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INGENIO PLUS

60 ÷ 160 kVA

PRODUCT GUIDE

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					OML46009		

- The present manual is an integrant part of the products technical back-up documentation. Read the warnings with attention, as they give important instructions concerning safe usage.
- This equipment must be used only for its appointed operation. Any other use is to be considered incorrect and therefore dangerous. The manufacturer cannot be held responsible for damages caused by incorrect, wrong and unreasonable use.
- Borri holds itself responsible only for the equipment in its original configuration.
- Any intervention that alters the structure or the operating cycle of the equipment must be carried out and authorized directly by Borri.
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Contents

SCOPE

The scope of the present document is provide an overview of the product and its main technical characteristics, including the basic information about the installation, the connectivity and the available options.

The document is addressed to anybody needing a collection of information about the product, with specific reference to the installation. In case such information is not adequately comprehensive we suggest to consult the technical documentation listed at the chapter "References".

1 REFERENCES

1.1 Standards

The equipment described in this document are CE-marked in compliance with the following European Directives:

- 2006/95/CE Low Voltage Directive
- 2004/108/CE Electromagnetic Compatibility Directive

They are also manufactured in compliance with the following International Standards:

- EN 62040-1 General and safety requirements for UPS
- EN 62040-2 Electromagnetic compatibility (EMC) requirements
- EN 62040-3 Method of specifying the prescriptions and test requirements

1.2 Product technical documents

The present guide refers to the product technical documentation, which is listed below, where the detailed information about the topics covered can be found.

- OML46006 Technical specification
- OML46002 Operating manual

2 RANGE

The ***INGENIO PLUS*** uninterruptible power supplies are on-line, double conversion, without insulation transformer on the inverter line (transformer-free). They are designed to guarantee the highest reliability for the supply and protection of critical equipment in the most diverse applications, from the ICT and telecommunications to process industry, emergency and safety systems and medical equipment.

The ***INGENIO PLUS*** series is characterized by high efficiencies, which can be obtained thanks to the use of the ***Green Conversion*** algorithm. Besides the electrical efficiency the ***Green Conversion*** allows to optimise and maximise the battery efficiency and its expected lifetime,

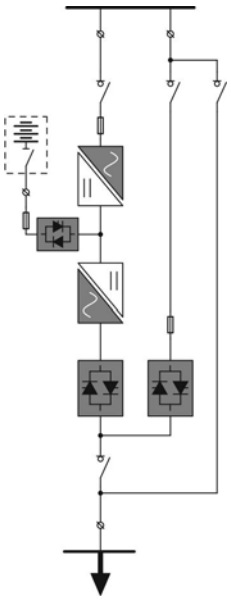
totally eliminating the voltage ripple and the floating charge micro-currents, through intermittent charging cycles, that are controlled by a specific algorithm.

The UPS's of the ***INGENIO PLUS*** series are available in a power range from 60 to 160 kVA and supplied in three-phase/three-phase configuration. They can provide an underated active output power compared to the rated apparent power (***kW = kVA***).

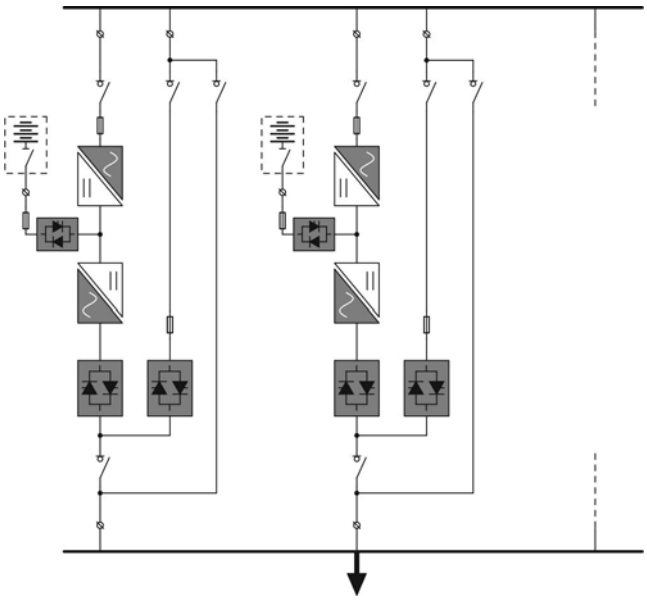
INGENIO PLUS		**60**	**80**	**100**	**125**	**160**
Rated output apparent power	[kVA]	60	80	100	125	160
Rated output active power	[kW]	60	80	100	125	160

2.1 Configurations

INGENIO PLUS can be supplied either in stand-alone configuration or in parallel up to 6 units for power increase or N+1 redundancy. Each single UPS unit is provided with its internal maintenance bypass switch.



Stand-alone configuration



Parallel configuration

3 FUNCTIONALITIES

3.1 Standard electrical functionalities

- LCD user interface with flow diagram
- Separate AC input for rectifier and bypass
- Internal maintenance bypass switch
- Internal batteries for ***INGENIO PLUS*** 60-80 kVA
- Internal sectioning of the neutral conductor for maintenance purposes
- Detection circuit for backfeed protection
- ***Green Conversion***

3.2 Optional electrical functionalities

- User interface with touch screen graphic display
- Bypass circuit breaker with tripping coil for backfeed protection
- Thermal probe for thermal compensation of the charging voltage
- External battery cabinet
- Insulation transformer
- Parallel kit

3.3 Standard connectivity equipment

- RS232 communication port for programming and service

3.4 Connectivity options

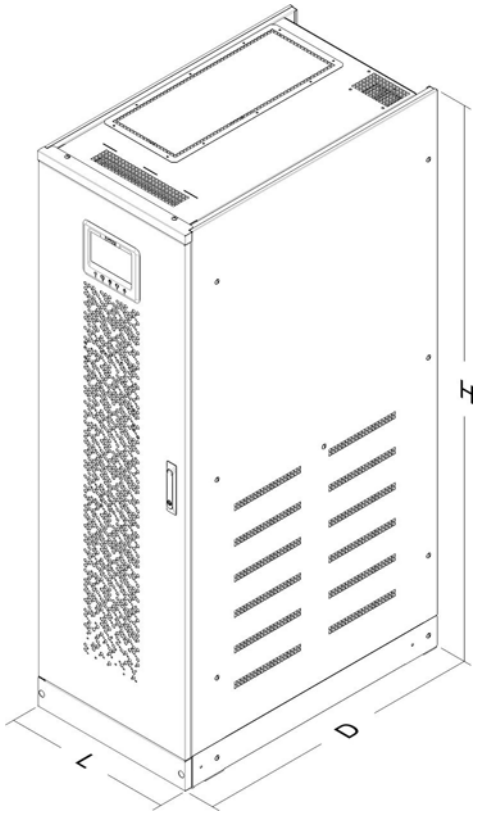
- Voltage-free contact card for status and alarms
- RS485 (ModBus RTU) communication port
- SNMP adapter

4 MECHANICAL INSTALLATION

4.1 Mechanical data

The devices are designed to reduce the direct and indirect clearances as much as possible; the installation against a wall is possible for all the range, as well as the side-by-side positioning for all the units without internal batteries (100÷160 kVA).

The accessibility to both the operating parts and the communication interfaces is from the front of the unit, as well as the access to all the internal components for maintenance / repair operations. The batteries can only be removed from the side; for such reason the 60-80 kVA UPS's must be positioned in such a way to leave at least one accessible side, preferably the right hand side.



Dimensions, weights and static loads						
INGENIO PLUS		60	80	100	125	160
Length (L)	[mm]	560				
Depth (D)	[mm]	940				
Height (H)	[mm]	1800				
Weight w/o batteries	[kg]	250	300	320	360	380
Maximum weight with batteries	[kg]	800	850	-	-	-
Static load w/o batteries	[kg/m^2]	490	590	630	710	750
Static load with batteries	kg/m^2	1570	1670	-	-	-

4.2 Batteries

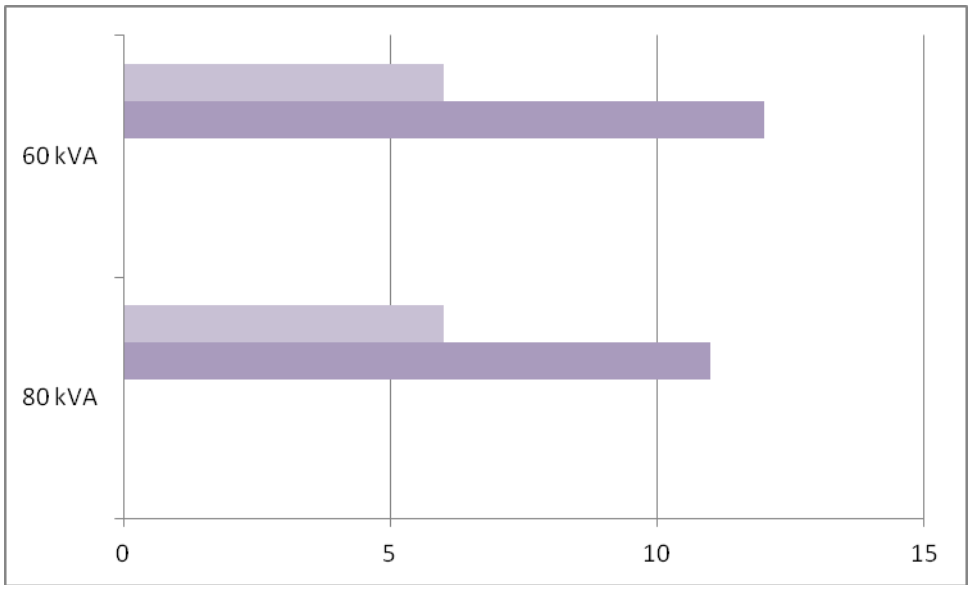
INGENIO PLUS is equipped with internal batteries for the 60 kVA and 80 KVA range, with which typical autonomies up to 12 minutes for the 60 kVA and 11 minutes for the 80 kVA can be reached.

For higher ranges and for longer autonomy times external battery cabinets are available. I order to limit the spaces the batteries are arranged in specific trays, optimized on the basis of the batteries' overall dimensions.

For extended autonomies the use of the ***DCM*** (*Dynamic Charging Mode*) function allows the battery recharge without the need for additional battery-charger devices.

INGENIO PLUS uses the ***Green Conversion*** operating algorithm, which allows to maximise the battery expected lifetime by means of the cyclic intermittent charging, at the same time guaranteeing its full availability and efficiency.

4.2.1 Autonomy table (minutes) with internal batteries



4.3 Ventilation

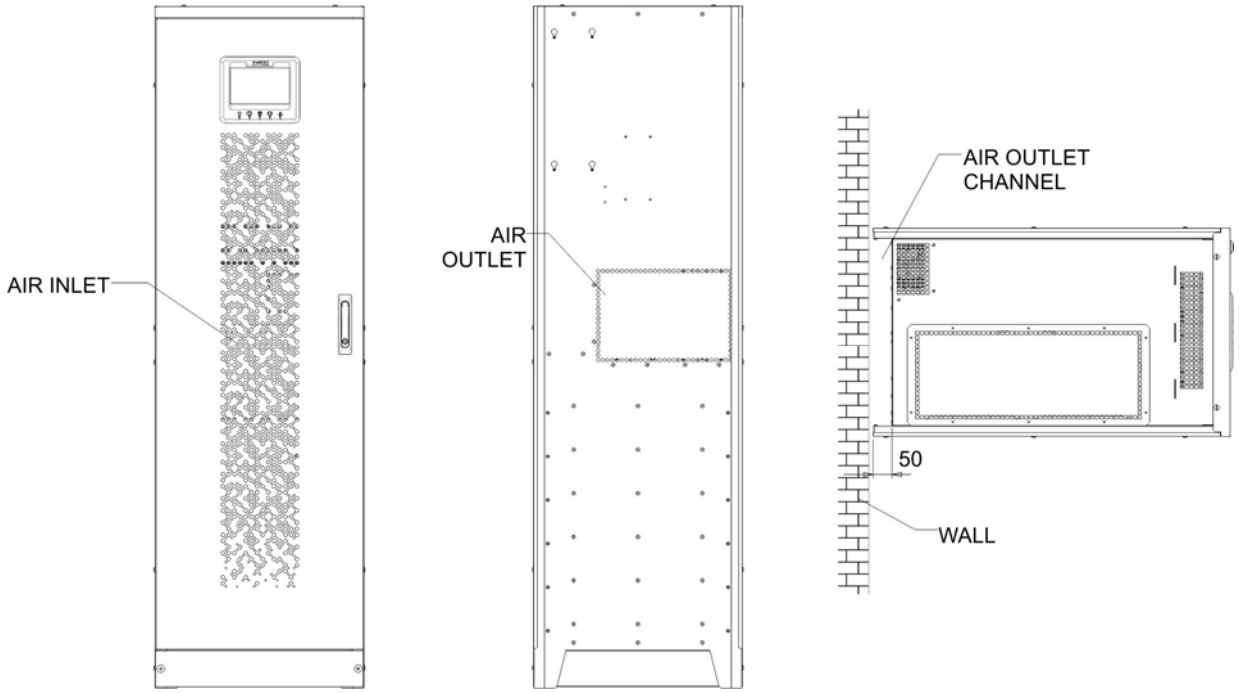
During the operation the UPS needs a continuous air exchange to guarantee proper operating conditions for the cooling fans.

Ventilation of the installation place						
INGENIO PLUS		60	80	100	125	160
Air volume	[m^3/h]	1000	1200	1200	1500	1500

Such exchange can be ensured by openings through which the air could naturally flow, or either by means of forced introduction of fresh air or forced removal of the hot air produced by the unit.

In these cases the ventilation devices (air delivery and pickup) must be positioned in order to guarantee the correct air flow. The cooling air enters the ***INGENIO PLUS*** UPS from the front and is expelled towards the back.

The UPS can be leaned against a wall anyway, since the air which is expelled to the back side can naturally flow towards the top thanks to the dedicated channel, which is present on the back of the cabinet.



5 ELECTRICAL INSTALLATION

5.1 Rated currents

The values of the equipment's absorbed and supplied rated currents are given with the purpose of calculating the supply lines and the related protection devices.

Rated currents						
INGENIO PLUS		60	80	100	125	160
Rectifier input (1)	[A]	109	140	170	214	267
Bypass input (1) (2)	[A]	87	115	144	180	231
UPS output (1) (2)	[A]	87	115	144	180	231
Battery (3)	[A]	100	133	166	208	266

(1) At 400 Vca rated voltage

(2) Refer to the technical specification for the overload values

(3) At the minimum discharge voltage

5.2 Protection devices

The protection devices listed in the following tables are those suggested on the basis of the rated currents which flow in the equipment input and output electrical lines. They do not take into account design variables such as the length of the cables, or possible over-ratings due to specific design prescriptions.

Protection devices – Rectifier input						
INGENIO PLUS		60	80	100	125	160
Automatic circuit breaker	[A]	125	160	200	250	320
Fuse, gG type	[A]	125	160	200	250	315
RCD (1)	[mA]	> 300 (selective)				

Protection devices – Bypass input						
INGENIO PLUS		60	80	100	125	160
Automatic circuit breaker	[A]	125	160	200	250	320
Fuse, gG type	[A]	125	160	200	250	315

(1) The RCD must be selective with the residual current protections installed in the load feeders. Use a single RCD for both the rectifier and bypass lines.

5.2.1 Backfeed protection device

The UPS is equipped with terminals where a normally open contact is connected. The contact closes when a voltage backfeed towards the bypass line, due to a device internal failure, is detected. Such contact can be used to command the tripping coil of the bypass line protection device. A 230 Vac voltage, coming from the UPS output, is present on the contact, therefore the tripping coil must be provided with such characteristic.

With regard to the protection device rated data, refer to the previous table.

5.3 Terminals and cables section

The detail data listed in the following table are indicative only. The cables design take into account the nominal carrying capabilities according to the CEI-UNEL35024/1 table, as regards to copper cables with PVC insulation sheath and maximum operating temperature of 70° C, without applying any de-rating factor. The cross sections do not take into consideration the overload factors allowed by each line, for which refer to the product Technical Specification.

In case of either different operating temperatures or installation conditions, apply the corrective factors specified by the regulations in force.

Suggested cables cross sections (1)						
INGENIO PLUS		60	80	100	125	160
Rectifier input	[mm^2]	35	50	70	70	95
Bypass input	[mm^2]	35	50	70	70	95
UPS output	[mm^2]	35	50	70	70	95
Battery	[mm^2]	25	35	50	70	95
Neutral (2)	[mm^2]	35	50	70	70	95
Earth (PE)	[mm^2]	16	25	35	35	50

Terminals						
INGENIO PLUS		60	80	100	125	160
Type		Screw terminal				
Conductor max cross section (3)	[mm^2]	35	70		95	
Max number of conductors		1				
Tightening torque	[Nm]	4 ÷ 4,5	7 ÷ 8		15 ÷ 20	

(1) The cross section is referred to the single phase conductor.

(2) In case of highly distorted load over-rate the neutral conductor by about 50%.

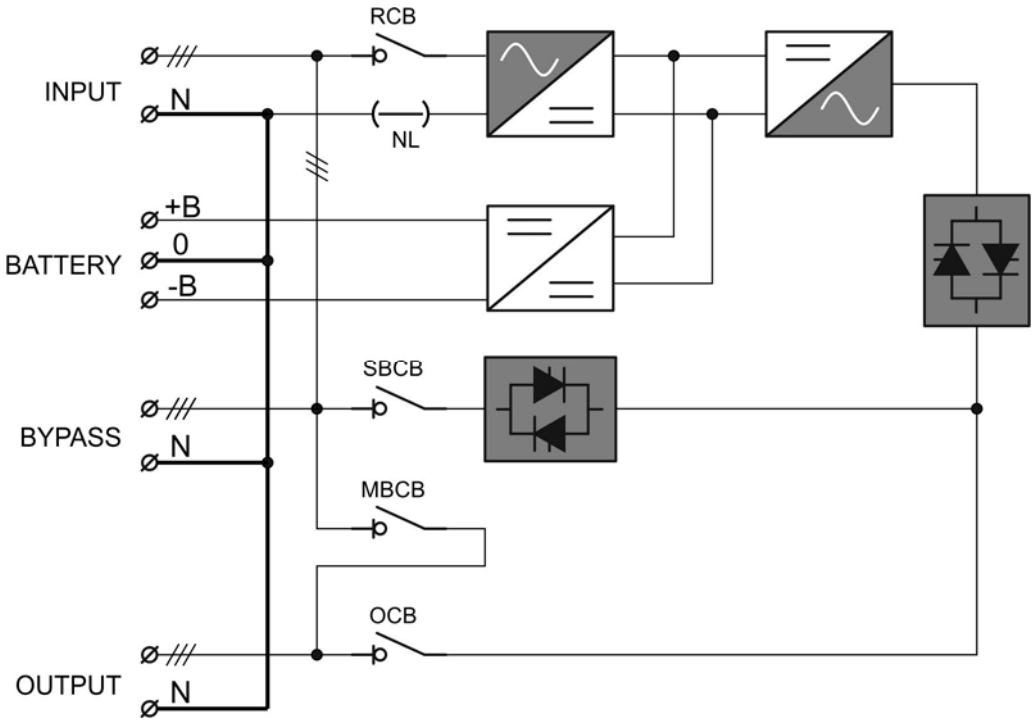
(3) Flexible and rigid cable

5.4 Connection of the neutral and earthing

The ***INGENIO PLUS*** UPS's are not provided of inverter transformer, so they have no galvanic isolation between input and output.

The insertion of the UPS in an electrical installation do not modify the earthing system, since the neutral conductor is directly connected between the input and the output. A sectioning device allows the interruption of the neutral conductor connection towards the inside of the UPS, leaving the input/output connection unaltered, in order to guarantee a safe access in case of repair or maintenance works.

INGENIO PLUS can be equally used in plants having *TN*, *TT* or *IT* earthing system.



6 SOFTWARE-ENABLED FUNCTIONS

6.1 Diesel mode operation (DIESEL MODE)

The *DIESEL MODE* operation is triggered by a closing contact, which signals when the diesel generator is running. Upon restart the rectifier will work with a reduced DC voltage, in order not to recharge the battery. In this way there is energy saving during the temporary operation under diesel generator.

6.2 Rectifier soft-start programming (*walk-in*)

The duration of the rectifier start-up ramp (*walk-in*) can be extended up to 30 seconds, with the purpose of decreasing the current absorption gradient and consequently reduce the disturbances on the diesel generator.

6.3 Rectifier delayed start-up programming (*hold-off*)

The rectifier start-up can be delayed up to 300 seconds. Such setting is important in plants with several UPS's supplied by the same AC source, being them in stand-alone or parallel configuration. Using a different delay for each device it will be possible to stagger the re-start, in order to reduce the impact on the diesel generator.

6.4 DCM mode (Dynamic Charging Mode)

The DCM algorithm allows to increase the maximum battery recharging current using the power that is not required by the load. The rectifier dynamically manages such recharging mode, supplying power to the load as a priority and saving the remaining available power for the battery.

Battery recharging current						
INGENIO PLUS		60	80	100	125	160
Maximum current	A	15	15	15	20	20
Maximum current with DCM	A	50				

6.5 Management of VFI / VFD (ECO) operating modes

The ECO mode can only be activated in stand-alone configuration. the load is constantly supplied by the bypass line and transferred to the inverter, as a secondary source, in case of mains outage or anomaly. The maximum break during the transfer is equal to 10 ms.

6.6 Frequency converter

The frequency converter mode allows to have an output voltage with a different frequency of the input's (50 Hz → 60 Hz, or 60 Hz → 50 Hz). With this operating mode the bypass line is disabled, being the synchronization with the inverter not possible to achieve.

7 CONNECTIVITY

The UPS has been designed taking particular care to the device interface with the external environment, taking into account the most used methods and protocols that allows the integration of the unit within complex control systems.

All the interfaces described below are installed in specific slots, which are accessible without removing the device's second access protections.

7.1 Remote alarm / status card

The card makes 5 UPS alarms / operating status available via voltage-free SPDT contacts. The maximum contact's current carrying capability is equal to 1 A, at a maximum voltage of 250 Vac or 30 Vdc.

7.2 RS232 serial interface

The RS232 serial interface is used for the connection with the programming and control software, and uses a proprietary communication protocol.

7.3 RS485 serial interface (ModBus RTU)

The RS485 interface makes all the UPS operating parameters, such as measures, status and alarms, available via ModBus RTU protocol. The interface card is provided with both a 3-pole terminal board (Data+ / Data- / GND) and a DB9-F connector

The ModBus RTU protocol is used for the purpose of real-time UPS monitoring by a data processing and managing centralized device.

The ModBus RTU interface can also be connected to the Borri Data Manager device, which is used to implement the Tele-service function.

7.4 SNMP adapter

The SNMP adapter makes all the UPS operating parameters available via TCP/IP (Internet Protocol).

The adapter is connected to the LAN (Local Area Network) and the UPS is thereby reachable through the network via the address assigned to the device, and using any web browser.

The SNMP adapter is mainly used for UPS remote monitoring; it can also use the e-mail services to send messages upon the occurrence of given events, which can be defined by the operator.

In addition, the SNMP adapter is used to be interfaced with the most used operating systems (Windows, Unix, etc.) in order to command the controlled shutdown of the servers as the battery autonomy end is approaching.

8 OPTIONS

8.1 Thermal compensation of the battery charging voltage

In order to optimize the sealed lead-acid batteries' (VRLA) performance and expected lifetime, the charging voltage must be varied as a function of the operating temperature.

Such compensation function is already integrated within the control, the proposed option provides for the supply of the thermal sensor already connected to the specific cable, having a maximum length of 15 meters.

It will be sufficient to place the sensor next to the batteries and connect the cable to the UPS, according to the instructions given in the installation manual. The rectifier will automatically vary the charging voltage if the batteries operating temperature, which is displayed in the front panel, differs from the reference value, equal to 20° C.

8.2 Parallel configuration kit

The parallel configuration kit allows to make a stand-alone unit ready for the parallel operation and consists of an interface card, which can be easily installed in a specific slot, parallel cable, having a length of 20 meters, and programming software for the operating parameters.

The installation of the kit and the system configuration can be directly carried out by electrical technicians, although it is advised to use the manufacturer's expertise and experience.

8.3 Load-sync for single units

The load-sync device consists of an additional interface board for each UPS, plus the communication cable between the units.

The *load-sync* mode allows the synchronization of the output voltage of two UPS systems connected to different distribution lines, and is generally used when a STS (Static Transfer Switch) is connected downstream of the devices, which can therefore work with two synchronous input sources.

In order to use such modality the bypass lines of the two UPS's must come from the same AC source.

8.4 Load-sync box for paralleled systems

The load-sync box device consists of wall-mounted box, containing all the hardware devices to control the synchronization between two paralleled UPS systems.

The *device* allows the synchronization of the output voltage of two paralleled UPS systems connected to different distribution lines, and is generally used for applications where a very high reliability is required (TIER III and IV data center configurations). A STS is generally connected downstream of the two systems.

8.5 Insulation transformer

The insulation transformer is used when it is required to have different earthing systems, one for the UPS supply line and a different one for the downstream load distribution.

It is also necessary when two independent sources for the rectifier and bypass supply, having separate neutral conductors, are used.

The transformer is installed inside an additional cabinet, integrated with supply circuit breaker and interconnection cables to the UPS. For units up to 100 kVA the insulation transformer can be installed inside the UPS cabinet. For 60 kVA and 80 kVA units it can be integrated internally in case the internal batteries are not provided.

8.6 Battery fused switch

The fused switch used for isolating the battery from the UPS is an accessory that must be provided for during the electrical plant design phase. The switch is installed inside a metal box, arranged for wall installation, and equipped with auxiliary contact for the signalisation of the switch open/closed status.