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INGENIO

30 ÷ 50 kVA



PRODUCT GUIDE

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- 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.
- Borri cannot be held responsible of the consequences deriving from the use of non original spare parts.
- Borri reserves the right to make technical modifications to the present manual and to the equipment without prior warning. If any typing errors or mistakes are detected, they will be corrected in the new versions of the manual.
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Indice

SCOPE	4
1 REFERENCES	5
1.1 Standards	5
1.2 Product technical documents	5
2 GAMMA	6
2.1 Configurations	6
3 FUNZIONALITÀ	7
3.1 Standard electrical functionalities	7
3.2 Optional electrical functionalities	7
3.3 Standard connectivity equipment	7
3.4 Connectivity options	7
4 MECHANICAL INSTALLATION	8
4.1 Mechanical data	8
4.2 Batteries	9
4.2.1 Autonomy table (minutes) with internal batteries	9
4.3 Ventilation	10
5 ELECTRICAL INSTALLATION	11
5.1 Rated currents	11
5.2 Protection devices	11
5.2.1 Backfeed protection device	12
5.3 Terminals and cables section	12
5.4 Connection of the neutral and earthing	13
6 SOFTWARE-ENABLED FUNCTIONS	14
6.1 Diesel mode operation (DIESEL MODE)	14
6.2 Rectifier soft-start programming (<i>walk-in</i>)	14
6.3 Rectifier delayed start-up programming (<i>hold-off</i>)	14
6.4 Management of VFI / VFD (ECO) operating modes	14
6.5 Frequency converter	14
7 CONNECTIVITY	15
7.1 Remote alarm / status card	15
7.2 RS232 serial interface	15
7.3 RS485 serial interface (ModBus RTU)	15
7.4 SNMP adapter	15
8 OPTIONS	16
8.1 Thermal compensation of the battery charging voltage	16
8.2 Parallel configuration kit	16
8.3 Insulation transformer	16
8.4 Battery fused switch	16
8.5 Backfeed protection device	16

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.

- OMM59001 Technical specification
- OMM56003 Operating manual

2 GAMMA

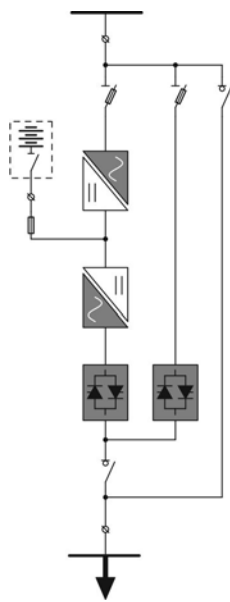
The **INGENIO** uninterruptible power supplies are on-line, double conversion, without insulation transformer on the inverter line (transformer-free). They are designed to guarantee the highest reliability for the supply and protection of critical equipment in the most diverse applications, from the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

The UPS's of the **INGENIO** series are available in a power range from 60 to 160 kVA and supplied in three-phase/three-phase configuration.

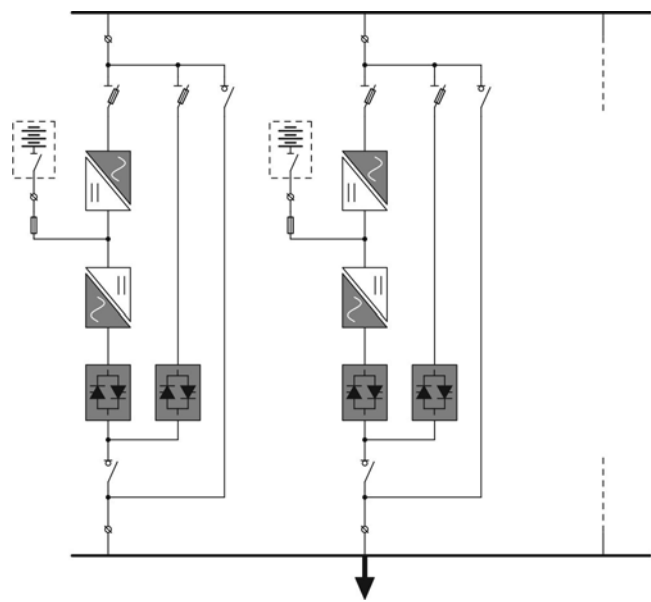
INGENIO		30	40	50
Rated output apparent power	[kVA]	30	40	50
Rated output active power	[kW]	27	36	45

2.1 Configurations

INGENIO 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 FUNZIONALITÀ

3.1 Standard electrical functionalities

- LCD user interface with flow diagram
- Common AC input for rectifier and bypass
- Internal maintenance bypass switch
- Internal batteries
- Internal sectioning of the neutral conductor for maintenance purposes

3.2 Optional electrical functionalities

- Separate AC input for rectifier and bypass
- Internal contactor 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

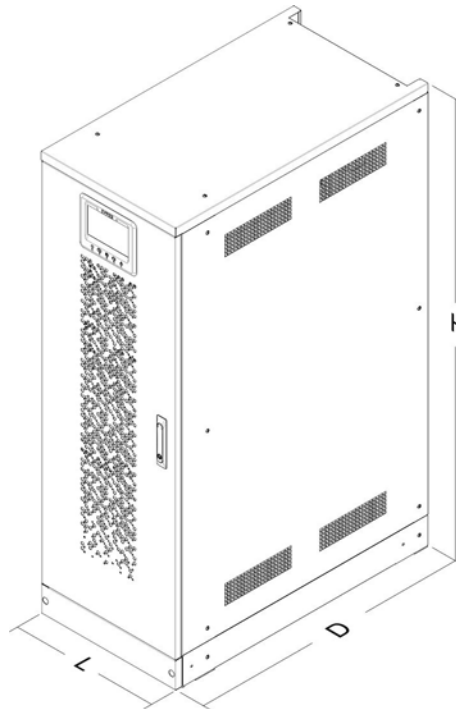
- Voltage-free contact card for status and alarms
- RS485 (ModBus RTU) communication port
- SNMP adapter

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 provided with external battery cabinet.

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 UPS's must be positioned in such a way to leave at least one accessible side, preferably the right hand side.



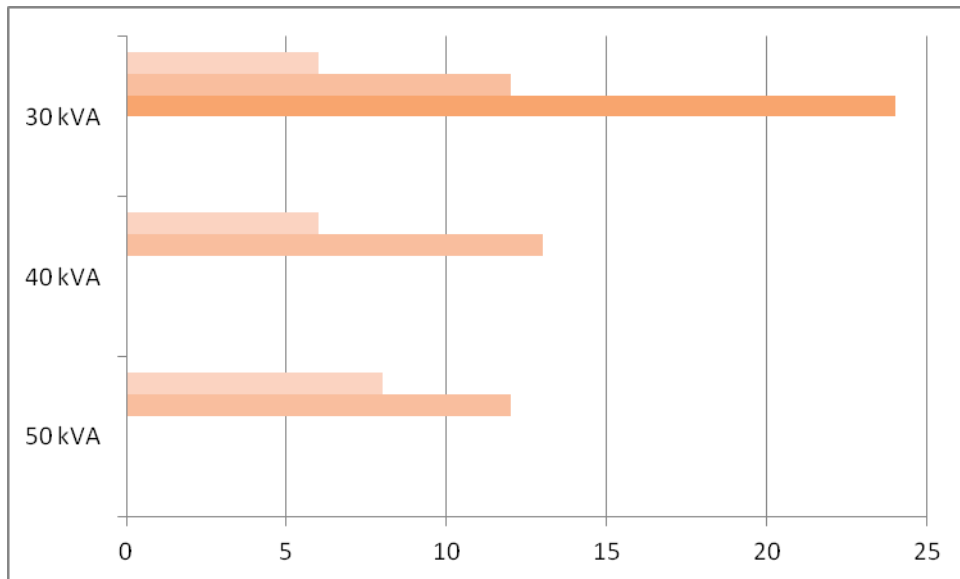
Dimensions, weights and static loads				
INGENIO		30	40	50
Length (L)	[mm]	500		
Depth (D)	[mm]	940		
Height (H)	[mm]	1500		
Weight w/o batteries	[kg]	140	150	190
Maximum weight with batteries	[kg]	500	510	550
Static load w/o batteries	[kg/m ²]	310	335	425
Static load with batteries	kg/m ²	1110	1135	1225

4.2 Batteries

INGENIO is equipped with internal batteries, with which typical autonomies up to 24 minutes for the 30 kVA and 12 / 13 minutes for the 50 kVA and 40 kVA respectively, can be reached.

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

4.2.1 Autonomy table (minutes) with internal batteries



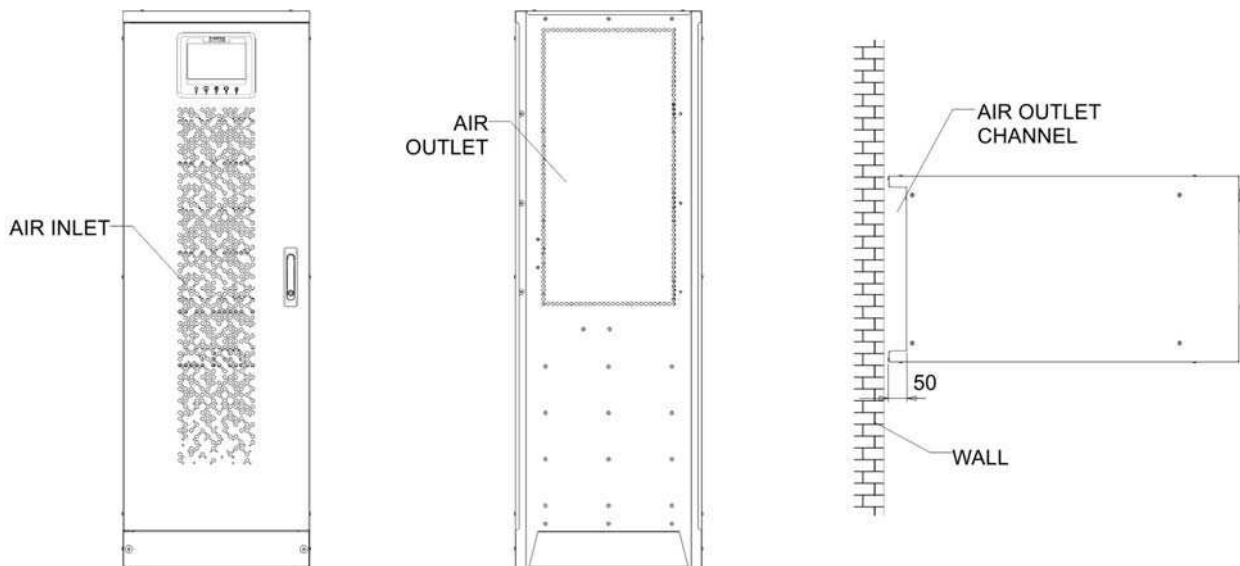
4.3 Ventilation

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		30	40	50
Air volume	[m ³ /h]	900	900	1100

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** 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		30	40	50
Rectifier input ⁽¹⁾	[A]	54	66	89
Bypass input ^{(1) (2)}	[A]	44	58	73
UPS output ^{(1) (2)}	[A]	44	58	73
Battery ⁽³⁾	[A]	46	61	76

(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 or general				
INGENIO		30	40	50
Automatic circuit breaker	[A]	63	80	100
Fuse, gG type	[A]	63	80	100
RCD ⁽¹⁾	[mA]	> 300 (selective)		

Protection devices – Bypass input ⁽²⁾				
INGENIO		30	40	50
Automatic circuit breaker	[A]	63	80	100
Fuse, gG type	[A]	63	80	100

(1) The RCD must be selective with the residual current protections installed in the load feeders. In case of separate AC input for rectifier and bypass or paralleled UPS, use a single RCD for both the rectifier and bypass lines.

(2) The bypass protection must only be considered in case of separate inputs. In case of common AC input use the values given for the "rectifier input or general" protection.

5.2.1 Backfeed protection device

The UPS can be optionally equipped with an internal contactor that automatically disconnects the bypass line in case a voltage feedback is detected.

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		30	40	50
Rectifier input	[mm ²]	25	25	35
Bypass input ⁽²⁾	[mm ²]	25	25	35
UPS output	[mm ²]	25	25	35
Battery	[mm ²]	10	16	25
Neutral ⁽³⁾	[mm ²]	25	25	35
Earth (PE)	[mm ²]	16	16	16

Terminals				
INGENIO		30	40	50
Type		Screw terminal		
Conductor max cross section ⁽⁴⁾	[mm ²]	35		
Max number of conductors		1		
Tightening torque	[Nm]	4 ÷ 4,5		

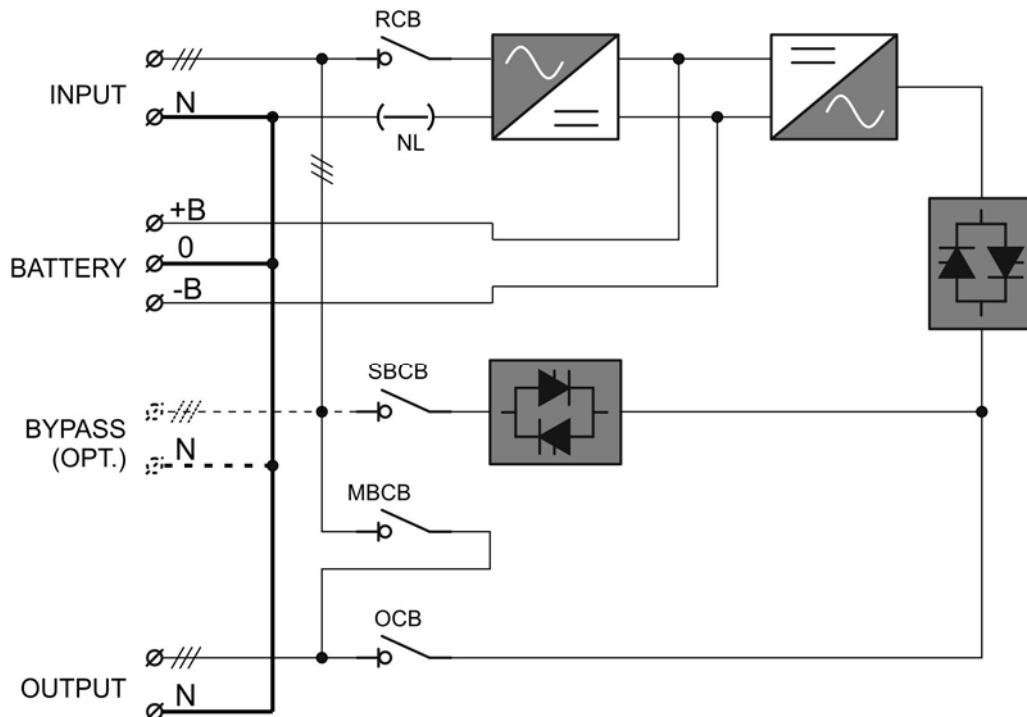
- (1) The cross section is referred to the single phase conductor.
- (2) The cables for the bypass input are only to considerd in case of separate inputs. In case of common AC input use the values given for the "rectifier input or general" cables.
- (3) In case of highly distorted load over-rate the neutral conductor by about 50%.
- (4) Flexible and rigid cable

5.4 Connection of the neutral and earthing

The **INGENIO** 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 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 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.

6.5 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 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. It can also be integrated inside the UPS cabinet in case the internal batteries are not installed.

8.4 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.

8.5 Backfeed protection device

The backfeed protection is a regulation requirement which can be fulfilled by the **INGENIO** UPS's by the optional installation of a contactor on the bypass line. The contactor is installed inside the UPS and automatically disconnect the bypass line in case the control logic detects a voltage backfeed.