80-NET

UNINTERRUPTIBLE POWER SUPPLY

USER HANDBOOK

10H52167UM01 - rev. 8

80-NET may differ from the one displayed on the front cover.

1. SAFETY

1.1. INTENDED USE

This device serves as an uninterruptible power supply (UPS) for connected loads. The device is in compliance with all relevant safety regulations concerning information technology equipment, including electronic appliances for use in an office environment.

1.2. WARNING NOTICE

Warning

CHLORIDE considers the safety of personnel to be of paramount importance. For this reason it is essential that procedures relating to safety be studied before commencing work and properly adhered to thereafter.

- **The user or Operator** may only intervene in the operation of the UPS provided that the instructions laid out in "Normal and safe operation" on page 43 are strictly adhered to.
- **Installation**, (see "Installation" on page 15), may only be carried out by **qualified technicians**.
- Even when all switches are off and isolators are open, hazardous voltages are present within the UPS; any operation that requires protection panels to be opened and/or removed may be carried out by authorized technical personnel only.

1.3. SAFETY NOTICES

Warning

Carefully read the following safety notices! Failure to observe the indications may endanger your life, your safety, the reliability of your device or the security of your data.

- Use only suitable packaging to transport the device (protect against jolts and shocks).
- If the equipment is moved from a cold environment to the operating room, moisture condensation may occur. Before commissioning the device, it must be completely dry. Therefore, an acclimatisation period of at least two hours is required.
- The equipment must be installed in accordance with the environmental conditions specified in "Environmental conditions" on page 12 and "Technical data" on page 81
- There is no button on the panel and no switch inside the UPS that isolates completely the device (UPS) from the mains. To do this, the power cables must be disconnected.
- In case of interruption of the mains voltage, the external battery maintains the power supply of the user equipment.
- Lay the cables in such a way that no one can stand on or trip over them. When connecting the device to the power supply, follow the instructions in "Installation" on page 15 **It must be ensured that the live input source cannot accidentally become connected to the UPS during installation - see "Electrical preparations" on page 15 and "Normal and safe operation" on page 43**
- No objects such as pins, necklaces, paper clips, etc. must be left inside the device.

- In emergencies (e.g. damaged case, controls or power cables, penetration of liquids or foreign matter) switch off the device, disconnect the power cables and contact the appropriate customer service representative.
- Do not connect equipment that may overload the UPS (e.g. laser printers) or demand DC-current (e.g. half-wave rectifiers).
- The sum of the leakage currents (protective conductor current) of the UPS and the connected devices may exceed 3.5 mA for all ratings. Earth connection is essential before connecting supply.
- Do not connect or disconnect data transmission lines during thunderstorms.
- Emergency Power Off (E.P.O.) input - X8 - is located on the Connectivity Panel (see Fig. 13 on page 33). When this connection is open, the logic circuit will immediately shut down the UPS output (see "Emergency Power Off (E.P.O.) - (Input - X8)" on page 35). In order that the wiring installation safety complies to the European Harmonized Document HD384-4-46 S1, an Emergency Switching Device (E.S.D.) shall be fitted downstream of the UPS.
- UPS not suitable for use with permanent IT grounding systems.
- Dedicated components, which remain live even with all UPS switches in "OFF" must be labelled accordingly.
- This device is not equipped with its own mains separation device. You are, therefore, required to provide a mains separation device at the installation site.
- In order to guarantee safe working conditions, ensure all voltage sources are isolated before carrying out the power connections. ENSURE CORRECT POLARITY!
- The mains separation device for the mains supply must be provided with a warning plate on which the following is stated: "Switch off the UPS supply prior to working on this system!".

1.4. OVERHEATING

Warning

To avoid overheating inside the UPS, do not operate the unit with the rectifier running, the Inverter switched off and the Bypass switch open for extended periods.

1.5. EMERGENCY MEASURES

In order to conform to the European Standard EN62040-1-1 (par. 5.1.5) , a UPS must be fitted with an Emergency Power Off device (E.P.O.) that can be used to shut down the unit completely in the event of an emergency. 80-NET is equipped with a dedicated user input which is default configured to execute the EPO function. Refer to "Emergency Power Off (E.P.O.) - (Input - X8)" on page 35 for instructions on how to install an E.P.O. button on this UPS.

▶ **In the event of an emergency, press the EPO button immediately in order to shut down the entire system.**
If, for any reason, the EPO fails to switch off the UPS, proceed as follows:

- Open the external mains separation device.
- Switch off the load
- NEVER ATTEMPT TO OPEN OR CLOSE THE UPS BATTERY SWITCH UNDER EMERGENCY CONDITIONS
- In case of fire, call the emergency personnel/fire brigade, who must put out any flames using an extinguisher appropriate to the batteries in use.
- NEVER ATTEMPT TO EXTINGUISH A FIRE USING WATER AS BATTERIES CARRY LIVE VOLTAGE AT ALL TIMES.

1.6. DANGER AREAS

After removing the cabinet front door and safety panel, the connection terminals and bars, as well as exposed metal parts and other components carrying dangerous voltages are no longer protected against accidental contact!

Warning
The UPS contains capacitors which continue to store energy for a period of time after the device has been disconnected from the mains supply(ies) and battery. This voltage (> 400 V DC) is present at the battery terminals. For this reason, check that the UPS and the external mains separation device are switched off and the battery fuses removed. Before continuing work, measure the voltage at the battery terminals and at the mains input filter and wait until this has dropped to 0 V or wait at least 5 min. after disconnecting. Failure to do this can lead to severe electrical shock and even death.

1.7. LEAKAGE CURRENTS

Warning
The PE safety conductor shall be connected before any other cables.

1.8. RADIO FREQUENCY INTERFERENCE

Warning
80-NET complies with EMC product standard CEI EN 62040-2 class RS. To avoid interference, installation restrictions may apply or additional measures may be required.

1.9. BATTERIES - (EXTERNAL ONLY)

Battery maintenance must be carried out by authorised personnel.

- During the turn on and turn off procedures QS9 is operated only when the inverter is OFF.
- The batteries installed in the battery extension kits contain electrolytic substances. Under normal conditions the containers are dry, but a damaged battery may leak electrolyte which can be dangerous in contact with the skin and cause irritation to the eyes. Should this happen wash the affected part with copious amounts of water and seek immediate medical advice.
- Voltage is present on the battery contacts at all times.
- Even when discharged a battery has the capacity to supply a high short circuit current, which, in addition to causing damage to the battery itself and associated cables, may expose the operator to the risk of burns.
- Battery voltages can be hazardous. The voltage of a single cell is not dangerous, however a number of such blocks, connected in series, can produce dangerous voltages. During maintenance, disconnect the battery blocks so that not more than five batteries are connected in series.
- Periods of storage or disuse may not exceed 6 months, at 20°C, without the batteries being recharged. If this period is exceeded it is essential that the battery be recharged, which requires that the UPS be switched on. Guarantee is void if these instructions are not followed. However, it is advised that recharging be carried out at least once every 4 months.
- Since new batteries often do not provide full capacity after an initial charge it may be necessary to carry out a number of discharge/recharge cycles before optimum performance is achieved.
- In order to protect the environment batteries must be disposed of in accordance with the regulations governing disposal of toxic and harmful waste.

1.10. RE-PACKAGING

To re-package, proceed as follows:

▶ Do not pack the equipment until at least six hours have elapsed since the last recharge.

▶ Place the equipment in bags made of a material sufficiently porous to allow it to breathe (e.g. 100μm polyethylene).

▶ Do not remove air from the packaging.

2. INTRODUCTION

This User's Manual contains information regarding the installation, operation and use of the Uninterruptible Power System (UPS) 80-NET.
It is advised that this document be consulted before installation of the equipment, whose operation shall only be carried out by qualified personnel.
Thereafter, it shall be kept and referred to whenever it is necessary to carry out work on the UPS.

2.1. NOTES TO THE EC DECLARATION OF CONFORMITY

80-NET conforms to the following European directives:

2006/95/EC

Directive of the council for adaptation of the legal regulations of the member states regarding electrical equipment for use within specific voltage limits (superseding the 73/23/EC and successive amendments).

89/336/EC

Directive of the council for adaptation of the legal regulations of the member states regarding electromagnetic compatibility, modified by directive 91/263/EC, 92/31/EC and 93/68/EC.
Conformity is established through compliance with the following standards:

- CEI EN 62040-1
- CEI EN 62040-2

Additional information regarding adherence to these directives is included in the appendices NSR and EMC of the EU Declaration of Conformity. If needed, the EU Declaration of Conformity can be requested from CHLORIDE.

2.2. SYMBOLS AND PICTOGRAMS

The following symbols and pictograms are used in this handbook:

Warning
Indicates instructions which, if not observed, may result in danger to life, safety, the reliability of your device or data security.

Notice
Indicates additional information and tips.

Indicates a step that you must carry out.

2.3. TERMS USED

2.3.1. Service bypass

The switch that allows continuous supply to the load via the bypass input mains during maintenance work; also referred to as the maintenance bypass.

2.3.2. Electronic bypass

A thyristor switch which connects the load directly to mains in event of inverter overload; also referred to as a static switch or static bypass.

2.3.3. Qualified personnel

Personnel who are familiar with the installation, assembly, commissioning and operation of the product and are qualified to carry out the respective activities.

2.3.4. Display

The control panel comprises a liquid crystal, alphanumeric display, which provides diagnostic and operational information about the UPS.

2.4. DOCUMENTATION STRUCTURE

These instructions may be supplemented with additional sheets, describing specific extensions or options.

3. PREPARATION FOR USE

3.1. TRANSPORT

The equipment must be kept upright at all times and handled with care, damage may be caused if dropped or subjected to severe impact. When moving the equipment with a forklift, secure it against tilting.

3.2. DELIVERY AND STORAGE

The goods have been checked thoroughly before dispatch. On receipt check the packaging and ensure that the contents are undamaged. Any damage or missing parts must be reported to the supplier **within 8 days of delivery**.

3.3. UNPACKING

The utmost care shall be taken when removing the packaging in order to avoid damaging the equipment. Check all packaging materials to ensure that no items are discarded. Once the packaging has been removed, the UPS shall be taken off the pallet by removing the retaining screws, as illustrated in Fig. 1, and lifting it off using a fork lift (max width between forks - 540mm - Ref EN 1757). Note that the retaining brackets must not be unscrewed from the UPS feet. Note also, that when moving the pallet, the maximum distance between forks is 690mm.

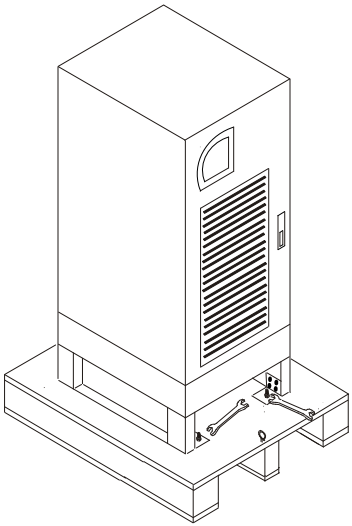


Figure 1 - Unpacking

If it is not intended that the UPS be used within seven days of delivery, attention shall be paid to the storage conditions.

- If the batteries or the equipment are to be stored they must be kept in a **clean, dry environment and away from extremes of temperatures**.

3.4. ENVIRONMENTAL CONDITIONS

The UPS must be installed vertically, on a level and even surface and in an area protected from extremes of temperature, water and humidity. Do not stack units and do not place objects on top of them.
The operating temperature range of the UPS is 0 °C to 35 °C (40°C for maximum 8 hours continuous operation).
The ideal environmental temperature range is 15 °C to 25 °C.The battery life is defined at 20°C. Each increment of 10 °C above 25 °C reduces the expected life by 50%.

3.4.1. Installation altitude

The maximum operating altitude of the UPS, without derating, is 1000 m. At higher altitudes the load must be reduced according to Fig. 2.

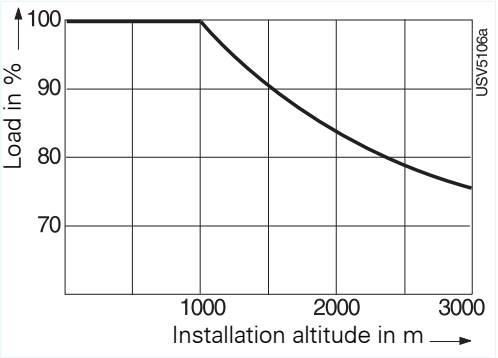


Figure 2 - Permissible load dependent on installation altitude

3.5. ACCESS TO AREA

The area must have sufficient space for installation manoeuvres to be carried out. Access doors must be wide enough to permit unobstructed transport of the device (“Installation” on page 15).

3.6. INSTALLATION SITE

The external dimensions of the UPS are as follows:

Rating (kVA)	Width (mm)	Depth (mm)[1]	Front panel (mm)	Height (mm)[2]
60/80	570	858	550	1780
100/120	845		825	
160	1120		550+560	
200	1245		550+685	

[1] This figure includes the handle and front panel - without them the depth is 830mm.
[2] Leave a minimum distance of 500mm between the top of the cabinet and the ceiling of the installation area.

- No rear wall-distance is required, unless the power cables are routed from above, in which case the distance must at least equal to the bending radius of the cables in use.
- There are no limits on either side of the device, although it should be noted that the front door has an aperture of 180°

The cable entry glandplates are illustrated below:

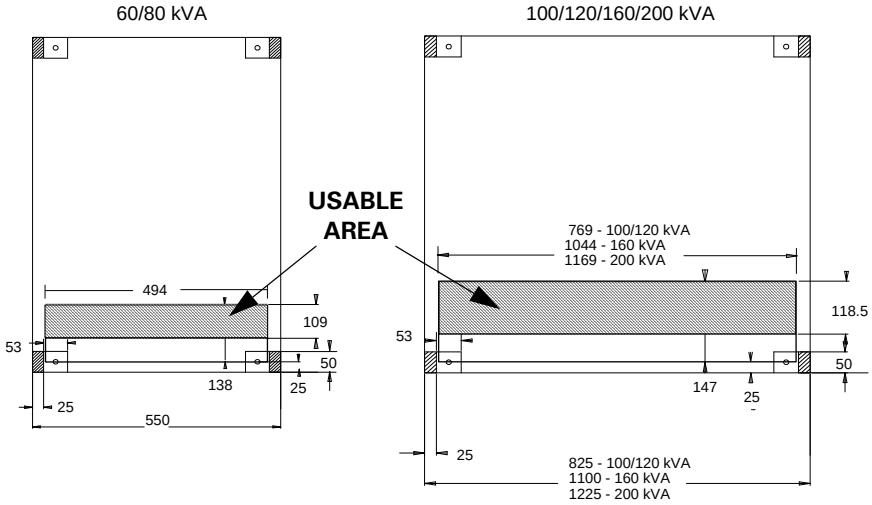


Figure 3 - Glandplates

3.7. FLOOR

The floor where the UPS is installed must be even and level, its load-carrying capacity must also be sufficient to support the floor loading of the UPS - the UPS footprints are illustrated in Fig. 4 and Fig. 5, the weight may be found in the Data Tables in "Technical data" on page 81.

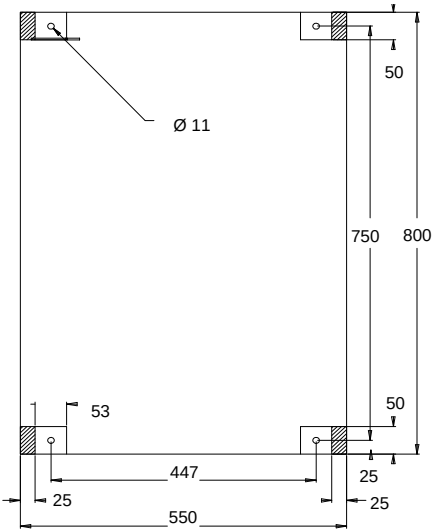


Figure 4 - Footprint 60/80 kVA

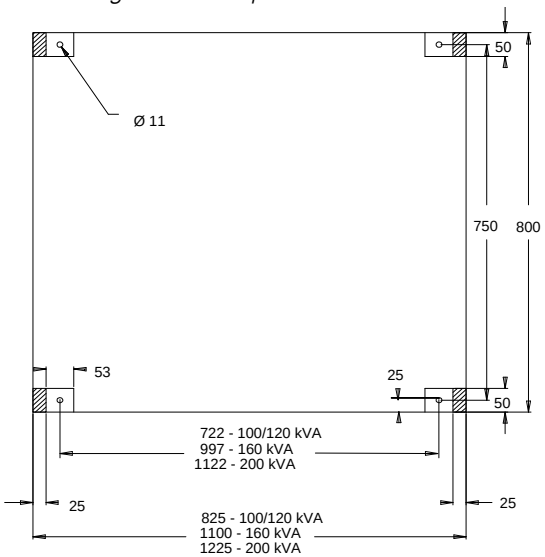


Figure 5 - Footprint 100/120/160/200 kVA

4. INSTALLATION

4.1. ELECTRICAL PREPARATIONS

In order to guarantee safe working conditions, ensure all voltage sources are isolated before carrying out the power connections. ENSURE CORRECT POLARITY!

Ensure that the live input source cannot accidentally be connected to the UPS during installation.

Notice

Installation may only be carried out by qualified technicians and in conformity with the applicable safety standards.

For electrical installation, the nominal current rating of the source must be observed.

4.2. CURRENTS AND SUGGESTED CABLE SIZES

Use cable cross section and fuses according to Table 1 on page 21. Connect the mains supply cables to the UPS terminals U, V, W and U1, V1, W1, N. Connect the load to UPS terminals U2, V2, W2, N.
In the absence of a separate Bypass mains Supply, connect jumpers between U and U1, V and V1, W and W1. The conductor cross sections apply for maximum currents:

1). For PVC-insulated copper cables (at 70 °C).
2). When routed in conduits for electrical installations.
3). When air temperature surrounding the conduits does not exceed 30°C.
4). For cable lengths up to 30 m.
5). For stranded wires up to 35 mm^2 and for single wires above 35 mm^2.

Notice

Should there be any variation in the conditions it will be necessary to verify whether the cable dimensions satisfy the requirements of IEC-287 and DIN VDE 0298. In cases where the cables are so long that they cause a drop in voltage of >3%, a larger dimension shall be selected.
If mainly non-linear loads are present in your system, the neutral conductor (N) carries 1.7 times the current of the other conductors and should be dimensioned accordingly.
Routing of cables (e.g. mains cables, communication or data lines) to other equipment should be kept separate from that of the UPS (I/P, O/P, and external battery cables).

4.3. PHYSICAL APPEARANCE

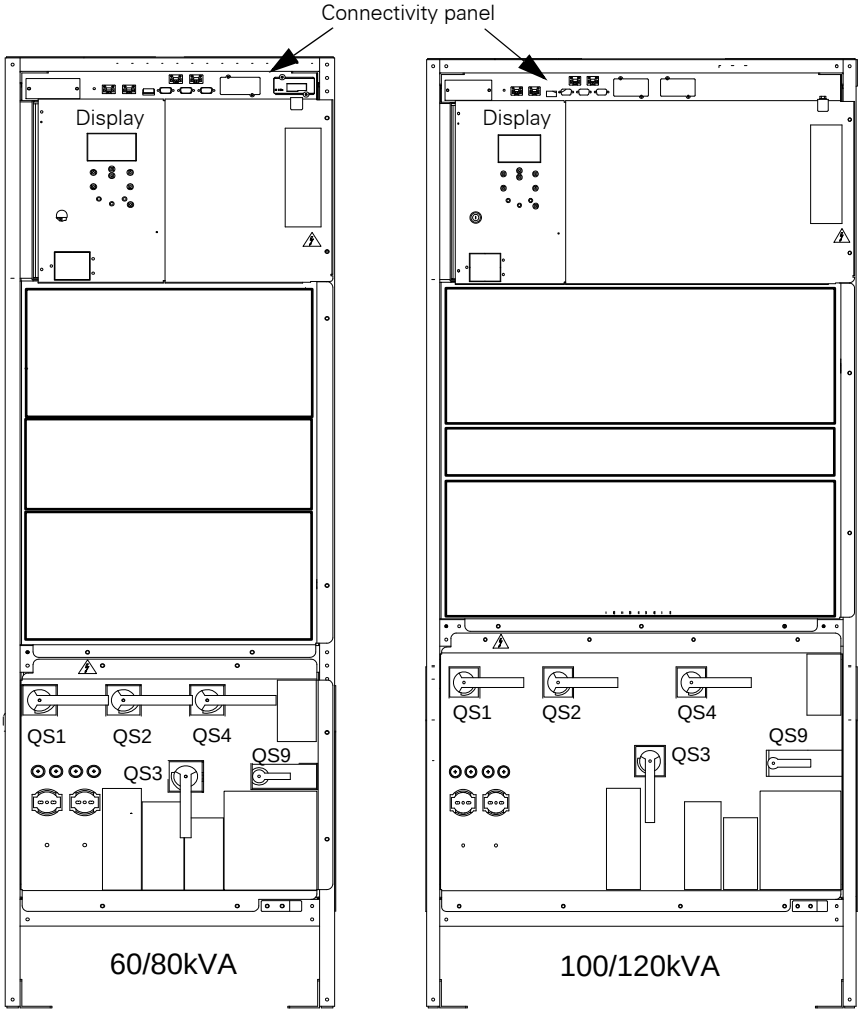


Figure 6 - Front view - 60-120 kVA

Legend:

- QS1 = MAINS INPUT SWITCH
- QS2 = ELECTRONIC BYPASS SWITCH
- QS3 = MAINTENANCE BYPASS SWITCH
- QS4 = OUTPUT SWITCH
- QS9 = BATTERY SWITCH

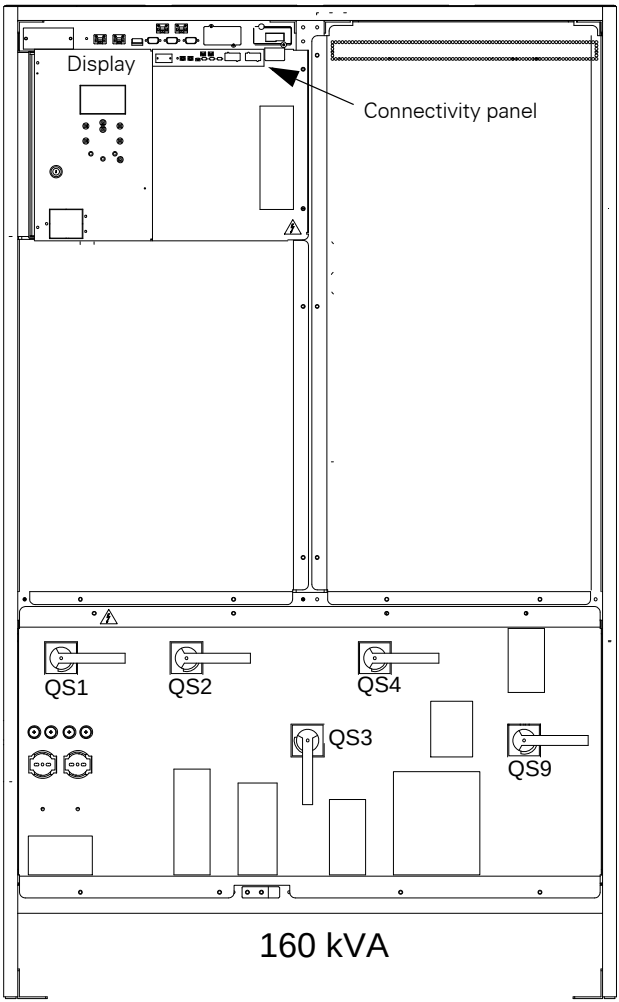


Figure 7 - Front view - 160 kVA

Legend:

- QS1 = MAINS INPUT SWITCH
- QS2 = ELECTRONIC BYPASS SWITCH
- QS3 = MAINTENANCE BYPASS SWITCH
- QS4 = OUTPUT SWITCH
- QS9 = BATTERY SWITCH

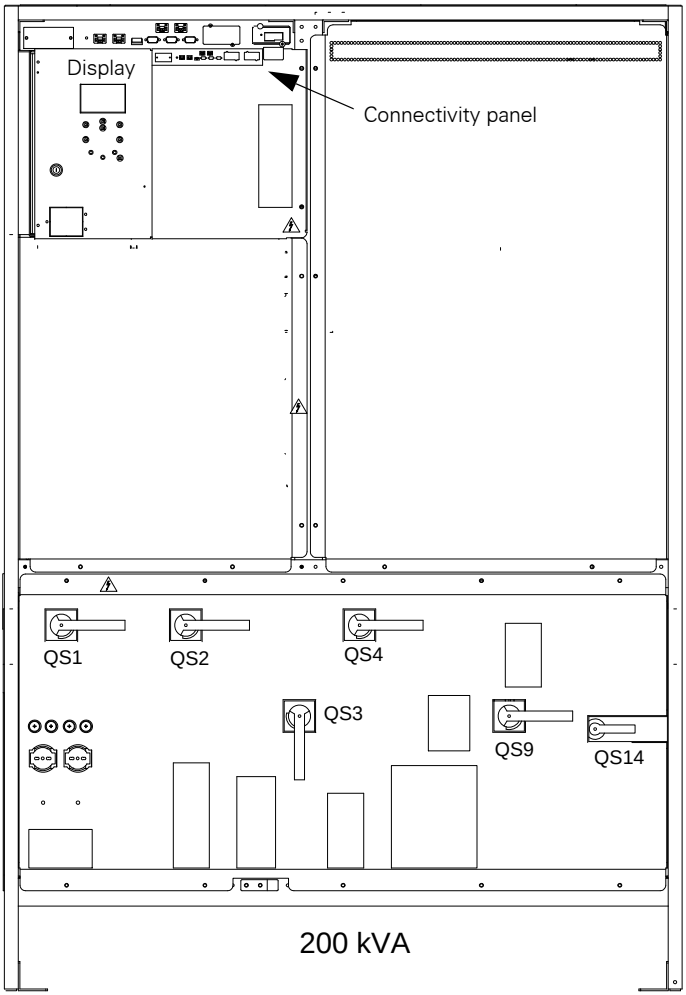


Figure 8 - Front view - 200 kVA

Legend:

- QS1 = MAINS INPUT SWITCH
- QS2 = ELECTRONIC BYPASS SWITCH
- QS3 = MAINTENANCE BYPASS SWITCH
- QS4 = OUTPUT SWITCH
- QS9 = BATTERY SWITCH
- QS14 = NEUTRAL BREAKER

4.4. EXTERNAL PROTECTION DEVICES

This device is equipped with manual switches intended only for Service Bypass and Internal Service operations. It is, therefore, essential that the customer install external protection devices at the installation site. These must be installed near the unit and labelled as the mains separation device for the UPS.

Warning

The following label must be displayed on all switching devices installed in the same electrical system as the UPS, even when these are located at a distance from the area in which it is located (according to European standard EN 62040-1):

ENSURE THAT THE UNINTERRUPTIBLE POWER SYSTEM IS ISOLATED BEFORE WORKING ON THIS CIRCUIT

4.4.1. Use of differential protection devices

Notice - Differential current breakers

The UPS does not require differential protection devices connected upstream, however, when these are fitted in order to comply with local regulations it must be remembered that separate DCBs in the mains and bypass supply lines may trip spuriously, interrupting the power supply to the unit. Therefore, if unavoidable, only one differential protection should be used for both primary and bypass input

A differential device installed on the input bypass supply senses the sum of all earth leakage currents in both the UPS and the load it supplies.
To avoid spurious operation, the following must be taken into consideration when selecting differential protection devices for installation on input lines:

1 The nominal value of ID must take into account the earth leakage current of the UPS and the load, in normal operating conditions: ID = ID_{UPS} + load leakage current.
N.B. The maximum limit for UPS earth leakage current is 5% of the nominal input current (see EN62040-1-1, Art. 4.5.13.)
2 Be of a delayed operation type (greater than 300mS);
3 The type of differential switch used must conform to product regulation EN62040-1-1, Art. 4.5.12.

In the case of parallel distributed systems a single, common differential protection device shall be fitted upstream of the point at which the line divides to supply the bypass inputs of the UPS. Installation of separate devices in divers configurations can result in spurious operation.

In order to guarantee correct current distribution in the neutral cables, installation personnel shall ensure that their lengths be as equal as possible.
If, however, the bypass lines are drawn from sources that are galvanically isolated from each other, a differential protection device may be installed on each line.

N.B. In this case, and in cases when the load is supplied from the Bypass via the Bypass Static Switch, the isolated sources are connected in parallel. It should be evaluated, on an individual basis, whether any resultant imbalance between the currents on the Bypass lines is compatible with the respective protection devices.

4.4.2. Primary mains input

These should be capable of protecting the primary AC mains supply up-line of the UPS, and should take into account the maximum current drain of each UPS as shown in Table 1 on page 21.

4.4.3. Bypass mains supply

Bypass mains input protection devices must have the following characteristics:

1 A max. current rating in accordance with the values in Table 1 on page 21;
2 A I^2t rating lower than that of the thyristor (see "Static bypass" on page 85 for pre-arc I^2t ratings) in order to protect it in the event of an output short circuit - in order to allow for component tolerances, the external protection device pre-arc I^2t rating should not exceed 80% of the SCR I^2t rating;
3 A pre-arc I^2t rating higher than that of the Inverter fuse (already fitted inside the UPS - see "Static bypass" on page 85 for pre-arc I^2t ratings) so that the Inverter fuse blows in the event of an overcurrent caused by an internal failure. In this case the load is supplied by the Bypass - in order to allow for component tolerances, the external protection device pre-arc I^2t rating should be at least 20% higher than that of the Inverter fuse

4.4.4. Battery input

These should be capable of protecting the battery against short-circuits, and should take into account the maximum current drain (in discharge at 1.8V per cell), see Table 1 on page 21. These devices should be fitted as close as possible to the battery.

4.4.5. UPS Output line

As load(s) can be supplied through the Uninterruptible Power System from two sources, the protection system on the output line should take into account the ratings of the following supplies:

Supply from inverter:
see Table 1 on page 21 and Table 11.1.4 on page 83

Supply from bypass static switch and maintenance bypass static switch:
see Table 1 on page 21 and Table 11.1.5 on page 85

N.B. If a single differential breaker is installed upstream of the UPS, any fault in the installation earthing system will result in the interruption of power to both the mains input and the direct line.

Table 1 indicates cable dimensions and the protection devices (fuses) which must be installed by the user to protect both these and the equipment.

Table 1: Conductor cross sections and fuses of standard UPS

UPS devices nominal power kVA	60	80	100	120	160	200
Primary Mains						
Max. current [A]	94	125	156	185	250	312
min. conductor cross section [mm²]	35	50	70	95	120	2 x 70
recommended fuse/breaker [A]	100	130	160	200	260	320
Screw size	M8x25	M8x25	M10x30	M10x30	M10x25	M10x25
Bypass Mains/Load						
Nominal current [A][1)]	87	116	145	174	232	290
min. conductor cross section [mm²]	35	50	70	95	2 x 50	2 x 70
Recommended fuse/breaker for loads [A]	100	130	160	200	260	320
Screw size	M8x25	M8x25	M10x30	M10x30	M10x25	M10x25
Battery, external +, -						
Max. current (at 1.8V/cell - 240 cells) [A]	117	155	194	233	310	388
min. conductor cross section [mm²]	35	70	95	120	2 x 70	2 x 95
recommended fuse/breaker[a)] [A]	125	160	200	250	320	400
Screw size	M10x25	M10x25	M10x30	M10x30	M10x25	M10x25
Neutral (N) from mains/ to load N, N2						
oversize if non-lin. load[coefficient]	1.7		1.7		1.7	
Screw size	M8x25		M10x30		M10x25	
Earth						
min. conductor cross section [mm²]	35		70			
Screw size	M8x25		M10x30		M10x25	
Type of connector	busbars					

1) For a nominal voltage of 380V multiply the current value by 1.05; for 415V, multpily by 0.95

Table 2: Tigthening torque

Screw size	**Nm (+/-10%)**
M8	20
M10	39
M12	68

Information about the presence of foreign materials in the vicinity of UPS equipment installations

The purpose of this note is to provide information and warning regarding a potential risk to the operational integrity of an installed UPS system, posed by the presence of foreign material inside or in the vicinity of the UPS module and the associated auxiliary equipment/components.

This risk is especially high if conductive materials find their way inside the UPS module or the associated auxiliary equipment/components.

The risk potentially involves damage to the installed UPS equipment, and subsequently degradation or loss of power to the connected critical site-load.

CHLORIDE employs the highest safety standards in equipment design, to ensure that no live parts are exposed to external contact, and also to ensure that the equipment is protected against the introduction of foreign bodies when operational (built to IP20 with optional filters available for specific conditions).

However, it is not practically possible for CHLORIDE to ensure that foreign bodies will not be introduced during the site installation works, when the UPS doors & covers are "open" and the electrical-terminals are exposed for power-line connections to be made by the electrical contractor/installer.

It is also not uncommon to have other trades working in the same (UPS equipment) room during the site-installation period, sometimes involving working above the UPS equipment and associated auxiliary equipment/components.

To avoid the possibility of a major disruption to site operations, and risks to property and personnel, including the possibility of a fatality, it must be the responsibility of each site's facility manager or construction manager, to ensure that the introduction of foreign bodies to the UPS module and associated auxiliary equipment/components is prevented.

UPS modules and their associated auxiliary equipment/components are all thoroughly inspected by CHLORIDE engineers prior to any commissioning and testing works being performed on site. Our engineers are instructed to abort all live work upon identification of conductive foreign bodies until the equipment and area has been thoroughly cleaned of any contaminants.

However, the person responsible for the site must ensure that the UPS module and associated auxiliary equipment/components, and the immediate surroundings is kept clean

and free of any possible conductive material such as metallic foil, food wraps, cable shields, washers and other hardware, scrap metal, swarf and dust.

If the UPS system is shutdown after the commissioning & testing works are completed, the UPS room must be kept clean to avoid the possibility (during restart) of the considerable volume of air-flow produced by UPS operation to dislodge &/or drag any foreign bodies into the equipment resulting in system failure and possible supply interruption to the critical site-load, and several hours of downtime occasioned by the damage typically associated with such events.

If the UPS is left running/operational at the completion of the commissioning and testing works, the room similarly needs to be kept clean to avoid ingress of any foreign bodies into the UPS module via the UPS forced air-flow.

CHLORIDE will not accept any liability or expenditure associated with incidents caused by the presence of introduced conductive foreign bodies in the UPS module or associated auxiliary equipment/components originated during pre-commissioning or post-commissioning activities within the UPS environment.

4.5. BACKFEED PROTECTION

In order to avoid electric shock hazard, that may be caused by backfeed of energy via the electronic static switch, an external disconnector must be installed in conformity with the Product Standard EN 62040-1 para. 5.1.4. The UPS generates a logic command at XT4 (see Fig. 13 on page 33) to ensure that the disconnector operates correctly.

N.B. In case of single-line feeder, the disconnector must be installed upstream of the UPS primary and bypass inputs. When this disconnector is activated, the UPS switches to Battery Mode.

N.B. The PE and N terminals must be connected in accordance with the requirements of the local mains distribution system (TN-C, TN-S, TN-C-S, TT etc.) For instance, in TN-C installations the PEN conductor from the supply transformer must be connected to the UPS PE and N terminals. See para. 4.6 on page 25 and Fig. 25 on page 75.

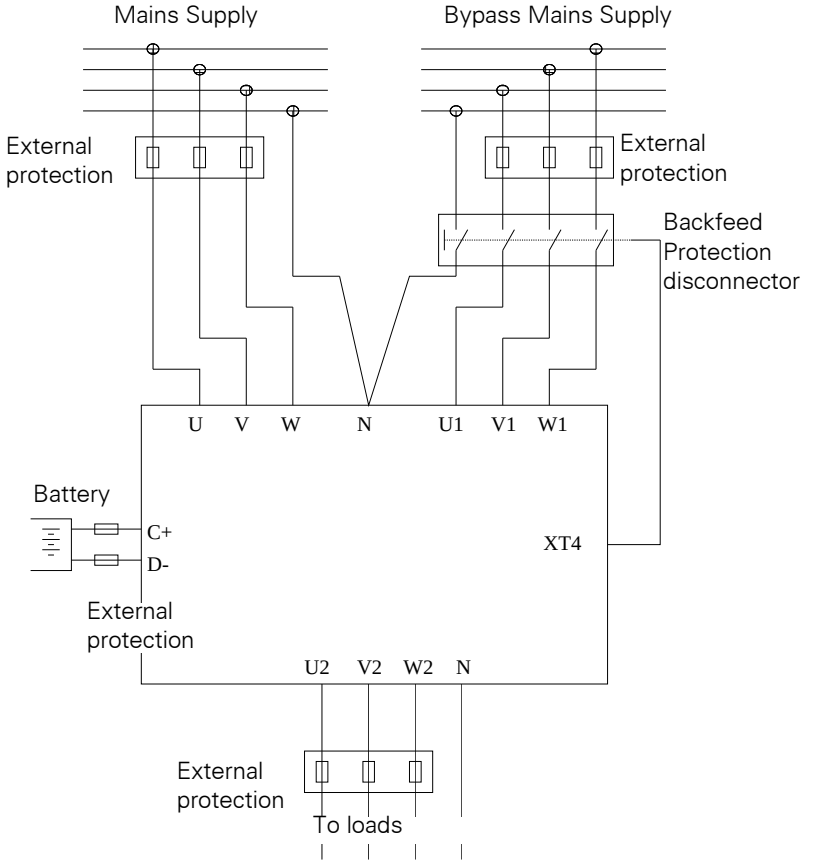


Figure 9 - External protection devices

4.6. EXTERNAL ELECTRICAL CONNECTIONS

In order to access the external electrical connections it is necessary to open the front door of the UPS and remove the secondary access panel (see para. 6). Connect the earth cable (PE) first at ⏚ .

Notice

In case of a TN-C distribution system, connect an insulated jumper between UPS ground ⏚ and the UPS Neutral connector.
Refer to local Standards and regulations for the correct jumper cross section.
Connect the mains supply PEN cable to the UPS Neutral connector (N).

Notice

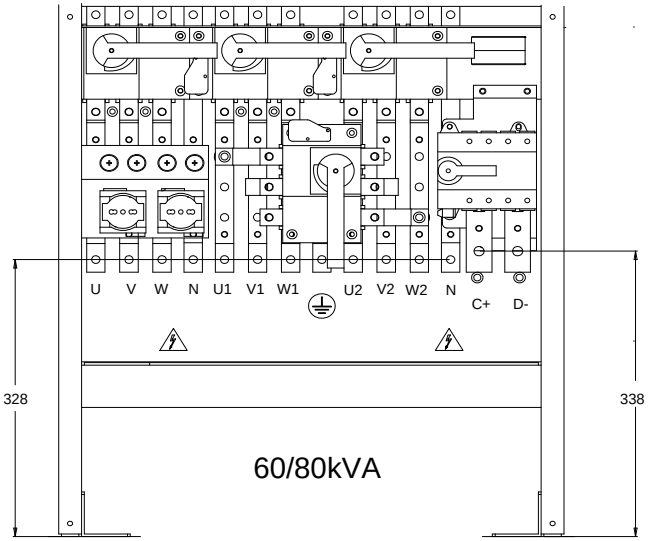
Ensure that the mains and load conductors are connected to the UPS as a clockwise (right hand) 3 phase system.

Ensure that the UPS is isolated before removing panels.

4.7. POWER CONNECTIONS

The power connections (see para. 10) on the front of the UPS are:

- U, V, W - MAINS INPUT
- U1, V1, W1 - BYPASS MAINS SUPPLY (only at the standard UPS type)
- N - NEUTRAL BAR (PEN/N) (PRIMARY AND BYPASS MAINS INPUT NEUTRALS)
- U2, V2, W2 , N - UPS OUTPUT TO LOAD
- D-, C+ - BATTERY TERMINALS
- EARTH ⏚



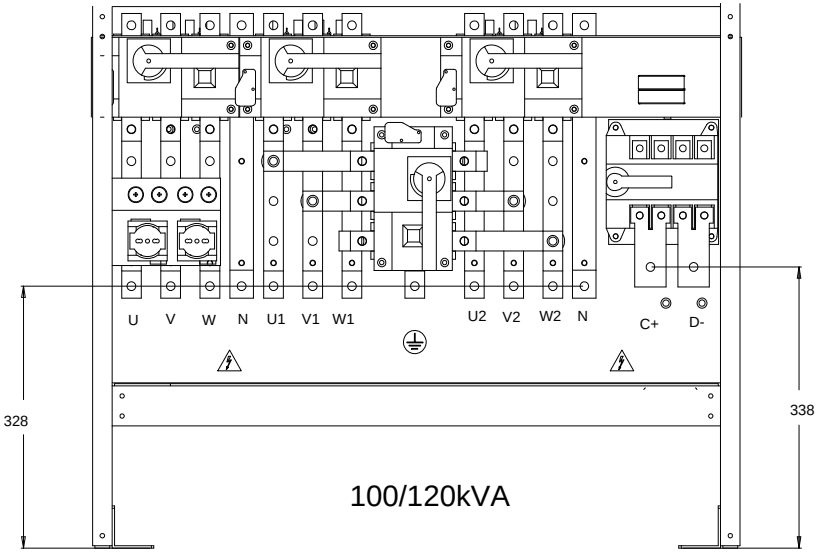


Figure 10 - Power connections standard UPS - 80 to 120kVA

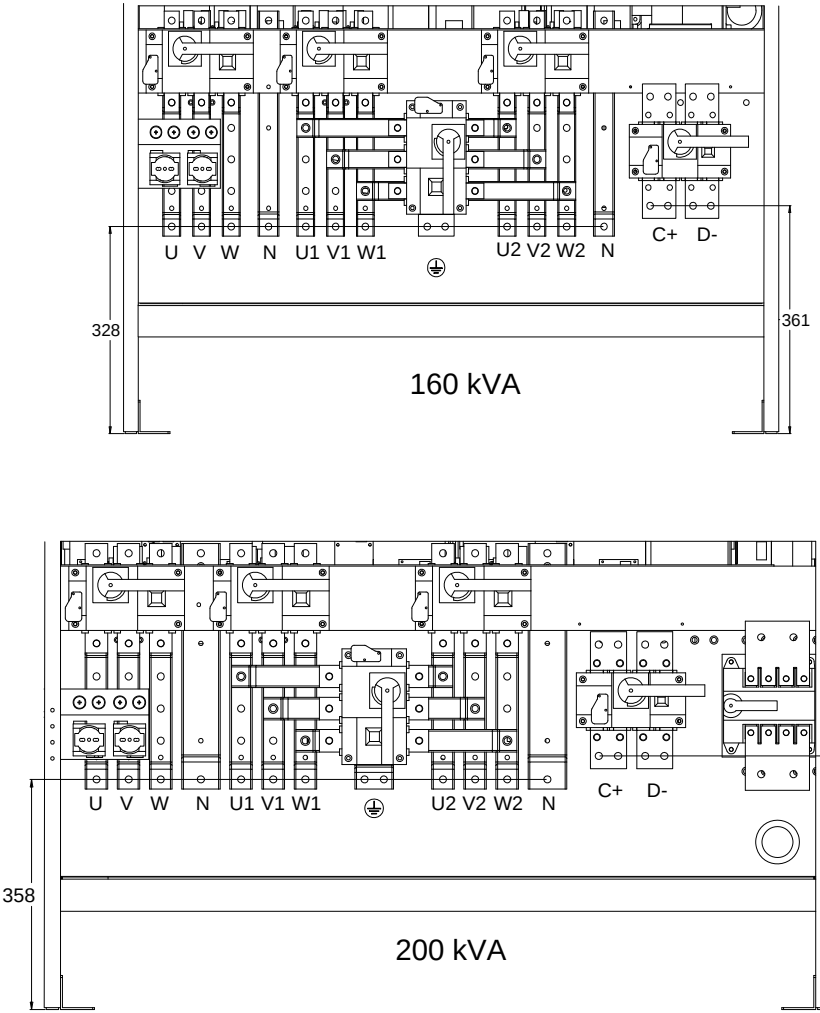


Figure 11 - Power connections standard UPS - 160/200 kVA

4.8. CONNECTING THE BATTERIES

The UPS is equipped with a separating device for the battery DC power connection.

▶ **Before connecting the batteries, please read the notice and warning label on the UPS or battery cubicle.**

Notice

Full safety instructions concerning the use and maintenance of UPS batteries are provided in the appropriate battery manufacturers' manuals. The battery safety information contained in this section relates to key considerations which must be taken into account during the installation design process, and may affect the design outcome, depending on localised conditions.

Warning

Special care should be taken when working with the batteries associated with the 80-NET. When all batteries are connected together the overall voltage exceeds 500V.

It is most important to ensure that the batteries are installed separately, in a purpose-designed, lockable, dedicated battery cabinet or battery room.

Battery cabinet specifications can be found in "Empty battery cubicle" on page 77 of this manual.

Warning

In the event of malfunction, the battery shelves and/or cabinet chassis or battery frames may become live!

Notice

The requirements of the EC directives are satisfied when battery cubicles are used with original accessories. If alternative batteries are used, you must ensure that the applicable EC directives are met and declare conformity. The UPS must still be parameterised with the service software and fitted with an all-pole disconnecting device and fuses, according to table 1 "Conductor cross sections and fuses of standard UPS". When dimensioning your battery cables, note the connection tolerances at terminals +/-.

Warning

ENSURE CORRECT POLARITY !

Notice

The most common battery type used in UPS installations is the valve regulated battery.
Valve regulated cells are not sealed.
The amount of gas given off is less than for flooded cells, but when planning the battery installation, allowance must be made for adequate ventilation and heat dissipation.
Valve-regulated cells are not completely maintenance-free. They must be kept clean and their connections checked periodically to ensure they are tight, and that there is no evidence of corrosion.
It is inevitable that the batteries will lose some charge during transportation and storage; before attempting to carry out an autonomy test, ensure that the batteries are fully charged as this may take several hours. Cell performance typically improves after a few discharge/recharge cycles.

Notice

The battery charger is configured for 240 cells valve regulated battery (2.27V/cell). The maximum recharge current setting is specified in tab. 10.1.3 (see: Max. batt. recharge current setting range: 240 cells @ Vi/p = 340 V and nominal load). Several charging methods, based on the type of battery, are available and can be configured by authorized personal only.

4.9. CONNECTIONS BETWEEN BATTERY CUBICLES AND UPS

- The battery cubicle should be installed adjacent to the UPS (note the battery terminals are located on the right hand side of the UPS).
- Make the ground connections (PE).
- Connect the batteries with cables as suggested in Table 1 to terminals + (positive pole) and - (negative pole), and in accordance with the connection diagram.
- Connect the cable for the temperature sensor between terminals XT1.1 and XT1.2 of the UPS terminal block and terminals X1.1 and X1.2 of the battery cabinet (Fig. 12).
- Shielded temperature sensor lines must be used between the UPS cabinet and the battery cabinet for EMC interference suppression as specified by CEI EN 62040-2 Class RS. The shielding is to be connected to the UPS. Secure the sensor in the battery cabinet using a cable clamp or similar device.
- The terminals XT2.1 and XT2.2 on the UPS connectivity panel (see Fig. 13 on page 33 and "External Battery Switch status - (input - XT2)" on page 35) can be used to monitor the status of an external auxiliary battery switch (not supplied).
- Before the system starts, ensure that the UPS battery connections polarity is correct. Wrong connections can damage the system and endanger operator safety.

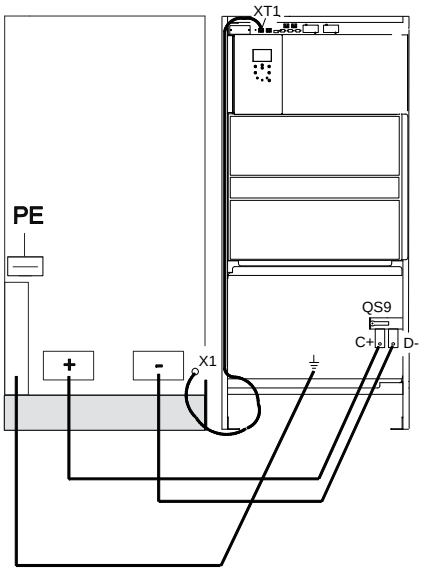


Figure 12 - External Battery Connections

4.10. HANDLING THE BATTERIES

Warning

Batteries are a potential source of danger due to their electrical charge and chemical composition. Therefore observe the battery handling instructions of the manufacturer. These usually can be found in the material which accompanies the shipment.

4.10.1. Recharging batteries

Notice

When recharging, observe the indications on the packaging

4.10.2. Exchanging batteries

Notice

Before exchanging batteries, both the batteries in the cubicle, as well as those to be installed must be **fully charged**.

4.10.3. Connecting external batteries

Warning

If a battery has been disconnected and is to be reconnected, the battery isolator may only be reconnected after you have made certain that voltage with the correct polarity is present in the intermediate circuit (see Connecting the Batteries).

5. INTERFACES

80-NET is equipped with two slot card bays:

- a slot available for use with a connectivity option, typically ManageUPS Net SNMP Adapter. Refer to CHLORIDE Connectivity Solutions for more details about available expansion slot cards (XS3);
- a slot for the LIFE.net slot modem (see LIFE.net Software and Installation Instructions - 10H52127PAMC), this is fitted as standard (user removable) (XS6);

two standard serial interfaces:

- a RS232 COM interface configured for use with PPVIS or external connectivity solutions (X3) - this is available when the XS3 slot is empty, or when the MUN card is installed;
- a RS232 COM interface for data transfer protocol, modem or external connectivity solutions (X6) - this is not available when the slot modem is installed;

Also available are:

- external Battery Temperature sensor (input - XT1);
- external Battery Switch status (input - XT2);
- EPO activated (output - XT3);
- Backfeed Protection activated (output - XT4);
- an AS400 compatible contact interface for signal exchange (output - X7);
- an interface to allow emergency shut down of the Bypass, Inverter and Rectifier (EPO) (input - X8).;

All of which are located on the Connectivity Panel (see Fig. 13).

The optional I/O connectors (behind the cover on the Connectivity Panel) include

- 4 free parameterizable Input contacts (AP10 - XT6);
- 2 free parameterizable Output contacts (AP10 - XT5);
- Service Interface (AP10 - X4);

The interfaces can be used for:

- Direct communication between UPS and computer;
- Integration of the UPS as client into a network via MopUPS or ManageUPS (see "MopUPS shutdown and monitoring software" on page 78)
- Transfer of operational states to external alarm systems

The required communication software and interface cables are available as options.

The interfaces can also be programmed via PPVIS (service software tool) for a wide range of functions.

The serial interfaces are isolated and RS232 compatible.

The inputs are opto-isolated and can be driven by external dry-contacts (e.g. relay contacts); the outputs are $24V_{DC}$ 1A/$120V_{AC}$ 1A rated relay contacts.

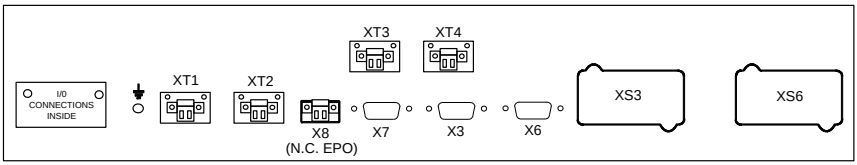


Figure 13 - Connectivity panel

5.1. RS232 SERVICE PORT - X3

A 9-pin, D-type female connector for serial RDS232C communications.
Pin functions are as follows:

Pin	Signal	Explanation
2	RS232 TxD	Send RS232
3	RS232 RxD	Receive RS232
5	RS232 GND	Signal ground RS232

5.2. RS232 LIFE.NET PORT - X6

If the LIFE.net slot modem is removed from the XS6 slot, this 9-pin, D-type male connector may be used for other connectivity applications.
Pin functions are as follows:

Pin	Signal	Explanation
2	RS232 RxD	Receive RS232
3	RS232 TxD	Send RS232
5	RS232 GND	Signal ground RS232

5.3. COMPUTER RELAY INTERFACE - (OUTPUT - X7)

A 9-pin, D-type female connector comprising 24 V, 1 A rated potential-free contacts and conforming to the requirements of IBM AS/400 and other computing systems
Pin functions are as follows:

Pin	Signal	Explanation
1	BYPASS ACTIVE (NC)	Bypass mode: contact open between pins 1 and 5
2	LOW BATTERY (NC)	Near end of discharge (in battery mode): contact open between pins 2 and 5
3	SUMMARY ALARM (NC)	UPS alarm: contact open between pins 3 and 5
4	AC FAIL (NC)	Mains failure: contact open between pins 4 and 5
5	COMMON	Common connection for all floating contacts
6	BYPASS ACTIVE (NO)	Bypass mode: contact closed between pins 6 and 5
7	LOW BATTERY (NO)	Near end of discharge (in battery mode): contact closed between pins 7 and 5
8	SUMMARY ALARM (NO)	UPS alarm: contact closed between pins 8 and 5
9	AC FAIL (NO)	Mains failure: contact closed between pins 9 and 5

5.4. EMERGENCY POWER OFF (E.P.O.) - (INPUT - X8)

Pin	Signal	Explanation
1-2	EPO ACTIVE (NC)	EPO active when open

For the Emergency Power Off switch function, connect a switch, having the properties of an Emergency Off button, i.e. Normally Closed, held open mechanically when activated, max. connection length 50m, and min. wire cross section 0.75mm^2 between the contacts of X8 (not supplied). The interface is a 2 pole screw terminal connector for wires up to 0.75 mm^2.
In order that the safety of the wiring installation comply to the European Harmonized Document HD384-4-46 S1, an Emergency Switching Device (E.S.D.) shall be fitted downstream of the UPS.
As soon as the cause for the emergency which triggered the switch is removed, switch off all UPS switches (input, output, battery disconnector, and all external battery switches) and repeat the start-up procedure as described in Table 6 on page 49.

Notice

The interface cables must be shielded and located away from the power cables (min. 20 cm). The shield must be connected at both ends. Control and power cables must cross at a 90° angle.

5.5. EXTERNAL BATTERY TEMPERATURE SENSOR - (INPUT - XT1)

Pin	Signal	Explanation
1-2	TEMPERATURE SENSOR	Temperature sensor

For an external battery cabinet temperature measurement sensor, connect the temperature sensor to the XT1 interface.
The interface is a 2-pole screw terminal (Phoenix 1.5/2 STF) that accepts wires up to 0.75mm^2.

5.6. EXTERNAL BATTERY SWITCH STATUS - (INPUT - XT2)

Pin	Signal	Explanation
1-2	BATTERY SWITCH (NC)	Closed when the battery is connected

To monitor the state of an external battery breaker (open or closed), connect an auxiliary contact to the XT2 interface.
The interface is a 2-pole screw terminal (Phoenix 1.5/2 STF) that accepts wires up to 0.75mm^2.

5.7. E.P.O. ACTIVE - (OUTPUT - XT3)

Pin	Signal	Explanation
1-2	EPO ACTIVE (NO)	Open when EPO is active

For a remote indication of the EPO status, connect the XT3 interface to the input contacts of an external alarm system. External contact rating: 1A 110 Vac.
The interface is a 2-pole screw terminal (Phoenix 1.5/2 STF) that accepts wires up to 0.75mm^2.

5.8. BACKFEED PROTECTION ACTIVE - (OUTPUT - XT4)

Pin	Signal	Explanation
1-2	BACKFEED PROTECTION ACTIVE (NC)	Open when backfeed is detected

If the energy backfeed via the electronic static switch is detected, the UPS generates a logic command at the XT4 interface; connect this interface to the auxiliary terminals of a switch capable of isolating the UPS input supply. External contact rating: 1A 110 Vac.
The interface is a 2-pole screw terminal (Phoenix 1.5/2 STF) that accepts wires up to 0.75mm^2.

5.9. SERVICE INTERFACE - (AP10-X4)

The AP10-X4 service interface is located behind the I/O cover (Fig. 14 on page 36). This interface is for use by trained service personnel only.

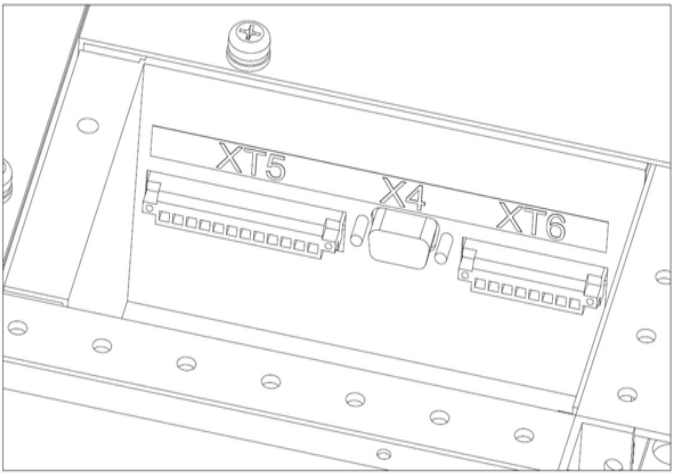


Figure 14 - Service interface and I/O contacts

5.10. CUSTOMIZABLE OUTPUT CONTACTS - (AP10-XT5)

The two AP10-XT5 interface customer-defined, 2A 110 Vac output contacts are located behind the I/O cover (see Fig. 14 on page 36). These contacts can be customized to perform various functions, by **qualified technicians only**.
The interface is a 12-pole screw terminal (Phoenix 1.5/12 STF) that accepts wires up to 0.75mm^2.

Pin	Signal	Explanation
1	XT5-KM1 common	Common Ground KM1
3	XT5-KM1 NO	Normally Open
5	XT5-KM1 NC	Normally Closed
8	XT5-KM2 common	Common Ground KM2
10	XT5-KM2 NO	Normally Open
12	XT5-KM2 NC	Normally Closed

The other pins are not connected.

Table 3: List of individual output functions

No.	Function name	Description
0	Inv. On/Summary alarm	Active with warning/fault present and inverter not running
1	Bypass On	Active when inverter is OFF
2	Battery low	Active in imminent shutdown condition with (W10)[1)] present
3	Rect. Fail/Line fail	Active when rectifier mains not available (W3) or bypass mains failure (W2)
4	On line	Active with inverter ON
5	Battery mode	Active with UPS in battery mode (W9)
6	Bypass On	Active with inverter OFF and load supplied by the Bypass line (via the static switch or maintenance Bypass switch)
7	Service Bypass warning	Active with UPS in maintenance Bypass (W8)
8	Self locked	Active with inverter ON but not synchronized with Bypass line (transfer from Inverter to Bypass with delay)
9	Shutdown active	On when Shutdown input (8) is active
10	Fault	Active when a fault is present
11	Inverter fault	Active when an inverter fault is present
12	Bypass fault	Active when a by pass fault is present
13	BAC fault	Active when a rectifier fault is present
14	Warning	Active when a warning is present

Table 3: List of individual output functions

No.	Function name	Description
15	Temperature warning	Active when an over temperature condition is present (W1)
16	Battery bck time below min.	Active in imminent shutdown condition (W10)
17	C DC-Link low	Active when DC link low (W11)
18	Overload	Active with output over load condition (W4, W6)
20	RF Mains failure	Active with primary input failure (W3)
21	Bypass Mains failure	Active with by pass mains failure (W2)
22	Battery temperature	Active with batt. Overtemperature present (W9)
23	Diesel Gen. ON	Active after a mains failure after following pre-defined delay
24	U Batt./C	Active when battery voltage falls below a defined limit
25	Battery 25	Active when battery capacity > 12%
26	Battery 50	Active when battery capacity > 38%
27	Battery 75	Active when battery capacity > 62%
28	Battery 100	Active when battery capacity > 88%
29	Load 25	Active when output load > 5%
30	Load 50	Active when output load > 25%
31	Load 75	Active when output load > 50%
32	Load 100	Active when output load > 75%
33	Load 105	Active when output load > 105%

1) For the meanings of the warning messages see Table 11 on page 62

5.11. CUSTOMIZABLE INPUT CONTACTS - (AP10-XT6)

The four AP10-XT6 interface customer-defined, digital input contacts are located behind the I/O cover (Fig. 14 on page 36). These contacts can be customized to perform various functions, by **qualified technicians only**.
The interface is a 8-pole screw terminal (Phoenix 1.5/8 STF) that accepts wires up to 0.75mm^2.

Pin	Signal	Explanation
1-2	Input contact XT6_1-2	Input Contact 1
3-4	Input contact XT6_3-4	Input Contact 2
5-6	Input contact XT6_5-6	Input Contact 3
7-8	Input contact XT6_7-8	Input Contact 4

Table 4: List of individual input functions

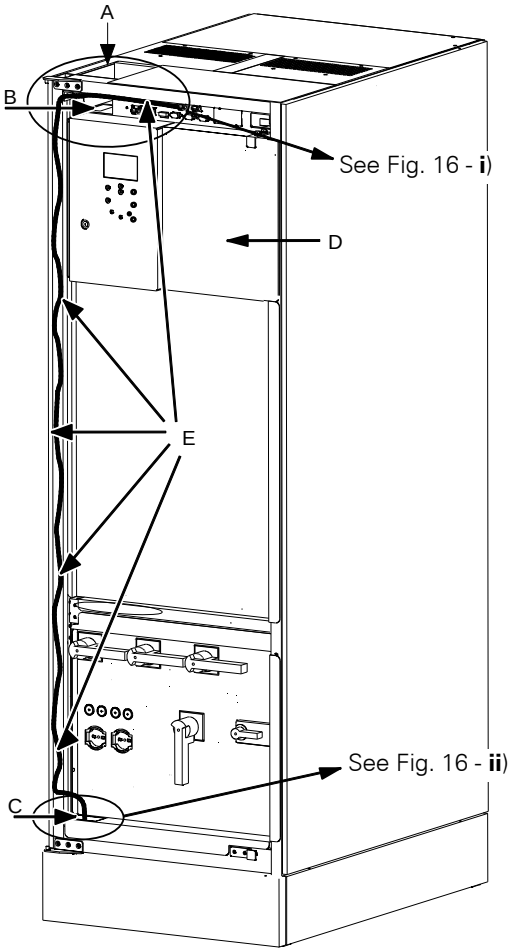
No.	Function name	Description
1	**Standby generator operation**	When the UPS is supplied by a generator, this input can be used to select: Inverter synchronised with Bypass; Bypass enabled; battery charger enabled
3	**Quick Stop**	Shuts down both the Inverter and the Bypass when activated. The Load is no longer supplied
4	**Manual Bypass switch report**	Shuts down the Inverter and transfers the Load to Bypass when activated; generates warning W8i1[1)]
7	**Start battery test**	Sets the Battery test command when activated
8	**Shutdown**	This command shuts down the Inverter and Bypass after an adjustable, pre-defined delay. When the command is deactivated, the Inverter restarts after another adjustable, pre-defined delay
9	**Reset**	Resets the fault condition when activated

1) For the meanings of the warning messages see Table 11 on page 62

5.12. SIGNAL CABLES

The various signal cables (Connectivity panel, Service interface and I/O contacts, and Parallel signal connections) can be routed through the bottom (see Fig. 15 - **C**) or the top (see Fig. 15 - **A** and **B**) of the UPS.
The Service interface and I/O are located behind the "I/O CONNECTIONS INSIDE" panel (see Fig. 13), and to the right.
The P.O.B. (Parallel Operation Board), necessary for parallel operation, is installed in the AP2 slot behind the upper panel (see Fig. 15 - **D**), and the signal cables are fed through the access panel (see Fig. 15 - **B** and Fig. 16 - **i**).

Figure 15 - Signal cable routing



5.12.1. Connectivity panel signals

Connect the signal cables (Fig. 16 - **A**) for the various options present, to the corresponding terminals on the connectivity panel (Fig. 16 - **C**). If the cables are to be routed through the bottom of the UPS (Fig. 16 - **ii**), run them along the channel provided to the left of the display - securing them to the pre-drilled holes in the frame (top and side, see Fig. 15 - **E**) using the cable clips provided - and out via the cut-out panel (Fig. 16 - **F**) at the base of the switch panel.
Alternatively, remove the roof panel (Fig. 16 - **B**) so that the cables can be routed through the top of the UPS (Fig. 16 - **i**), securing them frame using the cable clips.

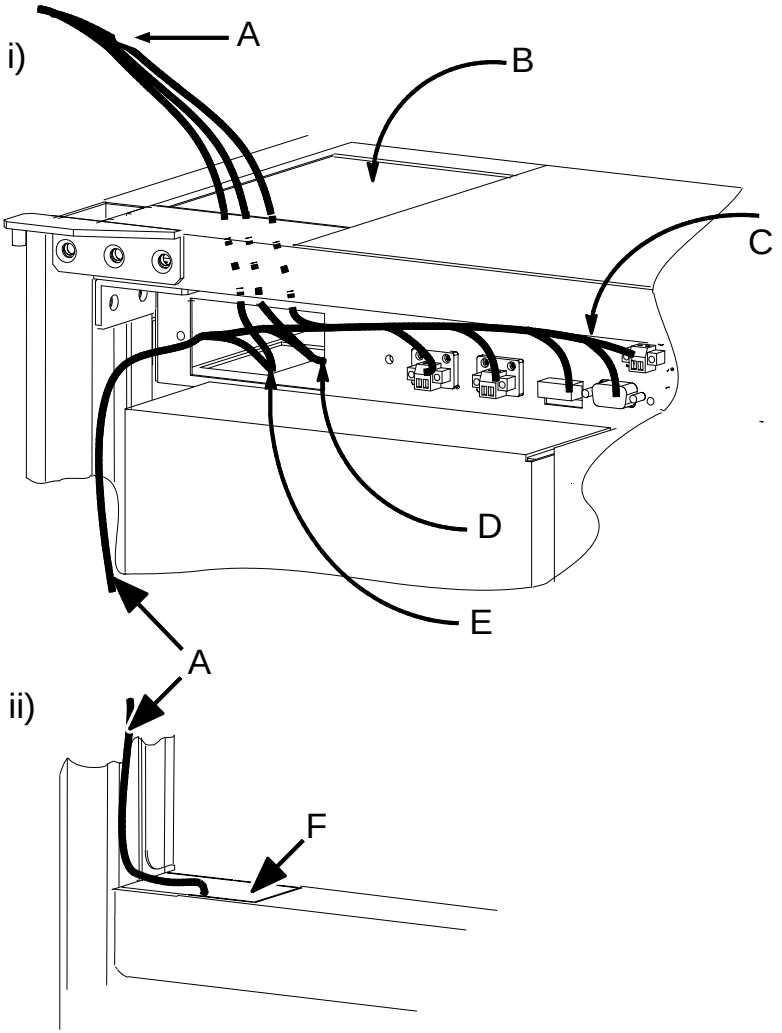
5.12.2. Optional I/O contacts

To access these contacts (AP10 - X4, AP10 - XT5 and AP10 - XT6), remove the "I/O CONNECTIONS INSIDE" cover (see Fig. 13), they are located immediately behind the opening and to the right (Fig. 16 - **D**).
Connect the signal cables to the corresponding terminals and, if they are to be routed through the bottom of the UPS, pass them through the opening and along the channel to the left of the display, as described above.
Alternatively, they can be routed through the top, as described above.

5.12.3. Parallel signals

The Parallel Operating Board (POB) is installed in AP2, which is located behind the upper panel (see Fig. 15 - **D**), the parallel cables must be secured to the underside of the panel above using the clips provided. Remove the screws holding the plate (Fig. 16 - **E**) in place, rotate and replace it in order to allow passage of the parallel signal cable/s (see Fig. 26 on page 76).
If the parallel signal cables are to be routed through the bottom of the UPS, pass them through the opening and along the channel to the left of the display, as described above.
Alternatively, they can be routed through the top, as described above.

Figure 16 - Signal routing - details



6. NORMAL AND SAFE OPERATION

6.1. FUNCTION

The uninterruptible power supply (UPS) is connected between the mains and the electrical load. It protects the load from mains interruptions and power failures.

6.1.1. On-line Principle

80-NET operates according to the on-line principle. In on-line operation, the alternating voltage of the mains is converted into direct voltage. This DC voltage is used simultaneously to charge the battery and supply the inverter. The inverter converts the direct voltage into interference-free alternating voltage at a fixed frequency and amplitude, from which are supplied the connected loads. This protects the load from mains supply disturbances and provides a secure supply for electrical loads (PCs, network servers, multi-console systems).

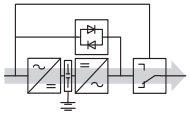


Figure 17 - UPS in on-line operation

In case of a mains failure, the batteries provides uninterrupted power to the loads for a given period, dependent on battery capacity and connected load.

6.1.2. Battery management

The battery is charged and discharged, as well as monitored, using a dedicated microprocessor control. This ensures battery lifetime is maximised. For details, see para 6.2 "Special features".

6.1.3. Overload capacity

In the event of an overload (e.g. > 150% of nominal load), the load is supplied by the Bypass.

In the event of an overload with no Bypass supply available, the Inverter will continue to supply the Load for a limited period (see "Inverter output" on page 83), after which it shuts down and the Load is no longer supplied. A fault message is displayed on the LCD and a manual reset must be carried out before the UPS can be used to supply the Load again - contact customer service for more information.

In the event of an Inverter fault, the Load is supplied by the Bypass, and the relevant fault message is displayed on the LCD. The fault condition must be corrected and a manual reset must be carried out before the Inverter can be used to supply the Load again - contact customer service for more information.

6.1.4. Communication

The UPS offers several interfaces for communication with computers. Further information is included in "Interfaces" on page 33.

Warning

To avoid overheating inside the UPS, do not operate the unit with the rectifier running, the Inverter switched off and the Bypass switch open for extended periods.

6.2. SPECIAL FEATURES

6.2.1. Safe and reliable operation

- Real on-line functioning, i.e. complete de-coupling of the load from all anomalies in the mains supply
- Important features of the UPS, such as vector control and high flexibility, are supported by the **C**ontrol **U**nit (internal processor - **CU**).
- Electronic bypass increases the reliability of the electrical supply

6.2.2. Easy installation and operation

- Parameterisation using bundled PC software
- No requirement for presence of Operator during normal operation
- Simple LCD provides clear indication of status, load and battery quality, clear operating and display concept
- Event memory for fault analysis
- Fault display and audible signal

6.2.3. Battery management

- Automatic battery management ensures maximum battery life
- Automatic battery circuit test
- Temperature-dependent charging

6.2.4. Environment, EMC

- EMC limits values to comply with European regulations and standards
- Energy savings due to high efficiency
- Low noise level
- Special EMC filter for higher demands (optional)

6.2.5. Modern technology

- Interfaces with software for all operating systems
- IGBT power transistors
- Highly integrated digital electronics (ASICs)
- Especially well suited for computer loads

The UPS can also be used as a frequency converter for 50/60 Hz or vice versa.

6.3. BLOCK DIAGRAM

(see Fig. 18).

KEY TO SWITCHES:

- QS1 = MAINS INPUT SWITCH
- QS2 = ELECTRONIC BYPASS SWITCH
- QS3 = MAINTENANCE BYPASS SWITCH
- QS4 = OUTPUT SWITCH
- QS9 = BATTERY SWITCH
- QS14 = NEUTRAL ISOLATOR (Normally closed - for maintenance purposes only)

6.3.1. Components

The UPS consists of the following components:

- Rectifier - Provides regulated DC voltage supply to inverter and booster/charger.
- Inverter - Provides a controlled AC output voltage to the critical load
- Booster/charger - Charges the battery when the mains supply is present. Supplies the inverter using energy from the battery when mains supply is not present.
- Bypass static switch
- Maintenance Bypass - Disconnects the Power Module during servicing, without interrupting the supply to the load
- EMC filter

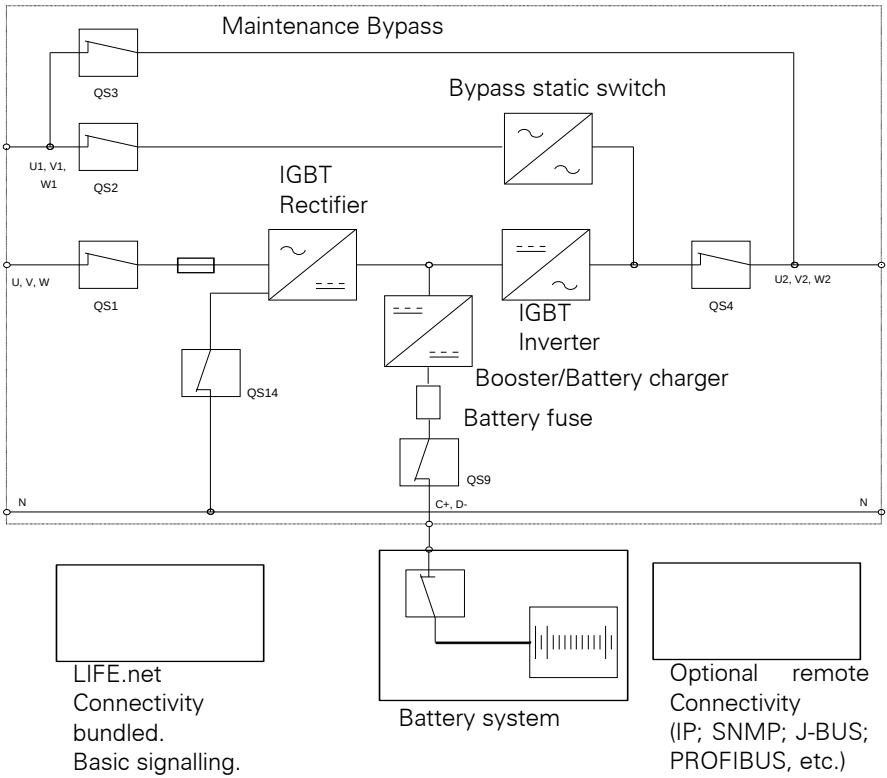


Figure 18 - UPS Overview

6.4. MAINTENANCE BYPASS

If it is necessary to take the UPS out of service, for maintenance or repair, 80-NET is equipped with a Maintenance Bypass switch (QS3), that enables transfer of the load to a bypass mains supply without any interruption in the supply to the load. All serviceable components, such as fuses, power modules etc. are isolated in this operating mode. Transfer/retransfer of the load is achieved by synchronising the UPS automatically to the bypass mains supply, paralleling it with the inverter, then opening or closing the Maintenance Bypass switch, as appropriate. The switch configuration during Maintenance Bypass is as follows:

- QS1 = OPEN
- QS2 = OPEN
- QS3 = CLOSED
- QS4 = OPEN
- QS9 = OPEN

(See Fig. 6 on page 16 and Fig. 18 on page GB- 45).

Warning

During parallel operation of UPS units, the load switching function of the built-in service bypass must be carried out by an external switching device (see "If the loads no longer need power, you may now open the

6.5. OPERATING MODES

The UPS has four different operating modes. These are described below.

6.5.1. On-line operation

Normal UPS operating mode. The connected loads are supplied from the mains via the Inverter. The batteries are charged as necessary. The inverter reliably filters mains disturbances and provides a stable, interference-free supply to the load. On the control panel, the "OK" LED is illuminated when the UPS is in on-line operation.

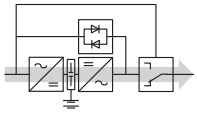


Figure 19 - Power flow in on-line operation

In this operating mode, the UPS switches to battery operation if a mains failure occurs. If an overload or short circuit occurs at the UPS output, or if there is a fault in the inverter, the UPS switches to bypass operation.

6.5.2. Battery operation

In this operating mode, the connected load is supplied from the batteries via the inverter. In the event of power failure, battery operation is automatically activated and supplies the loads withput interruption. If the power failure lasts longer than 30 s, the UPS signals a fault condition. In battery operation, the "OK" (green) LED on the control panel and the "WARNING" (yellow) LED are flashing.

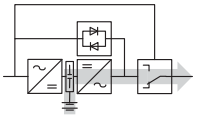


Figure 20 - Power flow in battery operation

From this operating mode, the UPS automatically returns to on-line operation within the backup time once the mains supply returns. If the power failure lasts longer than the loads can be supplied by the battery, the UPS provides relevant information via its interfaces. Computers can be automatically powered down with additional software (optional).

6.5.3. Bypass operation

In this operating mode, the connected loads are supplied from the mains via the electronic bypass. The electronic bypass serves to further ensure power to the loads. If an overload or short-circuit at the UPS output occurs, it is automatically activated to ensure uninterrupted power supply to the loads. The "WARNING" (yellow) LED on the control panel illuminates. From this operating mode, the UPS automatically returns to on-line operation after the fault is corrected.

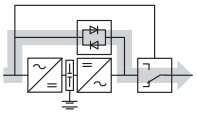


Figure 21 - Power flow in bypass operation

Bypass operation can also be specifically selected from the control panel with the key switch.

6.5.4. Maintnenance bypass

In this operating mode, the connected loads are supplied directly from the mains supply. The Display/Control Panel is disabled.

Maintenance Bypass is used to supply the connected loads during maintenance work on the UPS.

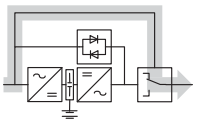


Figure 22 - Power flow in service bypass operation

6.6. COMMISSIONING

6.6.1. Forming

If the UPS devices have not been used for a period of more than one year, the intermediate circuit capacitors must be reformed. If the UPS devices are commissioned within one year after delivery (check nameplate), this action is not necessary.

▶ **Contact customer service if the intermediate circuit capacitors need to be reformed**.

▶ **Carry out commissioning as follows:**

6.6.2. Switch on the UPS

- Check that the UPS is connected according to "Installation" on page 15. For parallel operation please check "If the loads no longer need power, you may now open the external mains separation device for the UPS." on page 69.
- ensure that the ventilation grilles are unobstructed
- ensure the earth connection is in place
- ensure that any external switches are in the OFF (0) position
- ensure that **any external batteries are disconnected**

Danger

Do not connect any devices that may overload the UPS or draw direct current from it.

Notice

If these instructions are not observed correctly, problems may be experienced with the electrical supply.

6.6.3. Connect the batteries

Before the system starts, ensure that the UPS battery connections polarity is correct. Wrong connections can damage the system and endanger operator safety.

This operation must be carried out by authorized personnel. Check that the LCD Warning 13 is active when the external battery isolator device is open. After a few seconds, close the battery switch on the UPS (QS9). Warning 13 no longer appears on the LCD. The voltage on the UPS side of the external battery isolator device must have the same polarity as the battery voltage. Once the polarity has been checked it is possible to close the external battery isolator device.

6.6.4. Switch to on-line operation

- Set the UPS to On-line Operation (see para 6.7 on page 49).

The UPS is now in on-line operation and the loads are supplied from the inverter. Message 8 disappears from the display.

6.7. UPS SWITCHING PROCEDURES

Procedures refer to Fig. 18.

Table 5: Switch On procedure (all switches in "OFF")

Step	Action	Status
1	Switch QS1 to ON	
2	Switch QS2 to ON - Await Bypass Mode ON	
3	Switch QS4 to ON	Bypass Mode - Output voltage present
4	Close external battery switches then switch QS9 to ON	
5	Press Inverter ON button on Control Panel for approx. 5 seconds (see Fig. 23 on page 51).	Normal Mode (On Line)

Table 6: Switch Off procedure (UPS in On Line Mode)

Step	Action	Status
1	Press Inverter OFF button on Control Panel for approx. 5 seconds (see Fig. 23 on page 51).	Bypass Mode
2	Switch QS9 to OFF	
3	Switch QS4 to OFF	Load not supplied
4	Switch QS2 to OFF	
5	Switch QS1 to OFF	

Table 7: Transfer from On-line to Maintenance Bypass operation

Step	Action	Status
1	Press Inverter OFF on Control Panel for 5 sec (see Fig. 23 on page 51).	Normal Mode (Electronic bypass)
2	Switch QS9 to OFF	
3	Switch QS3 to ON	
4	Switch QS4 to OFF	Service Mode
5	Switch QS1 and QS2 to OFF	Maintenance Bypass Mode

Table 8: Transfer from Maintenance Bypass operation to On-line mode

Step	Action	Status
1	Switch QS1 and QS2 to ON - Await Bypass Mode ON	
2	Switch QS4 to ON	Service Mode
3	Switch QS3 to OFF	
4	Switch QS9 to ON	
5	Press Inverter ON on Control Panel for 5 sec (see Fig. 23 on page 51).	Normal Mode (On Line)

6.8. INVERTER STOP/START PROCEDURES

In the course of operating the UPS, it may become necessary, for example in an emergency situation, to switch off the Inverter, this is done by pressing the Inverter Stop button (see Fig. 23 - on page 51) and observing the following procedures:

6.8.1. Single UPS - Bypass normal

In this condition, press, and hold, the Inverter Stop button, for the first two seconds the buzzer sounds (tone #1 - continuous "beep"), if the button is released during this period the operation of the UPS is not affected and the Inverter remains on. After two seconds, the buzzer stops, and an warning message is indicated (warning and fault messages may be viewed by scrolling through the Display Menus as described in "Display" on page 53):

INVERTER INVERTER OFF	at which point the Inverter is switched off, the load is supplied by the Bypass and the Inverter Stop button can be released

6.8.2. Parallel UPS - Normal operation - Stop inverter

To switch off the Inverters of the UPS in a parallel system, press, and hold, the Inverter Stop button on each UPS control panel, one by one, the buzzer sounds (tone #1 - continuous "beep"), then, after two seconds, the message:

UPS xxxkVA STOP IN STANDBY	may be viewed (see "Display" on page 53), and the buzzer is silenced, while the Inverter continues to supply the load

Once the last Inverter Stop button has been pressed for two seconds, all the Inverters in the system switch off and the Load is transferred to the Bypass supply.
Until all the Inverters have switched off and the Load is transferred to the Bypass, the "STOP IN STANDBY" command may be reset on any, or all, of the UPS, by pressing the Inverter Start button on the control panel for a minimum of two seconds.

Refer also to para 7.2. on page 53

6.8.3. Parallel UPS - Start Inverter

To switch ON the Inverters of the UPS in a parallel system, press, and hold, the Inverter Start button on each UPS control panel, one by one, after two seconds, the message:

UPS xxxkVA START IN STANDBY	may be viewed (see "Display" on page 53).

Once the last Inverter Start button has been pressed, all the Inverters in the system switch ON and the Load is supplied from the Inverters.
Until all the Inverters have switched ON the "START IN STANDBY" command may be reset on any, or all, of the UPS by pressing and holding the Inverter Stop button on the control panel for a minimum of two seconds.
Refer also to para 7.2. on page 53

7. CONTROL PANEL AND DISPLAY

7.1. CONTROL PANEL

Figure 23 - Control Panel

LEGEND

1	Navigation button - Left soft key	2	Navigation button - Up
3	Navigation button - Down	4	Navigation button - Right soft key
5	Inverter "ON" push button	6	Inverter "OFF" push button
7	System Normal LED	8	Warning LED
9	Alarm LED	10	Reset push button
11	Command keyboard lock		

7.1.1. Description of Control Panel Functions

- ***Start Inverter***

Press the Inverter ON  button for 5 seconds.

- ***Stop Inverter***

Press the Inverter OFF  button for 5 seconds, an audible alarm will sound during this delay period.
The UPS can be manually switched between bypass and on-line operation using the keys "Inverter ON" (I) and "Inverter OFF" (O).

- ***Silencing Buzzer***

To silence the Buzzer press the Reset button momentarily

- ***Reset button***

In order to restore normal operation of the UPS following a fault condition, after having corrected the situation causing the fault, press the Reset button for at least one second.
The RESET button also serves as a function control for the control panel LEDs. All LEDs on the control panel illuminate for approx. 1.5 s after pressing the button in normal operation (no warning or fault indicators present), followed by the last five warning indicators appearing one after the other in the two-digit display. If a fault occurs, pressing the button mutes the audible signal and, once the fault has been corrected, pressing the button brings the UPS into operation again.

- ***Keyboard lock***

The mimic panel is equipped with a front panel key that disables all the mimic panel commands when the lock is set to "OFF".
In this state, if the operator attempts to perform any of the following actions, the message "COMMANDS DISABLED" appears in the LCD:

Start Inverter	Stop inverter	Reset Delay Call
Set/reset Battery Test	Set/reset Autonomy Test	Reset Fault
LIFE Manual Call	Set/reset Service Input	Set/reset I/O configuration

- ***General Status LED***

Three LED indicators provide a quick, general understanding of the status of the UPS, as described below:

OK LED (green) **Normal Operation**
When this light is on (not flashing), the system is running normally and neither warnings nor alarms are present. During mains failures (all other conditions at being nominal level), this LED will flash.

Warning LED (yellow) **Warning Condition(s) present**
This indication shall be activated by the presence of anomalous conditions, which could affect the nominal functioning of the UPS. These conditions are not originated with the UPS, but may be caused either by the surrounding environment or by the electrical installation (mains side and load side). It shall be possible to read the description of the active warning(s) by browsing the relevant LCD display menus.

Alarm LED (red) **Alarm Condition**
When this light is on, immediate attention should be given to the severity of the alarm, and service should be called promptly. It shall be possible to read the description of the active alarm(s) by browsing the relevant LCD display menus.

7.2. DISPLAY

The Display provides the user with a range of information and functions that can be accessed using the control panel navigation keys 1 to 4 (see Fig. 23 - on page 51).
UPS modifications and settings may only be carried out by appropriately qualified technicians. Settings should be tested only if the loads supplied by the UPS are non-critical.

The Main Page dispays a block diagram of the UPS, using standard technical symbols to indicate the current operating state (e.g. on-line operation, battery operation, by-pass operation, etc.), load level, and remaining auonomy. To access the Main Menu page from the Main (default) page, press the Right soft key (key 4 - see Fig. 23 - on page 51). From here you can scroll through the various sub-menus by using the Up and Down soft keys (2 and 3). Press the Right soft key to select any menu from the list, and the Left soft key (1) to return to the Main Menu page.
After 30 seconds of inactivity (i.e. without buttons being pressed) the display reverts to the default page.
The table on the following page provides a summary of the sub-menus.

When the UPS is not in normal operating mode, you can access the "Warning and Alarm" summary page directly from the Main (default) page. Warnings and alarms are identified by text strings and codes (see Table 11 on page 62 and Table 12 on page 65). When battery operation, the display switches between warning code and estimated backup time (minutes).

Table 9: Display menu summary

Menu	Sub-menus	Information/Functions
Actual values	- Mains Input - Bypass Input - DC Link - UPS Output - Battery	Provides information about the input, bypass and output voltages and frequencies; mains failures; output current and power; DC stage parameters; inverter operation; and battery conditions.
Status	- Synchronisation[1)] - Rectifier - Battery - Inverter - Bypass - Load	Provides status information about the main UPS blocks
LIFE.net	- LIFE Status[2)] - LIFE Delayed - LIFE Manual - LIFE Service	Provides status information about LIFE.net, and allows you to reset a delayed call; perform a manual call; and select service mode.
Display settings	- Language - Contrast	Allows you to select the display language from: English; German; French; Italian; Spanish; Portuguese; Chinese; Turkish. You can also adjust the display contrast by pressing the left and right keys (1 and 4) to move the bargraph.
Battery test	- Test Status - Perform a Test	Provides information about the battery status and allows you to carry out a battery test. You can select the length of the battery test from the list that appears.
Guided procedures	- See para 7.3 on page 55	Select this menu to carry out guided UPS switching procedures.
About	- Manufacturer - Type of UPS - Rating in kVA - Website - Firmware Code/Rev./Date	Provides miscellaneous information about the UPS, including the code, revision and release date for the various firmware versions.

1) Only if the Synchronisation option is installed - see Installation Manual 10H52160PUMC.
2) If LIFE.net is not installed/enabled, the message "LIFE is not activated on this UPS!!!" is displayed.

7.3. GUIDED PROCEDURES

For the following procedures, assume that the UPS is in one of the following operating modes:

- Switched off: all network and power switches are open. The load is voltage free.
- Service bypass operation: the UPS is switched off, but the load is connected via the service bypass switch supply line to the unprotected mains.
- Normal operation: all relevant mains and power switches are connected. The load is supplied by the UPS.

Notice

The acoustic alarm may be activated at various times in this procedure. It can be switched off by pressing the "Test/Reset" pushbutton.

Warning messages may appear briefly on the display. However, these may be disregarded.

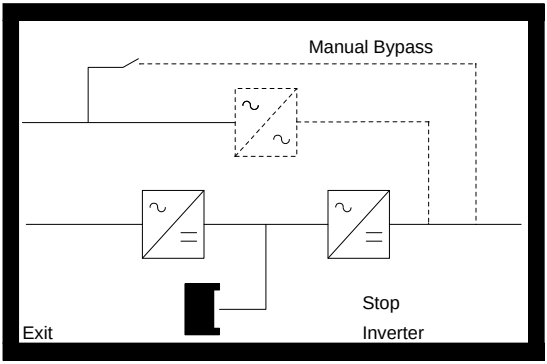
To access the guided procedures select "Guided Procedures" from the display Main Menu (see Table 9 on page 54). The procedures available for the current UPS configuration are displayed. The following table lists the various procedures that can be carried out for each configuration:

Table 10: UPS Guided procedures

Single UPS	Distributed Parallel
Manual Bypass	Manual Bypass
Return from Bypass	Return from Bypass
Start Up	System Start Up
Shutdown	System Shut Down

7.4. SAMPLE GUIDED PROCEDURE - MANUAL BYPASS

When the desired procedure has been selected from the Guided Procedures menu (in this case the Single UPS Manual Bypass procedure), the following window appears in the display, illustrating the principle UPS components and their current status:



The various UPS switches are also represented - the Maintenance Bypass switch, QS3, is shown in the open (OFF) position in the above example - these show the current status of the switches, and flash to indicate the user must open, or close, the corresponding switch.

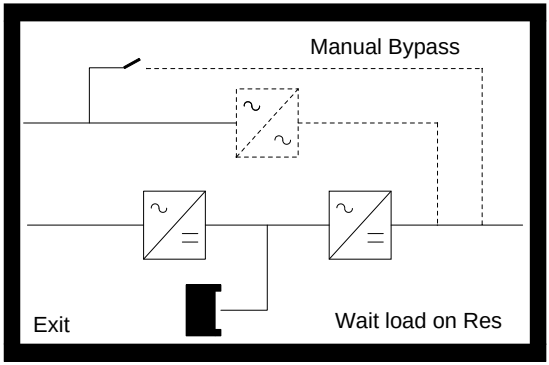
In the event of a fault, a warning message is displayed (see "Warning messages" on page 60 for full list of warning messages), exit the procedure, correct the fault condition and reset before proceeding.
Pressing the button identified by the "Exit" message at any moment interrupts the procedure.

In this case, the message "Stop Inverter" appears in the bottom right of the display, and

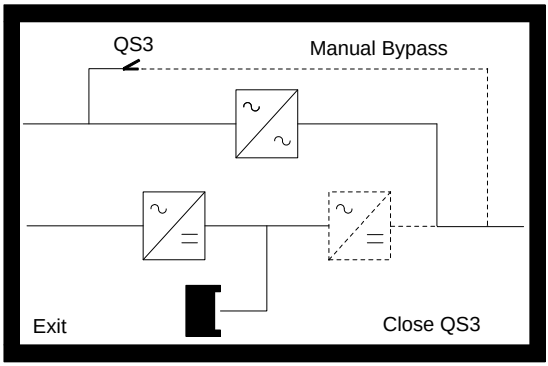
the Stop  symbol flashes over the Inverter, indicating that the user must stop the Inverter by pressing the corresponding button on the "Control Panel" on page 51. (See "Instruction messages" on page 60 for full list of instruction messages).

PROCEDURE:

1 Press the Stop Inverter button for at least 2 seconds.
2 The messge "Wait load on Res." is displayed, indicating that the system is waiting for the load to be transferred to the Bypass supply.

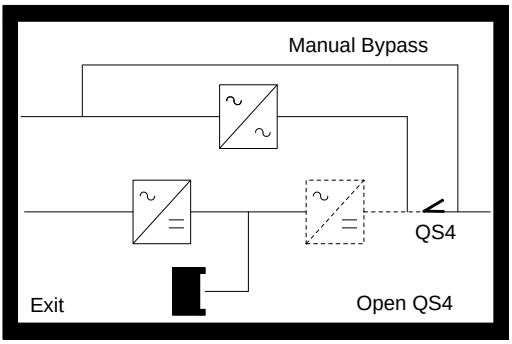


3 The message "Close QS3" is displayed, and the symbol representing QS3 on the display begins to flash.



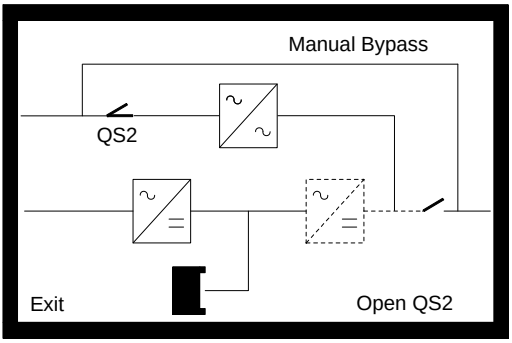
Close QS3 (Maintenance Bypass switch)

4 The message "Open QS4" is displayed, and the symbol representing QS4 on the display begins to flash.



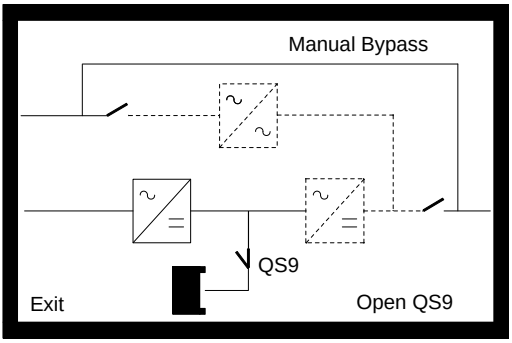
Open QS4 (Output switch).

5 The message "Open QS2" is displayed, and the symbol representing QS2 on the display begins to flash.



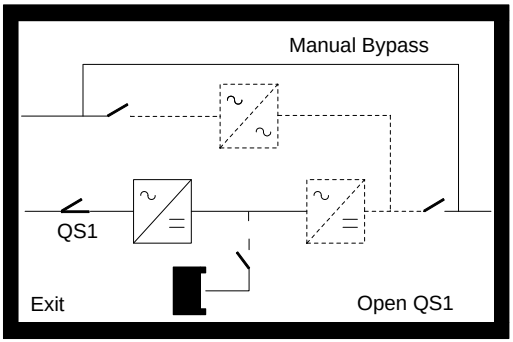
Open QS2 (Bypass switch)

6 The message "Open QS9" is displayed, and the symbol representing QS9 on the display begins to flash.



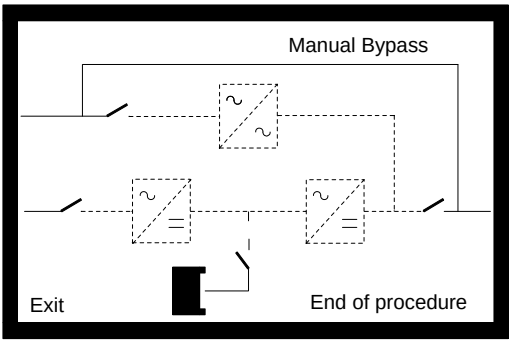
Open QS9 (Battery switch)

7 The message “Open QS1” is displayed, and the symbol representing QS1 on the display begins to flash.



Open QS1 (Input switch).

8 The message “End of procedure” is displayed.



7.4.1. Instruction messages

Stop Inverter	Open QS1	Close QS1
Start Inverter	Open QS2	Close QS2
Press Exit	Open QS3	Close QS3
Reset Fault	Open QS4	Close QS4
	Open QS5	Close QS5

7.5. Warning messages

Procedure not OK

Wait Vdc in range

Waiting Bypass ON

Wait Load on Bypass

Wait Load on Invert.

7.6. WARNING AND FAULT INDICATIONS

The UPS recognises and draws attention to a number of events occurring during operation. These events are divided into Warning and Fault indications. Whether the message is a warning or fault can be determined from the number which appears in the Warning/ Fault Diagnosis page of the display, and the buzzer signals.

7.6.1. Buzzer

The buzzer has two different patterns, which indicate the tyre of warning active.

- **Pattern 1: long intervals** - This event is less serious. It is not essential that the cause be rectified immediately, unless otherwise specified in table "Warning indicators".
- **Pattern 2: short intervals** - This is a serious event. The cause should be rectified straight away to avoid a fault condition.

The buzzer is silenced automatically as soon as the cause of the event is rectified. It can also be silenced manually by pressing the button TEST/RESET.

7.6.2. Warning indicators

If a warning indication appears, the UPS continues to operate. The yellow LED ALARM illuminates on the control panel. A number between 1 and 32 appears in the display indicating the type of warning.

7.6.3. Displayed Warnings

The various possible warning indications are listed in the table on the following page:

Table 11: Warning indicators

Warning indicator	Cause
1	W1i1 "Inverter over-temperature" W1i2 "Neutral-Booster stab. over-temperature"
2	W2i1 "Bypass switch open" W2i2 "Bypass supply failure" W2i3 "Parallel bypass not available"
3	W3i1 "Primary mains switch open" W3i2 "Primary mains power failure" W3i3 "Mains voltage low"
4	W4 "Inverter I2T"
5	W5i1 "DC Voltage low" W5i2 "Pre-charge active" W5i3 "Bypass disabled for DC low Voltage"
6	W6i1 "90% overload capacity reached" W6i2 "Current limit" W6i3 "Overload"
7	W7i1 "Bypass wrong phase rot." W7i2 "Primary mains wrong phase rot."
8	W8i1 "Maintenance bypass switch closed" W8i2 "SBS bypass switch closed"
9	W9 "Output load supplied by battery"
10	W10i1 "Imminent end of batt. aut. time" W10i2 "Battery shutdown imminent"*
11	W11i1 "Battery end discharge" W11i2 "Battery depleted"**
12	W12 "Commissioning or test mode"
13	W13 "Battery switch open"
14	W14 "Fan life exceeded"
15	W15 "CU1<->CU2 communication error"
16	W16 "CPU time slice override"
18	W18i1 "Battery discharging" W18i2 "battery charger inhibited"
19	W19i1 "Temp. probe not responding" W19i2 "Batt. temp. out of range" W19l3 "High battery temperature"

Table 11: Warning indicators

Warning indicator	Cause
20	W20i1 "Inverter remotely stopped" W20i2 "Inverter insufficient ventilation" W20i3 "Inverter remotely inhibited" W20i4 "I/O conflict" W20i5 "Input air temp. sensor fault" W20i6 "Input air temp. out of range" W20i7 "Input air temp. user alarm" W20i8 "SBS output switch open" W20i9 "IIC bus error"
22	W22i1 "Output load not supplied" W22i2 "Inverter Off" W22i3 "Inverter inhibited due to DC low"
24	W24i1 "Rectifier not configured" W24i2 "Mains voltage low" W24i3 "Battery SCR over-temperature"
26	W26i1 "Inverter stop pending command" W26i2 "Inverter start pending command"
27	W27 "Battery autonomy test"
28	W28 "Re-transfer inhibited"
29	W29 "External synchronisation error"
30	W30i1 "Do not insert battery" W30i2 "Do not close output switch"
31	W31i1 " DC voltage high" W31i2 "DC voltage low"
32	W32 "Output switch open"
***A power failure will only be indicated when the minimum time has been exceeded. **These messages may also appear if battery data have not been correctly entered. Call customer service.**	

Please inform customer service of the indicator number(s) and the illuminated LEDs.

7.6.4. Fault indications

If a fault occurs, the affected UPS component is always switched off, and the UPS automatically switches to the best possible operating mode for supplying the loads; the red FAULT LED illuminates on the control panel. A number between 33 and 183 appears in the Warning/Fault Diagnosis page of the display indicating the type of fault. Fault indicators are also indicated by a continuous tone from the buzzer. If a fault occurs, proceed as follows:

Acknowledge horn
First acknowledge the horn by pressing the TEST/RESET button

Correct fault
Next correct the fault by following the indications in Table 12 on page 65.
If the fault cannot be corrected:
Call Customer Service: The customer service addresses are given on the last page of this manual.

Acknowledge fault
After the fault has been corrected, it must be acknowledged by pressing the TEST/RESET button again.

7.6.5. Displayed Faults

The various possible fault indicators are listed in the tabel on the following page:

Table 12: Fault Indications

Fault	Cause
33	F33i1 "Inverter over-temperature" F33i2 "Inverter filter over-temperature" F33i3 "Inverter temperature sensor fault"
34	F34 "CU program error"
35	F35 "Incorrect power class"
36	F36 "Inverter contactor defective"
37	F37 "Multiple inv. cutoff for overcurr."
39	F39 "Inv. DC voltage high"
40	F40i1 "UPS fast turn off" F40i2 "E.P.O."
43	F43i1 "DC/AC desaturation ph. U" F43i2 "DC/AC desaturation ph. V" F43i3 "DC/AC desaturation ph. W"
44	F44 "Stop due to overcurrent"
46	F46i1 "Output over-voltage" F46i2 "Output under-voltage" F46i3 "Output frequency out of limits" F46i4 "Output short circuit" F46i5 "DC component phase U" F46i6 "DC component phase V" F46i7 "DC component phase W"
47	F47i1 "Inverter I2T phase U" F47i2 "Inverter I2T phase V" F47i3 "Inverter I2T phase W" F47i4 "Inverter overload timeout"
48	F48 "Backfeed protection active"
50	F50 "Bypass ready signal failure"
51	F51 "Bypass failed during line support"
52	F52 "Bypass overload timeout"
53	F53 "Bypass transformer protection"
54	F54 "Fan system faulty"
55	F55 "CU2 EEPROM faulty"
56	F56 "CU2 communication failure with CU1"
57	F57 "CU2 EPROM checksum fault"
58	F58 "Bypass output voltage fault"
59	F59 "CU2 fault accessing dual port RAM"
60	F60 "Parallel bypass fault"
61	F61 "Parallel board signal failure"

Table 12: Fault Indications

Fault	Cause
62	F62 "Ambient temperature sensor fault"
72	F72i1 "Primary mains transf. protection" F72i2 "Primary mains insulation"
73	F73i1 "Neutral Boost filter over-temp" F73i2 "Neutral Boost over-temperature" F73i3 "Neutral Boost filter desaturation" F73i4 "Neutral Boost temp. sensor fault"
83	F83i1 "Battery fault" F83i2 "Battery fuse blown" F83i3 "Battery insulation failure"
84	F84i1 "Battery SCR shorted" F84i2 "Battery SCR faulty" F84i3 "Battery SCR sensor fault"
101	F101 "Rectifier and boost fault"
133	F133i1 "Rectifier filter over-temperature" F133i2 "Rectifier over-temperature" F133i3 "Rectifier temperature sensor fault"
139	F139 "Rectifier DC overvoltage"
140	F140 "E.P.O."
141	F141 "CU1 DSP program error"
142	F142 "Rectifier pre-charge failure"
143	F143i1 "Rectifier desaturation phase U" F143i2 "Rectifier desaturation phase V" F143i3 "Rectifier desaturation phase W"
145	F145 "CU1 Power supply feedback failure"
155	F155 "CU1 EEPROM fault"
157	F157 "CU1 EPROM checksum fault"
159	F159 "CU1 fault accessing dual port RAM"
162	F162 "Battery temperature sensor fault"
173	F173i1 "Boost Charger filter over-temp" F173i2 "Boost Charger over-temperature" F173i3 "Boost Charger desaturation" F173i4 "Boost Charger temp. sensor fault"
182	F182 "Rectifier DC closed loop fault"
183	F183 "Battery test fault"

Please inform customer service of the indicator number(s) and the illuminated LEDs. Fault indicators not listed in the table can only be corrected by customer service.

7.7. TROUBLESHOOTING

7.7.1 Rectification of Errors

If, in spite of the high reliability of this device, problems should occur, please check the following points before contacting the responsible customer service representative:
Is the mains voltage present at the UPS input?
Is the input fuse defective or have circuit breakers tripped?
If you contact the responsible customer service representative, please have the following information ready:

- Device information = model, order no., series no. as per nameplate
- An exact description of the problem (what loads are being operated, does the problem occur regularly or sporadically etc.)

Problem	Possible cause	Action
No display No alarm (UPS switched off)	Main switch switched off	Switch on main switch
	No mains voltage present	Have mains inspected by qualified electrician
	Input fuse defective or input circuit breaker tripped	Replace with fuse of same type or reset circuit breaker. If the problem persists, contact the responsible customer service representative.
Green "OK" LED does not illuminate, buzzer sounds at intervals	No mains voltage present	UPS operation
Green "OK" LED does not illuminate when mains voltage present, buzzer sounds at intervals	Input fuse defective or input circuit breaker tripped	Replace with fuse of same type or reset circuit breaker. If the problem persists, contact the responsible customer service representative.
ALARM indicator illuminates, buzzer sounds continuously	UPS error	Contact the appropriate customer service representative
	Overheating	Reduce ambient temperature

Problem	Possible cause	Action
Backup time less than that specified	The fuse switch of the battery extension(s) is in "OPEN" position.	Move the fuse switch to the "ON" position.
	Batteries are not completely charged	Charge batteries, and test backup time. If the problem persists, contact the appropriate customer service rep.
	Batteries are defective	Contact customer service
	Charging device is defective	Contact customer service
No communication between UPS and PC	Wrong serial connection cable	Check whether the correct cable has been used (standard modem/null modem cables are not permissible)
	Interface on the PC is being used by another process or is defective.	Check whether other software/service is accessing the interface on the PC; try selecting a different serial interface.
	Interference on the data cable	Lay cable differently.

8. MAINTENANCE

8.1. MAINTENANCE INTERVALS

CHLORIDE recommends that regular maintenance checks be carried out on site by an authorized customer service. The UPS indicates when the end of a fan's lifetime has expired (see Table 12 on page 65). A replacement fan is recommended.

8.2. DISPOSAL OF BATTERIES

When the useful lifetime of the batteries has expired, they must be replaced by the Customer Service representative responsible. Exhausted accumulator batteries are classified as "harmful toxic waste" and as such, within the EU, must be disposed of by a certified disposal specialist. Outside the EU, disposal is to be performed in accordance with the applicable regulations for the given country. The Customer service centre is fully equipped to deal with such batteries in accordance with regulations and with the greatest respect for the environment.
The typical useful lifetime of the battery is 3 to 5 years at 25° C ambient temperature; it is, however, dependent on the frequency and duration of mains failures.

8.3. SERVICE ADDRESSES

Onsite service is available world-wide. Service telephone and fax numbers can be found on the last page of this manual.

8.4. DECOMMISIONING

8.4.1. Taking out of service

Switch to service bypass

- Switch the UPS to Maintenance Bypass operation (see Table 6 on page 49)

Disconnect batteries

- Open the battery isolator or battery switch if other external batteries are used.
- Before continuing work, measure the voltage at the battery terminals and at the mains input and wait until this has dropped to 0 V or wait at least 5 min. Failure to do this can lead to severe electrical shock and possibly death.

The UPS is now in maintenance bypass operating mode. The only voltage present is at the mains and load terminals. Qualified personnel may now carry out maintenance work while observing the corresponding safety measures.

Disconnect mains

If the loads no longer need power, you may now open the external mains separation device for the UPS.

9. PARALLEL OPERATION

Uninterruptible power supplies can be connected in parallel to increase power capacity or for additional safety (redundancy). If the UPS units are equipped with the additional POB (Parallel Operation Board) assembly, up to 8 of the same UPS blocks can be operated in parallel for increased power capacity or redundancy. Your UPS units are equipped with this option if the order number on the nameplate contains the letter "B" in the ninth position: CH80 xx-xxBxx-xxxx.
This feature can also be added at a later time and is, therefore, available as an option.
A multiple-block system is automatically regulated and controlled via the controller of the individual UPS blocks. The available electronic bypasses in the individual blocks work together just as all the corresponding inverters and divide the load current between them. All necessary communication for parallel operation is carried out via a shielded 25 conductor cable. Each UPS block is shipped with a 5m long communication cable which is sufficient for most installation requirements.
When planning the system and during installation, power cables having the same length are to be used between the input distribution and the input terminals for the bypass and rectifier (U, V, W, - U1, V1, W1, N), as well as from the UPS outputs (U2, V2, W2, N) to the parallel connection point on the load side. Differences of 20% are allowed for power cable lengths of up to 20 m. For larger distances, cable lengths may not vary by more than 10%. The PE and N terminals must be connected in accordance with the requirements of the local mains distribution system (TN-C, TN-S, TN-C-S, TT etc.) For instance, in TN-C installations the PEN conductor from the supply transformer must be connected to the UPS PE and N terminals. See note to "External electrical connections" on page 25, and Fig. 25 on page 75.

9.1. COMMISSIONING

Commissioning of multiple-block systems must be carried out by appropriately trained technicians.

9.2. SYSTEM CONFIGURATIONS

Fig. 24 and Fig. 25 illustrate the schematic diagram of a multiple-block system with Service Bypass Switch (SBS) in various multiple-block systems - contact CHLORIDE Technical Support for more information. The SBS illustrated can be in 80-NET parallel systems where units are of standard, 400V type.

9.3. COMMUNICATION BETWEEN THE UPS BLOCKS

UPS units exchange information between each other via the connector cable (25 pin connector) shipped with each unit. Fig. 26 displays the loop circuit. The communication cables are shielded and must be run separately to, and away from the power cables.

9.4. PARALLEL SWITCHING PROCEDURES

Procedures refer to Fig. 17 on page 43.

Table 13: Switch On procedure (all switches in "OFF")

Step	Action	Status
	On each UPS:	
1	Switch QS1 to ON	
2	Switch QS2 to ON - Await Bypass Mode ON	
3	Switch QS4 to ON	Electronic Bypass Mode - Output voltage present
4	Close external battery switches then switch QS9 to ON	
	When the above steps have been completed for all the UPS in the parallel system:	
5	Press Inverter ON button on each UPS Display Panel (Fig. 22 on page 47) for approx. 5 seconds, until all the Inverters are ON - at this point the Inverters synchronise and take over the Load	Normal Mode (On Line)

Table 14: Parallel Switch Off procedure (UPS in On Line Mode)

Step	Action	Status
	On each UPS:	
1	Press Inverter OFF on each UPS Display Panel (Fig. 22 on page 47) for 5 sec, until all the Inverters are OFF - at this point the Load is supplied by the Bypass	Electronic Bypass Mode
	Carry out the following steps for all the UPS in the parallel system:	
2	Switch QS9 to OFF	
3	Switch QS4 to OFF	Load not supplied
4	Switch QS2 to OFF	
5	Switch QS1 to OFF	

Table 15: Transfer from On-line to Maintenance Bypass operation

Step	Action	Status
	On each UPS:	
1	Press Inverter OFF on each UPS Display Panel (Fig. 22 on page 47) for 5 sec, until all the Inverters are OFF - at this point the Load is supplied by the Bypass	Electronic Bypass Mode
	Carry out the following steps for all the UPS in the parallel system:	
2	Switch QS3 to ON	
3	Switch QS4 to OFF	Service Mode
4	Switch QS9 to OFF	
5	Switch QS1 and QS2 to OFF	Maintenance Bypass Mode

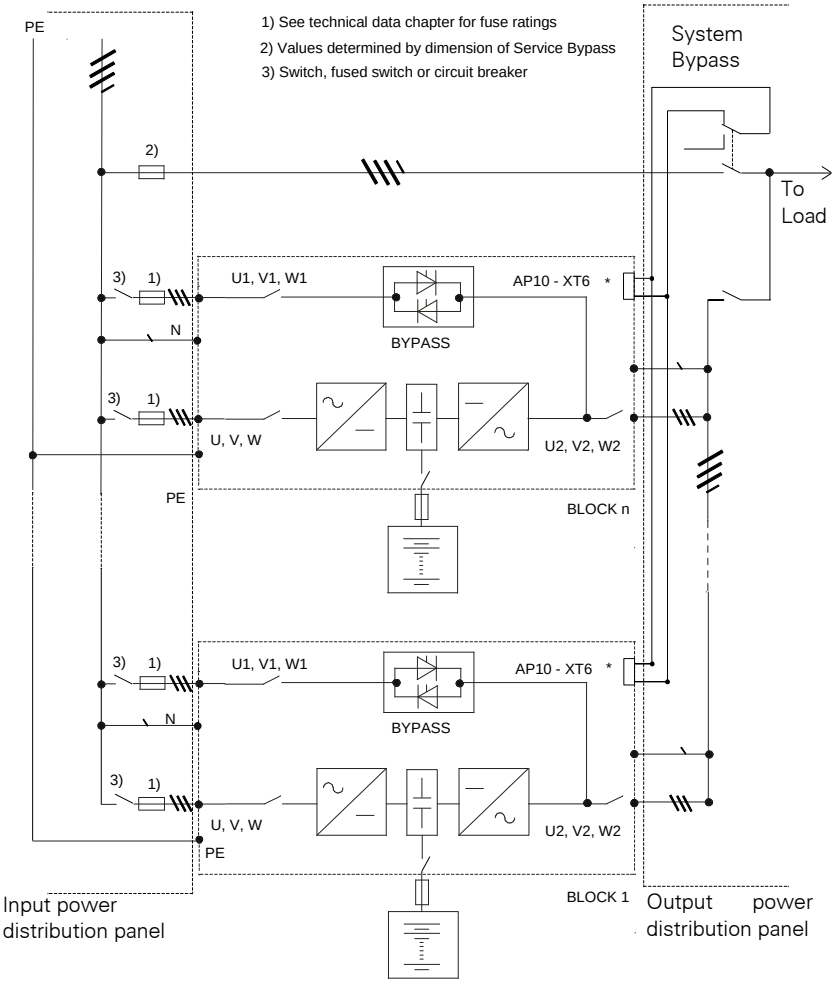
Table 16: Transfer from Maintenance Bypass operation to On-line mode

Step	Action	Status
	On each UPS:	
1	Switch QS1 and QS2 to ON - Await Bypass Mode ON	
2	Switch QS9 to ON	
3	Switch QS4 to ON	Service Mode
4	Switch QS3 to OFF	
	When the above steps have been completed for all the UPS in the parallel system:	
5	Press Inverter ON on Display Panel (Fig. 22 on page 47) for 5 seconds, until all the Inverters are ON - at this point the Inverters synchronise and take over the Load	Normal Mode (On Line)

Table 17: Parallel Switch Off procedure (Bypass Mode)

Step	Action	Status
	On each UPS:	
1	Switch QS9 to OFF	
2	Switch QS4 to OFF	Load not supplied
3	Switch QS2 to OFF	
4	Switch QS1 to OFF	

Figure 24 - Schematic diagram of a multiple block system



* - See "Customizable Input contacts - (AP10-XT6)" on page 39

Figure 25 - Schematic diagram of a multiple block system in a TN-C earthing system

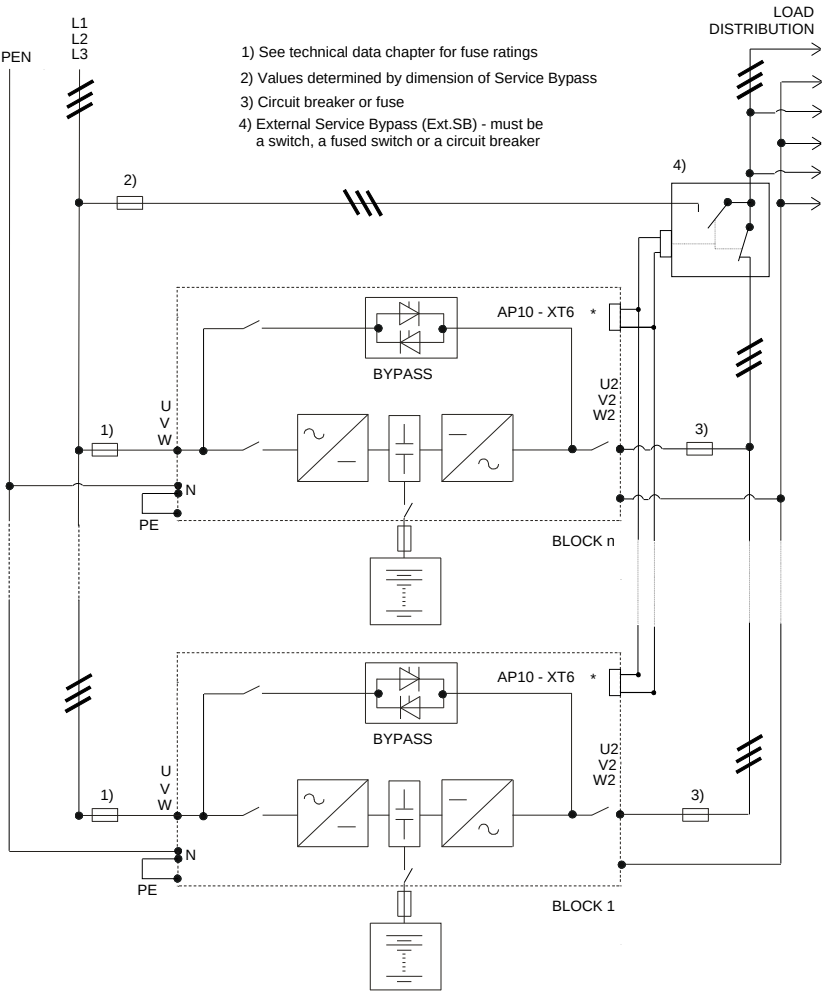
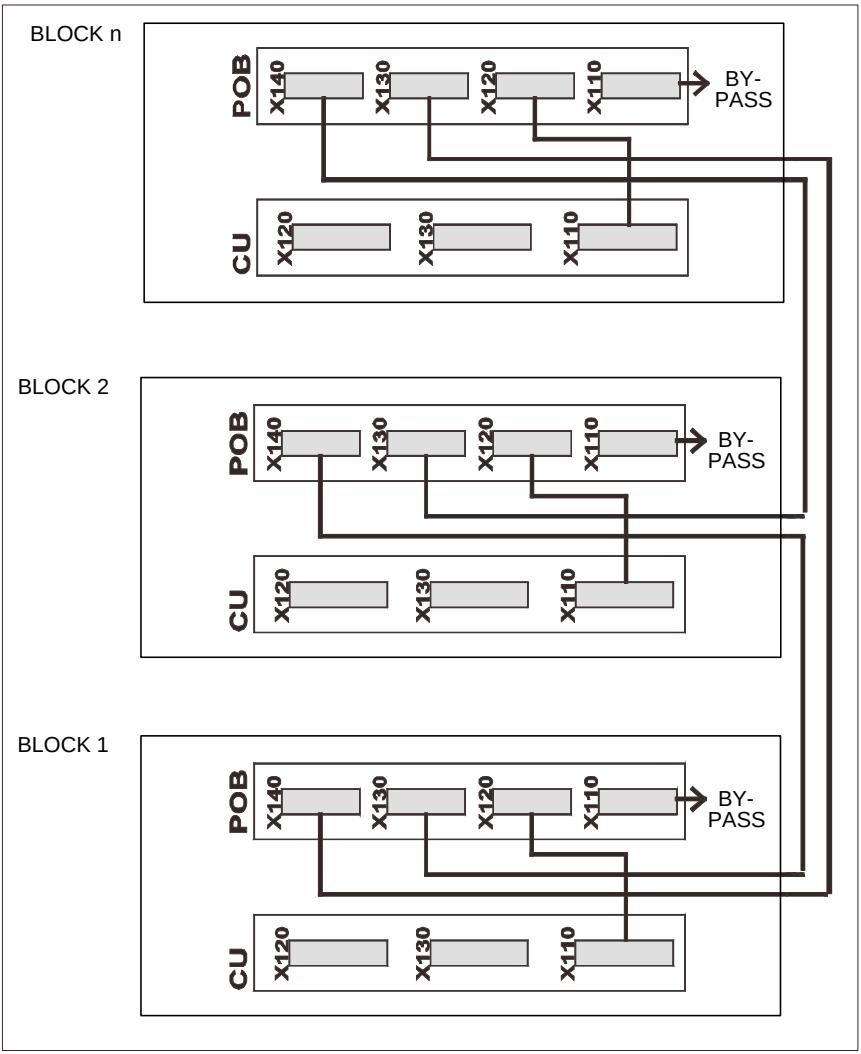


Figure 26 - Loop circuit for parallel UPS (25 pin connector)



10. OPTIONS

Some of the options listed in this section may modify the data in the standard technical data tables (see "Technical data" on page 81). It may not be possible to use certain options simultaneously on the same UPS.

10.1. REMOTE ALARM UNIT

A remote alarm panel is available for displaying important individual UPS messages. The connection cable must not exceed 300m.

10.2. EXTERNAL BATTERY CIRCUIT BREAKER

This option consists of a fully-rated circuit breaker, with an auxiliary contact which allows the UPS to monitor its status via a dedicated input contact. The circuit breaker is housed in a wall-mounted box and designed for use with rack-mounted battery systems. The circuit breaker also serves to protect the power cables connecting the battery to the UPS.

10.3. BATTERY MANAGEMENT MODULES (available upon request)

With these modules connected to the battery blocks, the following enhanced battery management features are available:

- Separate Battery Measuring Modules (BMM) monitor the condition of each individual battery block
- Each battery block is analysed by measuring its minimum and maximum voltage.

10.4. TOP CABLE ENTRY

This option permits power cables to be routed through the top of the UPS.

10.5. DUST FILTERS

This option improves the air inlet protection level from IP20 to IP40 for specific applications such as dusty environments. The filter is housed in the UPS cubicle (IP20).

10.6. EMPTY BATTERY CUBICLE

These cubicles consist of:

- Cubicle
- Disconnecting device
- Fuses
- Safety panel
- Connection terminals
- UPS/battery connection cables (for adjacent installation)

There are two sizes avaiable:

	Width (mm)	Depth (mm)	Height (mm)	Net Weight (kg)
Type A	820	858*	1780	220±35
Type B	1020	858*	1780	250±35

* including front handle; without handle 830mm.

10.7. EMPTY OPTIONS CUBICLE

A matching cubicle is available for customised applications such as:

- Isolation transformers
- Input/Output voltage matching transformers
- Customised distribution boards

10.8. FREQUENCY CONVERTER APPLICATION

80-NET can be programmed for use as a frequency converter (50Hz in - 60Hz out, or 60Hz in - 50Hz out), with or without a battery connected. In this operating configuration, the-data shown in the standard technical data tables may vary (e.g. output overload capacity). Please contact CHLORIDE Technical Support for details.

10.9. MOPUPS SHUTDOWN AND MONITORING SOFTWARE

MopUPS Professional is a safe system shutdown and power management software. With advanced features such as network shutdown, scheduled shutdown and restart, event messaging, event logging, data logging, real time viewing, UPS diagnostics and remote access, MopUPS has everything necessary to preserve data and maximize system uptime.

The software features:

1 **Remote management**
Site power and UPS status information can be access securely from any computer on your IP based network. View event history and voltage logs for trend analysis. View UPS system status in real time for situational decision support. Access is based on User Authentication with 128bit, MD5 encryption.

2 Remote messaging
Keeps you informed anywhere – fault and recovery messages are sent via SNMP Trap or email. Body of email will include URL for quick link back to UPS Web page. Many pager systems will forward email to your wireless pager - so you can be informed anywhere.

3 **Safe system shutdown**
Preserve data integrity and minimize recovery delays with automated system shutdown. MopUPS monitors the UPS for power failure, low battery, or other events that jeopardize computer power – and initiates controlled system shutdown.

While it is always possible to use a serial connection, it is recommended that a ManageUPS network SNMP Adapter be used for the communication connection between MopUPS Professional and 80-NET so that multiple Server Systems can communicate with the UPS via Ethernet.

With 80-NET in redundant parallel configuration, MopUPS P/R Edition monitors all connected 80-NET units simultaneously. It acquires load data, estimated autonomies, and other measurements from individual modules and aggregates them according to whether the system is serial or parallel redundant, and whether it is centralised or distributed parallel (with or without redundancy). This special edition MopUPS can analyse module-specific conditions and report situations that may affect redundancy or power margin. ManageUPS Net Adapter is required when using MopUPS P/R Edition.

For more details, see http://connectivity.chloridepower.com/

10.10. MANAGEUPS ADAPTER

ManageUPS NET Adapter II offers an open approach to network power management by delivering a complete set of manageability options including: WEB, Telnet, and Out-Of-Band accessibility, in addition to the full-featured, embedded SNMP agent. Event messages are available as email as well, as SNMP Traps - a truly versatile tool for managing 80-NET UPS systems in a network environment.

The software features:

1 **DHCP Network Configuration**
Supports automatic IP settings configuration using the DHCP protocol. The DHCP server must be located on a network routable from the LAN that ManageUPS-II is connected to.

2 **Multiple Network Access Methods**
Site power and UPS status information can be accessed securely from any computer on your network. View UPS system status in real time for situational decision support. Access via Telnet, SNMP, or Web Browser. SNMP Agent conforms to RFC1628 Standard UPS MIB.

3 **Network Shutdown**
ManageUPS includes a UPS status server and a network shutdown controller. Use these features with host shutdown software (RCCMD, MopUPS NSA, MopUPS Professional or MopUPS P/R) to ensure safe shutdown of multiple servers, workstations or PCs in tcp/ip network environments.

4 **Event and Data Logging**
ManageUPS II keeps a log file of UPS events and environment data. On-board log file viewer lets you filter records for easy analysis.

For details, see http://connectivity.chloridepower.com/

10.11. PROFIBUS PROTOCOL

80-NET can be connected to higher level automatic systems by installing a Profibus DP Interface Card in the CudSMC Box. The Profibus Card is compatible with the Profibus DP V1 bus system and enables very fast, cyclical data exchange between higher level systems such as Simatic S5, S7, Symadyn D, PC/PG and units in the field.
The following information can be transmitted by the UPS:

- Unit status
- Alarm and fault information
- UPS output voltage levels
- Control information

10.12. CONNECTIVITY

The following table gives details of the various combinations of connectivity solutions which can be used in association with 80-NET. Only one of the combinations may be used at a time; other combinations may be possible. For port numbers, please refer to “Interfaces” on page 33. For further information please refer to CHLORIDE Connectivity Solutions specifications. X3 and XS3 use the USS protocol, X6 and XS6 can be set to USS or LIFE.net protocol:

Connectivity solution	**Possible common connection board interfaces**	**Protocol**	**Combination**			
			A	**B**	**C**	**D**
ManageUPS II	Slot 1 (XS6) and Slot 2 (XS3)	USS	XS3	XS3	XS6	XS3 and XS6
Slot Modem Card	Slot 1 (XS6)	Life.Net	XS6	-	Not available	Not available
MUX for Slot Modem Card	Slot 1 (XS6)	Life.Net				
Application on Serial Interface 1 (e.g. MopUPS)	X3 (also available when ManageUPS Card is present in XS3)	USS	Available	Available	Available	Available
Application on Serial Interface 2 (e.g. MopUPS)	X6 (not available when Slot Modem/MUX is present in XS6)	USS	Not available	Available	Available	Available
Profi-BUS	CUdSMC box	Profibus DP V1	Yes	Yes	Yes	Yes
AS 400	X7	Dry contact	Yes	Yes	Yes	Yes

11. TECHNICAL DATA

11.1. UPS DEVICES

UPS model		80-NET					
Power kVA		**60**	**80**	**100**	**120**	**160**	**200**
11.1.1. System data							
Maximum input current @ ambient temp. 0°C to 40°C		94 A	125 A	156 A	185 A	250 A	312 A
Efficiency: AC/AC double conversion, nominal i/p conditions[3], resistive load, no recharging current:	Half load[7]	90%	92.5%	92%	92.5%	92.3%	92%
	Full load[7]	93%	94%	94%	94%	94%	94%
	Digital i/active[7]	98%	98%	98%	98%	98%	98%
Heat dissipation at nominal input conditions and output load	Float mode	3 kW	4 kW	5 kW	6 kW	8 kW	10 kW
	Recharge mode	3.6 kW	4.8 kW	6 kW	7.2 kW	9.6 kW	12 kW
	Digital i/ active mode	1 kW	1.3 kW	1.6 kW	1.9 kW	2.6 kW	3.2 kW
Noise at 1 m as per ISO 3746		64 dBA (±2 dBA)		68 dBA (±2 dBA)		(±2 dBA)	
Protection degree with doors open		IP20					
Mechanical dimensions:		see para. 3.6 on page 13					
Number of cabinets		1					
Frame colour (RAL scale)		7035					
Net Weight (kg)		280±35		360±35		495±35	590±35
Floor area		0.49 m^2		0.72 m^2		0.96 m^2	1.07 m^2
Floor loading		617 kg/m^2		557 kg/m^2		520 kg/ m^2	560 kg/ m^2
Cable entry		Bottom/side					
Access		Front					
Cooling		Forced ventilation with fan redundancy[1]					
Temperature	Operating	0-40 °C					
	Max. daily average (24h)	35 °C					

UPS model	80-NET					
Power kVA	**60**	**80**	**100**	**120**	**160**	**200**
Temperature Maximum (8h)	40 °C					
Transport and storage	-20 °C to +70 °C					
Max. relative humidity @ 20°C (non condensing)	Up to 90%					
Max. altitude above sea-level without derating	Up to 1000 m above M.S.L. (at higher altitudes 80-NET complies with IEC/EN 62040-3)					
Climate class according to IEC 721	Better than 3K2, see notes about installation site; check in accordance with IEC 68-2					
Immunity to electrical interference	IEC 801/-2/-3/-4/-5/-6					
EMC CLASS standard	EN 50 091-2 Class RS					
11.1.2. Input						
Nominal input voltage[2)]	400 V (3 Ph + N)					
Input voltage range	340 - 460 V					
Min. voltage w/o battery discharge	320 V					
Mains configuration	Symmetrical 3Ph mains, e.g. TN-C, TN-S, TN-C-S					
Nominal frequency	50 Hz (60 Hz selectable) ±6%					
Maximum input current @ ambient temp. 0°C to 40°C	94 A	125 A	156 A	185 A	250 A	312 A
Power factor @ nominal load and input conditions[3) 4)]	≥0.99					
I/p current distortion @ nominal i/p conditions and max. i/p power[4) 5)]	<3%					
Maximum i/p current distortion[4) 5)]	<5%					
Walk in/Soft start	10 s (1-90 selectable)					
Rectifier Hold-off	1 s (1-180 selectable)					
Inrush current/$I_{max.}$ input[6)]	≤1					

UPS model		80-NET					
Power	**kVA**	**60**	**80**	**100**	**120**	**160**	**200**
Rectifier efficiency w/o charging current, @ nom. i/p conditions + resistive load:	Half load[7)]	≤96.5					
	Full Load[7)]	≤97					
11.1.3. Battery							
Permissible battery voltage range		396 V to 700 V					
Recommended number of cells	VRLA Wet NiCd	240 240 378					
VRLA float voltage @ 20°C		2.27 V/cell					
VRLA end voltage		1.65 V/cell					
VRLA float voltage tempem-perature compensation		-0.11% per °C					
Float mode DC ripple for 10 min. autonomy as per VDE0510		$<0.01C_{10}$					
Float voltage stability in steady state		≤1%					
DC ripple voltage without battery		≤1%					
Optimum battery temp.		15°C to 25°C					
Max. batt. recharge current setting range: 240 cells @ $V_{i/p}$ = 400 V and nominal load		0 to 24 A	0 to 31 A	0 to 39 A	0 to 44 A	0 to 62 A	0 to 79 A
Max. batt. recharge current setting range: 240 cells @ V_{ip} = 340 V and nominal load		0 to 6.5 A	0 to 8.5 A	0 to 10.5 A		0 to 17 A	0 to 21 A
Battery o/p power in dis-charge mode, with nominal load		50.2 kW	67 kW	83.7 kW	100.5 kW	134 kW	167.5 kW
End battery voltage with 240 cells		396 V					
End battery current with 240 cells and nominal load		127 A	169 A	211 A	254 A	338 A	423 A
11.1.4. Inverter output							

UPS model		80-NET					
Power kVA		**60**	**80**	**100**	**120**	**160**	**200**
Nom. apparent power @ 40°C ambient temp., lagging or leading load PF		60 kVA	80 kVA	100 kVA	120 kVA	160 kVA	200 kVA
Nominal active power		48 kW	64 kW	80 kW	96 kW	128 kW	160 kW
Nominal output current		87 A	116 A	145 A	174 A	232 A	290 A
Maximum active power up to 100% of nominal apparent power		See note[8)]					
Overload at $V_{OUT\ NOM.}$ for 10 min.		125%					
Overload at $V_{OUT\ NOM.}$ for 1 min.		150%					
Short circuit current for 10ms/<5s		200%/150%					
Nominal output voltage		400 V (380/415 V selectable; 3Ph + N)					
Nominal output frequency		50 Hz (60 Hz selectable)					
Voltage stability in steady state condition for input variations (AC & DC) and step load (0 to 100%)		±1%					
Voltage stability in dynamic condition for i/p variations (AC & DC) and step load (0 to 100% and vice versa)		Complies with IEC/EN 62040-3, Class 1					
Voltage stability in steady state with 100% load imbalance (0, 0, 100)		±3%					
Output frequency stability	Synch. with bypass mains	±1% (2, 3, 4% selectable)					
	Synch. with internal clock	±.1%					
Frequency slew rate		<1 Hz/s					
Output voltage distortion at 100% nominal load		<3%					

UPS model		80-NET					
Power kVA		**60**	**80**	**100**	**120**	**160**	**200**
Output voltage distorsion at @ ref. non-linear load as per IEC/EN62040-3		<5%					
Load Crest Factor without derating		3:1 (I_{pk}:I_{rms})					
Phase angle accuracy with bal. loads		1°					
Phase angle accuracy with 100% unbalanced loads		<3°					
Inverter efficiency @ nom. ip conditions with resistive load:	Half load %	≤94.9	≤96.2	≤95.9	≤96.2	≤96.1	≤95.9
	Full load %	≤96.5	≤97				
Neutral conductor size		1.7 x nominal current					
Output power upgrading with ambient temperature at:	25°C	110%					
	30°C	105%					
	40°C	100%					
11.1.5. Static bypass							
Nominal bypass voltage[2)]		400 V (380/415 V selectable, 3Ph + N)					
Bypass voltage tolerance		10% (5 to 15% selectable)					
Nominal frequency		50 Hz (60 Hz selectable)					
Frequency range		±1% (2, 3, 4% selectable)					
Maximum overload capacity	10 min.	125%					
	1 min.	150%					
	600 ms	700%					
	100 ms	1000%					
SCR	I^2t @ T_{vj}=125 °C 8.3-10 ms	80000 A^2s		125000 A^2s		320000 A^2s	
	ITSM @ T_{vj}=125 °C 10 ms	4000 A		5000 A		8000 A	
Inverter fuse rating	I^2t @ T_{vj}=125 °C 8.3-10 ms	4000 A^2s		15000 A^2s		A^2s	

UPS model	80-NET					
Power kVA	**60**	**80**	**100**	**120**	**160**	**200**
Inverter to bypass and bypass to inverter transfer time with inverter synchronised to bypass	No break					
Default transfer delay time (inverter to bypass) with inverter not synchronised to bypass	20 ms					

1) Redundant cooling system. With one fan OFF the UPS can supply 70% of the nominal output power continuously at 25°C in nominal conditions.
2) In the case of a split input configuration, the primary input and the bypass input must have a common neutral. The neutral conductor may be connected only to the bypass or to the primary mains, but it must be present (byass and primary neutrals are connected inside the UPS).
3) At nominal voltage and frequency.
4) Top version only. Basic version data: THDi < 30% and PF > 0.95
5) With input voltage at nominal value and voltage distortion THDv ≤ 1%
6) "$I_{max\ input}$" parameter can be calculated using the maximum input power @ 400 V in battery recharge mode.
7) For tolerances see IEC/EN 60146-1-1 or DIN VDE 0558.
8) Nominal apparent power loads with PF > 0.8 can be supplied with marginal limitation of other performances. Please contact CHLORIDE Technical Support for further information.

Notice

Pay attention to the information provided on the device labels.