

Installation and Initial Start-Up

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1 INSTALLATION

1.1 Mechanical Installation

Equipment Delivery and Storage

After delivery, check equipment for any damage that may have occurred during shipment. On the packaging a tiltwatch and a shockwatch indicator are applied; if any of them is red it indicates bad handling. The shipper and your agency must be notified in writing about damages due to shipment, including a detailed description of visual defects. If you do not wish to install the equipment immediately, please observe the following storage recommendations:

- Store equipment in a vertical position in a well conditioned room, protected against humidity. Do not store the equipment in close proximity to frequently used passageways and keep it away from movable parts.
- If the UPS system is already unpacked, please ensure storage in a clean environment protected from dust and away from heat sources.

Handling the UPS System

The UPS can be simply lifted and moved by means of a lifting truck or a fork lifter for 80-250kVA units. For 10-60kVA units, remove the front side and rear side base sheets and attach two angle irons with 8MA bolts to the right front and rear side of the UPS. The UPS can now be moved with a lifting fork. Remove the angle irons when the UPS is set in the correct position.



Caution: Secure equipment from being knocked over

Setting Up

The UPS system should be installed in a dry, clean and lockable room. Provisions have to be made to remove heat created by the system. Under all installation conditions, the unrestricted flow of cooling air must be assured.

1 Installation

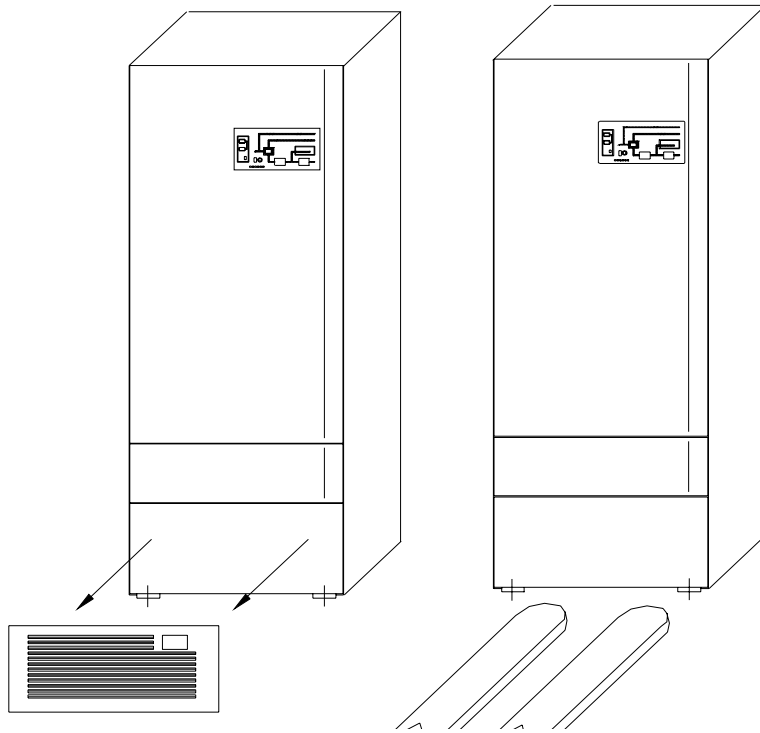


FIG. 1.1.1 Moving the UPS (10-60kVA)

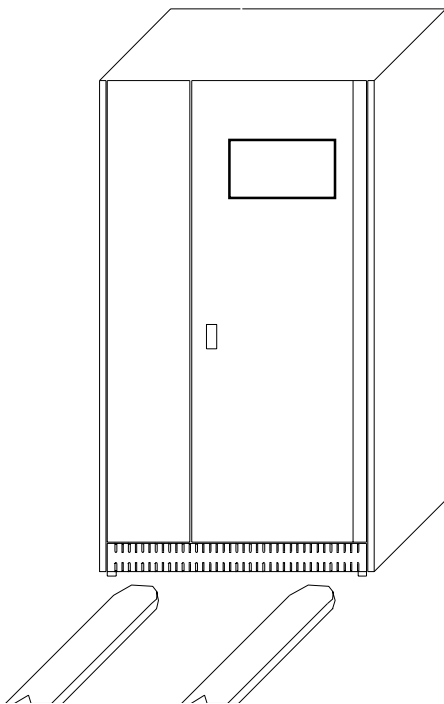


FIG. 1.1.2 Moving the UPS (80-120kVA)

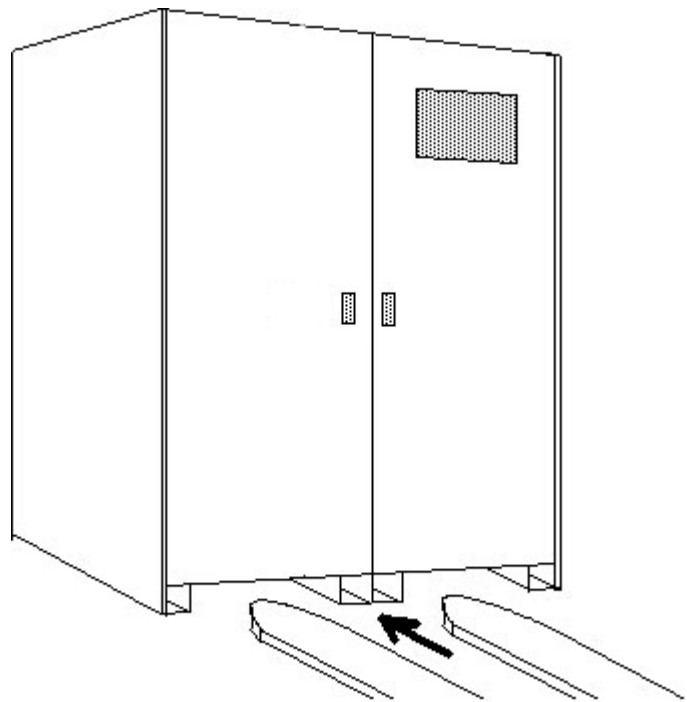
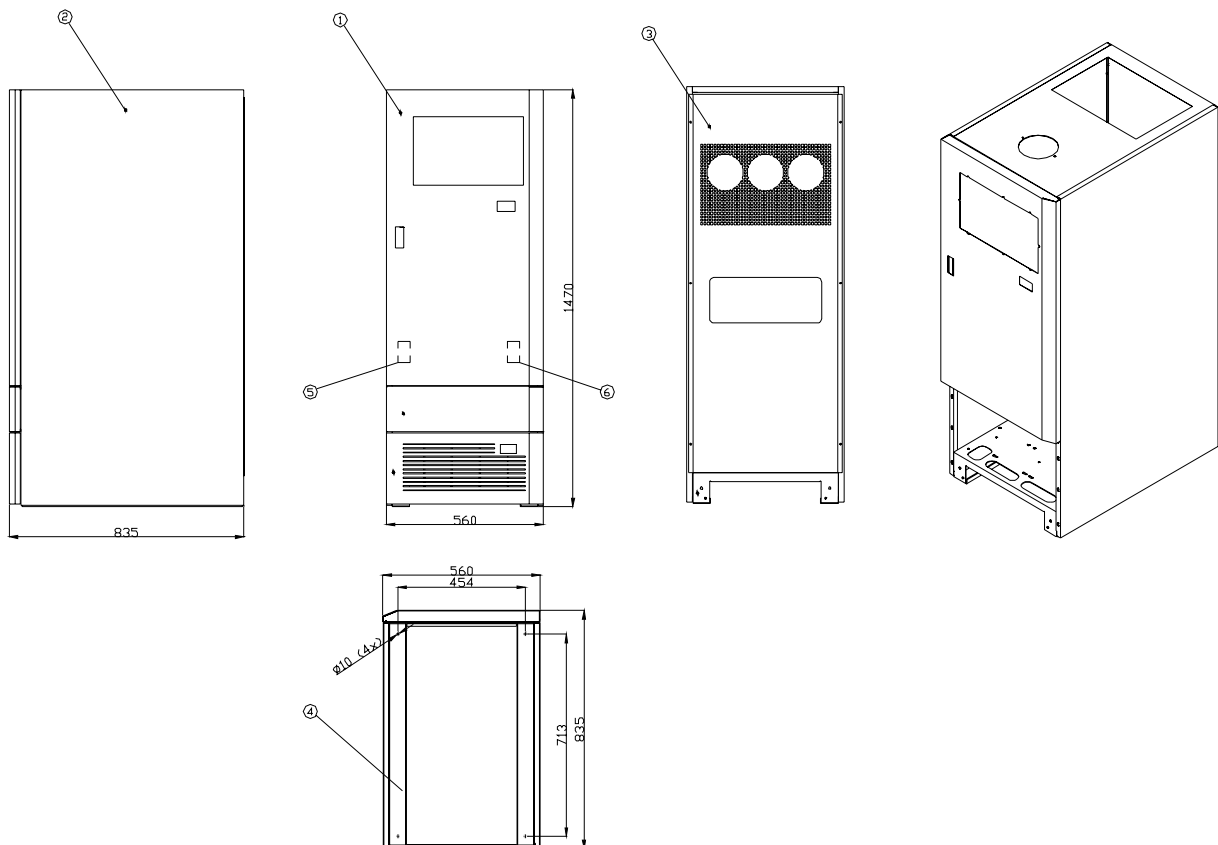


FIG. 1.1.3 Moving the UPS (160-250kVA)

1 Installation

1.2 Weight and Dimensions UPS (10/60kVA)

UPS Rating	Weight without battery [kg]	Static Load without battery [kg/m ²]	Weight with battery [kg]	Static Load with battery [kg/m ²]
10	310	663	597	1279
15	310	663	597	1279
20	345	738	632	1354
30	385	823	672	1439
40	440	941	-	-
60	510	1091	-	-

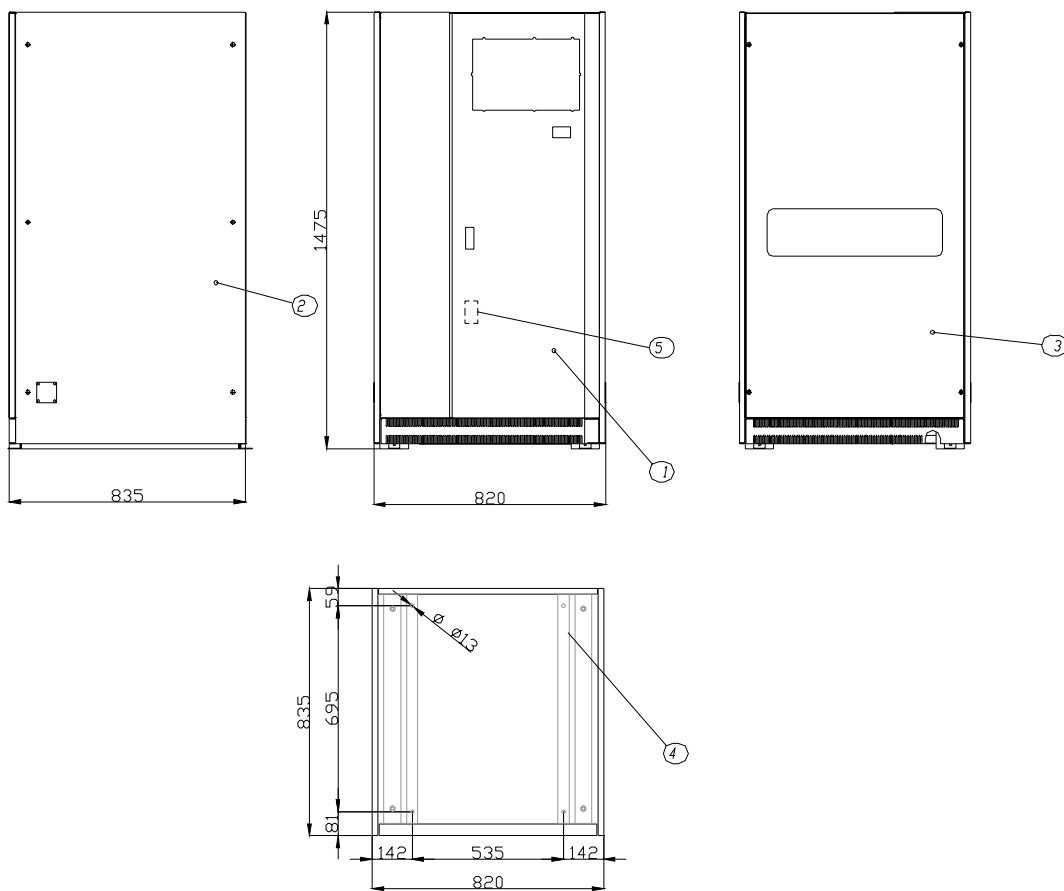


- 1= Front view
- 2= Side view
- 3= Rear view
- 4= Holes for floor fixing- Base plant
- 5 = Auxiliary power supply for 10-30kVA (inside the unit)
- 6 = Auxiliary power supply for 40-60kVA (inside the unit)

1 Installation

1.3 Weight and Dimensions UPS (80/120kVA)

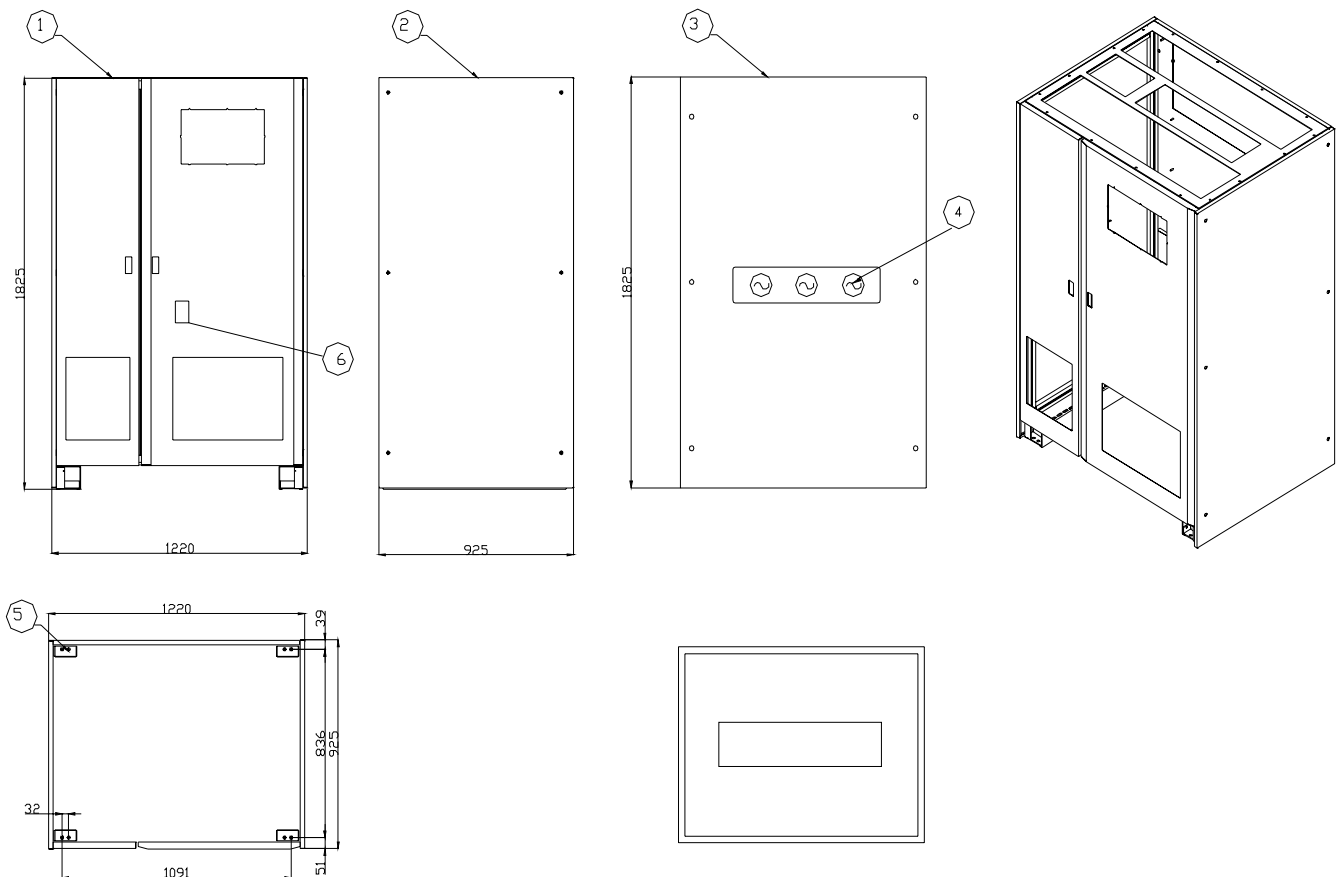
UPS Rating	Weight [kg]	Static Load [kg/m ²]
80	669	977
100	712	1040
120	745	1088



- 1= Front view
- 2= Side view
- 3= Rear view
- 4= Holes for floor fixing - Base plant
- 5= Auxiliary power supply (inside the unit)

1.4 Weight and Dimensions UPS (160/250kVA)

UPS Rating	Weight [kg]	Static Load [kg/m ²]
160	1175	1041
200	1175	1041
250	1300	1152



- 1= Front view
- 2= Side view
- 3= Rear view
- 4= Fan on 160-200kVA
- 5= Holes for floor fixing - Base Plant
- 6= Auxiliary power supply (inside the unit)

1 Installation

1.5 Room Size for UPS (10/250kVA)

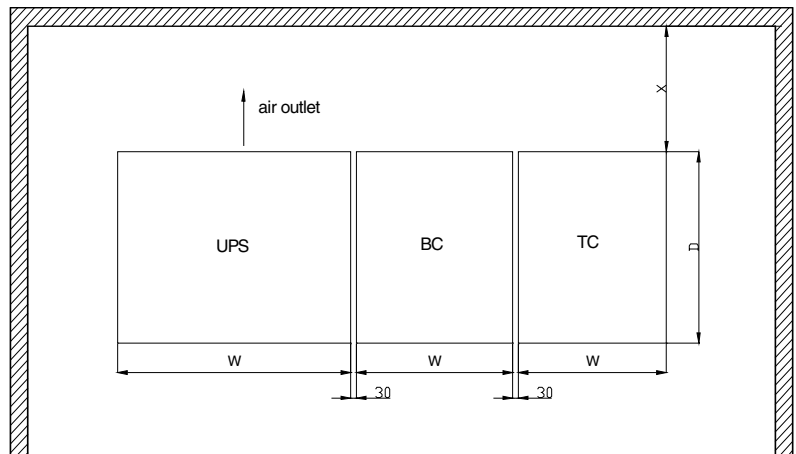
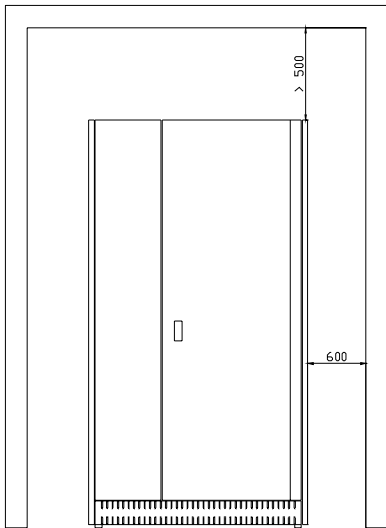
When locating the UPS system make sure that ventilation and space requirements are met. There should be a Xmm clearance on the rear side of the UPS (see note below) and 500mm on top of the UPS. See the dimensions of the UPS, battery cabinets and transformer cubicles in tables 1.5.1, 1.5.2 and 1.5.3.

Note:

X=300mm for fan working in 40/200kVA

X=0mm for fan working in 10/30kVA and 250kVA (close to the wall)

X=600mm for easy maintenance (40/250kVA)



BC = Battery Cabinet

TC = Transformer cabinet (optional)

1.5.1 UPS Dimensions

UPS Dimensions	UPS (10/60kVA)	UPS (80/120kVA)	UPS (160/250kVA)
Height	1470	1470	1825
Width	560	825	1220
Depth	835	835	925

Tab. 1.5.1 UPS Dimensions

1.5.2 Transformer Cubicle Dimensions

There are three type of transformer cubicle AC001, AC002 and AC003, they are used for the external option units f.e. units with 12 pulse chargers with or without galvanic separation, for THD filters, isolation transformer etc..(see tab. 1.5.3).

Transformer Cubicle Dimensions			
	AC001	AC002	AC003
Height	1470	1470	1825
Width	440	820	820
Depth	835	835	925

Tab. 1.5.2 Transformer cubicle dimensions

External Transformer Cubicle								
External Options	10-60kVA		80/100kVA		120KVA		160-250kVA	
	Type	Quantity	Type	Quantity	Type	Quantity	Type	Quantity
12 Pulse with Galvanic Separation	AC001	1	AC002	1	AC002	1	AC003	1
12 Pulse without Galvanic Separation	AC001	1	AC001	1	AC001	1	AC003	1
THD Filter V Harmonic	AC001	1	AC001	1	AC002	1	AC003	1
Isolation Transformer	AC001	1	AC002	1	AC002	1	AC003	1
Autotransformer 400/220V	AC001	1	AC002	1	AC002	1	AC003	2
12 Pulse with G. S. & THD XI & XIII Harm.	AC001	1	AC002	1	AC002	1	AC003	1
12 Pulse without G. S. & THD XI & XIII Harm.	AC001	1	AC002	1	AC002	1	AC003	1

Tab. 1.5.3 External transformer cubicle

1.5.3 Battery Cubicle Dimensions

In the following table are described the dimensions of each optional battery cabinet, for further details refer to the section 1.16.

Battery Cubicle Dimensions	For UPS (10/120kVA)			For UPS (160/250kVA)	
	BC4S	BC4L	BC4D	BC4H	BC4HD
Height	1470	1470	1470	1825	1825
Width	640	1040	2040	818	1596
Depth	835	835	835	925	925

Tab. 1.5.4 Battery cubicle dimensions

1 Installation

1.6 Electrical Installation

This equipment must be installed by qualified service personnel.



Switch off IRP, IRE, IUG, IBY circuit breakers to completely isolate the equipment.

Earth leakage protection: this device has a high leakage current towards protective earthing. The maximum earth leakage current is 300 mA. When setting the threshold of the earth leakage circuit breaker installed upstream from this equipment, consider this amount of current and that due to the loads.



High leakage current - it is essential to connect the protective earth before connecting the power supply.



All primary power switches installed remotely from the UPS area must be fitted with the following label: "***Isolate uninterruptible power supply (UPS) before working on this circuit***".

General

All electrical connections must be made in accordance with local standards and all input terminals (1-L1, 1-L2, 1-L3 and, if existing, 4-L1, 4-L2, 4-L3) must be protected by external fuses. The tables give recommended values for fuse sizes and cable cross-sections. These may vary, depending on local standards. They are valid for voltages 380/220 V, 400/230 V and 415/240 V. Ensure clockwise connection of conductors L1, L2 and L3 at input and output terminals.

If possible, install battery cables separately from other power cables in order to avoid possible RF interference. Before wiring, open all system switches (IRP, IRE, IBY, IUG) and the battery switch.

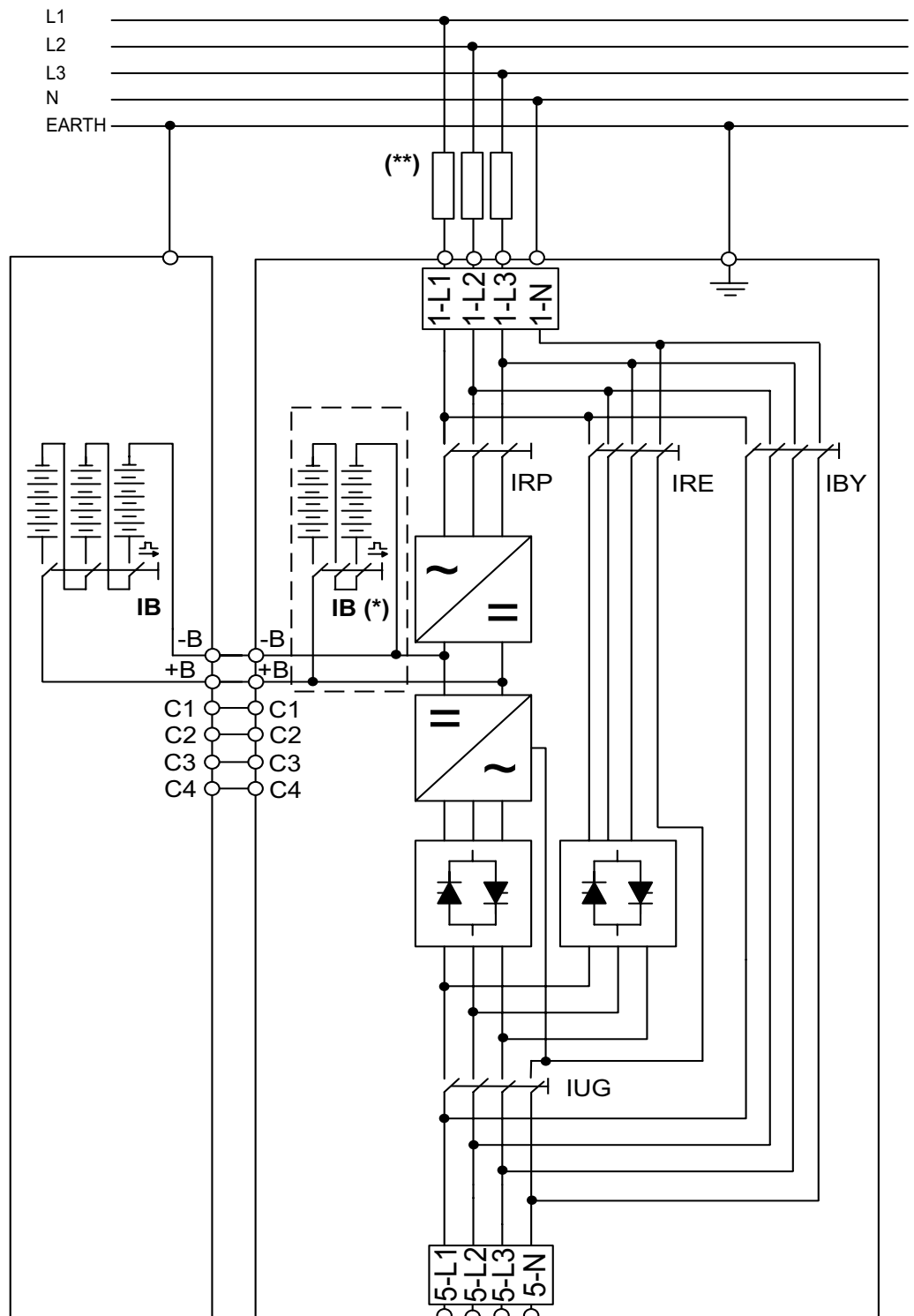


Warning: The external battery cabinet must be equipped with an overcurrent protection device depending on the battery short-circuit current and battery voltage.



Warning: The electrical installation must provide overcurrent protection for the input cables to the UPS.

1.6.1 UPS with Common Input for Rectifier and Bypass



(*) **Note:** Internal Battery only for 10-30kVA units

(**) **Note:** Customer supplied input fuses - see table 1.6.1

Note: Standard configuration for 10-120kVA UPS.

1 Installation

Input Cables / Fuses

UPS Rating [kVA]	Input cables [mm ²]	Input fuses [A]	earth cable [mm ²]
10	4x10	25	16
15	4x10	35	16
20	4x16	50	16
30	4x25	63	25
40	4x35	100	25
60	4x35	125	25
80	4x70	160	50
100	4x70	200	50
120	4x120	250	70
160	4x2x120	400	70
200	4x2x120	400	70
250	4x2x150	630	70

TAB.1.6.1 UPS input cables and fuses for UPS with common input for rectifier and bypass

Output / Battery Cables and Max. Current Ratings for Battery Overcurr. protection

UPS Rating [kVA]	Battery cables [mm ²]	Output cables [mm ²]	Max. inv. input current (Vdc=320V)
10	2x16	4x10	25
15	2x16	4x10	40
20	2x25	4x16	50
30	2x25	4x35	75
40	2x35	4x35	100
60	2x50	4x35	150
80	2x70	4x50	200
100	2x95	4x70	250
120	2x120	4x120	300
160	2x2x120	4x2x120	420
200	2x2x150	4x2x120	525
250	2x3x120	4x2x150	650

TAB.1.6.2 UPS output cables and fuses for UPS with common input for rectifier and bypass

1 Installation

Input Cables

UPS Rating [kVA]	Rect. cables [mm ²]	Bypass cables [mm ²]	Earth cable [mm ²]
10	3x10	4x10	16
15	3x10	4x10	16
20	3x16	4x16	16
30	3x25	4x25	25
40	3x25	4x25	25
60	3x35	4x35	25
80	3x50	4x50	50
100	3x70	4x70	50
120	3x120	4x120	70
160	3x2x120	4x2x120	70
200	3x2x120	4x2x120	70
250	3x2x150	4x2x150	70

TAB. 1.6.4 UPS input cables for UPS with separate inputs for rectifier and bypass

Input Fuses

UPS Rating [kVA]	Rect. Fuses [A]	Bypass Fuses [A]
10	25	25
15	35	35
20	50	50
30	63	63
40	100	100
60	100	125
80	125	160
100	160	200
120	200	250
160	300	400
200	400	400
250	630	630

TAB. 1.6.5 UPS input fuses for UPS with separate inputs for rectifier and bypass

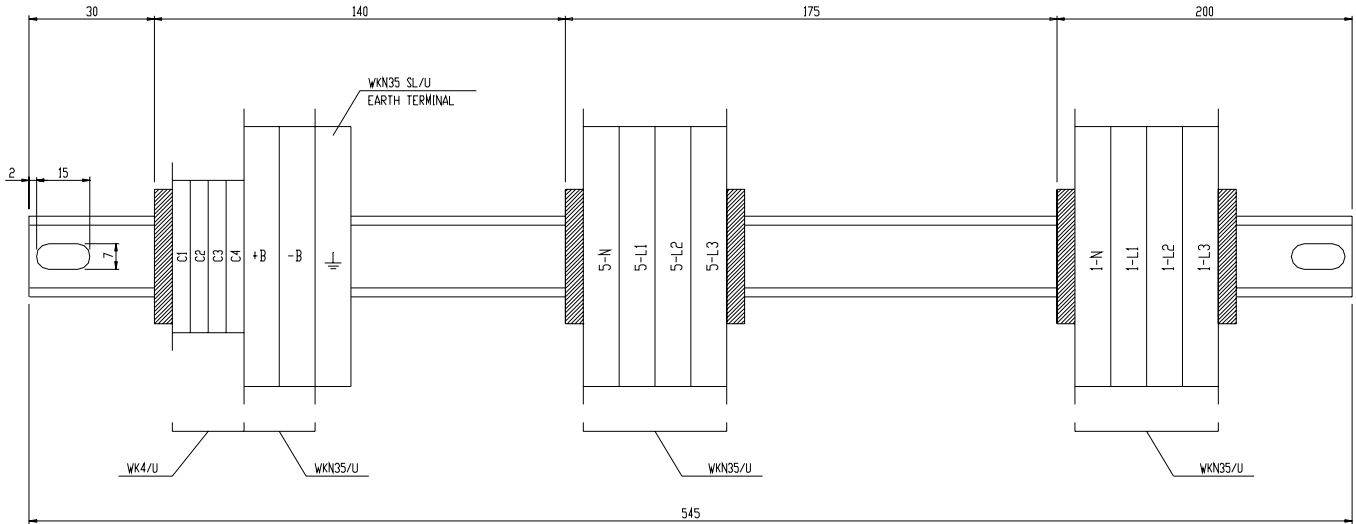
Output / Battery Cables

UPS Rating [kVA]	Battery cables [mm ²]	Output cables [mm ²]	Max. inv. input current (Vdc=320V)
10	2x16	4x10	25
15	2x16	4x10	40
20	2x25	4x16	50
30	2x25	4x35	75
40	2x35	4x35	100
60	2x50	4x35	150
80	2x70	4x50	200
100	2x95	4x70	250
120	2x120	4x120	300
160	2x2x120	4x2x120	420
200	2x2x150	4x2x120	525
250	2x3x120	4x2x150	650

TAB. 1.6.6 UPS output cables and fuses for UPS with separate inputs

1 Installation

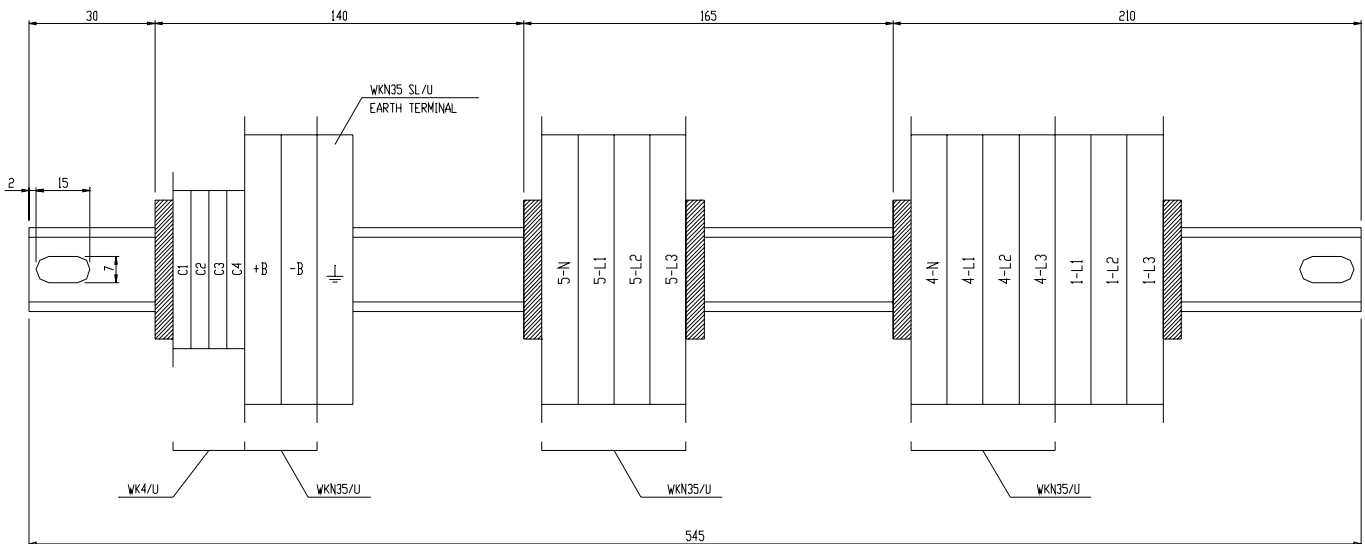
1.6.3 Terminal for UPS (10/30kVA)



PROFILLO DIN H=15mm

Terminal for UPS 10-30kVA

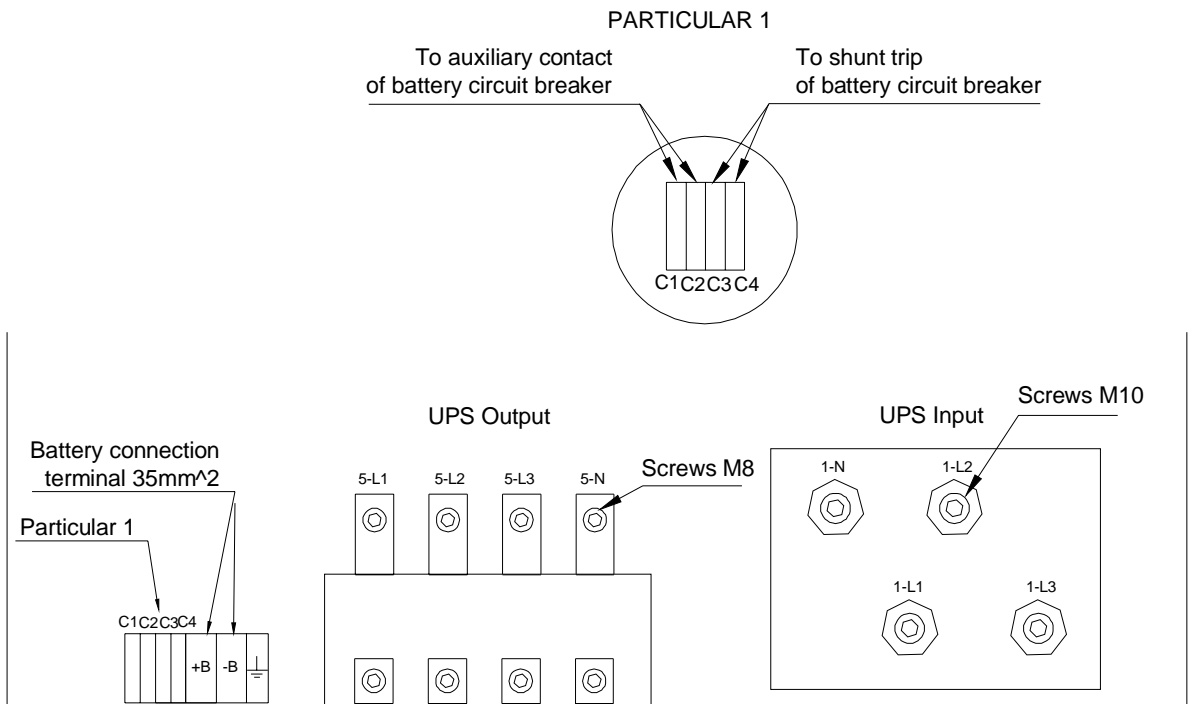
1.6.4 Terminal for UPS (10/30kVA) with Emergency Line Separated (optional)



PROFILLO DIN H=15mm

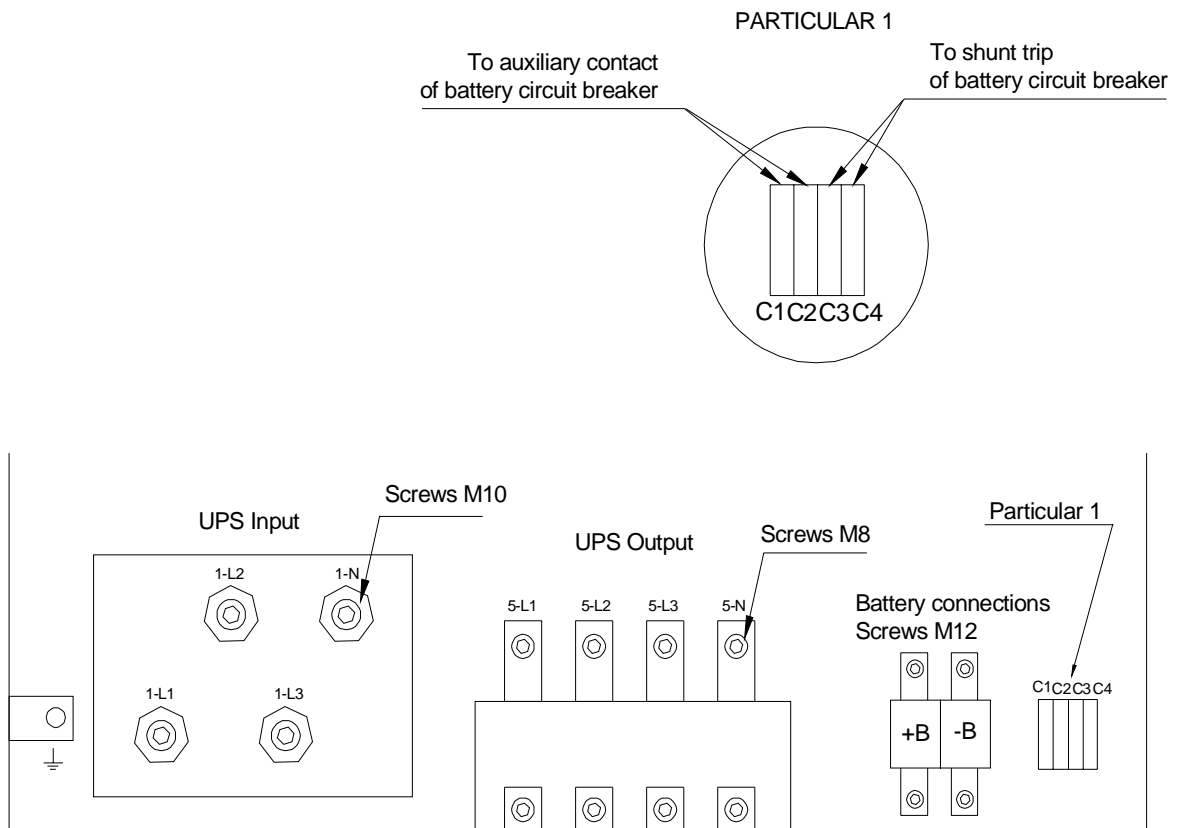
Terminal for UPS 10-30kVA with Emergency Line Separated

1.6.5 Terminals for UPS (40/60kVA)



Terminals for UPS (40/60kVA)

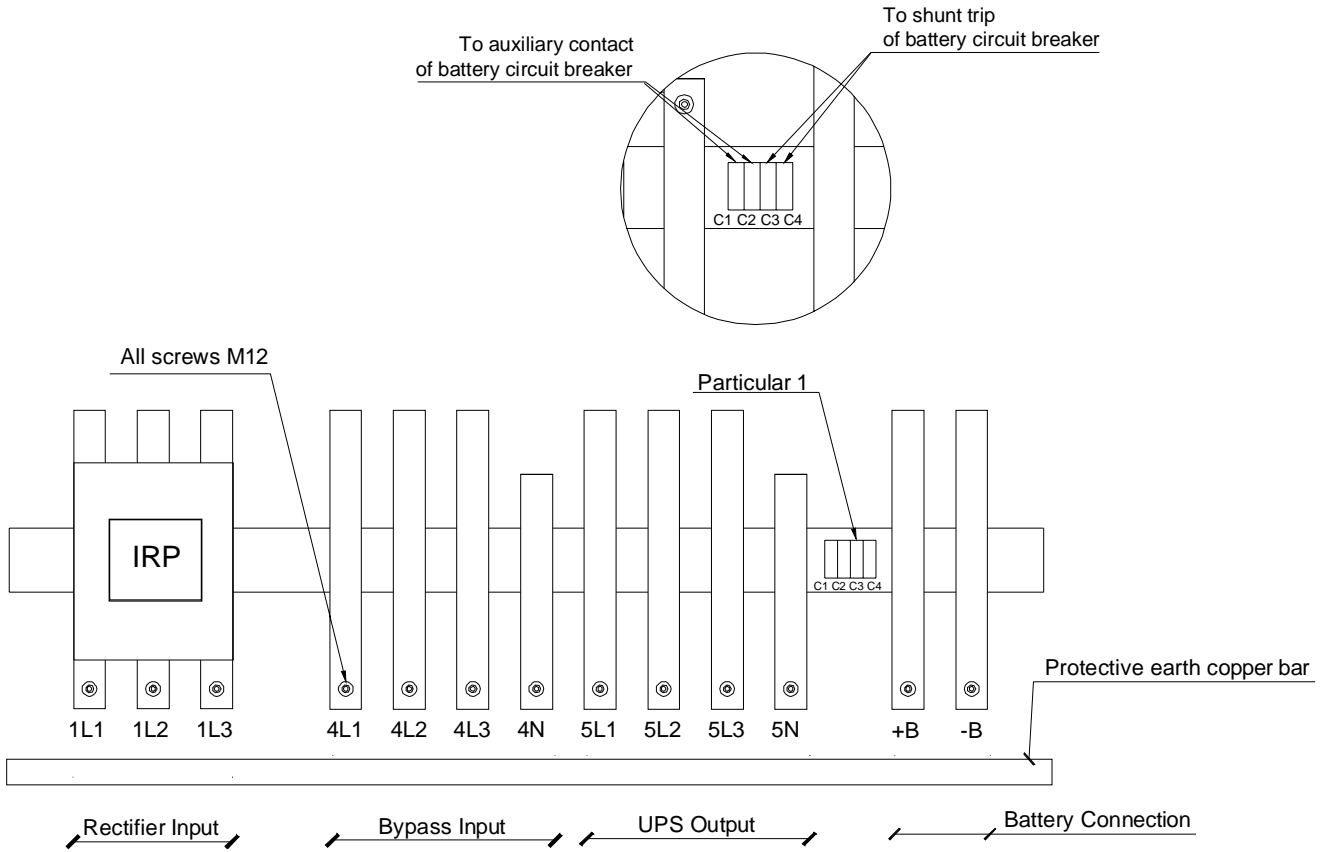
1.6.6 Terminals for UPS (80/120kVA)



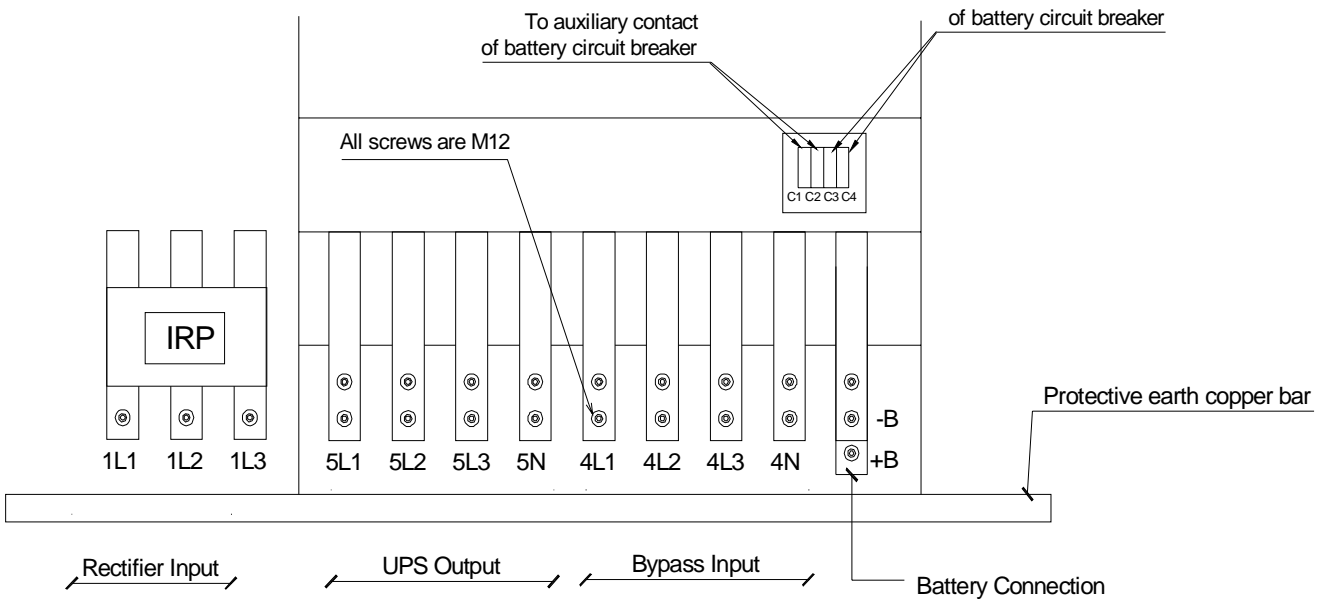
Terminals for UPS (80/120kVA)

1 Installation

1.6.7 Terminal for UPS (160/200kVA)



1.6.8 Terminal for UPS (250kVA)



1.7 Installation of Additional Optional Cabinet

1.7.1 UPS with Input and Output Transformers/ Autotransformers for Voltage Adaption

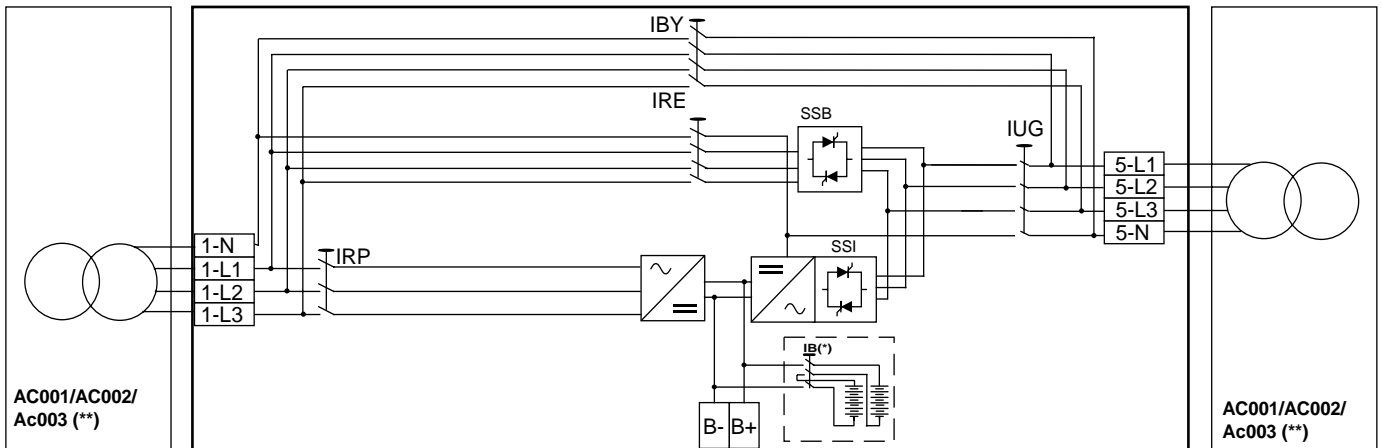


FIG. 1.7.1 UPS connection diagram, with input and output transformers to adapt the UPS to the on-site voltage.

(*) Note: Internal Battery only for 10-30kVA units

(**) Note: For UPS (10/120kVA) the transformers are located inside 1 external cabinet, for UPS (160/250kVA) the transformers are located inside 2 external cabinets

1.7.2 UPS with Isolation Transformer of the Bypass Supply

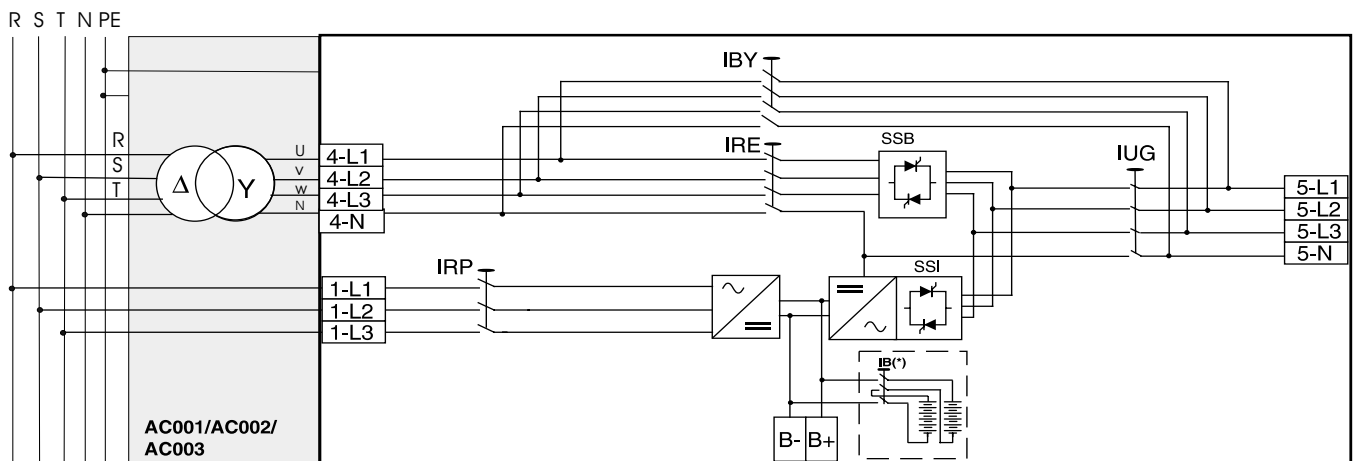


FIG. 1.7.2 UPS connection diagram, with bypass input transformer to isolate the neutral line (4-N may be connected to the earth or left disconnected.)

(*) Note: Internal Battery only for 10-30kVA units

Note: The cables from the secondary winding transformer to the input terminals 4-L1,4-L2,4-L3,4-N, must be provided by the customer.

Note: The secondary voltage phase shifted of 30° with respect to the primary voltage

This transformer ensure input/output galvanic isolation

1 Installation

1.7.3 UPS with THD filters

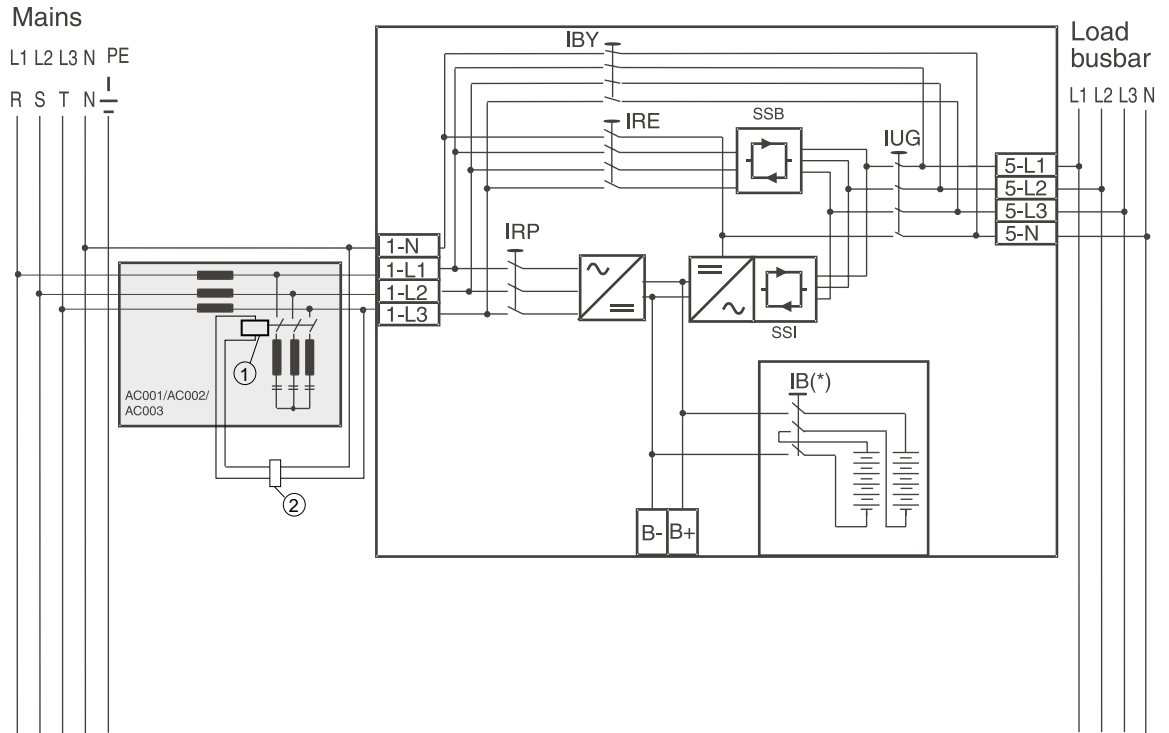


FIG. 1.7.3 UPS connection diagram, with THD filters

1= THD filter contactor supply voltage (230Vac)

2= 3 pole MATE-N-LOK connector for THD filter contactor supply voltage (230Vac)

(*) Note: Internal Battery only for 10-30kVA units

1.7.4 UPS with 12-pulse charger/rectifier

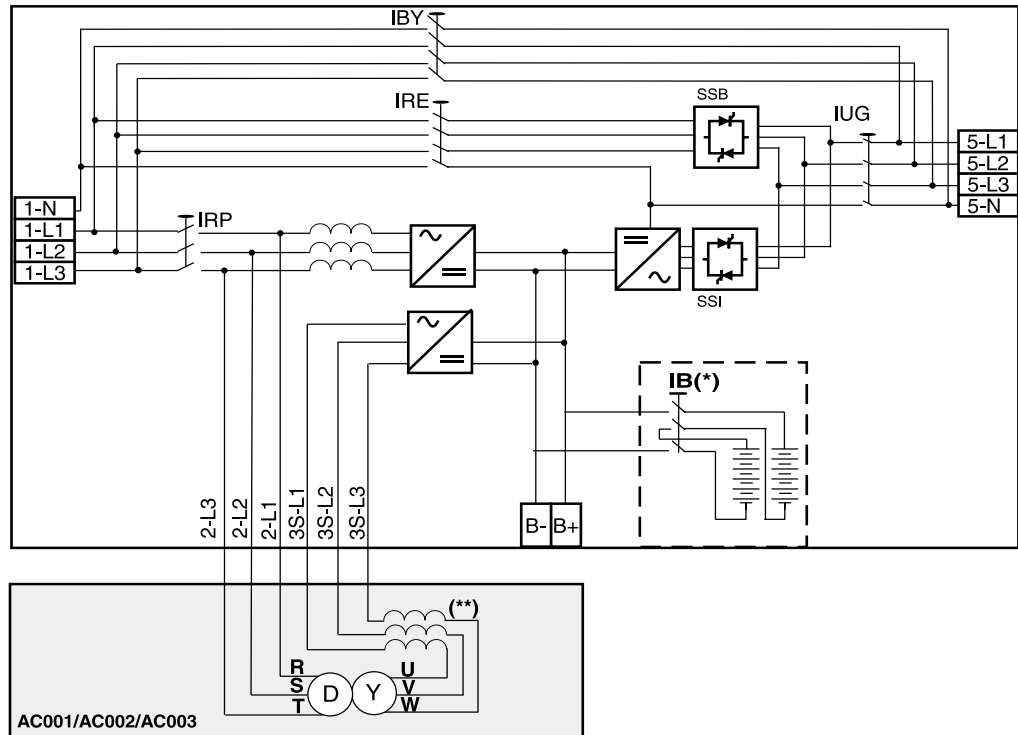


FIG. 1.7.4 Installation of 12-pulse units without galvanic isolation

(*) Note: Internal Battery only for 10-30kVA units

(**) Note: In the units 160 & 250kVA this choke is located inside the UPS cabinet

1.7.5 UPS with 12-pulse charger / rectifier and galvanic isolation of the input supply.

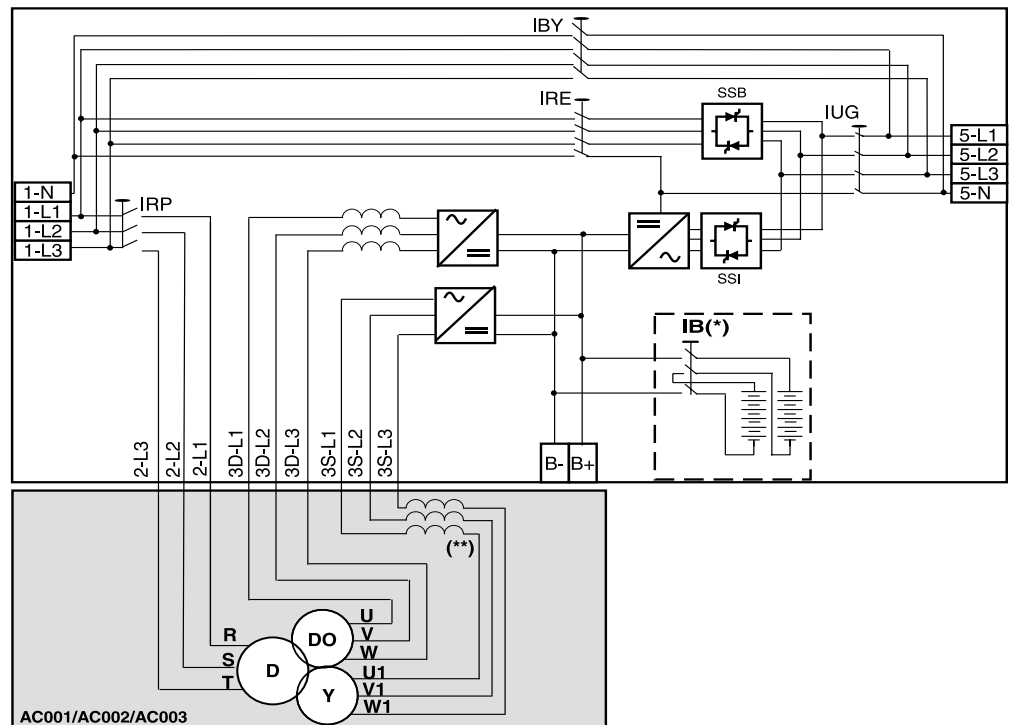


FIG. 1.7.5 Installation of 12-pulse units with galvanic isolation

(*) Note: Internal Battery only for 10-30kVA units

(**) Note: In the units 160 & 250kVA this choke is located inside the UPS cabinet
JUE 402588

1 Installation

1.7.6 UPS with 12-pulse charger/rectifier & THD Filters

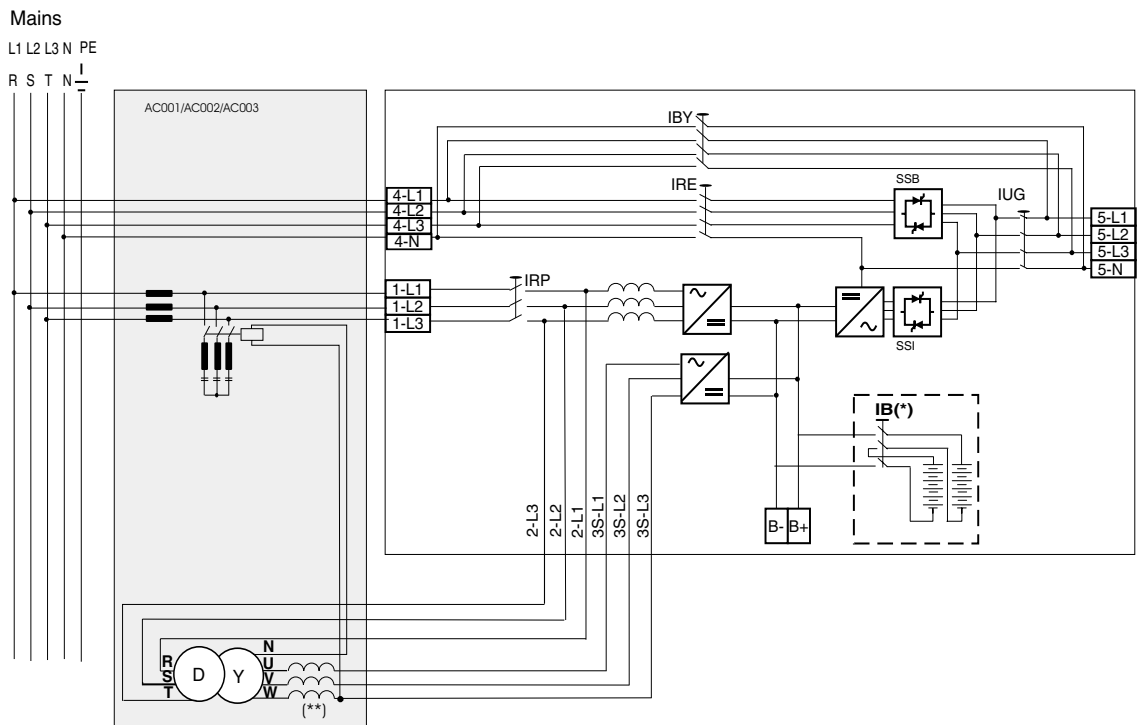


FIG. 1.7.6 Installation of 12-pulse units without galvanic isolation & THD Filters

(*) Note: Internal Battery only for 10-30kVA units

(**) Note: In the units 160 & 250kVA this choke is located inside the UPS cabinet.

1.7.7 UPS with 12-pulse charger / rectifier and galvanic isolation of the input supply & THD Filters.

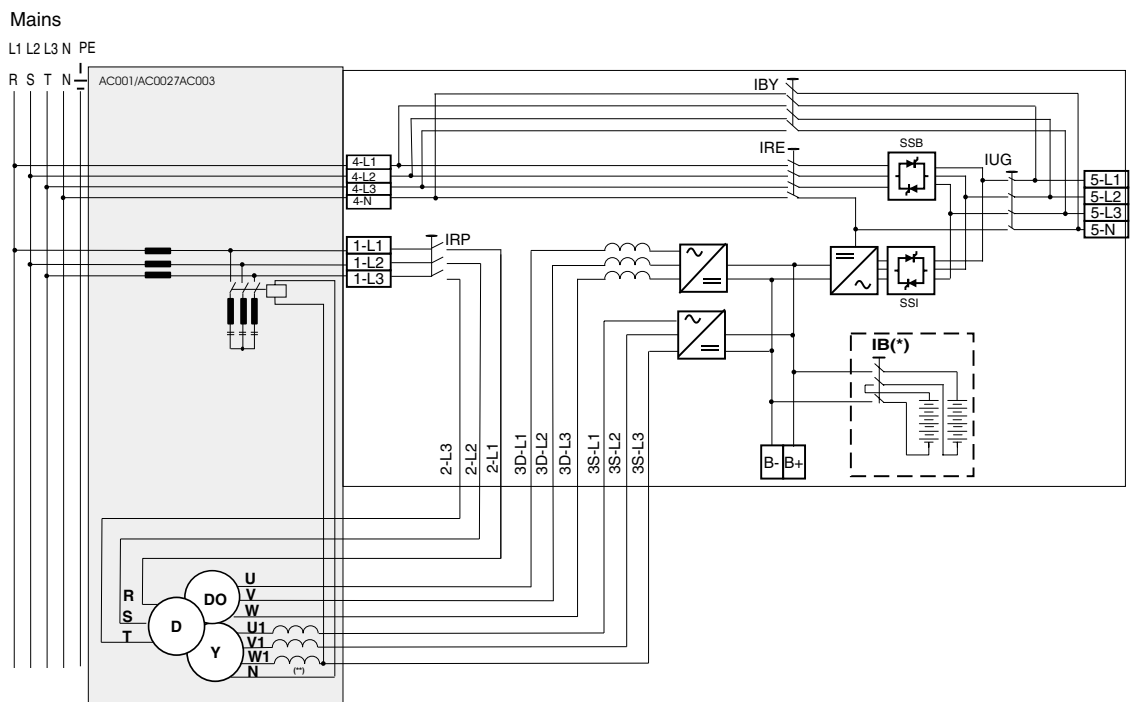


FIG. 1.7.7 Installation of 12-pulse units with galvanic isolation & THD Filters

(*) Note: Internal Battery only for 10-30kVA units

(**) Note: In the units 160 & 250kVA this choke is located inside the UPS cabinet.

1.8 Installation of an External Maintenance Bypass

An External Maintenance Bypass is used to provide a separate bypass line external to the UPS cabinet to supply the load when servicing the UPS. To allow transfer of the load to the bypass line without interruption a single Make-Before-Break (MBB) switch is used.

When an external maintenance bypass is installed, a normally open, voltage free contact must be available. This contact must be connected to the connector M4, Pin1 and Pin 2 at the top left hand corner of the mother board for the inverter/bypass electronics.

There are 10 type of Maintenance Bypass Cabinet:

MB3 2 switches: 80kVA, 250kVA, 400kVA, 500kVA, 800kVA

MB3 3 switches: 80kVA, 250kVA, 400kVA, 500kVA, 800kVA

If the standard no-break wall-mounted maintenance bypass switch is used (optional) in the MB3 cabinet, a normally open contact is provided.

2 Switches Maintenance Bypass

The two switches of the Maintenance Bypass consists of two internally interconnected 4 poles switches which provide a make-before-break commutation from/to the UPS output and the external bypass supply by manually switching a single key-interlocked switch. An interlock is provided to prevent an erroneous switching of the maintenance bypass if the inverter supply is still connected to the UPS system output. The three positions are labelled "I" for normal, "II" for bypassed and "I + II" when both switches are closed. When switching to the maintenance bypass, the switch must be switched all the way to position "II".

1 Installation

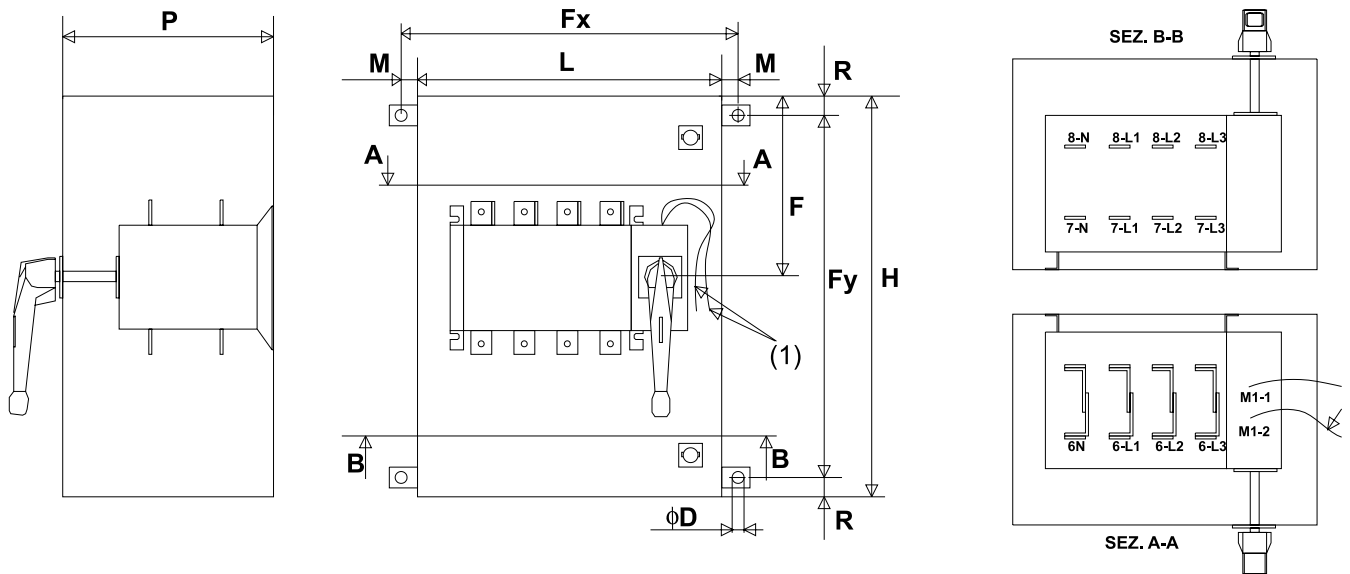


FIG. 1.8.1 MB3 2 switches (10/250kVA)

Bypass 2 Switches (*)		L	H	P	F	ϕD	Fx	M	Fy	R	Weight (Kg)
125A	80kVA	400	500	350	250	9	448	24	452	24	18,4
400A	250kVA	600	700	300	350	9	648	24	652	24	30,5
630A	400kVA	700	600	400	300	9	448	24	552	24	37,7
800A	500kVA	700	1200	500	600	9	748	24	1152	24	73,5
1250A	800kVA	700	1200	500	600	9	748	24	1152	24	80,6

(*) The power rating is referred to 400Vac

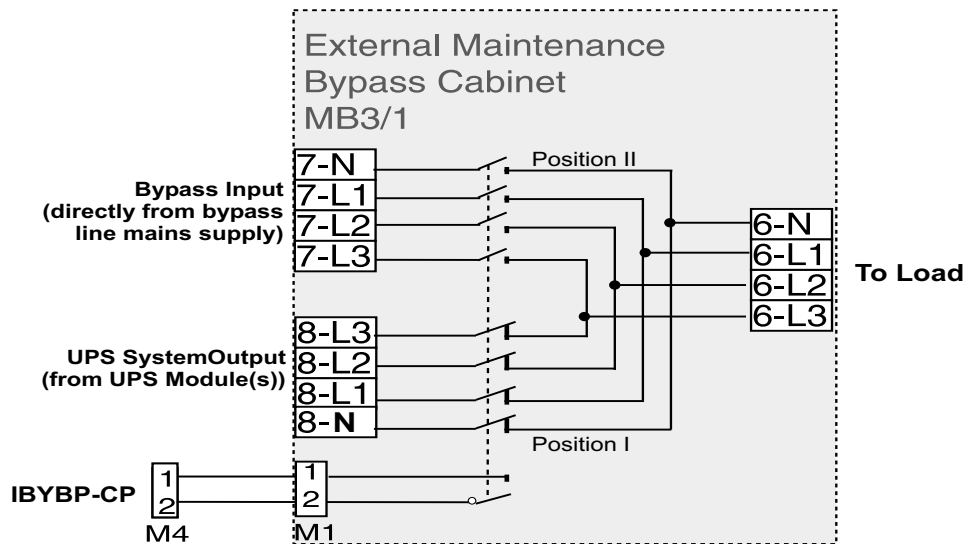


FIG.1.8.3 External Maintenance Bypass Switch (2 position)

3 Switches Maintenance Bypass The three switches of the Maintenance Bypass consists of three internally interconnected 4 poles switches which provide a make-before-break commutation from / to the UPS output and the external bypass supply with a single manual operation of the key-interlocked switch. In the third position (II) the UPS is isolated from the mains supply. Again an interlock is provided to prevent an erroneous switching of the maintenance bypass if the inverter supply is still connected to the UPS system output. The three positions are labelled "I" for normal, "II" for isolated and "I + II" when both switched are closed. To isolate the UPS system, the switch must be switched all the way to position "II".

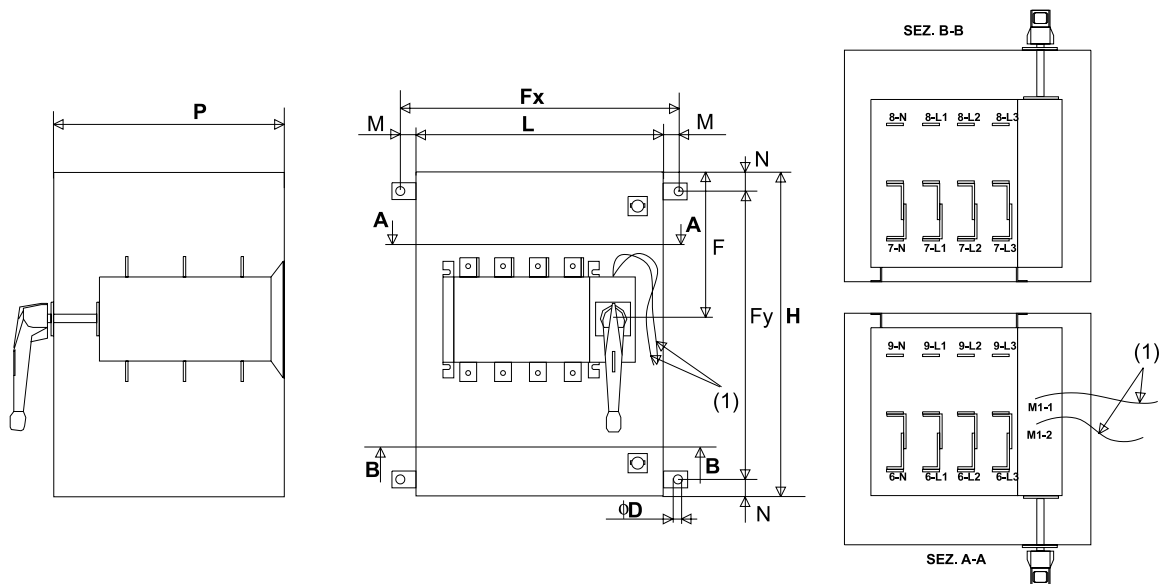


FIG. 1.8.5 MB3 3 switches (10/250kVA)

Bypass 3 Switches (*)		L	H	P	F	φ D	Fx	M	Fy	N	Weight (Kg)
125A	80kVA	400	500	350	250	9	448	24	452	24	19,3
400A	250kVA	600	800	500	400	9	648	24	752	24	42,4
630A	400kVA	600	600	500	400	9	648	24	752	24	39,6
800A	500kVA	700	1200	550	600	9	748	24	1152	24	87,0
1250A	800kVA	700	1200	550	600	9	748	24	1152	24	98,1

(*) The power rating is referred to 400Vac

1 Installation

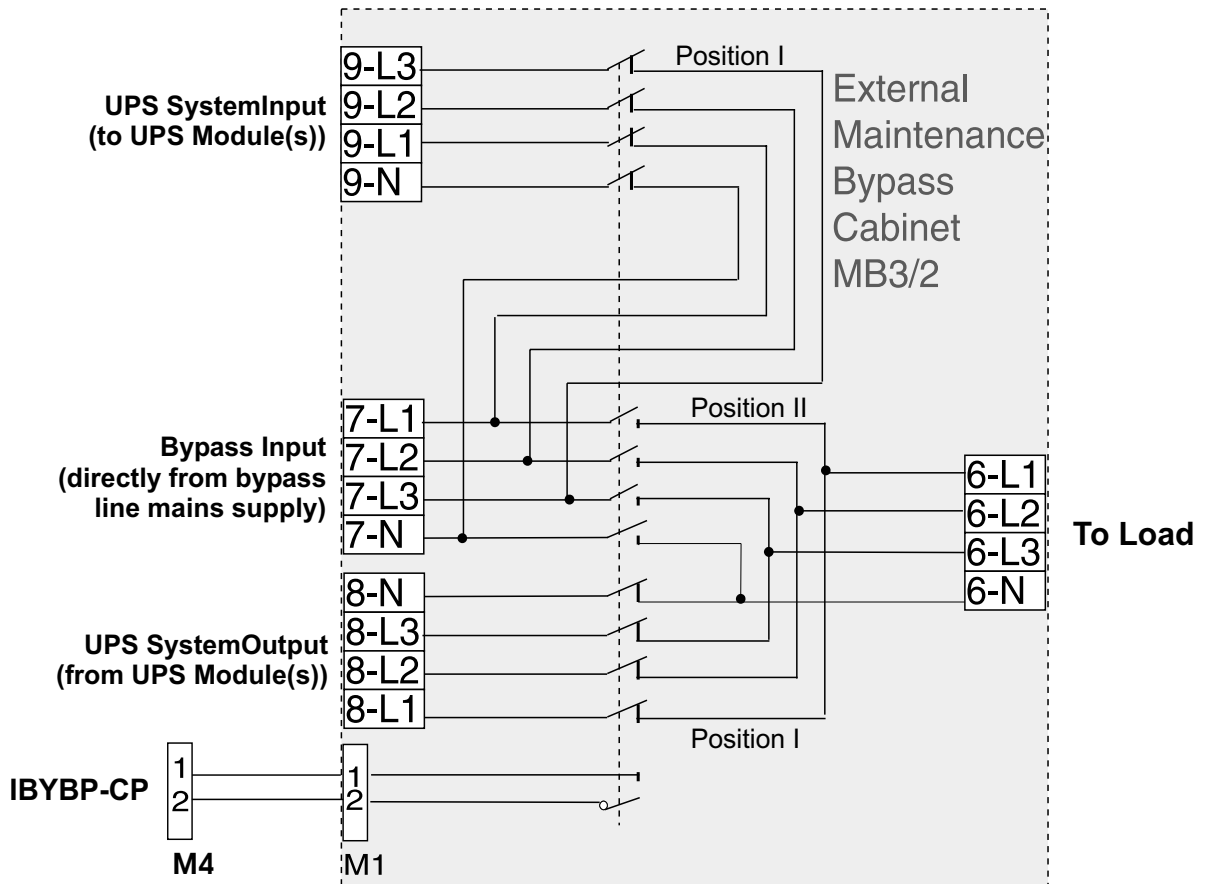


FIG.1.8.4 External Maintenance Bypass Switch 3 position (10/250kVA)

Note1: For Hot-Stand-by or parallel systems, it is sufficient to feed one contact into one unit only; however, they may be connected in parallel at M4 (of IBYBP-CP) Pin1 and Pin 2 for all units. In this case, separate terminals may be provided within the MB3 cabinet (see FIG. 1.9.2 and 1.10.2)

Note2: The cable used must be a twisted pair, with a total shield. This shield must be grounded at one end (the cabinet of the UPS may be used).

1.10 Remote Emergency Power off

A Remote Emergency Power Off push button may be connected to the system. A normally closed contact must be connected to pin 5 and 6 of the M4 terminal in the inverter motherboard IBYBP-CP (See FIG. 1.10.1. and FIG. 1.10.2.)

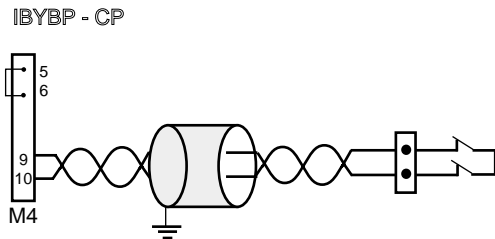


FIG. 1.10.1 Connection of Remote EPO with N.C. contact

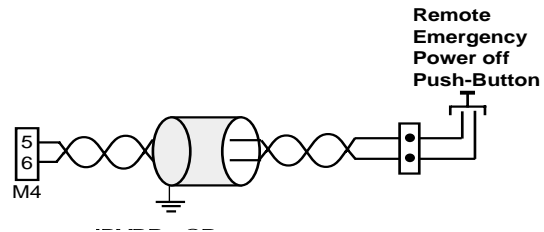


FIG. 1.10.2 Connection of Remote EPO with N.O. contact

- Note 1:** The cable used must be a twisted pair, with a total shield. This shield must be grounded at one end (the cabinet of the UPS may be used).
- Note 2:** For Hot-Stand-by or parallel systems, it is sufficient to feed one contact into one unit only, however they may be connected in parallel at M4 (of IBYBP-CP) Pin5 and Pin 6 for all units (N/O) only or series for (N/C).
- Note 3:** The remote EPO function when activated will switch off all inverters in the system and the UPS output. The rectifiers will remain on, charging the battery. If it is necessary to isolate all supply from the UPS, separate contacts must be provided in order to trip external input and battery circuit breakers.
- Note 4:** The N.C. contact can only be used for IBYBP-CP motherboards in rev. 0A and following.

1.10.1 EPO with SFP Panel

EPO can be activated with a normally closed or normally open contact on the SFP panel, as well. See the following figure.

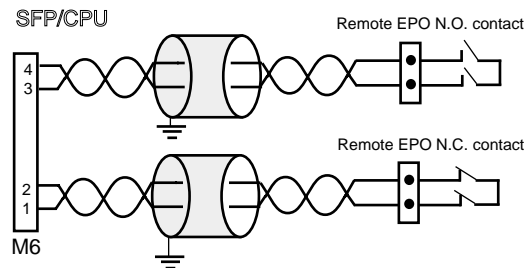


FIG. 1.10.3 Connection of Remote EPO with N.O./N.C. contacts

Note: If using N.C. contact JP1 must be open

Two relay contacts can be used to trip the battery circuit breaker or an additional external circuit breaker

1 Installation

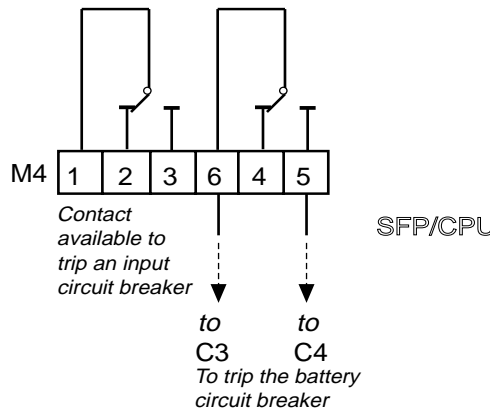


FIG. 1.10.4 Connection of Remote Emergency Power Off - Input and battery breakers trip circuit.

Nominal Rating of Contacts		
240 Vac	≅	0,5 A 125VA
110 Vac	≅	1 A 125VA

TAB. 1.10.1 Nominal Rating of contacts for the input breaker trip circuit.

1 Installation

1.11 Diesel - Generator Operation

During diesel generator operation, if the frequency of the diesel-generator, with the UPS and connected load is unstable, it is advisable to disconnect the synchronisation of the inverter. This is achieved with a normally-open, voltage-free contact (which closes during diesel-generator operation) and is connected to the connector M4 Pin 7 and Pin 8 as follows:

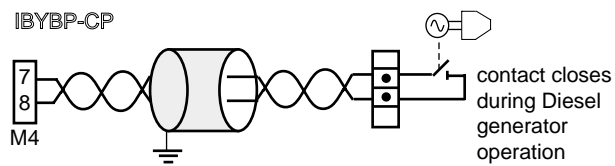


FIG. 1.11.1 Connection for Diesel Generator Operation (connector M4) - synchronisation disable.

Note1: For Hot-Standby or parallel systems, it is sufficient to feed one contact into one unit only, however they may be connected in parallel at M4 Pin7 and Pin 8 for all units

If it is necessary to reduce the current supplied by the diesel-generator, then a second voltage-free contact (again normally open) is required and must be connected to the connector M8, Pin 1 and Pin 2 on the rectifier electronic mother board (RBPHC16) see FIG.1.11.2

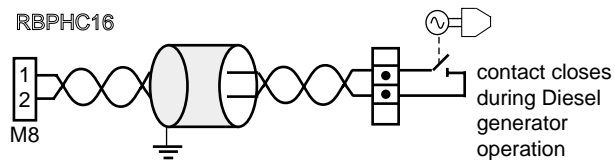


FIG. 1.11.2 Connection for Diesel Generator Operation (connector M8) - second level current limitation.

Note 1: The cable used in both cases must be a twisted pair, with a total shield. This shield must be grounded at one end (the cabinet of the UPS may be used).

Note 2: The cable for current limitation must be connected to all units for parallel or hot-standby units, using separate voltage-free contacts.

1 Installation

1.12 Common Alarm Contacts

As a standard feature, contacts are provided for a remote common alarm. The connector is located on the control p.c.b for the front operating panel "SFP/CPU" (for SFP panel) or "NCP/CPU" (for DMP/NCP panel), located inside the front door of the UPS.

1.12.1 Common Alarm Contacts for SFP Panel

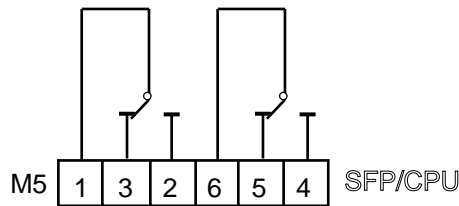


FIG. 1.12.1 Connection of Remote Common Alarm

Nominal Rating of Contacts		
240 Vac \cong	0,5 A	125VA
110 Vac \cong	1 A	125VA

TAB. 1.12.1 Nominal Rating of contacts for the common alarm.

Note 1: As an option a pcb CP-NET is available, providing more contacts, compatible with most common configurations (eg AS400, Novell etc.)

A Remote panel may also be purchased with identical functions to the front operating panel.

Note 2: To achieve a single common alarm for parallel or hot-standby units, the contacts of each unit may be interconnected in parallel (normally - open) or series (normally - closed).

1.13 Remote Reset

The UPS system may be reset remotely with the connection of contacts (a push-button) to the terminal M4 of the IBYBP-CP motherboard as shown:

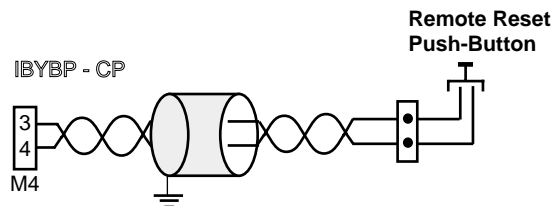


FIG.1.13.1 Connection of Remote Reset

Note: The cable used must be a twisted pair, with a total shield. This shield must be grounded at one end (the cabinet of the UPS may be used).

1 Installation

1.14 Installation of Hot-Standby Systems

For hot-standby systems the units must be connected together as shown in the FIG. 1.14.1 or FIG. 1.14.2

Note: The installation for each unit must be performed in accordance to the installation of single units as described in the previous sections. Additionally, the outputs must be connected in parallel as shown in FIG. 1.14.1 or in FIG.1.14.2

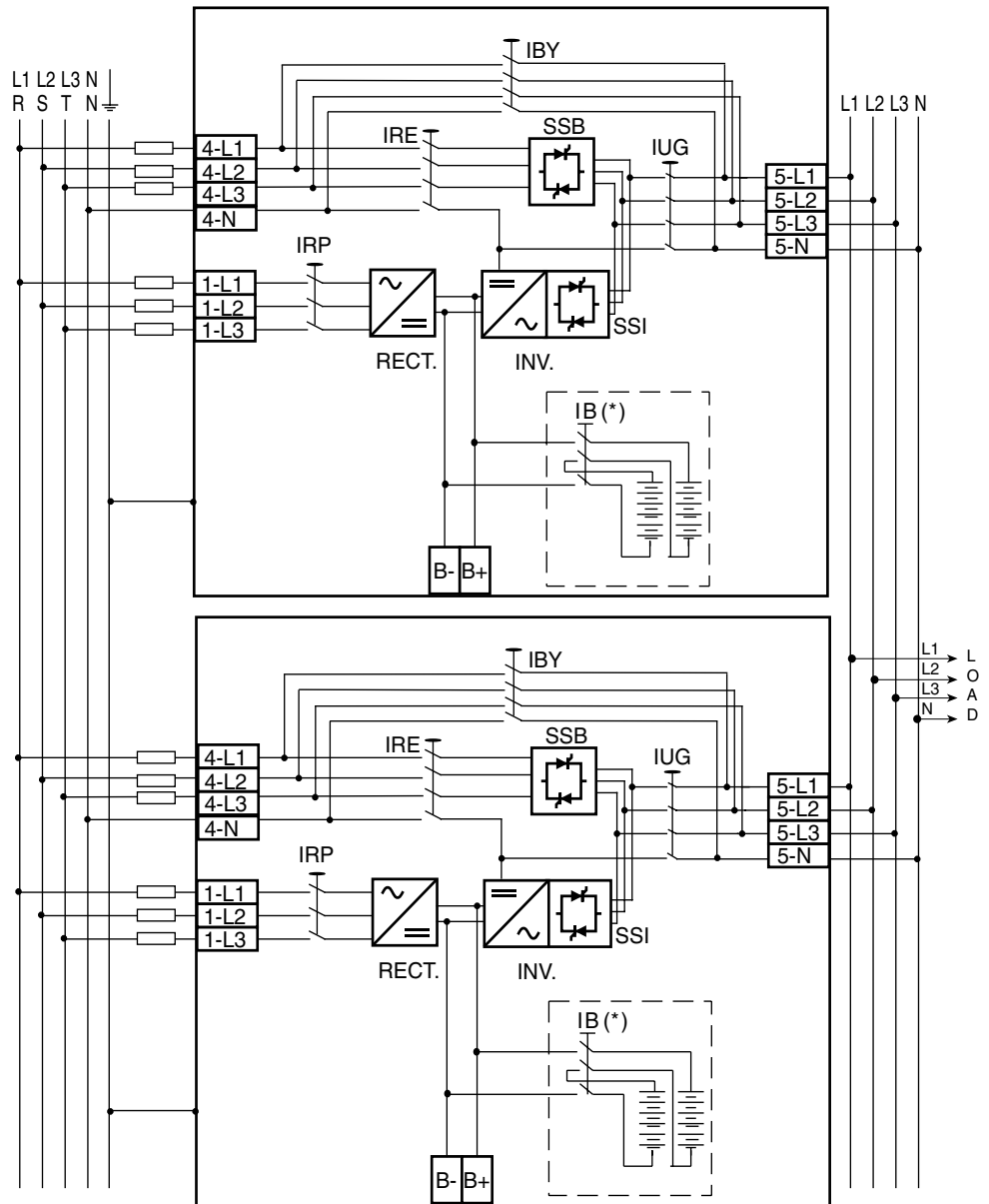


FIG. 1.14.1 Interconnection of hot-standby units with integrated maintenance bypasses and separate bypass terminals.

(*) **Note:** Internal Battery only for 10-30kVA units

Note: If an external output switch is added for each unit, it must include two auxiliary contacts connected as the IUG auxiliary contacts are connected inside each unit. Open every external output switch after opening the relative internal IUG and close it before closing IUG.

1 Installation

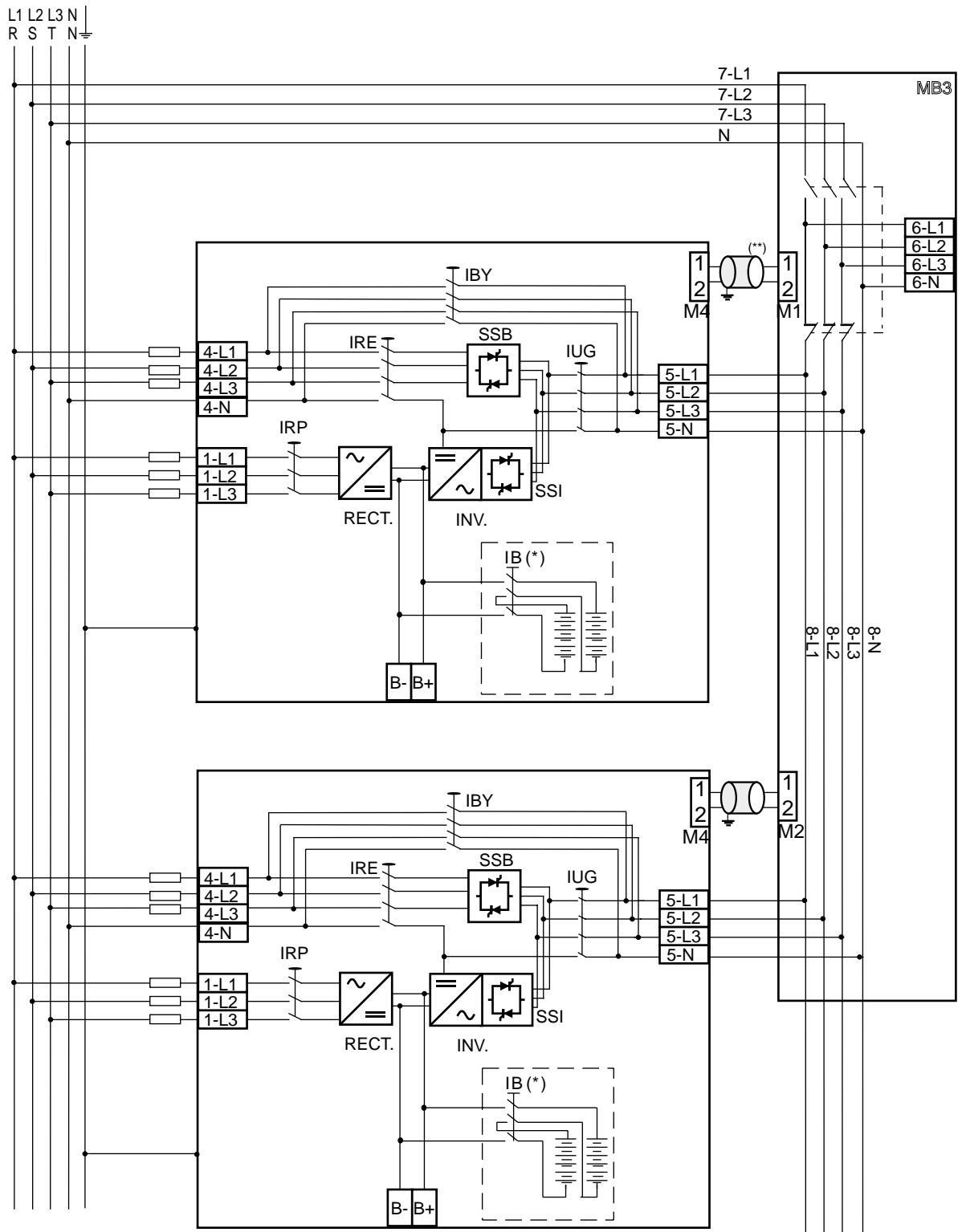


FIG. 1.14.2 Interconnection of hot-standby units with external maintenance bypass and separate bypass terminals.

(*) **Note:** Internal Battery only for 10-30kVA units

(**) **Note:** This cable must be a twisted pair, with a total shield (refer. to section 1.8)

(***) **Note:** The internal maintenance bypass (IBY) may or may not be installed in this configuration

1.14.1 Installation of the Interconnection Cable

The supplied cable must be connected between the units within the system. This must be connected to either of the connectors CN12 or CN13 on the mother-board of the Inverter/Bypass electronics (IBYBP-CP) and the other end of the cable is connected to either CN12 or CN13 on the mother-board of the Inverter/Bypass electronics (IBYBP-CP) of the other unit(s).

Note: If the unit is to be added to one already installed stand-alone unit which has not been previously tested in a hot-standby configuration, the supports and mounting screws to mount the cable to the p.c.b are supplied with the cable. They must be mounted at both sides of the selected connector in order to fix the cable securely to the connector with the supplied screws.

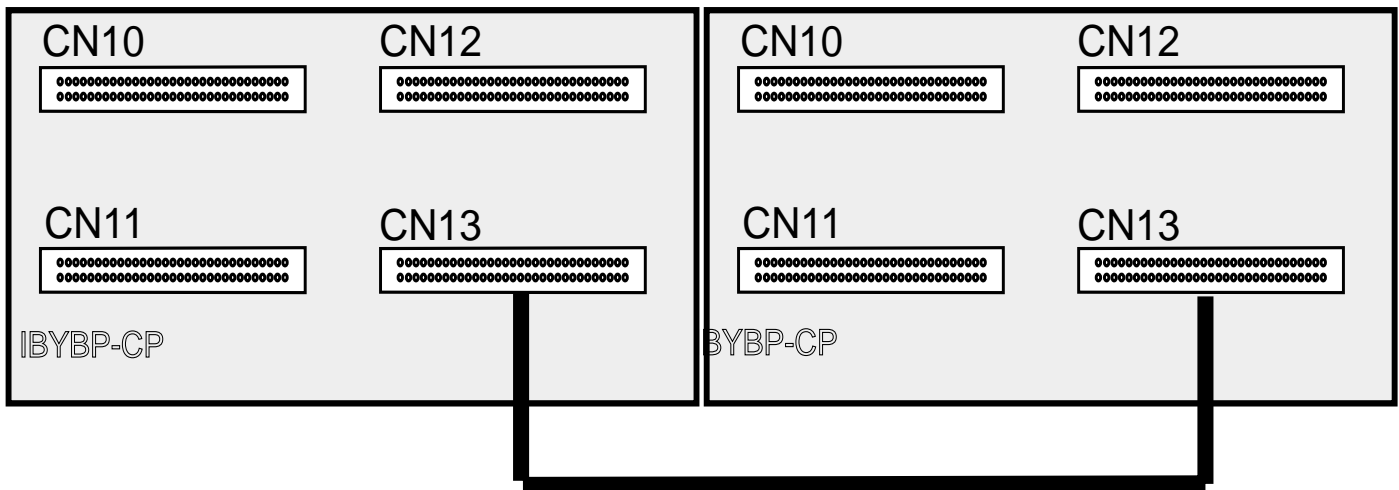


FIG. 1.14.3 Interconnection of control BUS cable for hot-standby units

1 Installation

1.15 Installation of Parallel Systems

Up to a total of 8 units may be installed together in the one parallel system.

Note: The installation for each unit must be performed in accordance to the installation of single units as described in the previous sections. Additionally to this, the outputs must be connected in parallel as shown in FIG. 1.15.1 or in FIG.1.15.2



Care must be taken with the installation of the bypass line and in particular, that the cables from the point of common coupling of the input supply to the terminals 1-L1, 1-L2, 1-L3 (or 4-L1, 4-L2, 4-L3, 4-N if an optional separate bypass input is installed), are of equal length. Likewise, the output cables from the output terminals (5-L1, 5-L2, 5-L3, 5-N) to the point of common coupling on the load side must be of equal length.

Note: If an external output switch is added for each unit, it must include two auxiliary contacts connected as the IUG auxiliary contacts are connected inside each unit. Open every external output switch after opening the relative internal IUG and close it before closing IUG

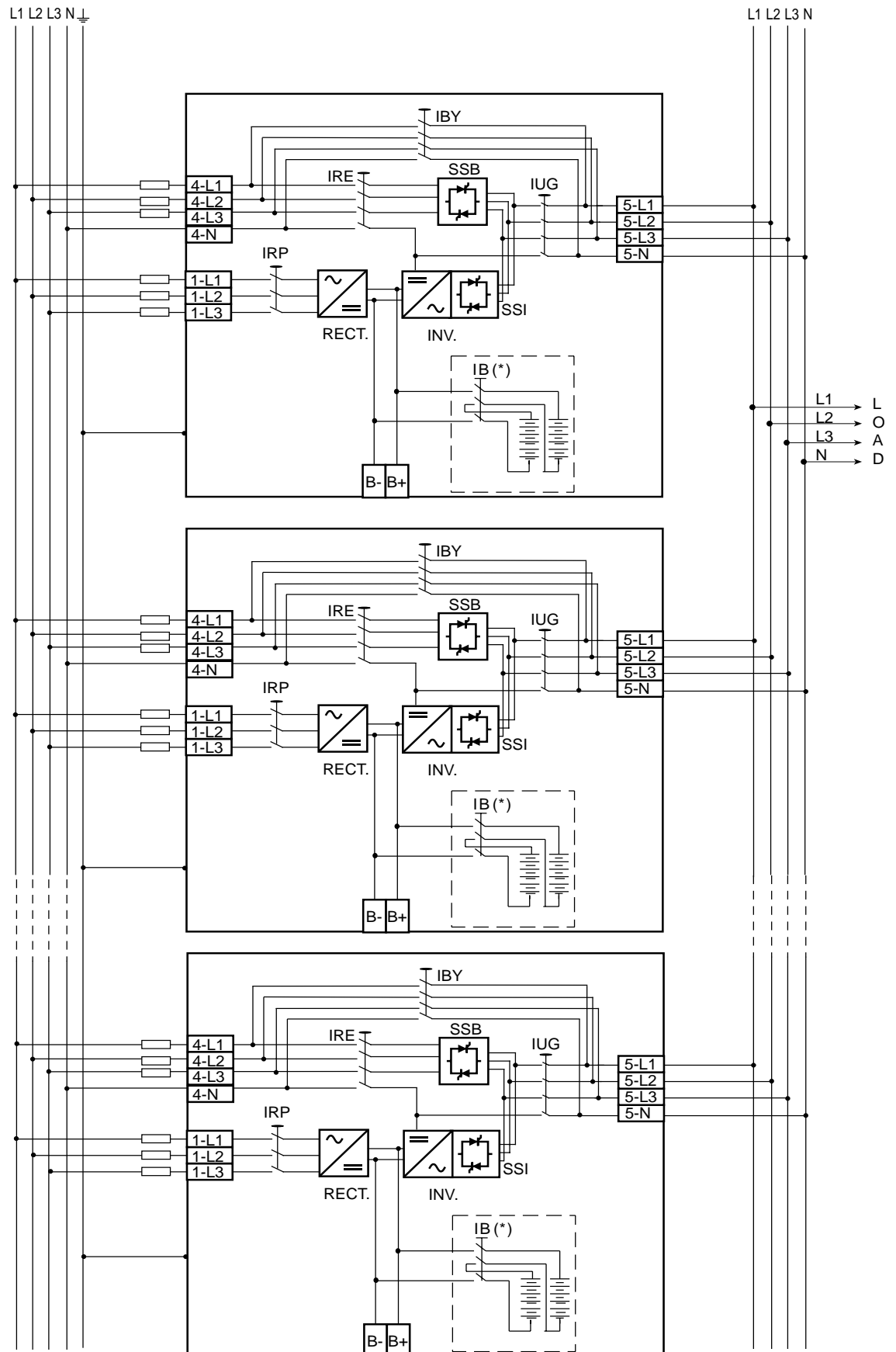


FIG. 1.15.1 Interconnection of parallel units with integrated maintenance bypasses and separate bypass terminals.

1 Installation

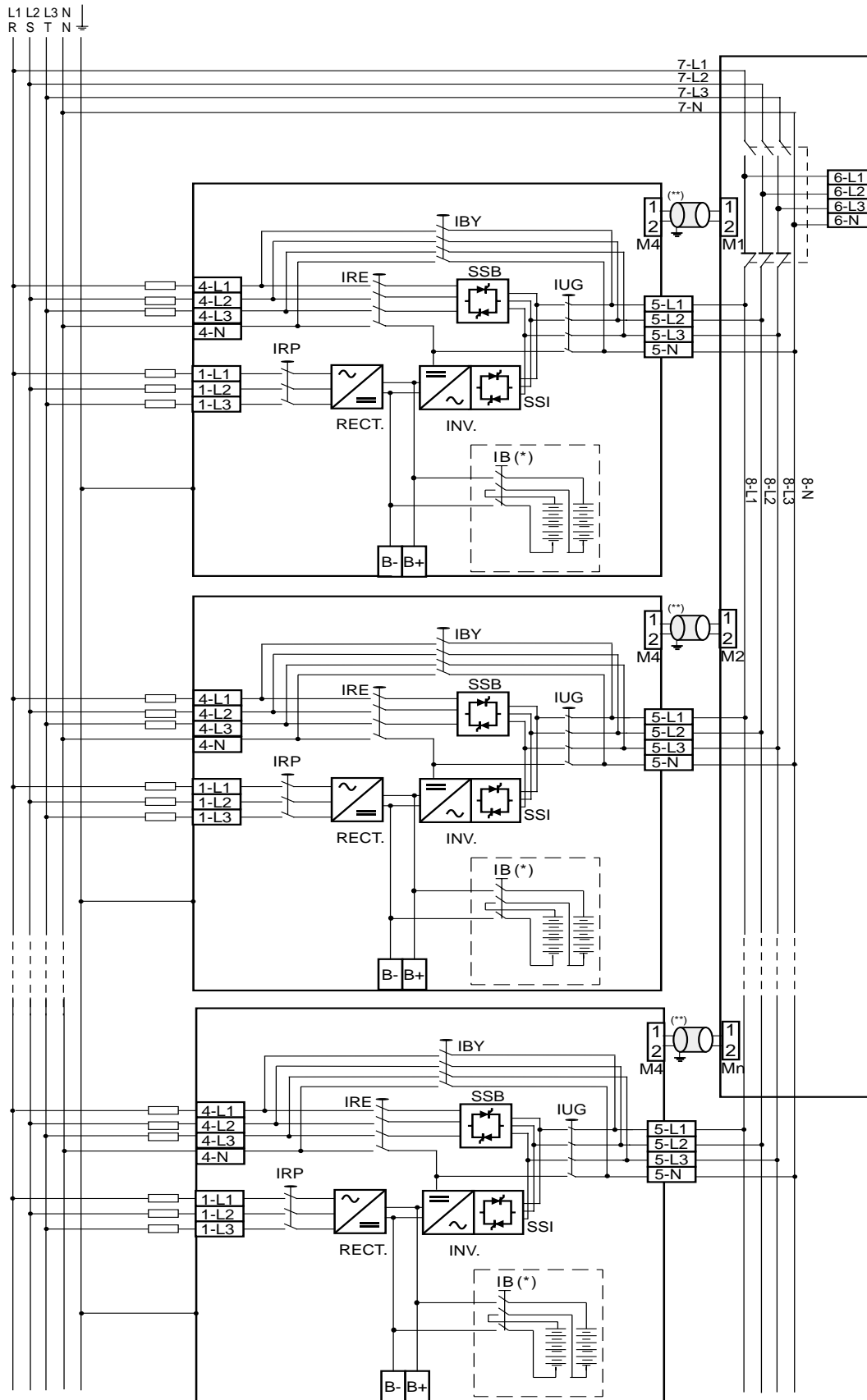


FIG. 1.15.2 Interconnection of parallel units with common maintenance bypass and separate bypass terminals.

(*) Note: The internal maintenance bypass may or may not be installed in this configuration.

(**) Note: This cable must be twisted pair, total shield (refer to section 1.8)

1 Installation

1.15.1 Installation of the Interconnection Cables

There are two interconnection cables supplied with the units for each additional unit to the first unit. These cables must be connected between the units as shown in FIG. 1.15.4 One cable is connected to either CN12 or CN13 (the other end being connected to the corresponding connector of another unit), and the other cable is connected to either of CN10 or CN11, again with the other end connected to the corresponding connector of another unit. In this way, all units will be interconnected by two cables in a BUS-Communication system (Daisy-chain connection).

Note: If the unit is to be added to one already installed stand-alone unit which has not been previously tested in a parallel configuration, the supports and mounting screws to mount the cable to the p.c.b are supplied with the cables. They must be mounted at both sides of the selected connectors in order to fix the cables securely to the connectors with the supplied screws.

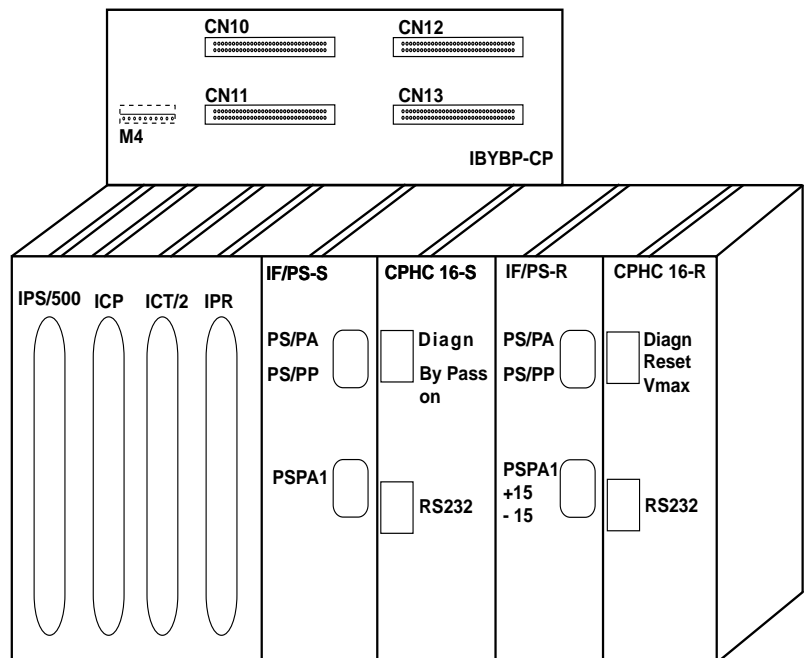


FIG. 1.15.3 Location of connectors on the IBYBP-CP pcb.

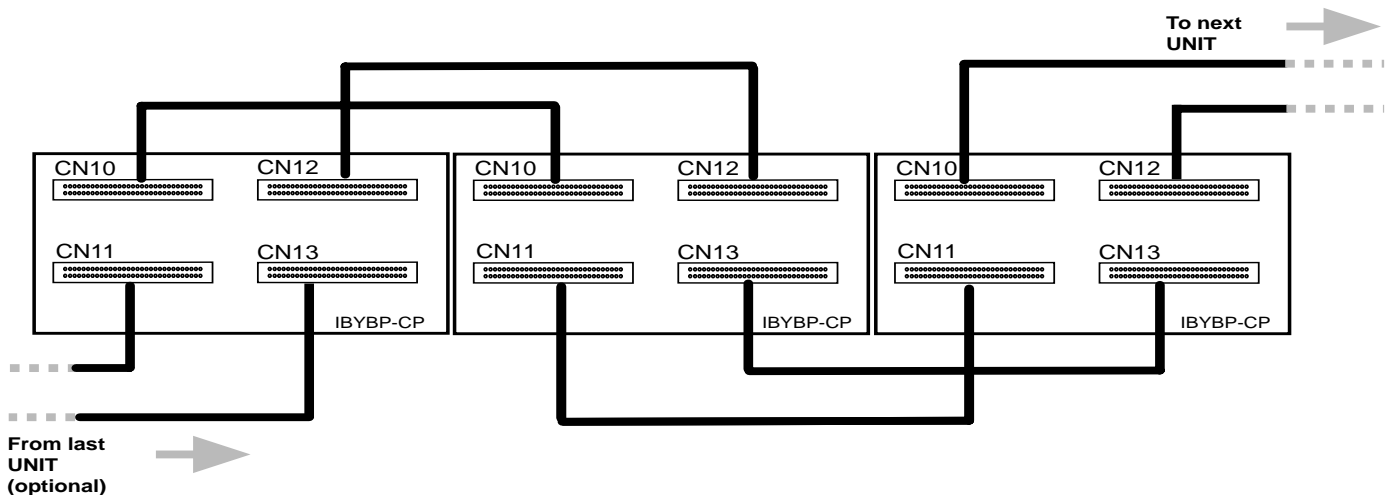


FIG. 1.15.4 Interconnection of control BUS cables between parallel units

1 Installation

1.16 Battery Installation



Battery Installation must be in accordance with local safety standards.

General The batteries are charged. The installation should only be made by appropriately qualified personnel. The screw connections between the batteries should be tightened with a torque wrench (max. 7 Nm).

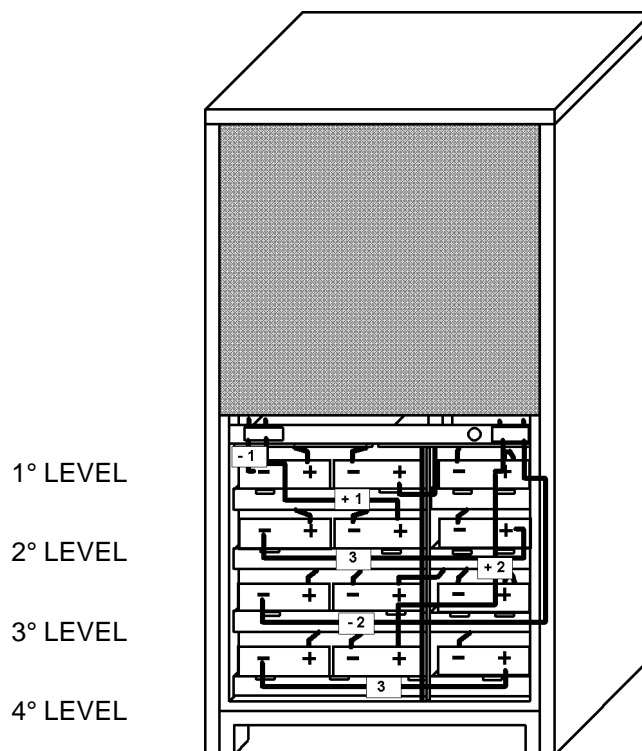
1.16.1 Installation of Internal batteries UPS (10-30kVA)

Internal Battery (24Ah) Installation

- Place five battery blocks on the tray of the first level.
- Place nine battery blocks on the trays of the second, third and fourth level.
- Interconnect the blocks in series (see FIG.1.16.1 for YUASA NP battery type or FIG.1.16.2 for YUASA NPI battery type)



Warning: after assembly there is a voltage of 67,5 V on the first level, and 121,5 V on the second, third and fourth levels.



UPS rear view



Warning: Open IB switch before connecting the cables

1 Installation

Internal Electrical Connections for YUASA NP Battery Type

Cable (1) n° 3; L = 280 mm; diameter 16 mm²

Cable (2) n° 8; L = 420 mm; diameter 16 mm²

Cable (3) n° 4; L = 490 mm; diameter 16 mm²

Cable (4) n° 2; L = 650 mm; diameter 16 mm²

Support (CA1) n° 4; See Fig. CA1

Support (CA2) n° 9; See Fig. CA2

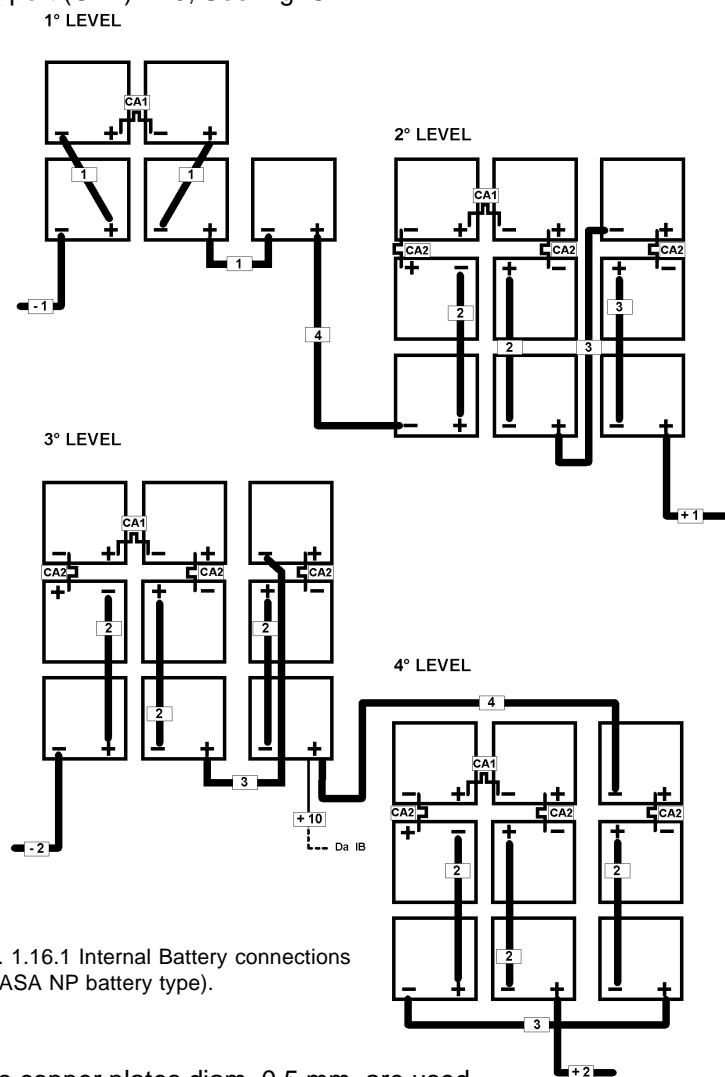
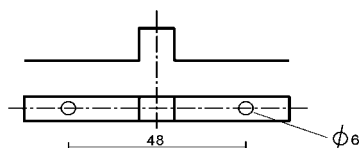
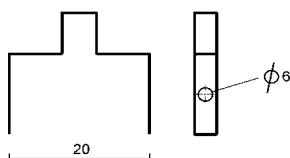


FIG. 1.16.1 Internal Battery connections (YUASA NP battery type).

Copper bars for battery connection Two copper plates diam. 0,5 mm. are used.



1 Installation

Internal Electrical Connections for YUASA NPI Battery Type

Cable (1) n° 3; L = 280 mm; diameter 16 mm²

Cable (2) n° 8; L = 420 mm; diameter 16 mm²

Cable (3) n° 4; L = 490 mm; diameter 16 mm²

Cable (4) n° 2; L = 650 mm; diameter 16 mm²

Support (CA3) n° 4; See Fig. CA3

Support (CA4) n° 9; See Fig. CA4

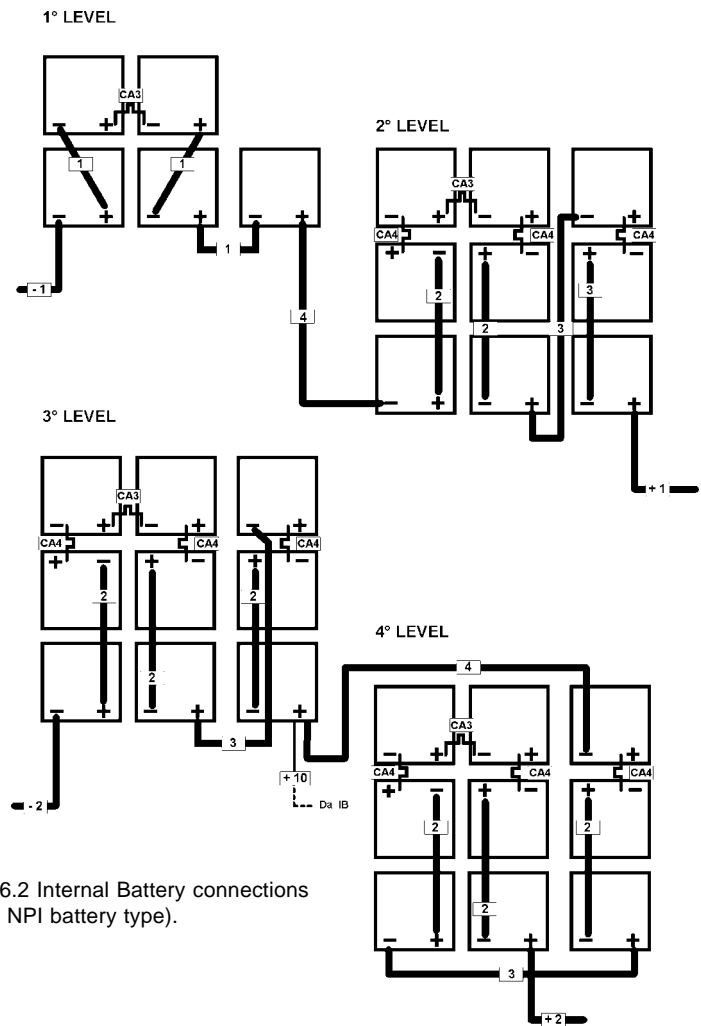
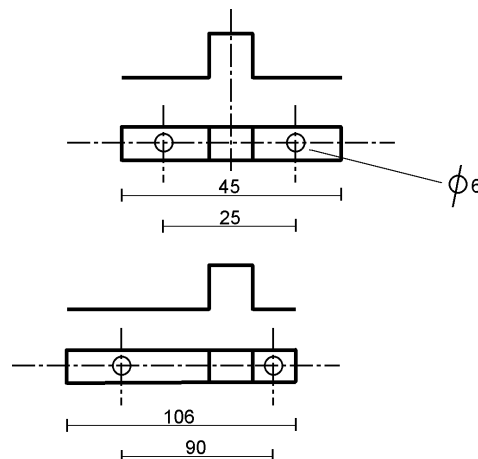


FIG. 1.16.2 Internal Battery connections (YUASA NPI battery type).

Copper bars for battery connection Two copper plates diam. 0,5 mm. are used.



1 Installation

1.16.2 Installation of External Batteries

There are ten preferred types of external battery cabinets to be used for this UPS.

- BC4S/125 small, same height of 10-120kVA (125A breaker)
- BC4S/250 small, same height of 10-120kVA (250A breaker)
- BC4L/125 large, same height of 10-120kVA (125A breaker)
- BC4L/250 large, same height of 10-120kVA (250A breaker)
- BC4L/400 large, same height of 10-120kVA (400A breaker)
- BC4D-2x32/125 double, same height of 10-120kVA (125A breaker)

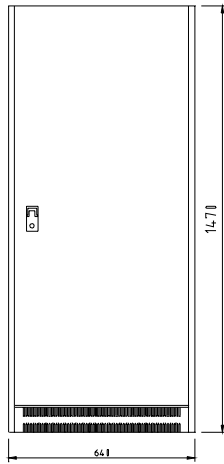
- BC4D-2x32/250 double, same height of 10-120kVA (250A breaker)
- BC4D-2x32/400 double, same height of 10-120kVA (400A breaker)
- BC4H/400 small, height for >120kVA (400A breaker)
- BC4HD/400 single for 6V blocks, height for >120kVA (400A breaker)
- BC4HD-2x32/400 double, height for >120kVA (400A breaker)

Table 1.16.2.1 gives the detailed indication on the types of batteries used within each battery cabinet.

	FIAMM FG 5 years	YUASA NP 5 years	JOHNSON CONTROLS UPS 10 years
BC4S/125 BC4S/250	32 x 27Ah-12V	32 x 24Ah-12V	32 x 12-100 24Ah - 12V
	32 x 42Ah -12V	32 x 38Ah- 12V	32 x 12-140 30Ah - 12V
			32 x 12-170 47Ah - 12V
			32 x 12-200 52Ah - 12V
			32 x 12-270 71Ah - 12V
BC4L/125 BC4L/250 BC4L/400	32 x 70Ah - 12V	32 x 65Ah - 12V	32 x 12-310 86Ah - 12V
			32 x 12-370 90Ah - 12V
			32 x 12-475 124Ah - 12V
BC4D/125-2x32 BC4D/250-2x32 BC4D/400-2x32	64 x 70Ah - 12V	64 x 65Ah - 12V	64 x 12-475 124Ah - 12V
BC4H/400	32 x 70Ah - 12V	32 x 65Ah - 12V	32 x 12-270 71Ah - 12V
			32 x 12-310 86Ah - 12V
			32 x 12-370 90Ah - 12V
			32 x 12-475 124Ah - 12V
BC4HD/400-2x32	64 x 70Ah - 12V	64 x 65Ah - 12V	64 x 12-475 124Ah - 12V
BC4HD/400			64 x 6-620 182Ah - 6V

TAB. 1.16.2.1: List of battery types used within each battery cabinet

1 Installation



1.16.3 BC4S Battery Cabinet (32 Monoblocks 12V)

The following battery cubicle have been designed to house a range of different batteries to suit the customers' autonomy requirement.

BC4S Dimendions:

Height 1470 mm Weight of Empty Cubicle 150kg
 Width 640 mm
 Depth 840 mm

To assemble the battery cabinet:

- Place eight battery blocks on the trays of the first, second, third and fourth level.
- Interconnect the blocks in series (block 1 / negative pole ==> block 2 / positive pole, according to the diagram on next page).

TIPO DI CAVO CABLE TYPE	LUNGHEZZA Length	QUANTITA' Quantity
A	170 mm	20
B	400 mm	8

1° Piano
8 Monoblocchi
1st tier
8 Monoblocks

2° Piano
8 Monoblocchi
2nd tier
8 Monoblocks

3° Piano
8 Monoblocchi
3rd tier
8 Monoblocks

4° Piano
8 Monoblocchi
4th tier
8 Monoblocks

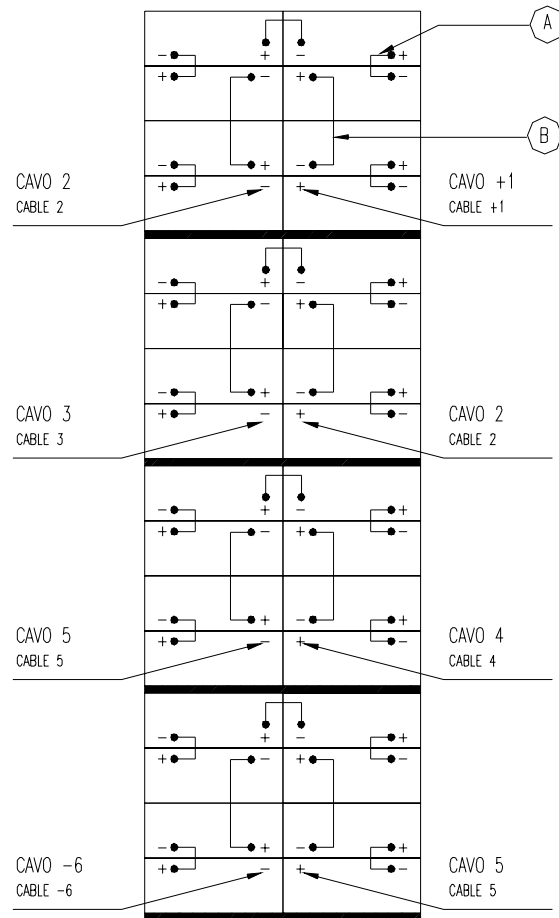


FIG. 1.16.3 BC4S battery layout



Important: Open the IB battery switch before connecting the cables.



Warning: after assembly there is a voltage of 96V on each level.

- Insert the trays into the battery cabinet.
- Place the trays with the batteries on the corresponding levels in the UPS.
- Connect the battery blocks of the various levels to the IB battery switch, and the IB to the terminals, as shown in fig. 1.16.4



Ensure appropriate ventilation of the battery room according to the standard EN50091-1, to prevent the risk of an explosion.

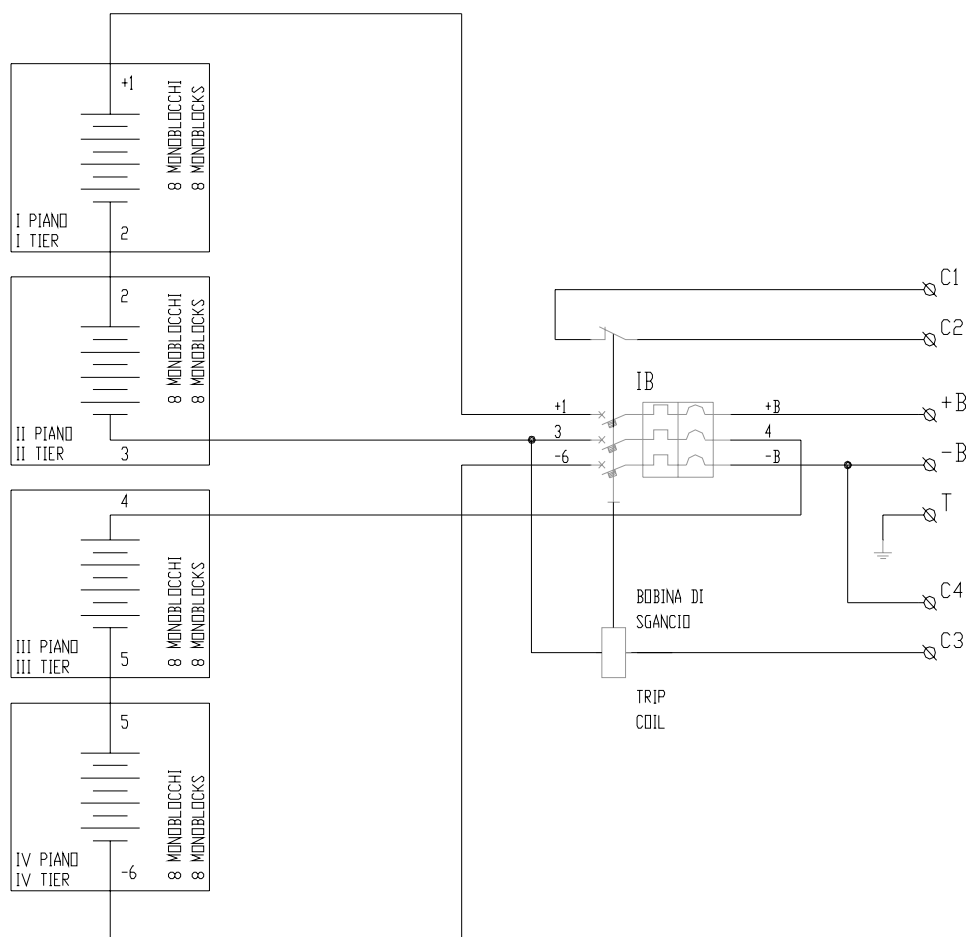
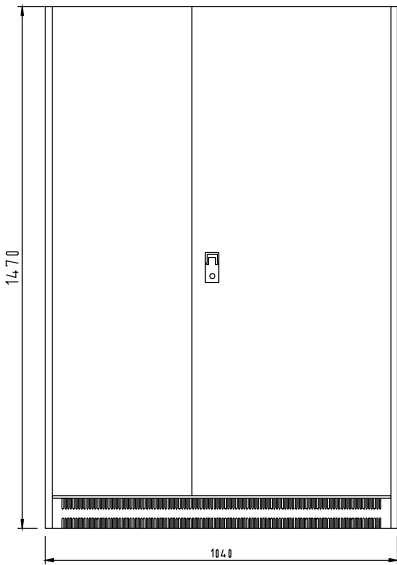


FIG. 1.16.4 BC4S internal electrical connections

1 Installation



1.16.4 BC4L External Battery Cabinet Installation (32 Monobloks 12V)

BC4L Dimendions:

Height 1470 mm Weight of Empty Cubicle 200kg
 Width 1040 mm
 Depth 840 mm

To assemble the battery cabinet:

- Place ten battery blocks on the trays of the first, second and third level.
- Place two battery blocks on the tray of the fourth level.
- Interconnect the blocks in series (block 1 / negative pole ==> block 2 / positive pole, according to the diagram on next page)

TIPO DI CAVO CABLE TYPE	LUNGHEZZA Lenght	QUANTITA' Quantity
A	180 mm	19
B	400 mm	6
C	500 mm	3

1° Piano
10 Monoblocchi
1st tier
10 Monoblocks

2° Piano
10 Monoblocchi
2nd tier
10 Monoblocks

3° Piano
10 Monoblocchi
3rd tier
10 Monoblocks

4° Piano
2 Monoblocchi
4th tier
2 Monoblocks

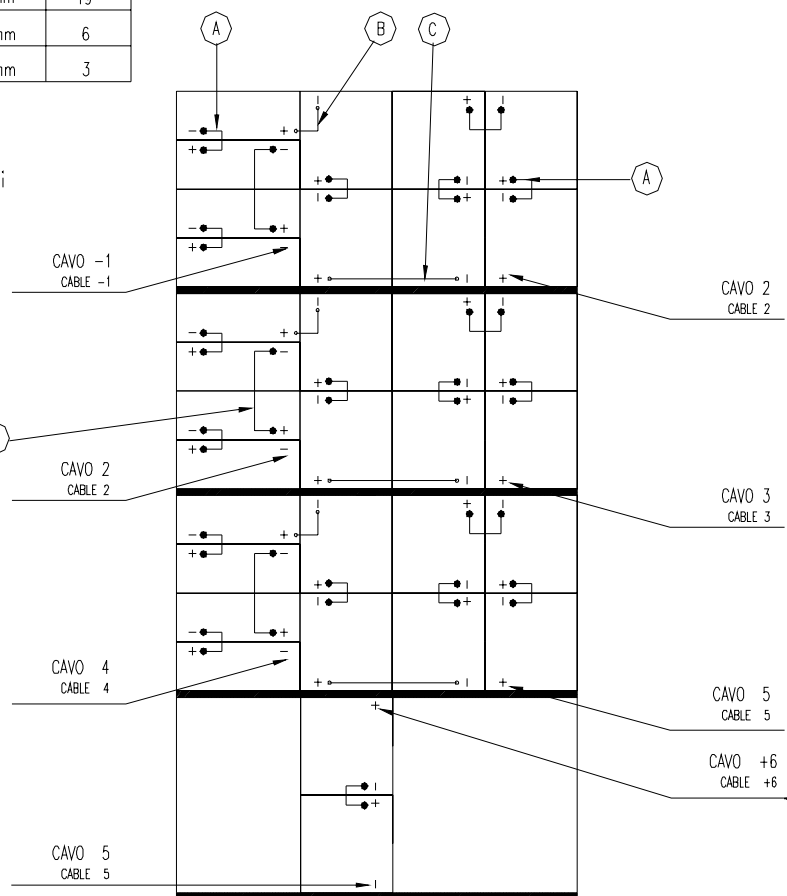


FIG. 1.16.5 BC4L battery layout

1 Installation



Warning: after assembly there is a voltage of 120V on the first, second and third level and 24V on fourth level.

- Insert the trays into the battery cabinet.



Important: Open the IB battery switch before connecting the cables.

- Place the trays with the batteries on the corresponding levels in the UPS.
- Connect the battery blocks of the various levels to the IB battery switch, and the IB to the terminals, as shown in fig. 1.16.6



Ensure appropriate ventilation of the battery room according to the standard EN50091-1, to prevent the risk of an explosion.

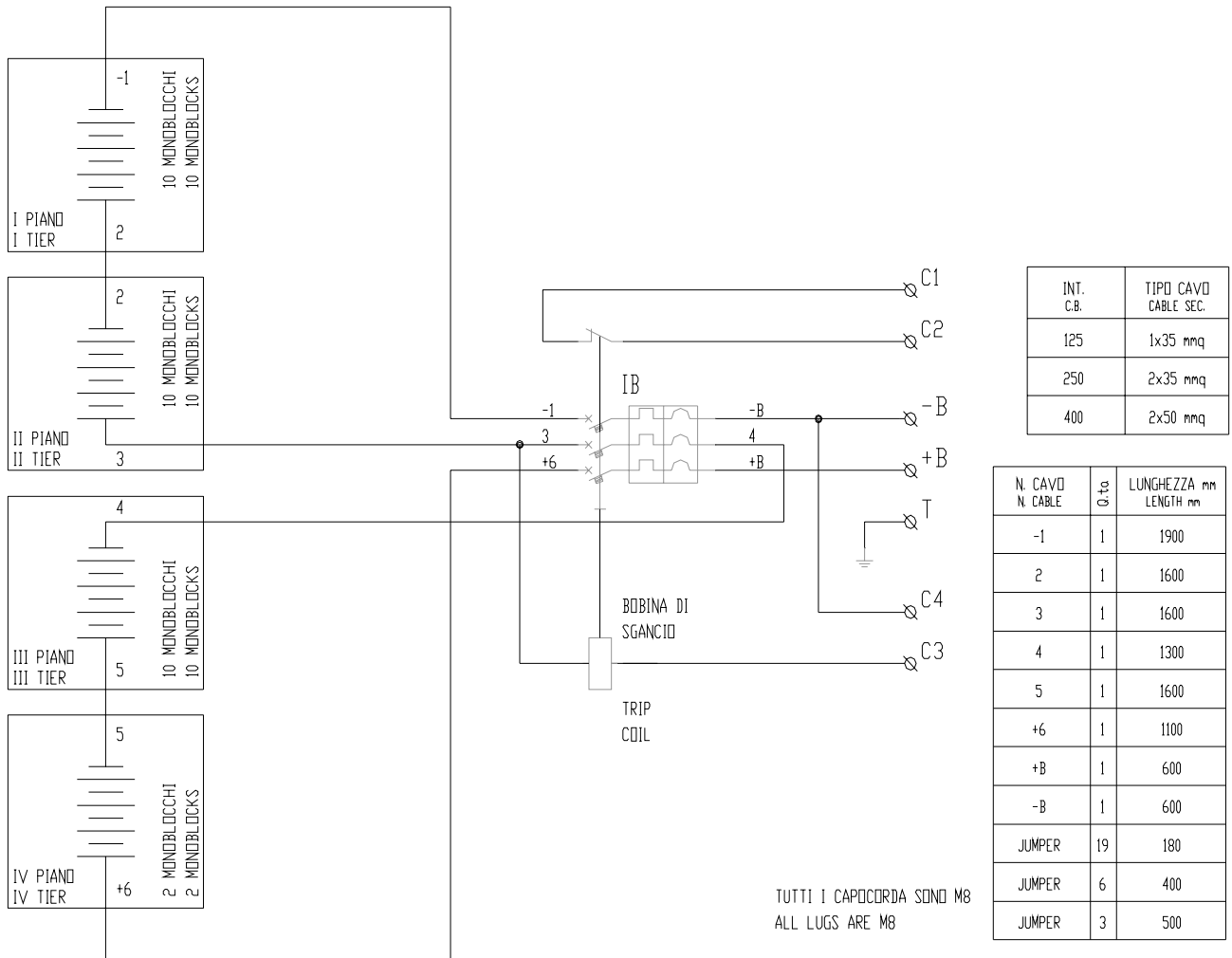
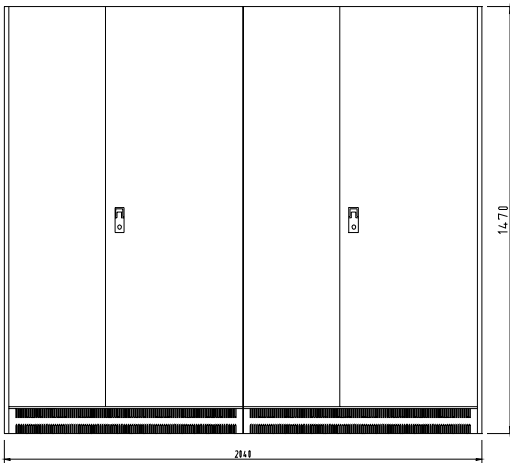


FIG. 1.16.6 BC4L internal electrical connections

1 Installation



1.16.5 BC4D External Battery Cabinet Installation (64 Monobloks 6V)

BC4D Dimendions:

Height 1470 mm Weight of Empty Cubicle 380kg
 Width 2040 mm
 Depth 840 mm

To assemble the battery cabinets:

- Place ten battery blocks on the trays of the first, second and third level.
- Place two battery blocks on the tray of the fourth level.
- Interconnect the blocks in series (block 1 / negative pole ==> block 2 / positive pole, according to the diagram on next page)

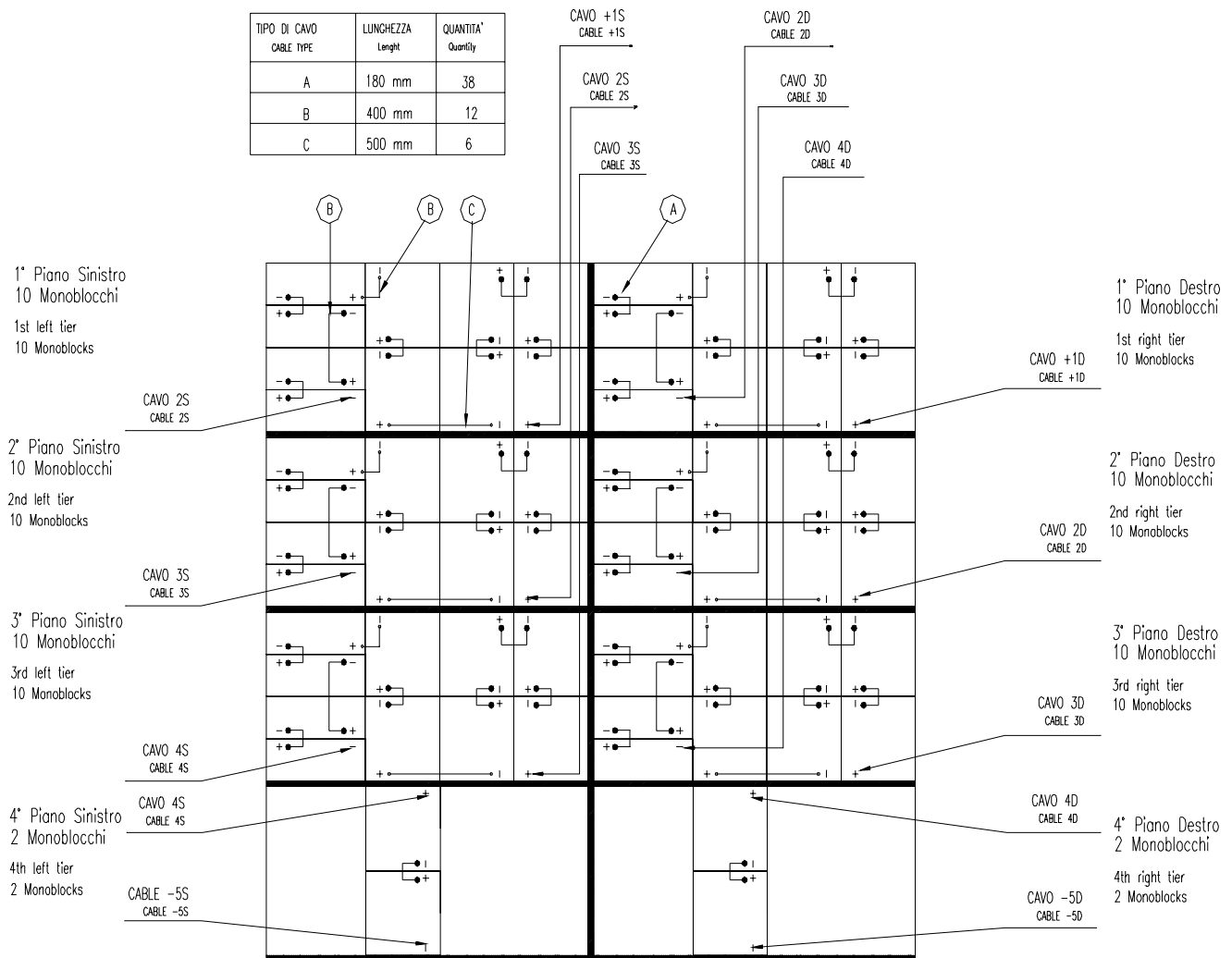


FIG. 1.16.7 BC4D battery layout

1 Installation



Warning: after assembly there is a voltage of 60V on the first, second and third level and 12V on fourth level of the left and right tier.

- Insert the trays into the battery cabinets.



Important: Open the IB battery switch before connecting the cables.

- Place the trays with the batteries on the corresponding levels in the UPS.
- Connect the battery blocks of the various levels to the IB battery switch, and the IB to the terminals, as shown in fig. 1.16.8



Ensure appropriate ventilation of the battery room according to the standard EN50091-1, to prevent the risk of an explosion.

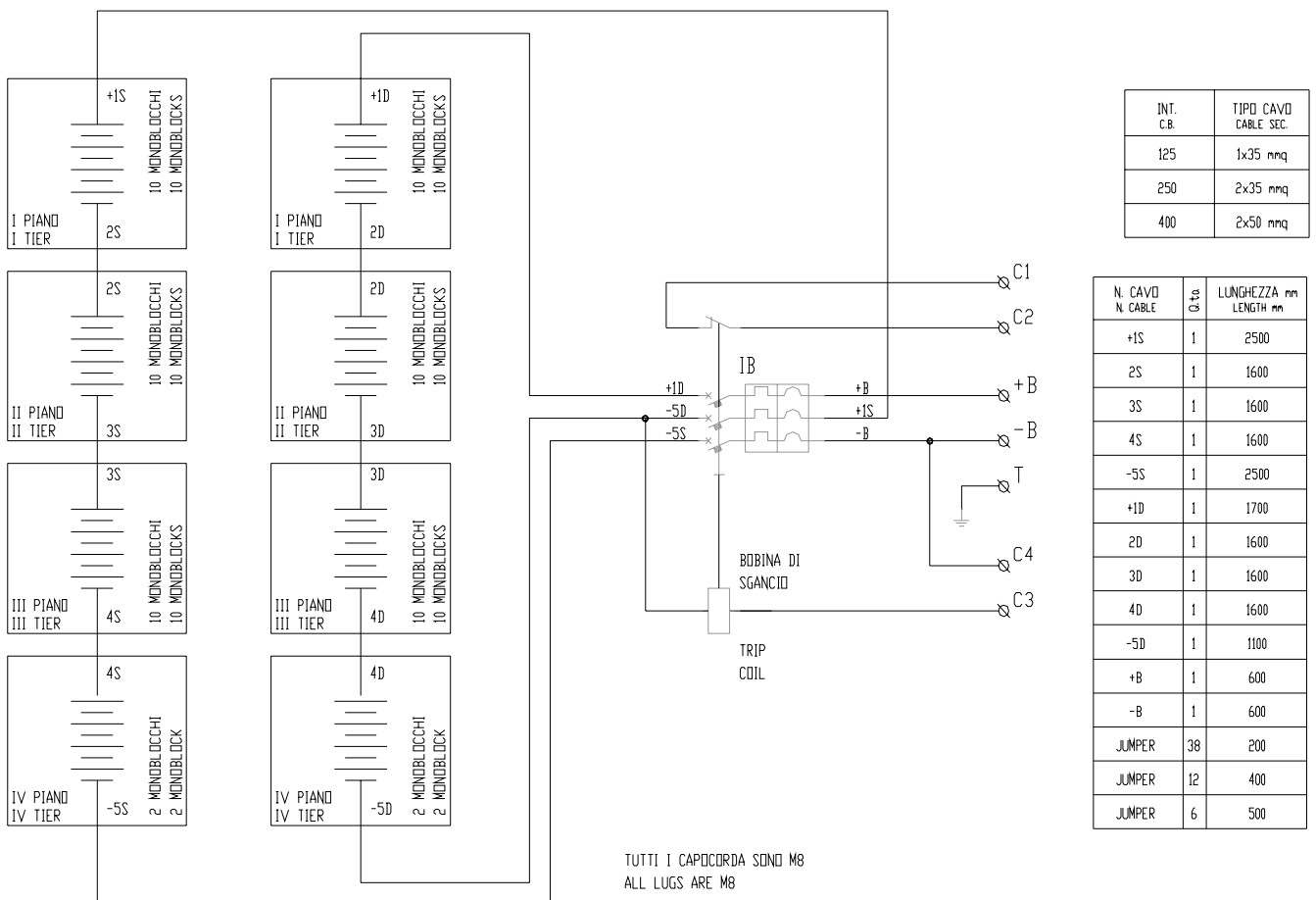
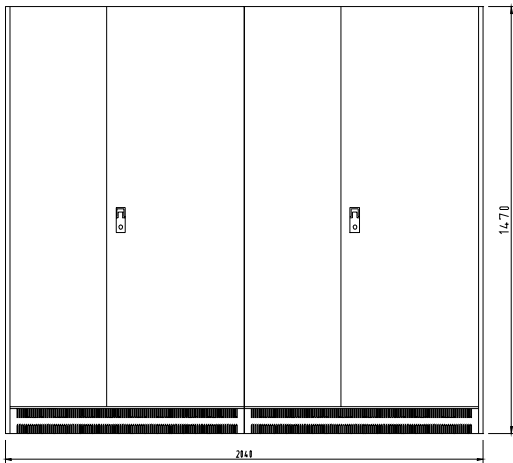


FIG. 1.16.8 BC4D internal electrical connections

1 Installation



1.16.5.1 BC4D-2x32 External Battery Cabinet Installation (64 Monobloks 2x32 12V)

BC4D Dimendions:

Height 1470 mm Weight of Empty Cubicle 380kg
 Width 2040 mm
 Depth 840 mm

To assemble the battery cabinets:

- Place ten battery blocks on the trays of the first, second and third level.
- Place two battery blocks on the tray of the fourth level.
- Interconnect the blocks in series for both strings (block 1 / negative pole ==> block 2 / positive pole, according to the diagram on next page) and then connect the strings in parallel, according to the diagram.

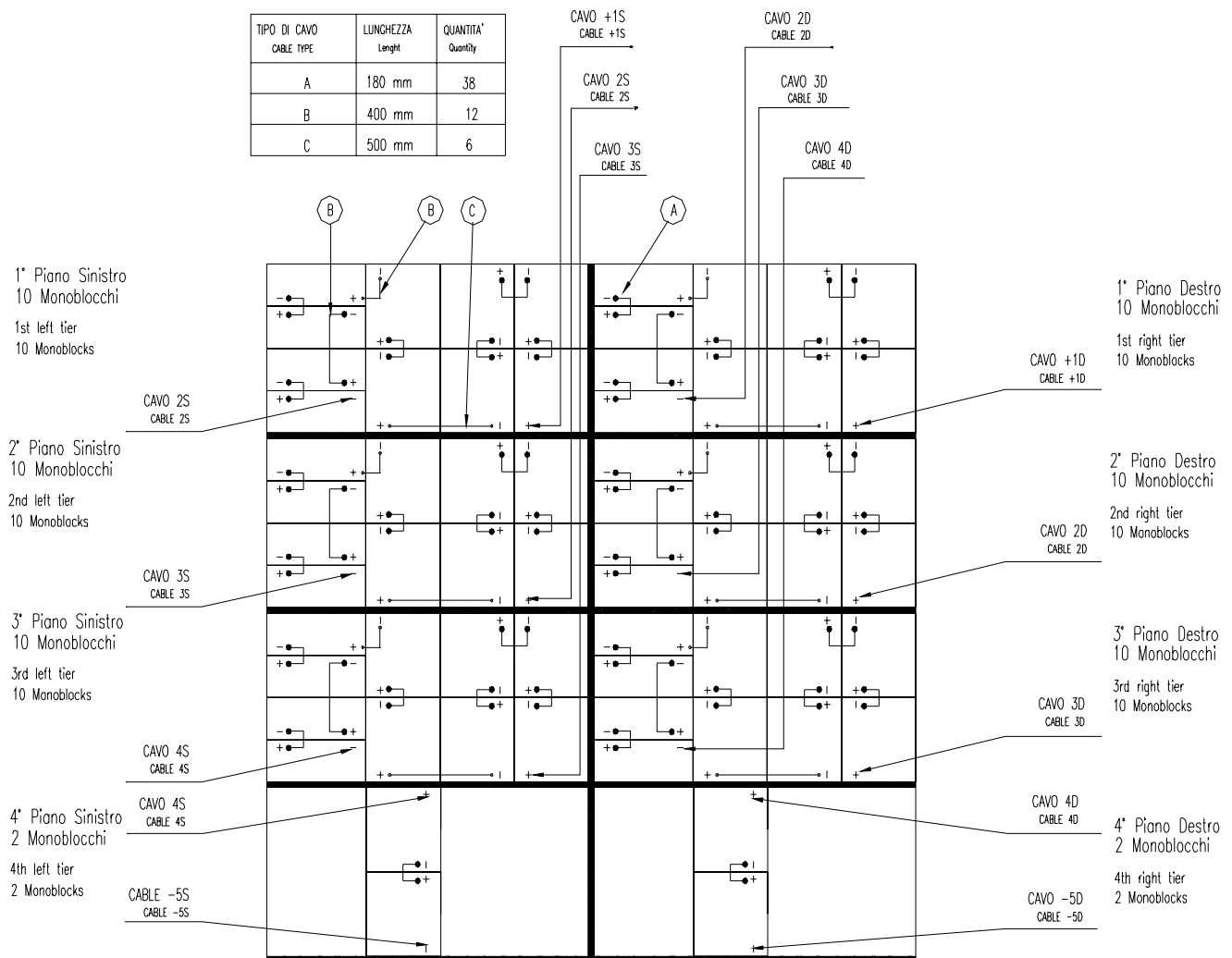


FIG. 1.16.7.1 BC4D 2x32 battery layout

1 Installation



Warning: after assembly there is a voltage of 120V on the first, second and third level and 24V on fourth level of the left and right tiers.

- Insert the trays into the battery cabinets.

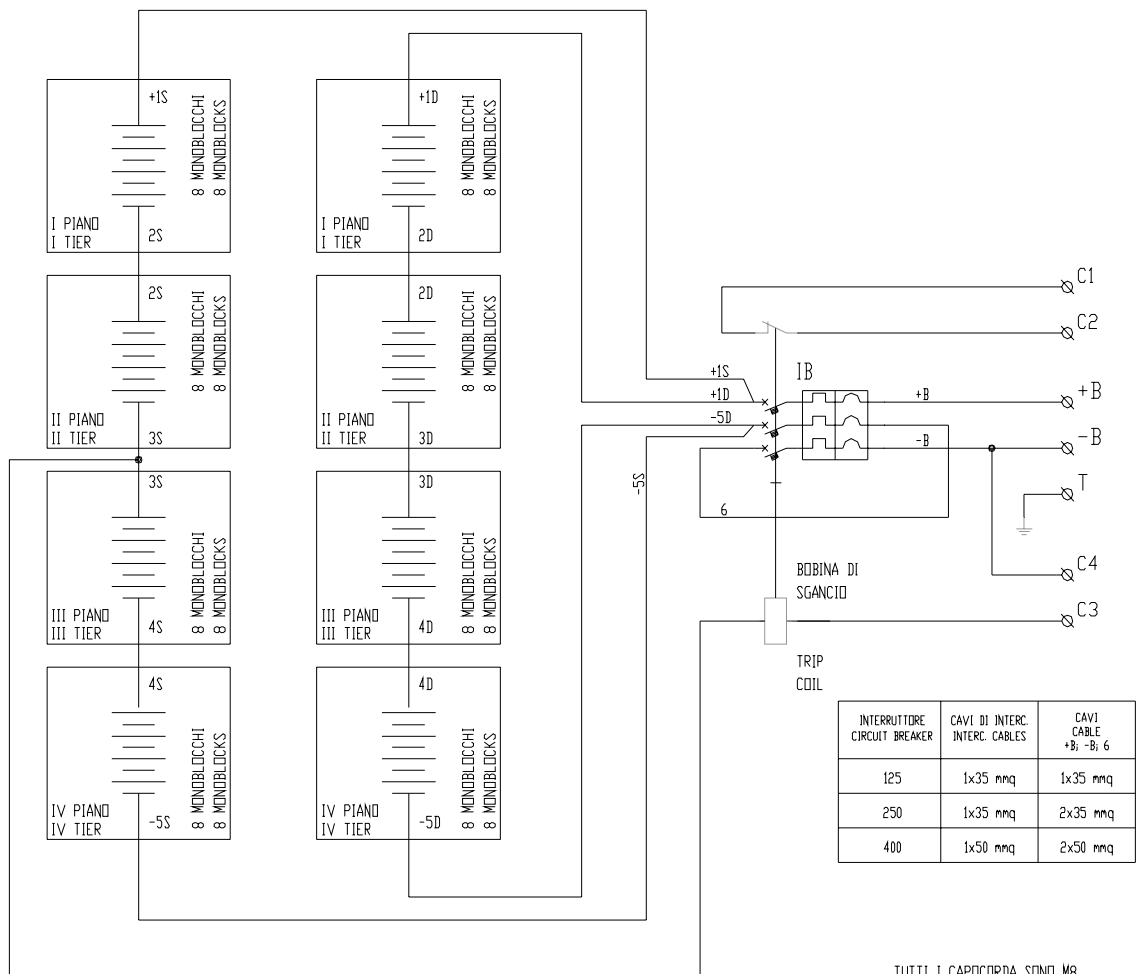


Important: Open the IB battery switch before connecting the cables.

- Place the trays with the batteries on the corresponding levels in the UPS.
- Connect the battery blocks of the various levels to the IB battery switch, and the IB to the terminals, as shown in fig. 1.16.8.1



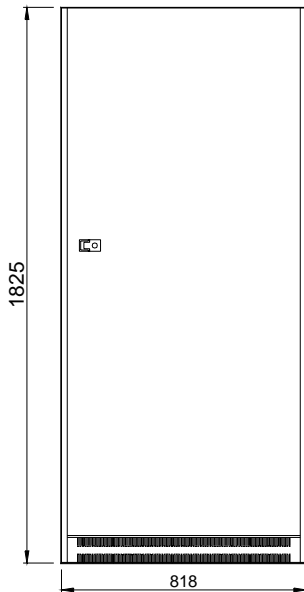
Ensure appropriate ventilation of the battery room according to the standard EN50091-1, to prevent the risk of an explosion.



TUTTI I CAPOCORDA SONO M8
ALL LUGS ARE M8

FIG. 1.16.8.1 BC4D 2x32 internal electrical connections

1 Installation



1.16.6 BC4H Battery Cabinet Installation (32 Monobloks 12V)

BC4H Dimensions:

Height 1825 mm Weight of Empty Cubicle 210kg

Width 818 mm

Depth 925 mm

To assemble the battery cabinet:



Important: Open the IB battery switch before connecting the cables.

- Remove the screws that fix the trays.
- Extract the trays of the battery cabinet.
- Place eight battery blocks on the trays of the first, second, third and fourth level.
- Interconnect the blocks in series (block 1 / negative pole ==> block 2 / positive pole, according to the diagram on next page).

TIPO DI CAVO CABLE TYPE	LUNGHEZZA Length	QUANTITA' Quantity
A	200 mm	24
B	400 mm	4

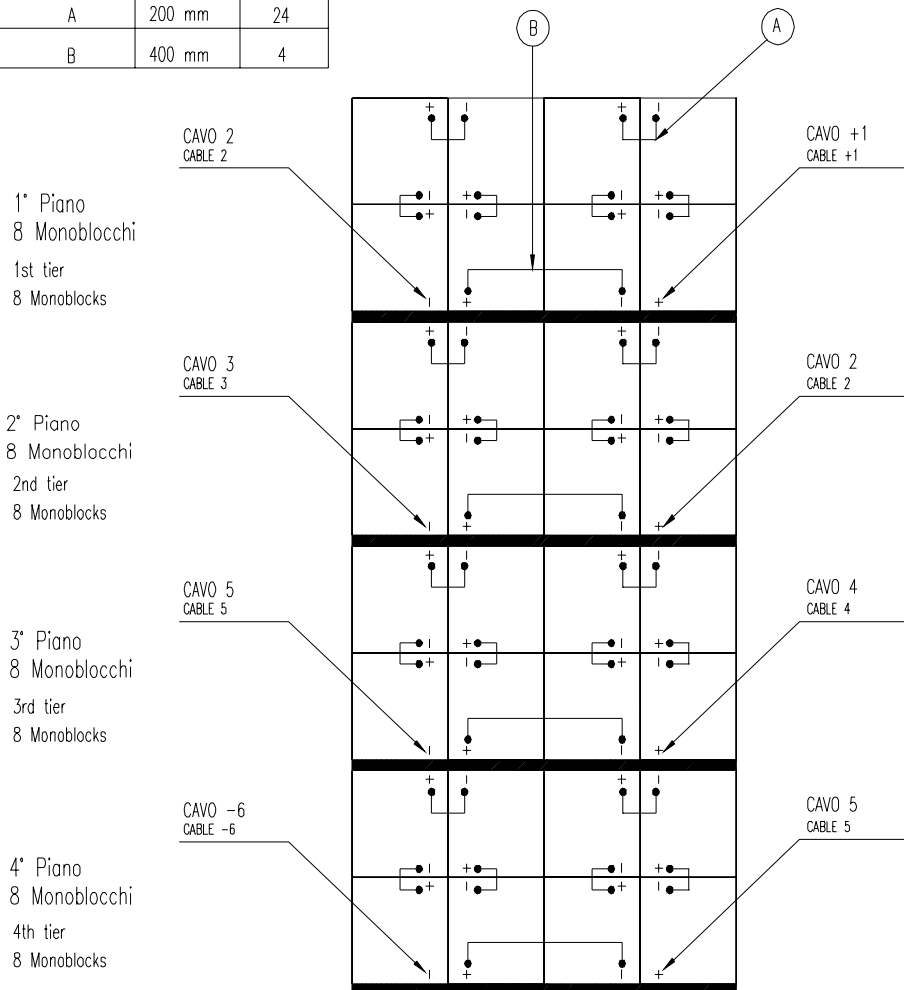


FIG. 1.16.9 BC4H Battery layout

1 Installation



Warning: after assembly there is a voltage of 96V on each level.

- Insert the trays and fix them with the screws.
- Connect the battery blocks of the various levels to the IB battery switch, and the IB to the terminals, as shown in fig. 1.16.10.



Ensure appropriate ventilation of the battery room according to the standard EN50091-1, to prevent the risk of an explosion.

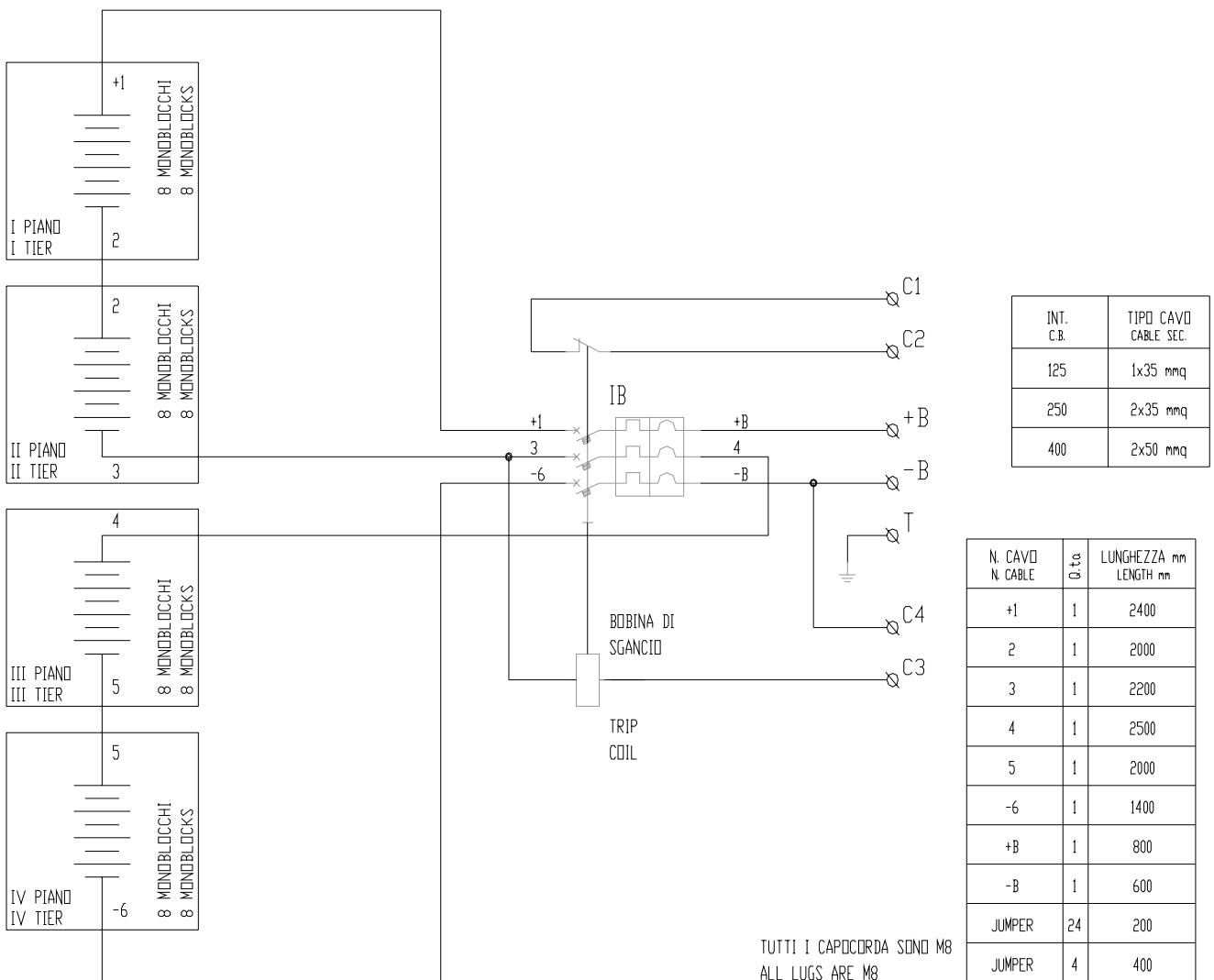
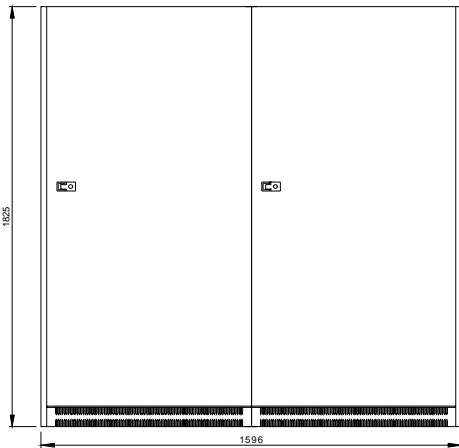


FIG. 1.16.10 BC4H internal electrical connections

1 Installation

1.16.7 BC4HD Battery Cabinet Installation (64 Monobloks 6V)



BC4HD Dimendions:

Height 1825 mm Weight of Empty Cubicle 376kg
 Width 1596 mm
 Depth 925 mm

To assemble the battery cabinet:



Important: Open the IB battery switch before connecting the cables.

- Remove the screws that fix the trays.
- Extract the trays of the battery cabinet.
- Place eight battery blocks on the left and right trays of the first, second, third and fourth level.
- Interconnect the blocks in series (block 1 / negative pole ==> block 2 / positive pole, according to the diagram on next page).



Warning: The nominal voltage of the monoblocks must be 6V (in fact $64 \times 6 = 384V$ (nominal voltage))

TIPO DI CAVO CABLE TYPE	LUNGHEZZA Length	QUANTITA' Quantity
A	170 mm	48
B	400 mm	8

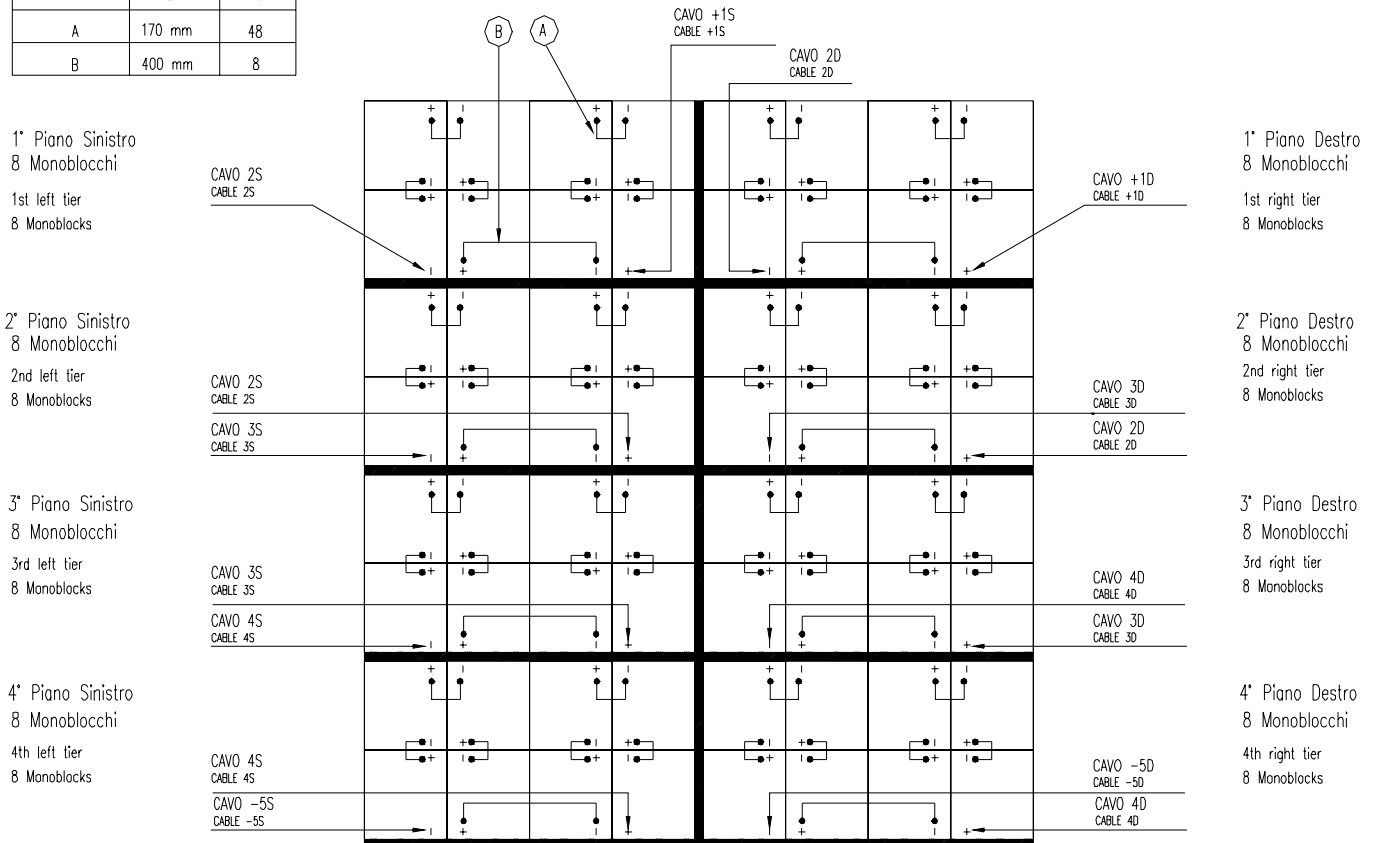


FIG. 1.16.11 BC4HD Battery layout

1 Installation



Warning: after assembly there is a voltage of 48V on each level of left and right tiers.

- Insert the trays into the battery cabinet and fix them with the screws.
- Connect the battery blocks of the various levels to the IB battery switch, and the IB to the terminals, as shown in fig. 1.16.12.



Ensure appropriate ventilation of the battery room according to the standard EN50091-1, to prevent the risk of an explosion.

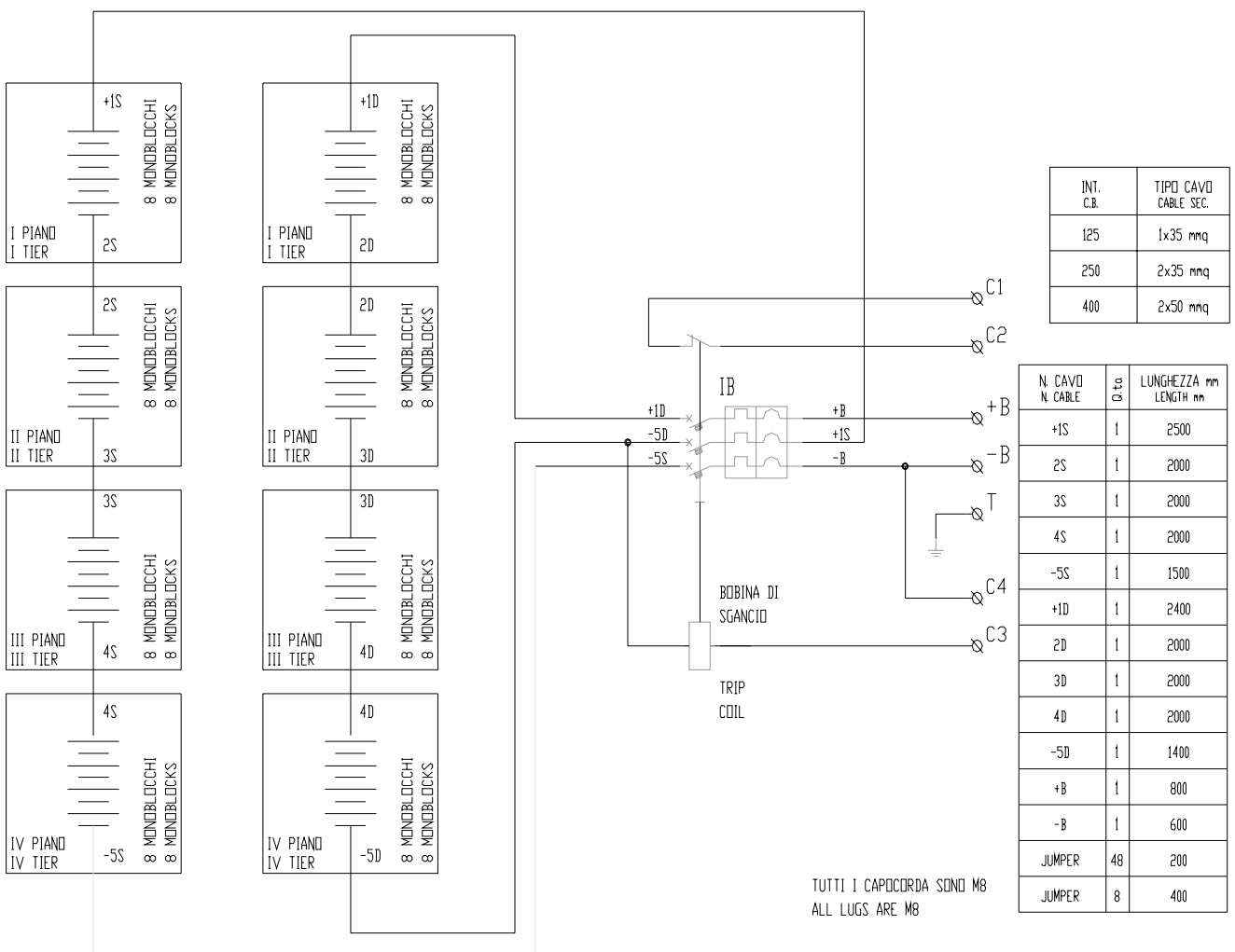


FIG. 1.16.12 BC4HD internal electrical connections

1 Installation

1.16.7.1 BC4HD-2x32 Battery Cabinet Installation (64 Monobloks 2x32 12V)

See the battery layout and dimension of BC4HD battery cabinet



Important: Open the IB battery switch before connecting the cables.

- Remove the screws that fix the trays.
- Extract the trays of the battery cabinet.
- Place eight battery blocks on the left and right trays of the first, second, third and fourth level (see fig. 1.16.11 on previous page).
- Interconnect the blocks in series for both strings (block 1 / negative pole ==> block 2 / positive pole and than connect the strings in parallel according to the diagram below.



Warning: after assembly there is a voltage of 96V on each level of the left and right tiers.

- Insert the trays into the battery cabinet and fix them with the screws.
- Connect the battery blocks of the various levels to the IB battery switch, and the IB to the terminals, as shown in fig. 1.16.12.1.



Ensure appropriate ventilation of the battery room according to the standard EN50091-1, to prevent the risk of an explosion.

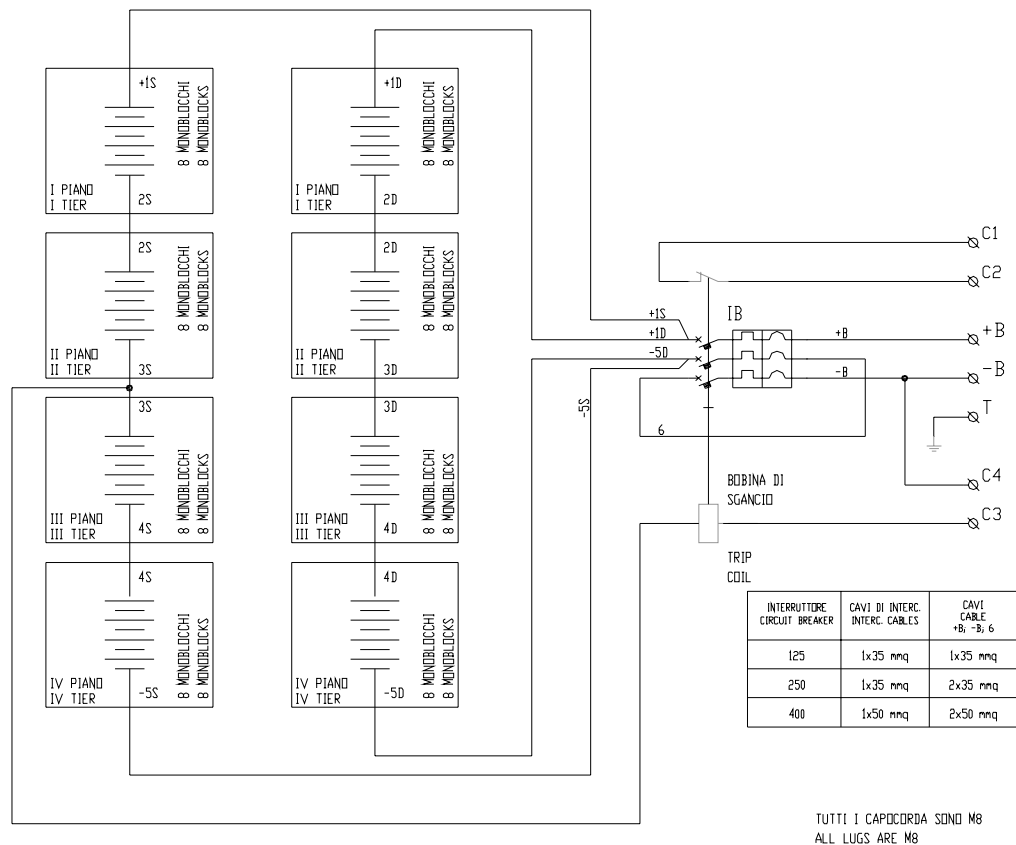


FIG. 1.16.12.1 BC4HD 2X32 internal electrical connections

1.17 Connection between UPS and Additional Battery Cabinets

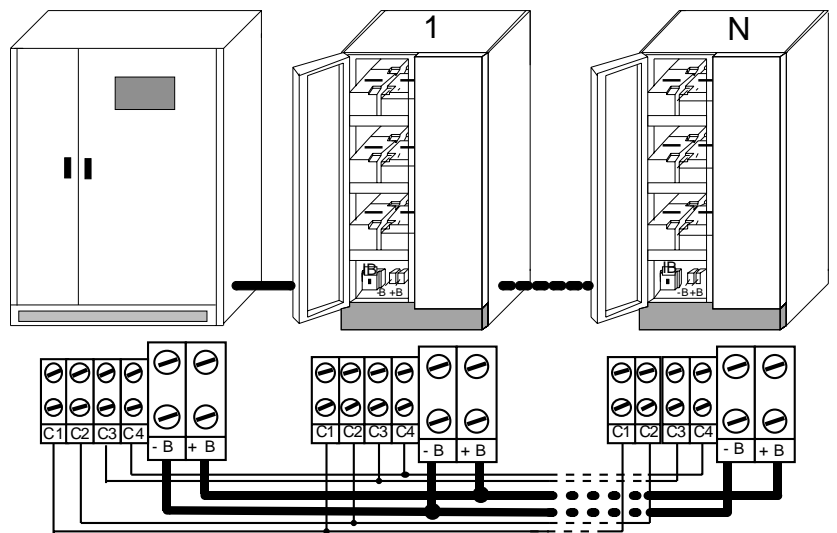


FIG. 1.17.1 UPS with additional battery cabinet

For the standard battery cabinet, the terminals C1, C2, C3 and C4 are connected to the corresponding terminals in the UPS cabinet as in FIG. 1.17.1.

If a battery is installed without standard cabinet(s), then a voltage-free auxiliary contact (normally closed) should be provided, along with a dc shunt trip circuit, for the battery circuit breaker / fuse switch. The auxiliary contact is connected to the terminals C1 and C2. The shunt trip circuit is connected in series with C3 and C4 and the appropriate number of batteries in order to achieve the rated shunt trip coil voltage.

2 Initial Start-Up

2.1 Initial Start Up Procedure

General With the Start Up procedure the correct installation of the UPS according to the previous section is checked. It must be carried out by specialised personnel.



Safety precautions according to the appropriate local safety standards must be applied.

Should problems arise during the Start Up Procedure, call for service assistance.

Preparation For carrying out the Start Up Procedure, a 3 1/2 digit voltmeter with 1% accuracy, an AC/DC clip-on ammeter and a small screwdriver for potentiometers are needed.

The installation of the UPS must have been carried out according to the previous section.

- Check that the ventilation system of the UPS room is ready to operate.
- Check that all switches IRP, IRE, IUG, IBY, IB are open and the load is off.



Check that the connectors on the backpanel control boards IBYBP-CP and RBPHC16 are completely inserted before starting unit.

Particular care should be given to green type connectors (pitch 5,04mm.)

A: Rectifier Power Supply Check

- Switch on the external mains supply to the UPS.
- Check that the supply voltage at terminals 1-L1, 1-L2, 1-L3 is within $\pm 10\%$ of the UPS rated voltage.
- Close **IRP**.

? *Does the display on the **CPHC16 -R** pcb for the rectifier give the indication "P"?*

yes The phase rotation at the input is incorrect.

- Open **IRP**, switch off the external mains supply and exchange any two of the cables at input terminals 1-L1, 1-L2, 1-L3.
- Return to **A**.

no The rectifier input voltage is o.k. and the rectifier will automatically start to operate.

- Wait until the Front Panel is illuminated
- Push the button PB2 on the top of ICP board
The inverter will start and after approximately 10s the green led "INV ok" will be lit permanently.
- Press the push-button PB3 on the bottom of ICP card:
after a few seconds the three green leds on the SS/FY card will be lit.

NOTE: If the battery switch indication is not on then the connections to C1 and C2 in the battery cabinet are not correct. Refer to the section "Installation".

- On the SS/FY pcb, measure the voltage at the Inverter R, Inverter S, Inverter T screws with respect to the neutral terminal 5-N.

? *Does this voltage correspond to the desired voltage?*

- no**
- Adjust the voltage to the desired value individually for each phase using P3, P4 and P5 on the ICT-2 pcb.
NOTE: If the inverter output voltage is changed, the value at TP1 (adjusted with P1) on the ICP pcb should be checked. (6V corresponds to nominal voltage). Note also that for parallel systems, if the voltage is changed here, the current sharing will also be affected. Therefore, change the voltage settings **ONLY IF ABSOLUTELY NECESSARY**. Small variations of the voltage will not affect the system performance. The UPS is already pre-calibrated in the factory with nominal load.

yes • Continue with C

C: Inverter free-run frequency check

- Insert a pin d=2mm in the red test point S1 on the ICP pcb. The red LED LD3 on the ICP pcb must be lit permanently. The inverter frequency is now free-running without the internal oscillator.
- On the SS/FY pcb, measure the inverter frequency on the Inverter R, S or T screws with respect to neutral.
- Check that the frequency is set at the required value (50/60 Hz +/- 0,1 Hz). It can be adjusted with P1 on the ICT-2 pcb. Remove the pin from S1. The inverter now synchronises with the internal oscillator.

D: Battery Installation Check

- Make sure that the batteries have been installed according to the instructions for installation.

With an external battery cabinet BC4S:

- Measure the battery voltage in the battery cabinet at the battery switch between cables:
+1 (+) and 3 (-) nominal +192
4 (+) and -6 (-) nominal +192

With an external battery cabinet BC4L:

- Measure the battery voltage in the battery cabinet at the battery switch between cables:
+6 (-) and 4 (-) nominal +240
3 (+) and -1 (-) nominal +144

With an external battery cabinet BC4D:

- Measure the battery voltage in the battery cabinet at the battery switch between cables:
- +1D (+) and -5D (-) nominal +192
- +1S (+) and -5S(-) nominal +192

With an external battery cabinet BC4D-2x32:

- Measure the battery voltage in the battery cabinet at the battery switch between cables:
- +1D (+) and -5D (-) nominal +384
- +1S (+) and -5S(-) nominal +384

2 Initial Start-Up

With an external battery cabinet BC4H:

- Measure the battery voltage in the battery cabinet at the battery switch between cables:
+1 (+) and 3 (-) nominal +192
4 (+) and -6 (-) nominal +192

With an external battery cabinet BC4HD:

- Measure the battery voltage in the battery cabinet at the battery switch between cables:
+1S (+) and -5S (-) nominal +192
+1D (+) and -5D (-) nominal +192

With an external battery cabinet BC4HD-2x32:

- Measure the battery voltage in the battery cabinet at the battery switch between cables:
+1D (+) and -5D (-) nominal +384
+1S (+) and -5S (-) nominal +384

? *Does this voltage have positive polarity?*

- no**
- Open **IRP**, **wait for 5-10 minutes**, and then reconnect the battery cables at the terminals which lead to the switch(es) where the wrong polarity was detected.
 - Return to **D**.

- yes**
- Check the voltage between the battery terminals B+ and B-.

The value of this voltage should already be set according to the amount of batteries installed and it must be between 380Vdc and 420Vdc.

- Close battery switch **IB**.

The alarm "battery switch open" stops.

E: Bypass Power Supply Check

- If your unit has separate supplies for rectifier and bypass (terminals 4-L1, 4-L2, 4-L3, 4-N), switch on the external supply for the bypass. Check that the bypass supply voltage at terminals 4-L1, 4-L2, 4-L3, 4-N is within $\pm 10\%$ of the nominal input voltage.

If there are no separate input terminals then the bypass input is the same as that checked previously for the rectifier input.

- Close **IUG**.
- Close **IRE**.

? *Does the display on the **CPHC16 -S** pcb for the bypass give the indication "P"?*

- yes**
- Open **IRE** and exchange any two of the cables at the bypass input terminals 4-L1, 4-L2, 4-L3.
 - Return to **E**.

- no**
- Are the status LEDs (green) for the bypass line on the operating panel continuously on?

no: Check that the mains frequency is in tolerance.

OK?

yes: Is the pcb CPHC16 -S for the bypass correctly functioning? The display should be rotating clockwise.

no: Call for service assistance.

yes: Check the input supply again. Check that it is in accordance with the UPS rating label.

no: The mains frequency must be within tolerance in order for the bypass to be available

yes: Continue with **F**.

F: Synchronisation Check

- Check that the green LED LD1 on the ICT-2 pcb is lit permanently and there is no "**S**" indication on the bypass electronics.
- On the SS/FY pcb, measure the voltage between the screws Bypass R and Inverter R. Then repeat for the other two phases.

? *Are the voltages < 25Vac?*

- no**
- If the voltage is continuously fluctuating from 0 to 400V there is a synchronisation problem. Switch off IRE and call for service assistance.

If the voltage is slightly higher but relatively constant and the default values have been re-entered using the serial interface on the CPHC16 -S p.c.b., then the synchronisation may need to be readjusted. This can be easily confirmed by comparing the two sinewaves for a possible phase difference.

Are the two waveforms phase-shifted?

yes: The synchronisation must be readjusted using the serial interface of the CPHC16 -S pcb and the PSRS232 and a portable computer.

no: The difference is probably due to distortion of the mains voltage (the inverter voltage is an almost perfect sinewave)

Continue with **G**

yes: Continue with **G**

G: Static Switch Commutation Check

- **COMMUTATION TO THE BYPASS**

Press the push-button on the CPHC16 pcb for the bypass. The SSB static switch will switch on and SSI will switch off, as indicated on the front panel and on the SS/FY pcb (red LEDs).

- **COMMUTATION TO INVERTER**

2 Initial Start-Up

Press the pushbutton PB3 at the bottom of the ICP pcb. The static switch SSI will switch on and the SSB will switch off, as indicated on the front panel and the SS/FY pcb (green LEDs).

Commutations to/from the bypass and inverter may also be performed using the Test Menu of the Smart Front Panel.

H: Battery Charging Current Limitation Check

- Connect the load and open **IRP**.

The load is now supplied only by the batteries.

- Discharge the batteries for about 2 minutes at nominal UPS load or longer if the connected load is smaller than nominal UPS load
- Close **IRP** again.
- After 30 seconds, measure the battery voltage.

? *Is the battery voltage lower than the set floating charge voltage?*

no The rectifier is not yet in battery current limitation. In order to check the battery current limitation you must discharge the batteries for a longer period.

- Return to **H**.

yes The battery current limitation can now be checked according to the battery installed. Standard setting is 10% of the battery capacity.

- Measure the battery recharging current with a dc clip-on ammeter.

? *Is this approximately 10% of the battery Ah capacity?*

yes

Goto I

no Check the settings of the dipswitch S1 on the CPHC16 -R pcb for the rectifier according to following table. If the requested value is not included in the following table the battery charging current may be adjusted using the RS232 connector on the CPHC16-R pcb and a portable computer. This must be performed by first discharging the battery by switching the IRP off, connecting the PC and adjusting the charging current. **The battery must remain connected throughout the procedure.**

Battery Charging Current Limitation: Valid for:
 EPROM R_12p.bin V.2.0 or later (UPS size 10-120kVA)
 EPROM ERC.bin V.1.0 or later (UPS size 160-250kVA)

BATTERY CHARGING CURRENT LIMITATION (A) S4000												Dip configuration		
10	15	20	30	40	60	80	100	120	160	200	250	Dip 6	Dip 7	Dip 8
1.5	1.5	2	3	4	6	8	10	12	20	20	25	OFF	OFF	OFF
2.25	2.25	3	4.5	6	9	12	15	18	30	30	37,5	OFF	OFF	ON
3	3	4	6	8	12	16	20	24	40	40	50	OFF	ON	OFF
4.5	4.5	6	9	12	18	24	30	36	60	60	75	OFF	ON	ON
6	6	8	12	16	24	32	40	48	80	80	100	ON	OFF	OFF
7.5	7.5	10	15	20	30	40	50	60	100	100	125	ON	OFF	ON
9	9	12	18	24	36	48	60	72	120	120	150	ON	ON	OFF
CUSTOM*														
12	12	16	24	32	48	63	79	95	158	158	190	ON	ON	ON

TAB. 2.1 Battery charging current limitation

(*) Note: Maximum value on custom mode.

Warning: Do not change the settings of the dipswitches from 1 to 5; this impair proper operation of the system

- Return to H.

I: Date & Time Setting

- **Clear alarm memory**

Enter the alarm memory, a stack of the last 100 alarms, by pressing F2 followed by F4 from the "4) Alarms" Menu. The entire alarms memory must be deleted by pressing F3 followed by the F1 keys.

- **Date and clock adjustment**

Enter the "7) Test" Menu (PW 8031) and select "7) clock", then each item (DD-MM-YYYY, hh:mm:ss) can be selected with the cursor keys "<" and ">". The values can be adjusted using the "up" or "down" keys. To store the adjustment, press the "ENTER" key, otherwise the date and time remain unchanged.

END THE START-UP PROCEDURE FOR A STAND-ALONE UNIT HAS BEEN SUCCESSFULLY COMPLETED NOW.

3 Additional Start-Up Proced. for Multi-Unit Systems

3 ADDITIONAL START-UP PROCED. FOR MULTI-UNIT SYSTEMS

3.1 Start-Up Procedure for Hot -standby Systems

Repeat the procedure of section 2 for the second unit in the system (with the first unit off).



Ensure that the interconnecting BUS cable is connected according to section 1.15.1 and FIG 1.15.4.

- J**
- Switch off the inverter at the second unit with PB2 at the top of the ICP pcb. The unit will transfer to the bypass supply.
 - Switch on IRP of the first unit.
 - Ensure that the IUG switch of this unit is off.
 - Switch on IRE of the first unit.
- After approx. 10 seconds the display will flash with a "U" indication and the SSB static bypass switch will be closed.
- Measure across the IUG output switch from input to output of each phase.

? *Is this voltage less than 2V a.c for all three phases?*

no The output power interconnections are incorrect and must be reconnected correctly. Switch off both units and the mains supply and recheck the connections. Return to **J**

yes Continue

- Close the IUG of the first unit. The two static bypasses (SSB) are now connected in parallel.
- Close the battery switch of the first unit.
- Start the unit by pressing "START" on the front operating panel. When the inverter is synchronised, the unit will transfer the inverter to the output (SSI closes and both SSB switches switch off).
- Press "START" on the operating panel of the second unit.

The inverter will start and become ready (check that the green LED LD6 on the ICP pcb is illuminated) but the SSI static switch will not close.

- Check the commutation of the inverters by pressing PB2 at the top of the ICP pcb on the unit currently with the SSI closed.
- Restart the inverters (with PB2 on ICP or with "START").

3 Additional Start-Up Proced. for Multi-Unit Systems

Clear alarm memory Enter the alarm memory, a stack of the last 100 alarms, by pressing F2 followed by F4 from the "4) Alarms" Menu. The entire alarms memory must be deleted by pressing F3 followed by the F1 key. Repeat for all the units.

Date and clock adjustment Enter the "9) Test" Menu (PW 8031) and select "7) clock", then each item (DD-MM-YYYY, hh:mm:ss) can be selected with the cursor keys "<" and ">". The values can be adjusted using the "up" or "down" keys. To store the adjustment, press the "ENTER" key, otherwise the date and time remain unchanged. Repeat for all the units.

THE SYSTEM IS NOW IN NORMAL OPERATION AND THE **HOT-STANDBY** START-UP HAS BEEN SUCCESSFULLY **COMPLETED**.

Note: If an external output switch is added for each unit, it must include two auxiliary contacts connected as the IUG auxiliary contacts are connected inside each unit. Open every external output switch after opening the relative internal IUG and close it before closing IUG

3 Additional Start-Up Proced. for Multi-Unit Systems

3.2 Start-Up Procedure for Parallel Systems

Repeat the procedure of section 2 individually for all units in the system, with the other units off.

Note: If the BUS cables were connected before the start-up of each unit individually, it is possible that erroneous alarms are displayed or the EPO command is activated. This condition is not possible if the interconnecting cables are disconnected.



Connect the BUS cables according to section 1.15.1 and FIG 1.15.4.

- Open IRP, IRE, IB and IUG of the last unit checked with the procedure in section 2.
- K**
- Ensure that no load is connected to the system output.
 - Ensure that all IUG switches are open.
 - Switch on the IRE switches of all units. Wait until all units give a flashing "U" indication on the display of the CPHC16-S pcb.
 - Close IRP of all the units and press RESET on all the units.
 - When the front operating panel is initialised on all units (after 3 beeps), close the battery switches of the respective units.
 - Close the IUG of unit 1. At each unit in turn:
 - Measure across the IUG output switch of the next unit from input to output of each phase.
- ?** *Is this voltage less than 2V.a.c for all three phases for every unit?*
- no** The output power interconnections are incorrect and must be reconnected correctly. Switch off all units and the mains supply and recheck the connections.
Return to **K**
- yes**
- Close the IUG of this unit and proceed with the following unit until all IUG are closed.
 - The static bypasses (SSB) will now be connected in parallel for all units.
 - Press the "START" push-button on any one unit. The inverter will start and when synchronised to the bypass supply, transfer to the system output and all static bypass switches (SSB) will open.
 - Press the "START" push-button on each successive unit in the system, each time checking that the SSI closes on the unit and that the system operates in parallel operation.
 - Commutations to the bypass/inverter supplies may be checked by pressing the pushbutton on the CPH16 -S pcb and PB3 at the bottom of the ICP pcb.
 - Apply a load to the UPS system and check for correct sharing of the load currents on each phase. If stand-alone units have been converted for parallel operation, the current sharing needs to be checked and is best performed with a load as close as possible

3 Additional Start-Up Proced. for Multi-Unit Systems

to the nominal load. Measure the currents at the output of each module on phase T. If this current varies by more than $\pm 1\%$ for this module, fine adjustment can be made with P1 on the IPR pcb.

Check the currents at the output of each module on phase S. These currents must be balanced to within $\pm 1\%$ by finely adjusting the inverter voltage of phase S (P4 on ICT-2). i.e. If the module is supplying more current than the system average, the inverter voltage of this module must be reduced slightly. Repeat for phase R currents by finely adjusting the R phase inverter voltage of this module with P3 on the ICT-2 pcb until the currents on the phase R of all modules are equal to within $\pm 1\%$.

Clear alarm memory Enter the alarm memory, a stack of the last 100 alarms, by pressing F2 followed by F4 from the "4) Alarms" Menu. The entire alarms memory must be deleted by pressing F3 followed by F1 key. Repeat for all the units.

Date and clock adjustment Enter the "9) Test" Menu (PW 8031) and select "7) clock", then each item (DD-MM-YYYY, hh:mm:ss) can be selected with the cursor keys "<" and ">". The values can be adjusted using the "up" or "down" keys. To store the adjustment, press the "ENTER" key, otherwise the date and time remain unchanged. Repeat for all the units.

- THE SYSTEM START-UP HAS NOW BEEN SUCCESSFULLY COMPLETED.

Note: If an external output switch is added for each unit, it must include two auxiliary contacts connected as the IUG auxiliary contacts are connected inside each unit. Open every external output switch after opening the relative internal IUG and close it before closing IUG