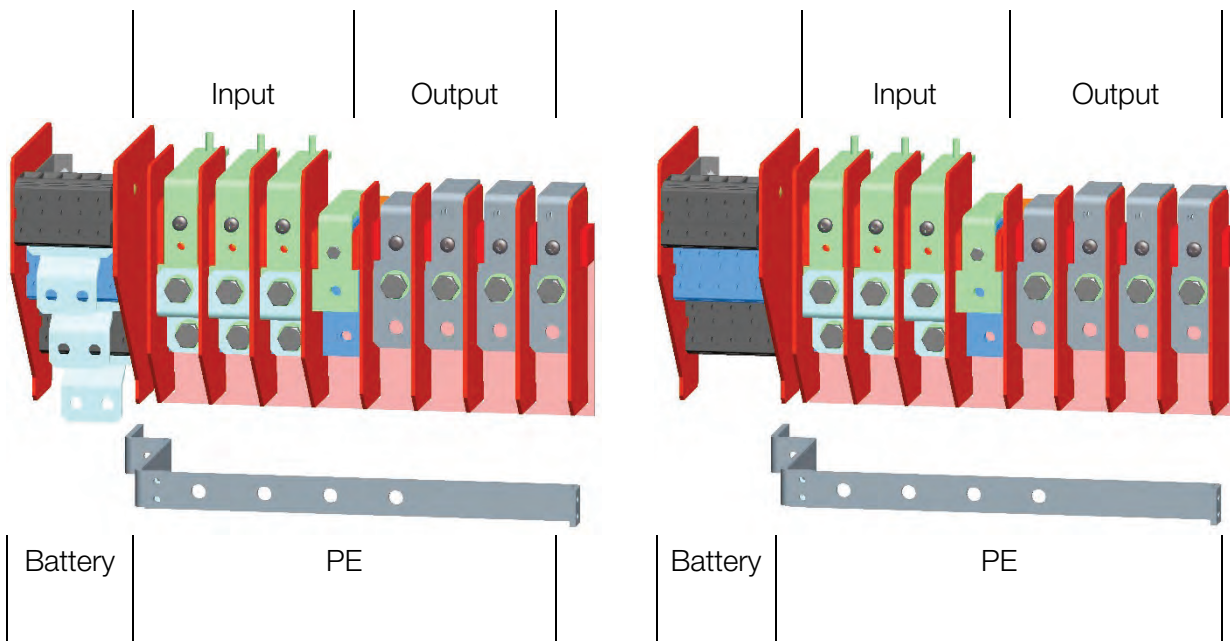
UPScale ST 80



UPScale ST 120



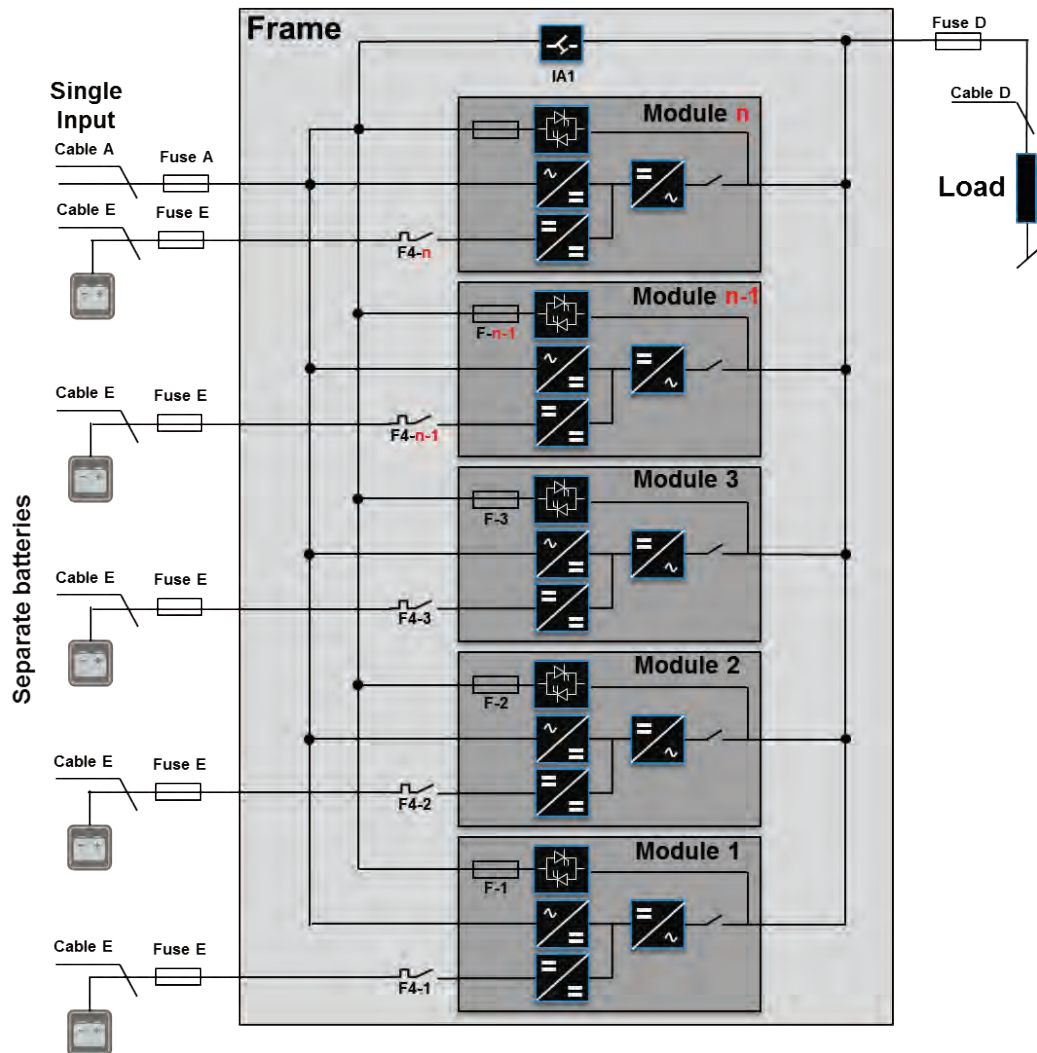
UPScale ST 200



16.3 Single input feed (standard version)

16.3.1 Block diagram

Cable sections and fuse ratings recommended. Alternatively, local standards to be respected.



16.3.2 Cable sections

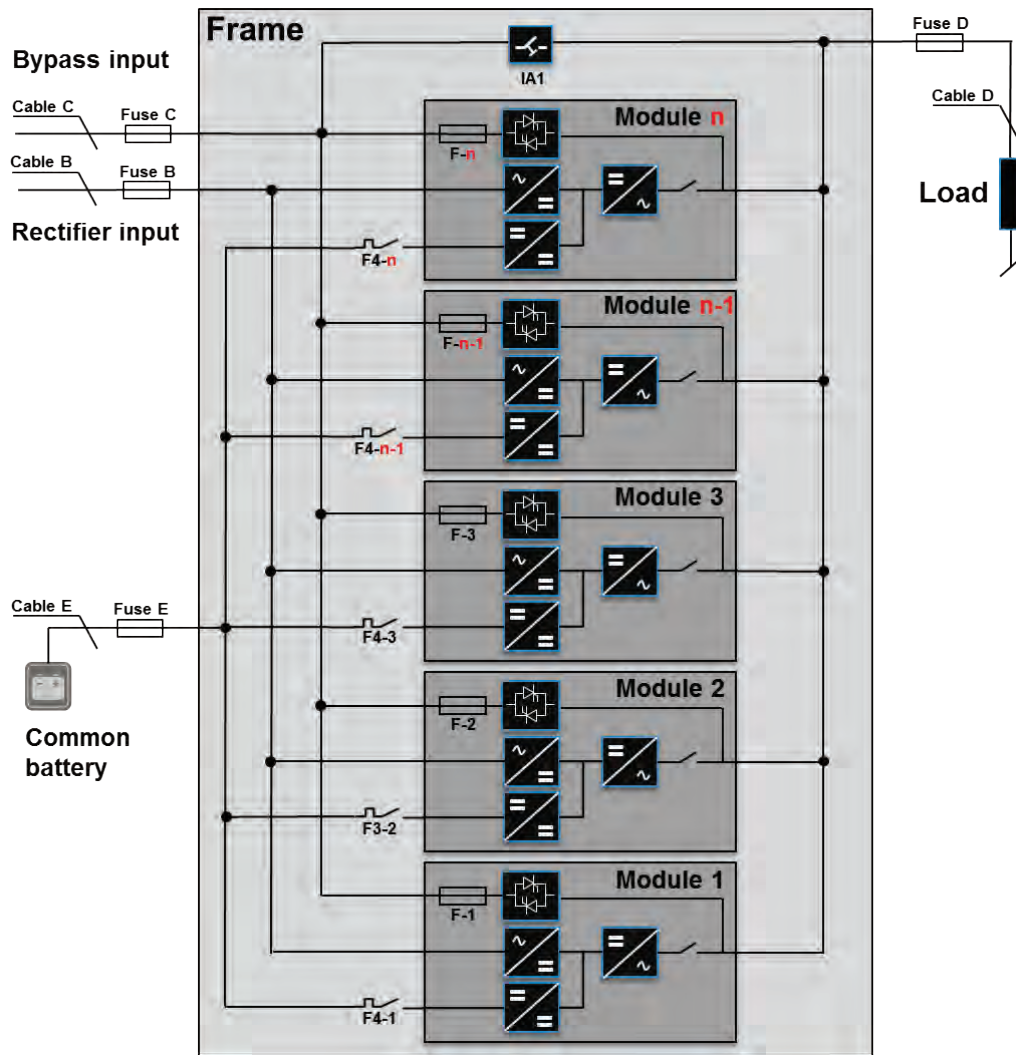
Frame type	Load in kW	Input 3 x 400 V/230 V			Output 3 x 400 V/230 V @ cosphi 1.0		Battery		
		Fuse A (Agl/CB)	Cable A (mm ²) (IEC 60950-1)	Max. input current with battery charging [A]	Cable D (mm ²) (IEC 60950-1)	I _{nom} [A]	Fuse E + / N / - (Agl/CB)	Cable E (mm ²) for CBAT UPScale 120 or 200 ONLY + / N / -	
								Com. battery	Sep. Battery
UPScale ST 40	40	3 x 80 A	5 x 16	68 A	5 x 16	58 A	NOT ALLOWED		
UPScale ST 60	60	3 x 125 A	5 x 35	102 A	5 x 35	87 A			
UPScale ST 80	80	3 x 160 A	5 x 50	136 A	5 x 50	116 A	3 x 224 A*1	3 x 95 *1	4x(3x10)
UPScale ST120	120	3 x 224 A	4 x 95+1 x 50 (PE)	208 A	5 x 70	174 A	3 x 300 A*1	3 x 150 *1	6x(3x10)
UPScale ST 200	200	3 x 350 A	5 x 185	333 A	5 x 185	290 A	3 x 450 A *1	3x(2x95)*1	5x(3x25)

*1 only valid for common battery use

16.4 Dual input feed (optional version)

16.4.1 Block diagram

Cable sections and fuse ratings recommended. Alternatively, local standards to be respected



16.4.2 Cable sections

Frame type UPS Scale ST	Load in kW	Input 3 x 400 V/230 V			Bypass 3 x 400 V/230 V		Output 3 x 400 V/230 V @ cosphi 1.0		Battery		
		Fuse B (Agl/CB)	Cable B (mm ²) (IEC 60950-1)	Max. input current with battery charging [A]	Fuse C (Agl/CB)	Cable C (mm ²) (IEC 60950-1)	Cable D (mm ²) (IEC 60950-1)	I nom [A]	Fuse E +/- (Agl/CB)	Cable E (mm ²) for CBAT UPSscale 120 or 200 ONLY +/- / N / -	
40	40	3 x 80 A	5 x 16	68 A	3 x 80A	4 x 16	5 x 16	58 A	NOT ALLOWED		
60	60	3 x 125 A	5 x 35	102 A	3 x 125A	4 x 35	5 x 35	87 A	NOT ALLOWED		
80	80	3 x 160 A	5 x 50	136 A	3 x 160A	4 x 50	5 x 50	116 A	3 x 224 A*1	3 x 95 *1	4 x (3 x 10)
120	120	3 x 224 A	4 x 95+1 x 50 (PE)	208 A	3 x 224A	4 x 95	5 x 70	174 A	3 x 300 A*1	3 x 150 *1	6 x (3 x 10)
200	200	3 x 350 A	5 x 185	333 A	3 x 350 A	4 x 185	5 x 185	290 A	3 x 450 A*1	3x(2x95)*1	5 x (3 x 25)

*1 only valid for common battery use

Contact us

www.abb.com/ups
ups.sales@ch.abb.com

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Technical data sheet

DPA UPScale™ ST S2

10 – 200 kW



Document information

File name : TDS_ABB_DPA_UPSCALE_ST_S2-10-200kW_EN_REV-E.docx
UPS model : DPA UPScale ST S2
Date of issue : 14.10.2015
Article number : N/A
Document number : 4NWD002987
Revision : E

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1 Introduction

In environments that demand zero downtime, continuous power protection availability is essential. In order to respond to today's dynamic IT and process-related environments that experience daily change through new server technologies, migration and centralization, resilient and easily adaptable power protection concepts are required.

DPA UPScale is the foundation for continuous power protection availability of network-critical infrastructures in enterprise data centers where business continuity has paramount importance and in process control environments where manufacturing continuity is essential.

DPA UPScale is a second-generation, high power-density, leading-edge double conversion power protection technology that is standardized on a modular component approach that helps speed deployment, improve adaptability and increase system availability while reducing total cost of ownership.

DPA UPScale is a unique on-demand architecture that integrates the power rack, power distribution unit, backup battery rack and monitoring and management solutions to allow easy selection of optimized configurations.

DPA UPScale's distributed parallel architecture provides the highest availability, unmatched flexibility and, at the same time, lowest cost of ownership in IT environments.

This technical specification provides detailed technical information on the mechanical, electrical and environmental performance of the DPA UPScale model types to support tender and end-user requirements. The DPA UPScale family was designed to respond to the most stringent safety, EMC and other important UPS standards.

The UPS has the **Classification Code VFI-SS-111**.

2 System description

The DPA UPScale ST S2 is a three-phase, transformerless modular uninterruptible power system (UPS). It is a true on-line double conversion UPS providing quality power for sensitive equipment. Its modular design consists of:

- *DPA UPScale modules M10 (10 kW), M20 (20 kW)*
- *Maintenance bypass switch*
- *Incoming, outgoing and battery terminals*
- *Communication interfaces*
- *Parallel interface (option)*
- *System graphical display (option)*
- *Internal battery modules (option)*

The DPA UPScale ST S2 family has five models available:

- *DPA UPScale ST S2 40 (40 kW)*
- *DPA UPScale ST S2 60 (60 kW)*
- *DPA UPScale ST S2 80 (80 kW)*
- *DPA UPScale ST S2 120 (120 kW)*
- *DPA UPScale ST S2 200 (200 kW)*

DPA UPScale modules types:

- *UPSscale M 10 (10 kW)*
- *UPSscale M 20 (20 kW)*

Key features of DPA UPScale ST S2:

99.9999% (6 nines) availability

- Decentralized parallel architecture
- No single points of failure
- Redundant capacity (N+1) per frame
- Replace or add modules with no downtime
- Short mean time to repair (MTTR)

Low total cost of ownership

- Up to 96% true online efficiency
- Eco-mode efficiency $\geq 98\%$
- Unity power factor (kW = kVA)
- Low input harmonic distortion (THDi < 3%)
- Small footprint and high power density (472 kW/m²)

All-in-one solution

- Power range from 10 kW to 200 kW in a single frame
- Internal battery modules for short autonomies and external battery cabinets for long autonomies
- User-friendly interface per module and system level
- Remote control and monitoring options available

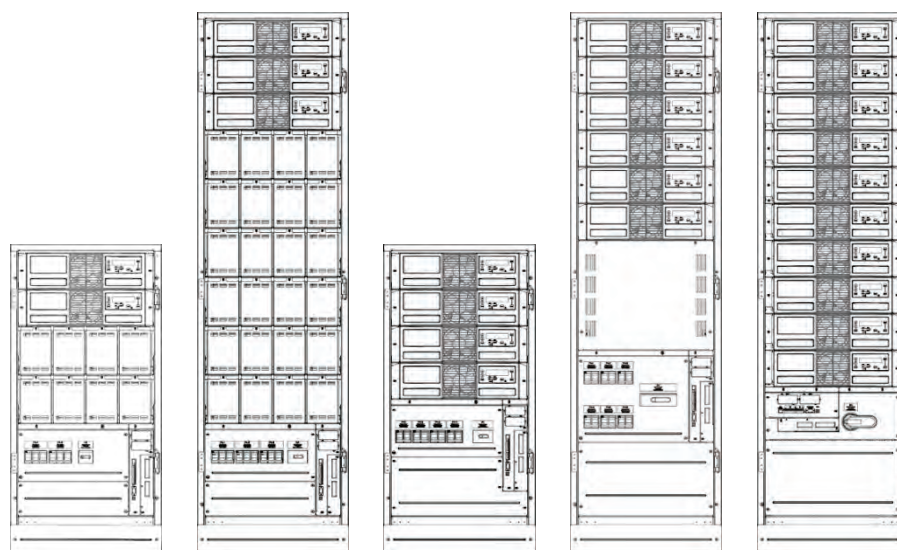
Efficient service concept

- Simple power upgrade
- Fast maintenance
- Full front access
- Fewer spare parts needed

3 Mechanical characteristics

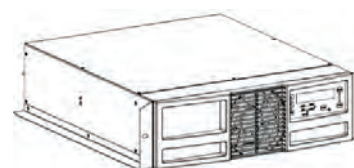
DPA UPScale S2	ST40	ST60	ST80	ST120	ST200
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DPA UPScale ST S2 frames



System power rating	<i>kW</i>	40	60	80	120	200
Max power modules per frame	-	2 modules	3 modules	4 modules	6 modules	10 modules
Internal battery blocks 12 V VRLA		up to 80 x 7 Ah	up to 240 x 7 Ah	-	-	-
Dimensions (WxHxD)	<i>mm</i>	550x1135x775	550x1975x775	550x1135x775	550 x 1975 x 775	
Weight empty frame w/o modules w/o batteries	<i>kg</i>	92	173	82	133	174
Weight of frame with modules and w/o batteries	<i>kg</i>	130 - 136	229 - 238	157 - 169	245 - 263	360 - 389
Audible noise at 1 m from front, 100% / 50% load, 20 kW modules	<i>dBA</i>	66 / 60 ¹⁾ ¹⁾ approx.	66 / 60 ¹⁾	68 / 62 ¹⁾	68 / 62 ¹⁾	70 / 64 ¹⁾
Color	-	RAL 9005				
Access		Front access				
Cable entry		From bottom				
Protection class		IP20				

Module type	UPSscale M 10	UPSscale M 20
Module rated power	<i>kW</i> 10	20
Dimensions (WxHxD)	<i>mm</i> 488 x 132 x 540 (3HU)	
Weight	<i>kg</i> 18.6	21.5
Colors	RAL 9005	



UPSscale M10/M20 module

4 Environmental characteristics

The following data declarations are valid for DPA UPScale M10 and M20 modules.

Ambient temperature range	°C	0 - 40
Relative humidity range		< 95% (non-condensing)
Installation altitude with full rating ASL	m	1000
Derating power factor for installation altitude above 1000 m ASL	m	0.95 @ 1500 m 0.91 @ 2000 m 0.86 @ 2500 m 0.82 @ 3000 m
Storage temperature	°C	-25 - +70

The following are recommended for internal and external batteries:

Ambient temperature range	°C	20 – 25
Battery storage time at ambient temperature		Max. 6 months

5 Input characteristics

Module type	UPSscale M10	UPSscale M20
Module rated power	kW 10	20
Nominal input voltage	V 3 x 380/220 V+N, 3 x 400 V/230 V+N,	3 x 415/240 V+N
Input voltage tolerance (ref to 3 x 400/230 V) for loads in%:	V (-20%/+15%) 3 x 320/184 V to 3 x 460/265 V for <100% load (-26%/+15%) 3 x 296/170 V to 3 x 460/265 V for < 80% load (-35%/+15%) 3 x 260/150 V to 3 x 460/265 V for < 60% load	
Input frequency	Hz 35 – 70	
Input power factor	- 0.99 @ 100% load	
Inrush current	A max. In	
Rated short-time withstand current (I_{scw})	kA 10 for 1.5 seconds	
AC power distribution system: TN-S, TN-C, TN-C-S, TT, 3ph + N		
Total harmonic distortion (THDi)	% < 4.5	< 3.0
Max. input power with rated output power (cosphi = 1.0), rated input voltage and charged battery per module	kW 10.5	21
Max. input current with rated output power (cosphi = 1.0), rated input voltage and charged battery per module	A 15.2	30.4
Max. input power with rated output power (cosphi = 1.0), rated input voltage and discharged battery per module	kW 11.5	23
Max. input current with rated output power (cosphi = 1.0), rated input voltage and discharged battery per module	A 16.6	33.3
Bypass input rated voltage	(-/+15%) 3 x 400 V or 196 V to 264 V ph-N	

6 Battery characteristics

Module type	UPScale M10	UPScale M20	
Battery type	-	Maintenance-free VRLA or NiCd	
No. VRLA 12 V battery blocks @ max. rated output power	-	30 ²⁾ - 50	40 ²⁾ - 50
Allowed no. of 1.2 V NiCd cells @ max. rated output power	-	300 ²⁾ - 500	400 ²⁾ - 500
Floating voltage	VDC	VRLA: 2.25 V/cell - NiCd: 1.4 V/cell	
End of discharge voltage	VDC	VRLA: 1.65 V/cell - NiCd: 1.05 V/cell	
Maximum charging current per module	A	4 (6 A charger is optional)	
Battery charging curve	-	Ripple-free; IU (DIN 41773)	
Temperature compensation	-	Standard (temp. sensor optional)	
Battery test	-	Automatic and periodically (adjustable)	

²⁾ Min battery block range allowed under following conditions:

Module type	UPScale M10	UPScale M20					
No. VRLA 12 V battery blocks	-	30-32	34-50	40-46	48-50		
Max power	<i>kW</i>	6	10	10	16	20	20
Max autonomy	<i>min</i>	any	5	any	any	5	any

7 Output characteristics

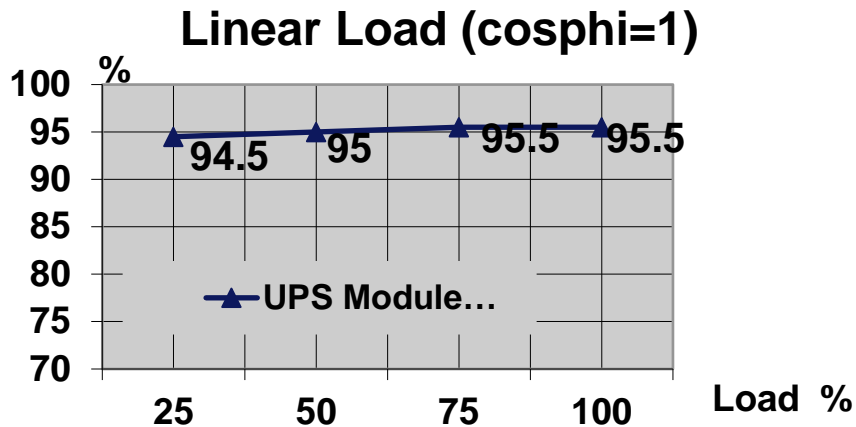
7.1 System output characteristics

DPA UPScale S2	
AC power distribution system	TN-S, TN-C, TN-C-S, TT, 3ph
Output rated voltage	V 3 x 380/220 V or 3 x 400/230 V or 3 x 415/240 V
Output voltage stability	% Static: < +/- 1% Dynamic (step load 0%-100% or 100%-0%) < +/- 4%
Output voltage distortion	% With linear load < 1.5% With nonlinear load (EN62040-3:2001) < 3%
Output frequency	Hz 50 Hz or 60 Hz (selectable)
Output frequency tolerance	% Synchronized with mains < +/- 2% (selectable for bypass operation) or < +/- 4% Free running +/- 0.1%
Efficiency AC-AC (at cosphi 1.0) (tolerance +/- 0.5% applies on all figures)	% Load : 100% 75% 50% 25% : 95.5 95.5 95 94.5
Eco-mode efficiency at 100% load	% 98%
Permissible unbalanced load (All three phases regulated independently)	% 100%
Phase angle tolerance (With 100% unbalanced load)	° < 2°
Crest factor (load supported)	3:1

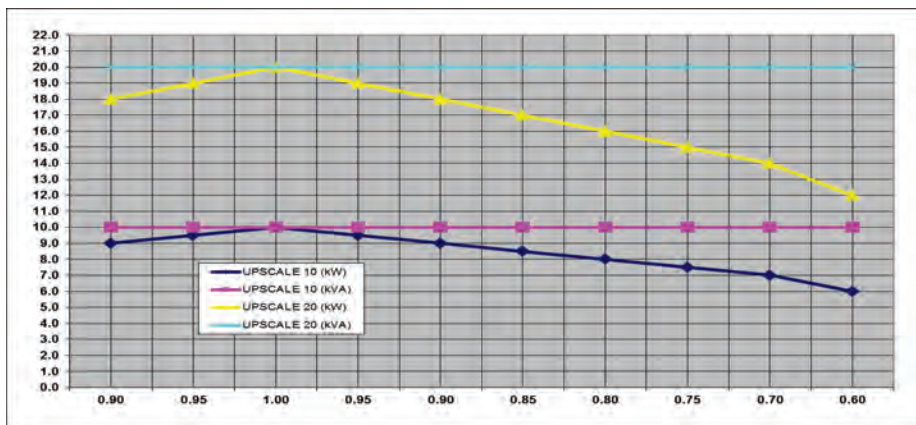
7.2 Module output characteristics

Module type	UPSscale M10	UPSscale M20
Output rated apparent power (cosphi 0.8)	kVA 10	20
Output rated active power (cosphi 1.0)	KW 10	20
Output nominal current (In) at 230 VAC ph-N and cosphi 1.0	A 14.5	29
Overload capability on inverter	% 125% load 150% load	10 min. 60 sec.
Output short capability on static bypass (RMS)	A 10 x In during 20 ms	
Output short capability on inverter (RMS)	A 3.0 x In during 40 ms	2.25 x In during 40 ms (3.0 x In optional)
Static bypass transfer time: inverter → bypass / bypass → inverter / in Eco-mode	ms <1 / <5 / <6	

7.3 Graphic: AC-AC efficiency with linear load @ cosphi 1



7.4 Graph: Output power in kW and kVA versus cosphi



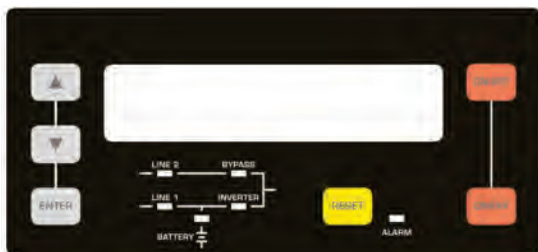
		UPScale module		UPScale module	
		M-10		M-20	
cos(φ)		kW	kVA	kW	kVA
	0.9	9	10	18	20
	0.95	9.5	10	19	20
unity	1	10	10	20	20
Ind.	0.95	10	10	19	20
	0.9	9	10	18	20
	0.85	8.5	10	17	20
	0.8	8	10	16	20
	0.75	7.5	10	15	20
	0.7	7	10	14	20
	0.6	6	10	12	20

8 Standards

Safety	EN 62040-1-1, EN 60950-1
Electromagnetic compatibility	EN 61000-6-4 Prod.standard: EN 62040-2 EN 61000-6-2 Prod.standard: EN 62040-2 EN 61000-4-2, EN 61000-4-3 - EN 61000-4-4 - EN 61000-4-5 - EN 61000-4-6
EMC classification, Emission class	C3
Immunity class	C3
Performance	IEC/EN 62040-3
Product certification	CE

9 Control and monitoring

9.1 DPA display

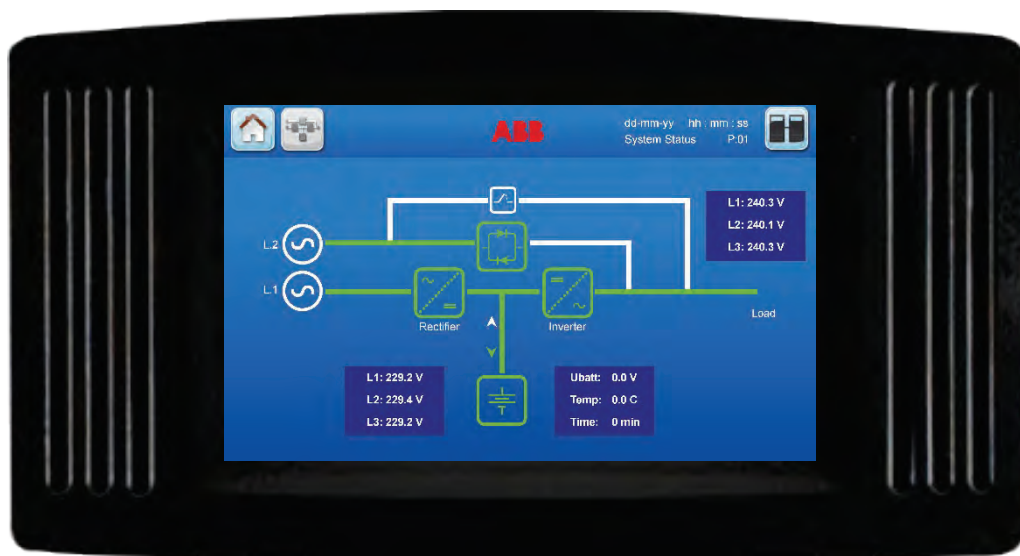


The DPA display and control panel module has three sections:

1. The LCD provides monitoring and measurement information
2. The mimic diagram delivers the general status of the UPS
3. Control keys allow the operator to manipulate UPS settings

9.2 System graphical display



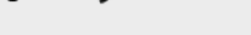





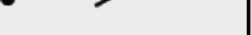


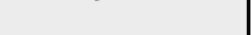


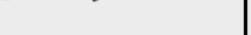





The user-friendly touchscreen graphical display on the system level offers the opportunity to directly monitor the system status as well as the status of each individual module. The graphical display additionally provides all measurements (at module and system level) and the user can transfer from the inverter to bypass and vice-versa. All other commands must be performed on the DPA display. With both displays in place (module and system level), the UPS offers full user friendliness without making compromises on robustness.



9.3 Communication interfaces

Customer interfaces : outputs Dry port X 2	Five voltage-free contacts For remote signaling and automatic computer shutdown
Customer interfaces: inputs Dry port X1	1x remote shutdown [EMERGENCY OFF (normally closed)] 2x programmable customer's inputs (1 st default as GEN-ON (normally open) (2 nd free programmable customer's inputs (normally open) 1x temp. sensor for battery control 1x 12 VDC output (max.)
Serial ports RS232 on Sub-D9	1x system frame For monitoring and integration in network management
USB	1x for monitoring and software management
Network interface card (optional)	SNMP interface, Modbus TCP, Modbus RS-485

9.4 Customer interfaces: input and output dry ports

Block	Terminal	Contact	Signal	On Display	Function
X 2	X 2 / 1	NO 	ALARM	MAINS_OK	Mains present
	X 2 / 2	NC 		Mains failure	
	X 2 / 3	C 		Common	
	X 2 / 4	NO 	Message	LOAD_ON_INV	Load on inverter
	X 2 / 5	NC 		(Load on mains bypass)	
	X 2 / 6	C 		Common	
	X 2 / 7	NO 	ALARM	BATT_LOW	Battery low
	X 2 / 8	NC 		Battery OK	
	X 2 / 9	C 		Common	
	X 2 / 10	NO 	Message	LOAD_ON_MAINS	Load on bypass (Mains)
	X 2 / 11	NC 		(Load on inverter)	
	X 2 / 12	C 		Common	
	X 2 / 13	NO 	ALARM	COMMON_ALARM	Common ALARM (System)
	X 2 / 14	NC 		NO alarm condition	
	X 2 / 15	C 		Common	
X1	X1 / 1	 IN	+ 12 VDC		Generator operation
	X1 / 2	GND	GND		(NC = Generator ON)
	X1 / 3	 IN	+ 12 VDC		Customer IN 1
	X1 / 4	GND	GND		(Function on request, to be defined)
	X1 / 5	 IN	+ 3.3 VDC		Temperature battery
	X1 / 6	GND	GND		(If connected, the battery charger current if depending on the battery temp.)
	X1 / 7	 IN	+ 12 VDC		Remote shutdown
	X1 / 8	GND	GND		(Do not remove the factory mounted bridge until external remote shutdown is connected)
	X1 / 9	 IN	+ 12 VDC		12 VDC source
	X1 / 10	GND	GND		(max. 200 mA load)

All voltage-free contacts are rated 60 VAC max. and 500 mA max.

All the interfaces are connected to Phoenix spring terminals with wires (0.5 mm²)

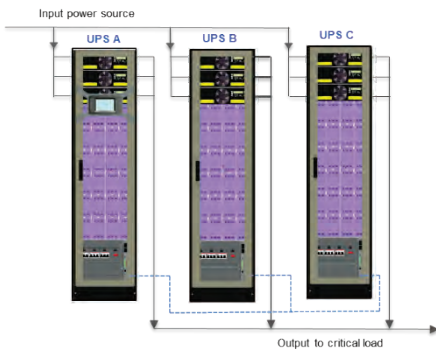
10 Multi-cabinet configuration

The DPA UPScale ST S2 may be paralleled to increase the power capacity up to 400 kW in steps of 10 or 20 kW. A maximum of 20 modules can be paralleled, into four frames.

The following system configurations are available:

DPA UPScale S2	ST40	ST60	ST80	ST120	ST200
Number of modules per frame	2	3	4	6	10
Parallel frames per system	4	4	4	3	2
Max number of modules per system	8	12	16	18	20
Max. total system capacity w/o redundancy	160 kW	240 kW	320 kW	360 kW	400 kW

For a multiple-cabinet system, the following options are necessary:



	UPS A	UPS B	UPS C
System graphical display	X	-	-
Parallel interface	X	X	X
Parallel cable	X	X	-

11 Options

The following table shows different optional UPS features and the DPA UPScale ST S2 models to which they apply.

DPA UPScale S2		Frames					Modules	
Option		ST40	ST60	ST80	ST120	ST200	M10	M20
System	Backfeed protection	●	●	●	●	●	-	-
Power module	Battery start	-	-	-	-	-	●	●
	Battery charger enhancement	-	-	-	-	-	●	●
	Output short capability 3 x In	-	-	-	-	-	-	●
Control & monitoring	SNMP interface	●	●	●	●	●	-	-
	Modbus TCP/IP	●	●	●	●	●	-	-
	Modbus RS-485	●	●	●	●	●	-	-
	System graphical display	●	●	●	●	●	-	-
	Remote graphical display	●	●	●	●	●	-	-
Wiring	Halogen-free cable	●	●	●	●	●	●	●
Mechanics	Back plinth	●	●	●	●	●	-	-
Battery	Internal battery modules	●	●	-	-	-	-	-
	External battery cabinets	-	-	●	●	●	-	-
	Temperature sensor	●	●	●	●	●	-	-
Configuration	Parallel interface	●	●	●	●	●	-	-
	Parallel cable 5/10/15/20/25 m	●	●	●	●	●	-	-
	Synchronization kit	●	●	●	●	●	-	-

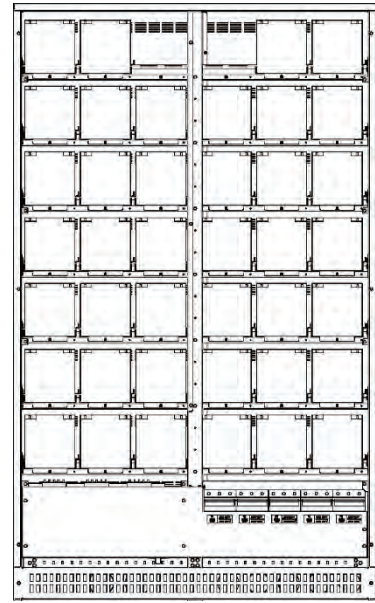
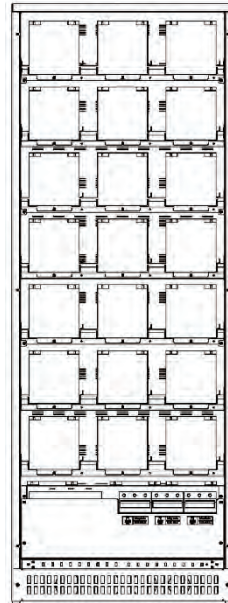
12 External battery cabinets

S-type = For separate battery
 C-type = For common battery

CBAT-UPScale-120
 S-type or C-type

CBAT-UPScale200
 S-type or C-type

Battery frames



Configuration accommodates:	<i>Max.</i>	120 batt. block x 24 Ah/28 Ah on 8 shelves 3 x 5=15 blocks/shelf	200 batt. blocks x 24 Ah/28 Ah on 7 shelves 6 x 5=30 blocks/shelf
Battery fuses / max. batt. strings terminals :	<i>S-type</i>	9 / 3 (Terminal 9 x 16/25mm ²)	15 / 5 (Terminal 15 x 16/25mm ²)
Battery fuses / max. batt. strings terminals :	<i>C-type</i>	9 / 3 + Com. connection bar 3 x (2x M8) +PE 2xM8	15 / 5 + Com. connection bar 3 x (2x M10) +PE 2x M10
Fuse type (very fast-acting)	<i>A</i>	3 x 100 A	5 x 100 A
Dimensions (WxHxD)	<i>mm</i>	730 x 1975 x 800	1200 x 1975 x 800
Weight with trays and w/o batteries	<i>kg</i>	290	410
Possible battery configurations within the battery cabinets		Battery configurations (1x40)x28Ah / (2x40)x28Ah/ (3x40)x28Ah / (2x50)x28 Ah	Battery configurations (1x40)x28Ah / (2x40)x28Ah/ (3x40)x28Ah / (4x40)x28Ah/ (5x40)x28Ah / (2x50)x28Ah/ (4x50)x28Ah

13 Battery autonomy

13.1 Examples of internal battery autonomy of DPA UPScale S2 ST40 and ST 60

Module type		UPSscale M 10		UPSscale M 20 Module needs at least 48 blocks for full power or minimum 40 blocks for 16 kW		
Internal separate battery configuration		Battery autonomy in min. per module				
Frame type	Separate battery / module	8 kW	10 kW	12 kW	16 kW	20 kW
UPSscale ST 40 max. 80 blocks up to 2 modules	(1 x 40) x 7 Ah / Module	8	6	5		
UPSscale ST 40 max. 80 blocks 1 modules ONLY	(1 x50) x 7 Ah / Module	11	8.	7	4	
UPSscale ST 60 max. 240 blocks up to 3 modules	(1 x 40) x 7 Ah / Module	8	6	5		
UPSscale ST 60 max. 240 blocks up to 3 modules	(2x 40) x 7 Ah / Module	21	15	12	8	5

Internal common battery configuration		Battery autonomy in min. for total system power				
With 1 module	Module type	1 x UPScale M 10		1 x UPScale M 20		
	Total system power	8 kW	10 kW	12 kW	16 kW	20 kW
UPSscale ST 40 or UPSscale ST 60	1 x (2x 40) x 7 Ah	21	15	12	8	5
UPSscale ST 60	2x (1 x50) x 7 Ah	28	21	16	11	8
UPSscale ST 60	3 x (1 x 40) x 7 Ah	35	26	21	14	5
UPSscale ST 60	3 x (1 x50) x 7 Ah	47	35	28	19	14
UPSscale ST 60	4x (1 x50) x 7 Ah	69	52	41	28	21
UPSscale ST 60	3 x (2x 40) x 7 Ah	88	66	52	35	5
With 2 modules	Module type	2 x UPScale M 10		2 x UPScale M 20		
	Total system power	16 kW	20 kW	24 kW	32KW	40 kW
UPSscale ST 40 or UPSscale ST 60	1 x (2x 40) x 7 Ah	8	6	5		
UPSscale ST 60	2x (1 x50) x 7 Ah	11	8	7	4	
UPSscale ST 60	3 x (1 x 40) x 7 Ah	14	11	8	6	5
UPSscale ST 60	3 x (1 x50) x 7 Ah	19	14	11	8	6
UPSscale ST 60	4x (1 x50) x 7 Ah	28	21	16	11	8
UPSscale ST 60	3 x (2x 40) x 7 Ah	35	26	21	14	5
With 3 modules	Module Type	3 x UPScale M 10		3 x UPScale M 20		
	Total System Power	24 kW	30 kW	36 kW	48 kW	60 kW
UPSscale ST 60	2x (1 x50) x 7 Ah	7	5	4		
UPSscale ST 60	3 x (1 x 40) x 7 Ah	8	6	5		
UPSscale ST 60	2x (2x 40) x 7 Ah	12	9	7	5	4
UPSscale ST 60	4x (1 x50) x 7 Ah	16	12	10	7	5
UPSscale ST 60	3 x (2x 40) x 7 Ah	21	15	12	8	5

13.2 Examples of external battery autonomy

These configurations are mostly used in combination with the frame DPA UPScale S2 ST 80 or ST 120 or ST 200.

13.2.1 Autonomy table for DPA UPScale ST 80 / 120 / 200 – 10 kW modules

Load power in kW / autonomy in minutes											
	5 min.	6 min.	8 min.	10 min.	12 min.	15 min.	20 min.	25 min.	30 min.	40 min.	60 min.
10 kW	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	1x 34x 24Ah	1x 34x 28Ah	1x 42x 28h	2x 34x 24Ah
20 kW	n.a.	n.a.	n.a.	1x 34x 24Ah	1x 34x 28Ah	1x 40x 28Ah	1x50x 28Ah	2x 34x 24Ah	2x 34x 28Ah	2x 42x 28Ah	3 x 38x 28Ah
30 kW	1x 30x 24Ah	1x 30x 24Ah	1x 34x 28Ah	1x 46x 28Ah	1x50x 28Ah	2x 40x 24Ah	2x 40x 28Ah	2x 46x 28Ah	2x50x 28Ah	3 x 46x 28Ah	4x 46x 28Ah
40 kW	1x 34x 28Ah	1x 36x 28Ah	1x 48x 28Ah	2x 34x 24Ah	2x 36x 24Ah	2x 40x 28Ah	2x50x 28Ah	3 x 40x 28Ah	3 x 44x 28Ah	4x 42x 28Ah	n.a.
50 kW	1x 42x 28Ah	1x 48x 28Ah	1x50x 28Ah	2x 36x 28Ah	2x 42x 28Ah	2x 48x 28Ah	3 x 40x 28Ah	4x 38x 28Ah	5x 34x 28Ah	n.a.	n.a.
60 kW	1x 46x 28Ah	1x50x 28Ah	2x 36x 28Ah	2x 42x 28Ah	2x 48x 28Ah	3 x 40x 24Ah	3 x50x 28Ah	2x 44x 28Ah	4x50x 28Ah	n.a.	n.a.
80 kW	2x 34x 28Ah	2x 36x 28Ah	2x 46x 28Ah	3 x 38x 28Ah	3 x 44x 28Ah	3 x50x 28Ah	4x50x 28Ah	n.a.	n.a.	n.a.	n.a.
100 kW	2x 42x 24Ah	2x 48x 28Ah	3 x 40x 28Ah	3 x 46x 28Ah	4x 44x 28Ah	4x 48x 28Ah	n.a.	n.a.	n.a.	n.a.	n.a.
120 kW	2x 48x 28Ah	3 x 40x 24Ah	3 x 46x 28Ah	4x 44x 28Ah	4x50x 28Ah	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
160 kW	3 x 44x 28Ah	3 x 48x 28Ah	4x 46x 28Ah	4x50x 28Ah	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
200 kW	4x 40x 28Ah	4x 48x 28Ah	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.

Color codes for appropriate battery cabinet:

- CBAT-DPA UPSCALE-120
- CBAT-DPA UPSCALE-200

13.2.2 Autonomy table for DPA UPScale ST 80 / 120 / 200 – 20 kW modules

Load power in kW / autonomy in minutes											
	5 min.	6 min.	8 min.	10 min.	12 min.	15 min.	20 min.	25 min.	30 min.	40 min.	60 min.
20 kW	1x48x24Ah*	1x48x24Ah*	1x48x24Ah*	1x48x24Ah*	1x48x24Ah*	1x48x24Ah*	1x50x28Ah	2x48x24Ah	2x48x24Ah	2x48x24Ah	3x48x24Ah
40 kW	1x48x24Ah*	1x48x24Ah*	1x48x28Ah	2x48x24Ah*	2x48x24Ah*	2x48x24Ah*	2x48x28Ah	3x48x24Ah*	3x48x28Ah	4x48x24Ah	n.a.
60 kW	1x46x28Ah	1x50x28Ah	2x48x24Ah*	2x48x24Ah	2x48x28Ah	3x48x24Ah*	3x50x28Ah	4x48x24Ah	4x50x28Ah	n.a.	n.a.
80 kW	2x48x24Ah*	2x48x24Ah*	2x50x28Ah	3x48x24Ah*	3x48x24Ah	4x48x24Ah*	4x50x28Ah	n.a.	n.a.	n.a.	n.a.
100 kW	2x48x24Ah	2x50x24Ah	3x48x24Ah*	3x48x28Ah*	3x48x28Ah	4x48x28Ah	n.a.	n.a.	n.a.	n.a.	n.a.
120 kW	2x48x28Ah	3x48x24Ah*	3x48x28Ah	3x48x28Ah	4x48x28Ah	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
160 kW	3x48x28Ah	3x48x28Ah	4x48x28Ah	4x48x28Ah	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
200 kW	4x44x28Ah	4x48x28Ah	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
240 kW	5x40x28Ah	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.

Color codes for appropriate battery cabinet:

- CBAT-DPA UPSCALE-120
- CBAT-DPA UPSCALE-200

* Battery configuration gives more autonomy than indicated; the battery blocks may be reduced if the UPS is partially loaded. Refer to the product datasheet.

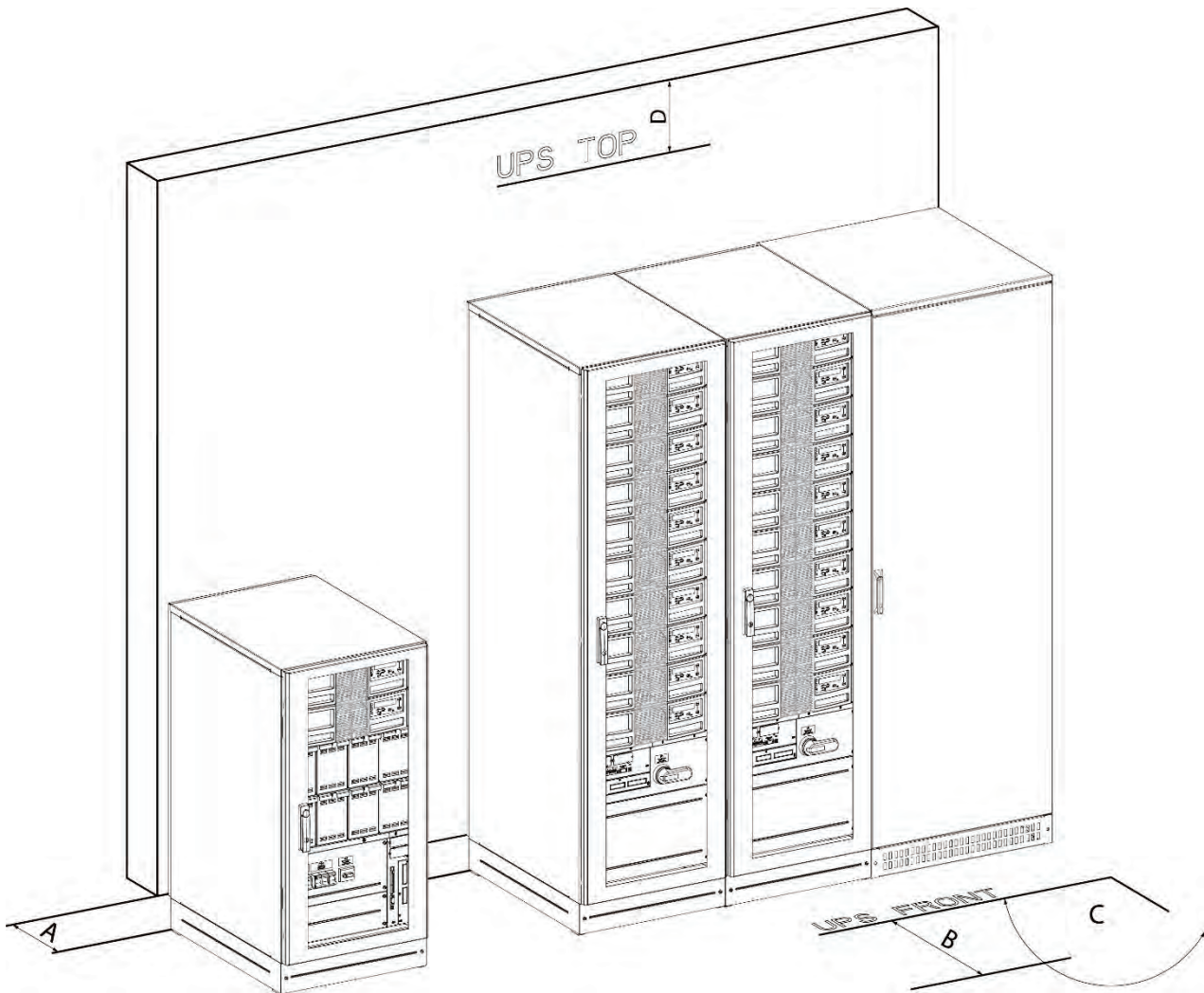
Battery configurations are for example purposes only and calculations are based on an ambient temperature of 20 °C to 25 °C. ABB recommends that the user checks or recalculates configurations according to the battery manufacturer's datasheet.

14 Heat dissipation per module with nonlinear load

Module type		UPScale M10	UPScale M20
Heat dissipation with 100% nonlinear load per module (EN 62040-1-1)	<i>W</i>	550	1100
Heat dissipation with 100% nonlinear load per module (EN 62040-1-1)	<i>BTU/h</i>	1887	3754
Airflow (25° - 30°C) with 100% nonlinear load per module (EN 62040-1-1)	<i>m³/h</i>	150	150
Dissipation at no load	<i>W</i>	120	150

15 Installation planning – UPS positioning

The minimum clearances as described below that are needed to allow proper airflow to the UPS system, and to allow proper service and maintenance, should be respected.



<i>DPA UPScale S2 cabinets</i>		<i>ST40, ST60, ST80, ST120</i>	<i>ST200</i>	UPS + battery cabinets in row.
A	Back clearance for ventilation (forced air outlet)	200 mm	300 mm	
B	Front clearance needed to allow correct door opening	1000 mm		
C	Maximum door opening angle	115°		
D	Top clearance (Top clearance is only needed if there is no side clearance)	400 mm		

16 Wiring and block diagrams for all frames and modules

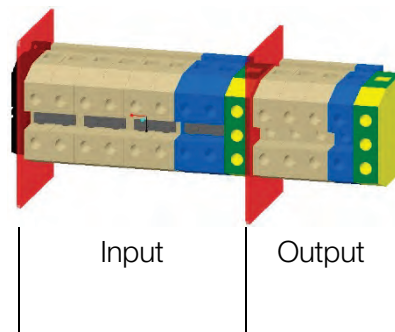
The customer has to supply the wiring to connect the UPS to the local power source. The installation inspection and initial start-up of the UPS and extra battery cabinet must be carried out by a qualified service personnel such as a licensed service engineer from the manufacturer or from an agent certified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

16.1 Terminal connections overview

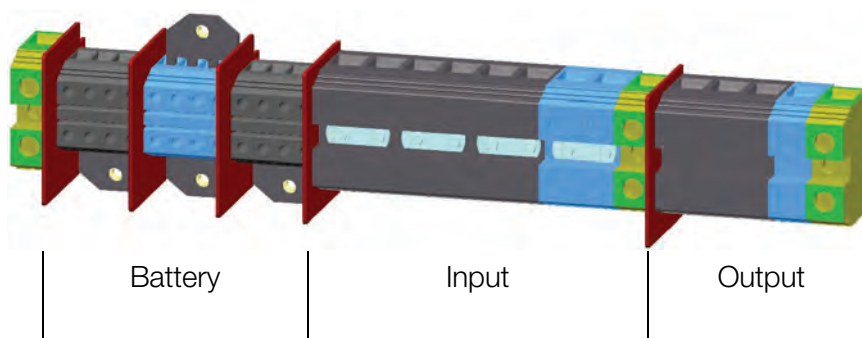
Frame type (T) Compression type Terminals (B) Bolted Terminals	Battery earth PE	Separate battery (+ / N / -)	Common battery (+ / N / -)	Input bypass 3+N	Input rectifier 3+N+PE	Output load 3+N+PE
UPScale ST 40	<i>NOT ALLOWED</i>			4 x 16/25 mm ² (T)	5 x 16/25 mm ² (T)	
UPScale ST 60				4 x 35 mm ² (T)	4 x 35 mm ² (T) + PE 50 mm ² (T)	
UPScale ST 80	50mm ² (T)	4x (3 x 10/16mm ²) (T)	3 x M6 (B)	3 x 50mm ² (T) + N 50mm ² (T)	3 x 50mm ² (T) + N 50mm ² (T) + PE 50 mm ² (T)	
UPScale ST 120	1xM10 (B)	6x (3 x 10/16mm ²) (T)	3 x 2xM5 (B) or 3 x M10 (B)	4 x 95mm ² (T)	4 x 95mm ² (T) + PE M10 (T)	
UPScale ST 200	1x M10 (B)	5x (3 x 35mm ²) (T) 2 modules have common battery	2x (3x M10) (B)	3x M12 (B) + PE 1x M12	4x M12 (B) + PE 1x M12	

16.2 Terminal connections

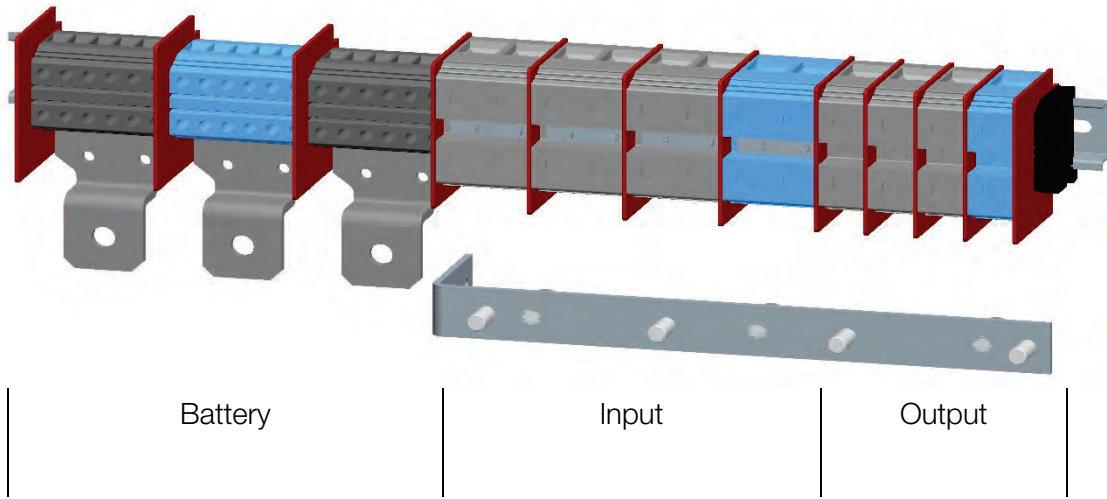
UPScale ST 40 & ST 60



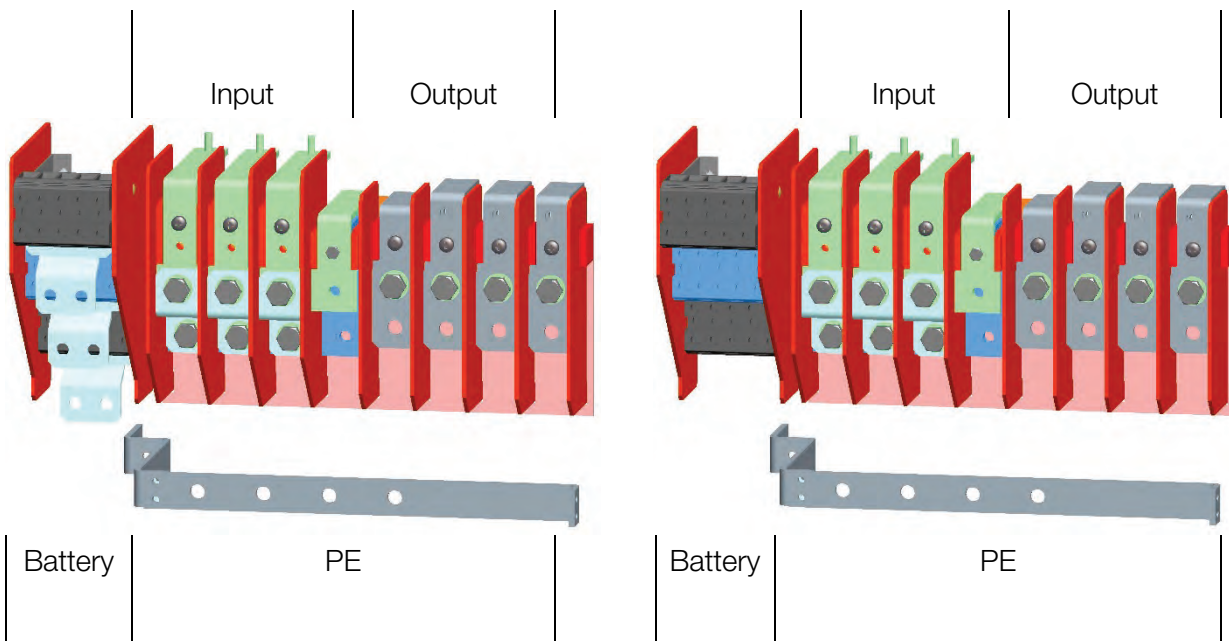
UPScale ST 80



UPScale ST 120



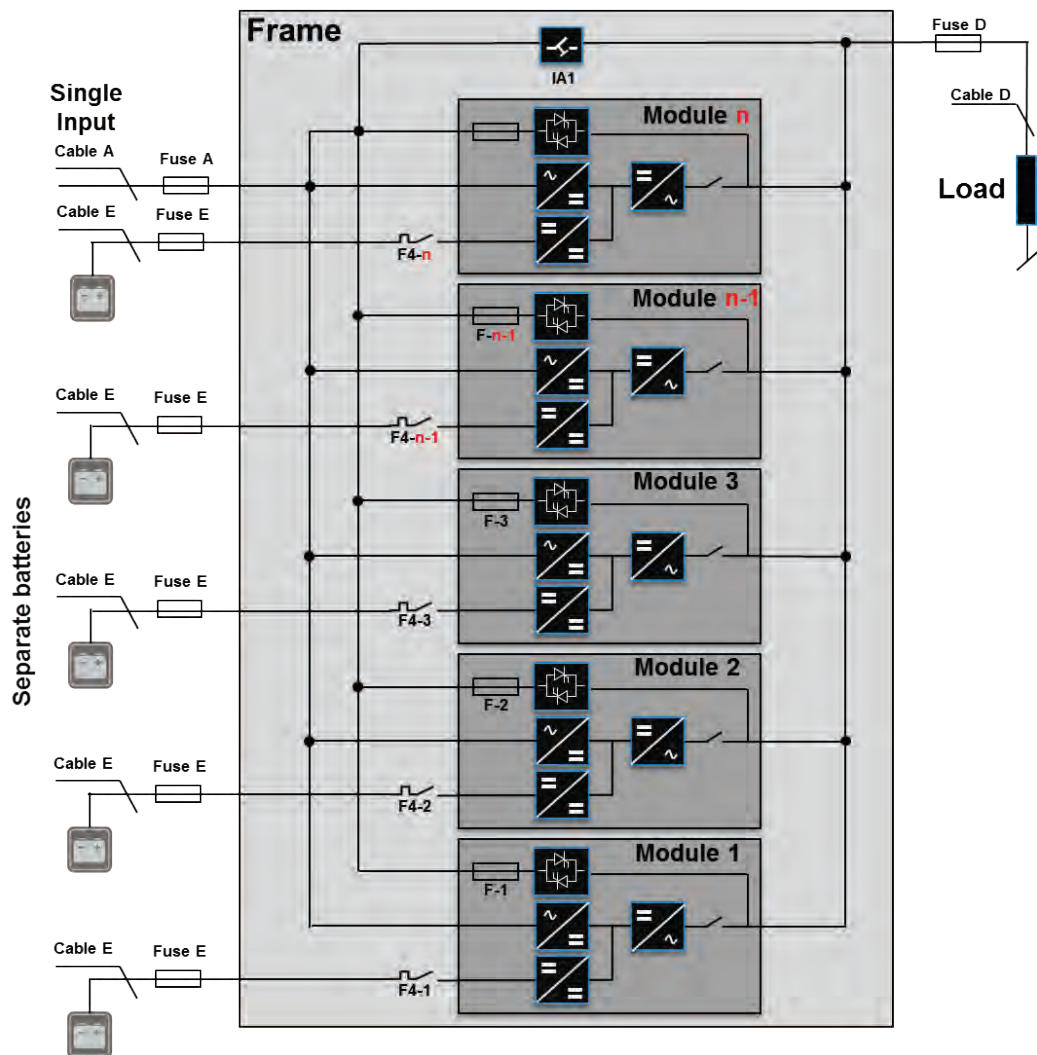
UPScale ST 200



16.3 Single input feed (standard version)

16.3.1 Block diagram

Cable sections and fuse ratings recommended. Alternatively, local standards to be respected.



16.3.2 Cable sections

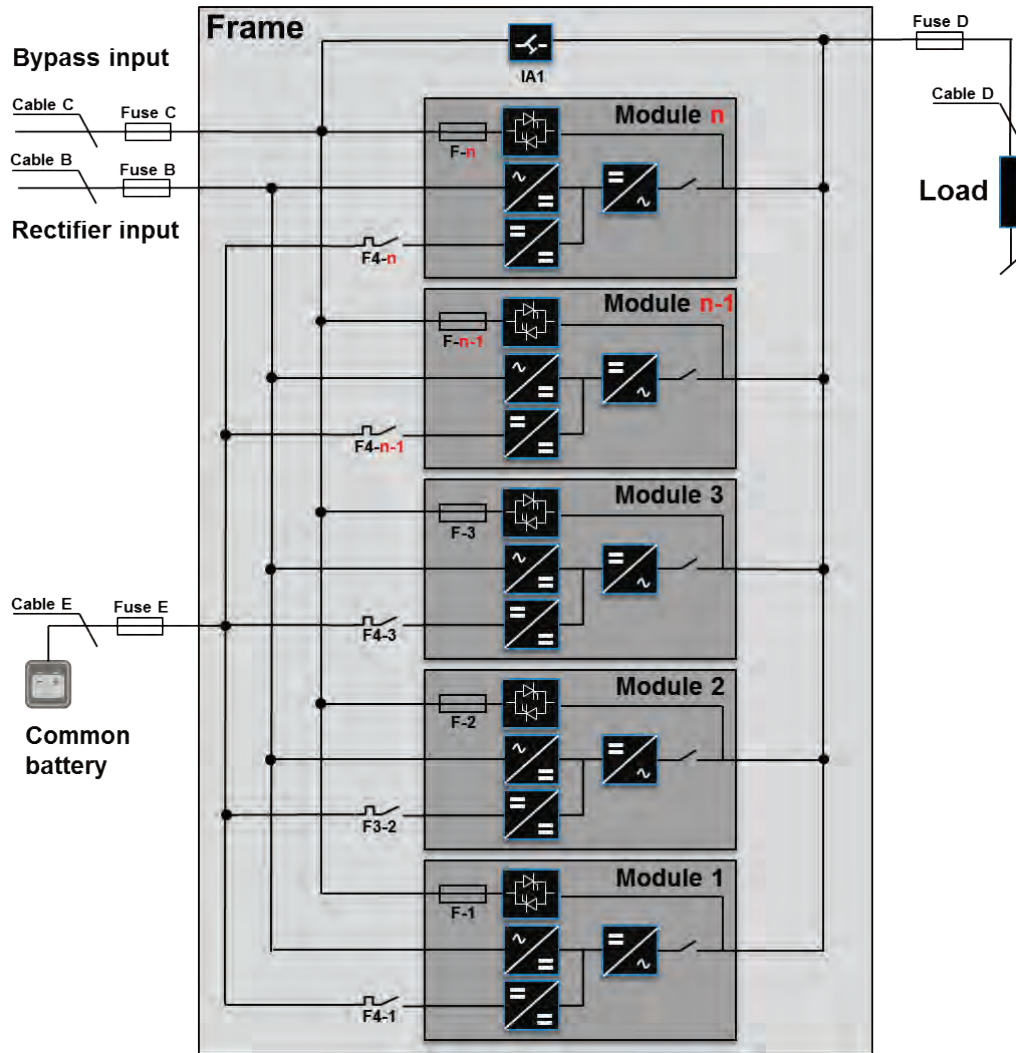
Frame type	Load in kW	Input 3 x 400 V/230 V			Output 3 x 400 V/230 V @ cosphi 1.0		Battery		
		Fuse A (Agl/CB)	Cable A (mm ²) (IEC 60950-1)	Max. input current with battery charging [A]	Cable D (mm ²) (IEC 60950-1)	I _{nom} [A]	Fuse E + / N / - (Agl/CB)	Cable E (mm ²) for CBAT UPScale 120 or 200 ONLY + / N / -	
								Com. battery	Sep. Battery
UPScale ST 40	40	3 x 80 A	5 x 16	68 A	5 x 16	58 A	NOT ALLOWED		
UPScale ST 60	60	3 x 125 A	5 x 35	102 A	5 x 35	87 A			
UPScale ST 80	80	3 x 160 A	5 x 50	136 A	5 x 50	116 A	3 x 224 A*1	3 x 95 *1	4x(3x10)
UPScale ST120	120	3 x 224 A	4 x 95+1 x 50 (PE)	208 A	5 x 70	174 A	3 x 300 A*1	3 x 150 *1	6x(3x10)
UPScale ST 200	200	3 x 350 A	5 x 185	333 A	5 x 185	290 A	3 x 450 A *1	3x(2x95)*1	5x(3x25)

*1 only valid for common battery use

16.4 Dual input feed (optional version)

16.4.1 Block diagram

Cable sections and fuse ratings recommended. Alternatively, local standards to be respected



16.4.2 Cable sections

Frame type UPS Scale ST	Load in kW	Input 3 x 400 V/230 V			Bypass 3 x 400 V/230 V		Output 3 x 400 V/230 V @ cosphi 1.0		Battery		
		Fuse B (Agl/CB)	Cable B (mm ²) (IEC 60950-1)	Max. input current with battery charging [A]	Fuse C (Agl/CB)	Cable C (mm ²) (IEC 60950-1)	Cable D (mm ²) (IEC 60950-1)	I nom [A]	Fuse E +/- (Agl/CB)	Cable E (mm ²) for CBAT UPSscale 120 or 200 ONLY +/- / N / -	
40	40	3 x 80 A	5 x 16	68 A	3 x 80A	4 x 16	5 x 16	58 A	NOT ALLOWED		
60	60	3 x 125 A	5 x 35	102 A	3 x 125A	4 x 35	5 x 35	87 A	NOT ALLOWED		
80	80	3 x 160 A	5 x 50	136 A	3 x 160A	4 x 50	5 x 50	116 A	3 x 224 A*1	3 x 95 *1	4 x (3 x 10)
120	120	3 x 224 A	4 x 95+1 x 50 (PE)	208 A	3 x 224A	4 x 95	5 x 70	174 A	3 x 300 A*1	3 x 150 *1	6 x (3 x 10)
200	200	3 x 350 A	5 x 185	333 A	3 x 350 A	4 x 185	5 x 185	290 A	3 x 450 A*1	3x(2x95)*1	5 x (3 x 25)

*1 only valid for common battery use

Contact us

www.abb.com/ups
ups.sales@ch.abb.com

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