



## Important Notices!

Thank you for choosing LEGRAND UPS System to supply your Critical Application.

This manual contains important information about commissioning, usage and technical properties of the UPS. It also contains safety information for operator and instructions to secure your critical load. Applying the recommendation detailed in this manual is necessary to use UPS safely and correctly.



Read the manual completely before working on this equipment!



Keep this manual in UPS's front cover's pocket for easy consultation!



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Units that are labelled with a CE mark comply with the Standard: EN 62040-1 and EN 62040-2.



## Description of the Symbols Used in the Manual



This symbol points out the instructions which are especially important.



This symbol points out the risk of electric shock if the following instruction is not followed.



This symbol points out the instructions, which may result with injury of the operator or damage of the equipment if not followed.



All packing material must be recycled in compliance with the laws in force in the country where the system is installed.

## Description of the Symbols Used in the Manual

UPS: Uninterruptible Power Supply

ESD: Emergency Switching Device

RS232: Serial Communication Protocol

RS485: Serial Communication Protocol

MODBUS: Modicon Communication Protocol

SNMP: Simple Network Management Protocol

V: Volt

A: Ampere

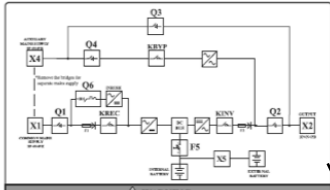
P: Power

For Mains Supply, Auxiliary Mains Supply, Output, Battery Circuit Breaker and Maintenance Bypass Circuit Breaker;

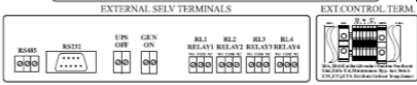
“ON”: Closing the Circuit

“OFF”: Opening the Circuit

| ⚠ WARNING |  |   |   |   |
|-----------|--|---|---|---|
| ⚡         |  |   |   |   |
| EN        | SEE INSTALLATION MANUAL BEFORE CONNECTING.                         | HIGH LEAKAGE CURRENT<br>Connect earth before supply.                                      | RISK OF BACKFEED<br>Before working on this circuit isolate Uninterruptible Power System (UPS). Then check for Hazardous Voltage between all terminals including the protective earth (PE).  | WAIT 5 MINUTES for capacitors to discharge.<br>To avoid an electrical shock hazard verify that the voltage on the electrolytic capacitors has completely discharged before performing any work on power module.                 |
| FR        | VOIR LA NOTICE D'INSTALLATION AVANT DE RACCORDER.                  | COURANT DE FUITE ÉLEVÉ<br>Connecter le conducteur de protection avant l'alimentation.     | RISQUE DE RETOUR DE TENSION<br>Avant de travailler sur le circuit électrique isoler l'alimentation sans interruption (ASI). Puis vérifier s'il y a présence de tension dangereuse entre toutes les bornes incluant la connexion de terre. | ATTENDRE 5 MINUTES la décharge des condensateurs.<br>Pour éviter un choc électrique, vérifiez que les condensateurs électrolytiques soient complètement déchargés avant intervention.   |
| IT        | LEGGERE IL MANUALE DI INSTALLAZIONE PRIMA DI COLLEGARE I UPS.      | ALTA CORRENTE DI DISPERSIONE<br>Collegare il conduttore di terra prima dell'accensione    | RISK/FED RISKIO<br>Prima di intervenire su questo circuito isolare l'UPS dalla rete.<br>Controllare la presenza di tensioni   | ATTENDERE 5 MINUTI per consentire la scarica dei condensatori<br>Per evitare il pericolo di scosse elettriche prima di eseguire qualsiasi operazione sul modulo di potenza verificare che non vi sia tensione sui condensatori. |
| DE        | LESEN SIE DIE BEDIENUNGSANLEITUNG BEVOR SIE DAS GERÄT ANSCHLIEßEN. | HOHER LECKSTROM.<br>Vorles Sie das Gerät bevor die Versorgungsspannung zugeschaltet wird. | RÜCKSPANNUNG RISKIO<br>Bevor Sie einen Eingriff am Gerät vornehmen trennen Sie die EVN-Anlage vom Netz.<br>Überprüfen Sie auf gefährliche Spannungen zwischen den Anschlüssen und der Schutzerd (PE).                                     | WARTEN SIE 5 MINUTEN bis die Kondensatoren entladen sind.<br>Um einen elektrischen Schlag zu vermeiden stellen Sie sicher, dass die Kondensatoren komplett entladen sind bevor Sie an der Leistungselektronik arbeiten.         |



EN READ THE MANUAL before operating installation.  
FR VÉRIFIEZ LIRE LA NOTICE d'installation avant l'installation et l'alimentation de l'UPS  
IT LEGGERE IL MANUALE DI INSTALLAZIONE prima di effettuare qualsiasi operazione  
DE LESEN SIE DIE BEDIENUNGSANLEITUNG vor der Installation!

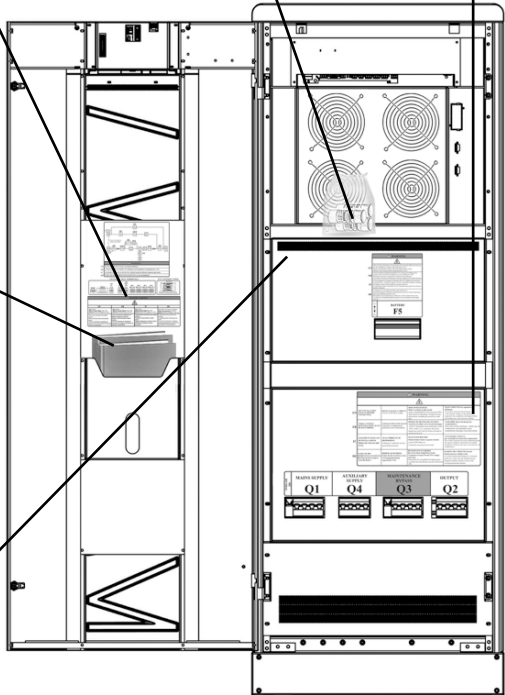


| ⚠ BATTERY WARNING  |  |   |  |
|--|--|---|--|
| EN   | FR   | IT  | DE   |
| <p>Type: VELA<br/>Nominal Voltage: 50-50 (2V), 720V (24V)<br/>Nominal Battery Capacity: 7 or 14Ah</p> <p>⚠ High current protection may require battery disconnect circuit and fuse.</p> <p>⚠ Risk of electrolytic leakage and explosion.</p> <p>⚠ Read all instructions, handling and disposal instructions relating to the batteries or cell sets for protection.</p> | <p>Type: VELA<br/>Nominale Tension: 50-50 (2V), 720V (24V)<br/>Capacité Batterie Nominale: 7 ou 14Ah</p> <p>⚠ Les courants de protection peuvent nécessiter un circuit de déconnexion de la batterie.</p> <p>⚠ Risque de fuite électrolytique et d'explosion.</p> <p>⚠ Lire les instructions de manipulation, de maintenance et de décharge des batteries ou des ensembles de cellules pour la protection.</p> | <p>Type: VELA<br/>Nominale Tensione: 50-50 (2V), 720V (24V)<br/>Capacità Batterie Nominale: 7 o 14Ah</p> <p>⚠ I correnti di protezione potrebbero richiedere un circuito di disconnessione della batteria.</p> <p>⚠ Rischio di perdita elettrolitica e di esplosione.</p> <p>⚠ Leggere le istruzioni di manipolazione, di manutenzione e di smaltimento delle batterie per proteggerle.</p> | <p>Type: VELA<br/>Nominale Spannung: 50-50 (2V), 720V (24V)<br/>Nennwert Batterie Kapazität: 7 oder 14Ah</p> <p>⚠ Ausstrom bei überhöhten Ladeströmen.</p> <p>⚠ Gefahr durch Stromschlag, wenn geladene Zellen direkt berührt werden.</p> <p>⚠ Lesen Sie die Montage-, Wartungs- und Entsorgungsinstruktionen, welche die zu verwendenden Vordruckblätter betreffen.</p> |

## Installation & Operating Manuals

| ⚠ WARNING                |  |
|--------------------------|--|
| ⚡                        |  |
| EN                       | <ul style="list-style-type: none"> <li>Do not close the battery circuit breaker (F5) until the difference between DC bus and Battery voltage decreases below 10V. Check measurement on the LCD in the Measurement menu.</li> <li>Refer to user manual before replacing battery fuses.</li> </ul>   |
| FR                       | <ul style="list-style-type: none"> <li>Ne pas fermer la protection batterie ( F5 ) tant que le différence de tension entre le bus DC et la Batterie n'est pas inférieure à 10V. Vérifiez les mesures sur l'écran LCD dans le menu Mesures.</li> <li>Se référer à la notice d'utilisation avant de remplacer les fusibles batterie.</li> </ul>                          |
| IT                       | <ul style="list-style-type: none"> <li>Non chiudere il sezionatore di batteria (F5) se la differenza di tensione tra la barra DC e la batteria supera i 10 Vdc. Controllare sempre le tensioni sul display (menu misura) prima di eseguire manovre.</li> <li>Consultare sempre il manuale di uso e manutenzione prima di sostituire i fusibili di batteria.</li> </ul> |
| DE                       | <ul style="list-style-type: none"> <li>Schließen Sie den Batterieschalter (F5) nicht bevor Gleichspannungswert und Batteriesystem die gleiche Spannung aufweisen (Differenz kleiner 10V).</li> <li>Überprüfen Sie die Spannung mit Hilfe des LCD in Menü Messwerte.</li> <li>Lesen Sie die Bedienungsanleitung bevor Sie die Batteriesicherungen ersetzen.</li> </ul>  |
| <p><b>BATTERY F5</b></p> |  |

## Battery Fast Fuses



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## 1. Foreword

### 1.1. Overview

Thank you for choosing LEGRAND UPS KEOR T EVO product.

KEOR T EVO has been designed with advanced technologies and the latest components generation; realized to satisfy both users and installers in their operational needs of high availability and performance.

This UPS aims to be efficient, functional, safe and very easy to install and use. LEGRAND has studied the best way to reconcile high-tech performance and ease of use, making "user friendly" technologically advanced products.

KEOR T EVO supplies maximum protection and power quality for any type of IT load, tertiary application, lighting or building.

Furthermore, standards deployed by Legrand for R&D, supplier selection and manufacturing comply with the highest quality standards. This product is manufactured in an ISO 9001 & ISO14001 certified factory in full compliance with the eco-design laws. The UPS KEOR T EVO system is made in compliance with the existing European Community directives and with the technical standards in force to comply with CE marking as certified by the Declaration of Conformity issued by the Manufacturer.

### Technology & Architecture

A special feature of KEOR T EVO is Online Double Conversion Operation (VFI-SS-111 as defined by the reference standard EN 62040-3) based on the capacity to supply a voltage that is perfectly stabilized in frequency and amplitude, even in event of extreme alterations of mains power supply.

The 3-Level Switching Technology used in this product is the latest solution to provide high energy efficiency even with low load conditions.

The energy efficiency performance of KEOR T EVO surpasses the minimum requirements defined by the Code of Conduct on Energy efficiency and Quality of European of AC UPS defined by EC.

KEOR T EVO represents the best solution combining high performance, low management costs and ease of operation and maintenance:

- Dual Input
- User friendly touch screen design
- UPS via LED bar (with traffic light coding) gives an immediate diagnosis of the system under any conditions.
- Internal Battery option as well as wide range external battery cabinets.
- Isolation transformer can be mounted inside UPS cabinet upon request.
- Integrated Maintenance Bypass
- Parallelable to increase the power
- Availability of different communication types

### 1.2. Manual

- The purpose of this manual is to provide indications for using the equipment safely and to carry out first level of troubleshooting.
- This manual is addressed to persons already educated on precautions to adopt in face of electrical hazard
- This manual is addressed to "User", generic term to identify all persons that will have the need and / or obligation to provide instructions or operate directly this UPS equipment
- Adjustments, preventive and curative maintenance jobs are not dealt with in this manual as they are reserved exclusively to skilled and authorized Legrand UPS Technical Service Engineers.

- The intended use and configurations envisaged for the equipment are the only ones allowed by the Manufacturer; do not attempt to use the equipment in disagreement with the indications given. Any other use or configuration must be agreed and written by the Manufacturer, in such a case, will be an enclosure to the manual.
- For its use the user must also comply with the specific laws in force that exist in the country where the equipment is installed. Reference is also made in this manual to laws, directives, etc., that the user must know and consult in order to fulfil the purposes established by the manual.
- If information is exchanged with the Manufacturer or assistance personnel authorized by the former, please refer to the equipment's rating plate data and serial number.
- The manual must be kept for the equipment's useful life cycle and, if necessary (e.g. damage which prevents it being consulted even partially) the user must ask the Manufacturer for a new copy, quoting the publishing code on the cover.
- The manual reflects the state of the art at the moment the equipment was put on the market, of which it is an integral part. The publication complies with the directives in force at such a date. The manual cannot be considered inadequate if updates of standards or changes are made to the equipment.
- Any integration to the manual which the Manufacturer deems fitting to send to the users must be kept with the manual, becoming an integral part of it.
- The Manufacturer is available to its clientele to provide additional information and will take into consideration any suggestions made to improve this manual to bring it even closer to the requirements for which it was drawn up.
- If the equipment is sold, which always includes handing over this operating manual, the primary user must notify the Manufacturer, giving him the address of the new user so the latter can be reached if there are any communications and/or updates deemed indispensable.



Read the manual completely before working on this equipment!



Keep this manual in UPS's front cover's pocket for easy consultation!



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Units that are labelled with a CE mark comply with the Standard: EN 62040-1 and EN 62040-2.





## 2. Warranty

### 2.1. Terms of Warranty

- Warranty is defined by General Conditions of Sale and Delivery.
- The UPS including all the internal parts is under the warranty of LEGRAND.
- If the UPS malfunctions because of component, manufacturing or installation (if it's done by authorized LEGRAND UPS Technical Service Personnel) problems during the warranty period, the UPS will be repaired (spares and labour) by the Manufacturer under warranty.

### 2.2. Out of Warranty Terms and Conditions

This Warranty does not apply if:

- UPS not commissioned or maintained by an authorized LEGRAND UPS Technical Service staff or an authorized LEGRAND distributor Technical Service staff
- UPS not used according the terms of operating and installation manual
- Product serial number label has been removed or lost

This Warranty does not cover any defects or damages caused by:

- Neglect, accident, misuse, misapplication
- Failure due to fortuitous circumstances or force majeure (lightning, floods...etc.),
- Unloading and transportation damage and failures after delivery,
- Damage or injuries caused by negligence, lack of inspection or maintenance, or improper use of the products,
- Faulty electrical wiring,
- Defects arising either from designs or parts imposed or supplied by the purchaser,
- Defects and damage by fire and lightning,
- Failures due to modification in the products without LEGRAND approval,
- Improper installation, testing, operation, maintenance, repair, alteration, adjustment, or modification of any kind by unauthorized personnel,

The Manufacturer will repair the device in such cases for a fee and is not responsible for the shipment of the equipment.

The Battery warranty does not apply if the temperature in the room exceeds 25 °C.

Extended battery warranty does not apply if:

- UPS has not been commissioned
- A yearly preventive maintenance visit has not been performed

By an authorized LEGRAND UPS Technical Service staff or authorized LEGRAND distributor Technical Service staff.

The UPS may contain batteries that should be recharged 24Hours min after 6 month storage duration to avoid deep battery discharge. Warranty cannot apply on batteries that have suffered of deep discharge.

### 3. Safety



Information related to safety of the UPS, battery, load and the user is summarized below. But the equipment should not be installed before reading the manual completely.

#### 3.1. Description of the Symbols Used on the Labels Applied to the UPS



PE: PROTECTIVE EARTH



PB: PROTECTIVE BONDING



DANGER! HIGH VOLTAGE (BLACK/YELLOW)



This symbol points out the instructions, which may result with injury of the operator or damage of the equipment if not obeyed.

#### 3.2. Individual Protective Gear

There is a high risk of electrical shock with the equipment as well as a considerable short circuit current. When installing and servicing the equipment it is absolutely forbidden to work without the protective gear mentioned in this paragraph.

The personnel who are going to work with the equipment for installation or maintenance jobs must not wear clothes with baggy sleeves or laces, belts, bracelets or other metal items that could be a hazard source.

The following indications summarize the protective gear to wear.



**Accident and spark proof footwear with rubber sole and reinforced toe**

Use : always



**Waterproof rubber gloves**

Use : always



**Protective gear**

Use : always



**Protective glasses**

Use : always

### 3.3. Important Notice for UPS

- The equipment may only be installed and commissioned by authorized LEGRAND UPS Technical Service Personnel.
- This manual contains important instructions that you should follow during installation and maintenance of the UPS and batteries. Please read all instructions before installing the equipment and save this manual for future reference.
- Not obeying the instructions written on this manual which may result with possible injury of the operator or damage of the equipment.
- The equipment shall be packed and fixed properly during transportation to avoid fall down and proper equipment should be used for transportation. Never transport in horizontal position.
- The UPS must always stand in a vertical position. Make sure that the floor can support the weight of the system.
- Connect the PE ground connector before connecting any other cable.
- UPS is designed for indoor use. To reduce the risk of fire or electric shock, install this UPS in a temperature and humidity controlled indoor environment, free of conductive contaminants. Ambient temperature must not exceed 40°C (104°F). Do not operate near water or excessive humidity (95% maximum without condensation).
- UPS requires 3Ph-N+PE input connection.
- Do not connect the output neutral to the protective ground or protective bonding (except the TNC Option). KEOR T EVO does not modify the neutral arrangements of the system; the use of an isolation transformer is required should it be necessary to modify the neutral arrangements downstream KEOR T EVO.
- KEOR T EVO must be protected from voltage surge with devices that are suited to the installation; the mains voltage surge must be limited to 2kV. These protective devices must be sized to take into account all the installation parameters (geographical position whether or not there is a lightning rod, whether or not there are other suppressors in the electrical installation, etc.)
- Even when connections removed, residual voltages of capacitors and/or high temperature may exist on connection terminals and inside the UPS. Before working on terminals, check between all the terminals included PE that no hazardous voltages exist.
- The connections shall be made with cables of appropriate cross-section in order to prevent the risk of fire. All cables shall be of insulated type and shall not be laid out on the walking path of the persons.
- According to IEC 62040-2; this is a product for commercial and industrial application. In the second environment installation restrictions or additional measures may be needed to prevent disturbances.
- Contact your local recycling or hazardous waste centre for information on proper disposal of the used battery or UPS.
- Make sure that the UPS is not overloaded to provide a higher quality supply to the loads.
- In case of an extraordinary situation (damaged body, cabinet or connections, penetration of foreign materials into the body or cabinet etc.) de-energize the UPS immediately and consult to the LEGRAND Technical Assistance Centre.
- When used for particular applications such as life support systems or any other application where product failure is likely to cause substantial harms to person, we would advise you to contact LEGRAND UPS to confirm the ability of these products to meet the requested level of safety, performance, reliability and compliance with applicable laws, regulations and specifications.

### 3.4. Important Notice for Battery

• **The batteries may only be installed and commissioned by authorized LEGRAND UPS Technical Service Personnel.**

- Make sure that the battery qty is proper for the unit and they are same type and capacity. Otherwise danger of explosion and fire is within the bounds of possibility.
- Do not dispose of batteries in a fire. The batteries may explode.
- Do not open or mutilate batteries. Released electrolyte is harmful to the skin and eyes. It may be toxic.
- In case of electrolyte in contact with skin, immediately wash the contaminated skin with water.
- Replaced batteries must be disposed of at authorized battery waste disposal centres.
- **A battery can present risk of electric shock and high short circuit currents.**

The following precautions should be observed when working on batteries;

- Remove rings, watches, necklaces, bracelets and all metal objects.
- Only use tools with insulated handles.
- Wear rubbers gloves and a rubber apron when handling batteries.
- Do not lay tools or metal parts on top of batteries.
- Eye protection should be worn to prevent injury from accidental electrical arcs.
- **Before a maintenance or repair work on the UPS;**
- Switch the input, output and battery circuit breakers (**Q1, Q2** and **F5**) to "**OFF**" position.
- If UPS has internal batteries; Remove and isolate + battery (red) and **N** battery neutral (blue) cables.
- If UPS has external batteries; also switch the circuit breakers of the battery cabinet to "**OFF**" position.
- Determine if the battery is inadvertently grounded. If inadvertently grounded; remove source of ground. Contact with any part of a grounded battery can result in electrical shock.
- Battery fuses shall only be replaced with the same rating and type which came along with the UPS.

### 3.5. Emergency interventions

The following information is of a general nature. For specific interventions please consult the laws existing in the country where the equipment is installed.

#### First aid interventions

If any first aid intervention is required, comply with company rules and traditional procedures.

#### Fire-prevention measures

Never use water to extinguish fire but only the extinguishers designed specifically for electronic equipment or battery fires.

## 4. Operation Modes

Uninterruptible Power Supplies (UPS) most important function is the protection of critical and sensitive loads from the irregular mains voltage conditions. They are used to supply uninterruptible energy to these loads in such irregular mains voltage conditions and provide regulated energy supply to the equipment present in the IT room, industrial workshop, hospitals and offices.

KEORT EVO UPS during Online mode operation provides stable pure sine wave not affected by input voltage fluctuations. This helps to extend the life time of your sensible loads. Power factor of the current consumed from mains is nearly one. This allows perfect adaptation to upstream generator or isolation transformer supply. The reactive power consumption decreases.

During mains voltage failure, the energy needed for the load is provided by the internal battery (or installed in external battery cabinet/s). These batteries are charged by an intelligent battery charging circuit when mains voltage is within the limits. Batteries are lead acid battery (VRLA) and do not require any maintenance until the end of their life time.

In case of long overload or inverter failure situation, UPS transfers the load supply to bypass line, and load is supplied by mains. When the condition turns back to normal, UPS will continue to supply the load through inverter.

UPS control and management is done by Digital Signal Processor (DSP) which is 200 times faster than standard microprocessors. This helps to make your UPS smarter. DSP uses all the sources on optimum conditions, observes the failure conditions, and communicates with your computer system.

UPS can be operated in one of the following operational modes depending on the condition of mains voltage, battery, load, UPS status or user preference.

You may see the block diagram of UPS in [Appendix-6 Description of UPS and Block Diagram](#).

### 4.1. Online Mode

Energy is drawn from the mains voltage input. Loads are supplied through the rectifier and the inverter. The AC voltage at the input is converted to a DC voltage by the rectifier. The inverter converts this DC voltage to an AC voltage with a stable sinusoidal waveform, amplitude and frequency. Output voltage and frequency can be set via front panel. Output voltage is sinusoidal and has a regulated amplitude and frequency. It is independent from the input voltage. The loads are not affected by the disturbances of the mains voltage.

If the mains voltage and frequency are in an acceptable range, Online Operation is possible.

Check [Appendix-4 Technical Specifications](#) for Online Operation mode mains voltage limits.

The upper limit of mains voltage is independent from the load percentage and it is Ph-N: 270V. UPS switches to Battery Operation mode when the mains voltage is over Ph-N: 270V. The mains voltage is required to decrease below Ph-N: 260V for UPS to return Online Operation.

Online Operation Conditions;

- In case Online Operation is set as operation mode of UPS, the mains voltage is within the limits and/or if there is no abnormal condition (overheat, overload, failure...etc.) UPS operates in Online Operation. Except for failures, as soon as the abnormal conditions are eliminated, UPS switches to Online Operation automatically.
- In case Bypass Operation is set as operation mode of UPS and the voltage and frequency is out of the bypass limits but within the rectifier limits, UPS switches to Online Operation.

#### 4.2. Battery Mode

In this operation, energy is drawn from the batteries. The loads are supplied via inverter. Output voltage is sinusoidal and has a regulated amplitude and frequency.

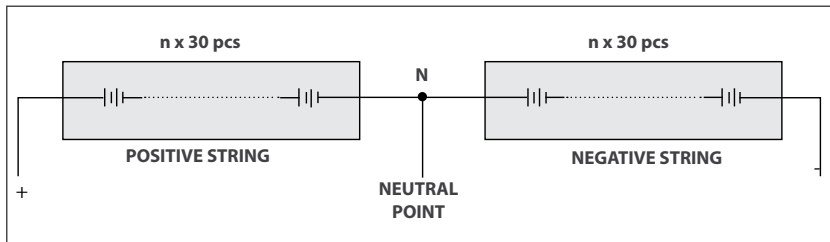
Battery voltage should be in acceptable limits and the inverter should be enabled for the UPS to operate in this mode.

UPS operates in Battery Operation in the following cases:

- While UPS is operating in Online Operation; if frequency/waveform/rms value of mains voltage go beyond the rectifier limits,
- While UPS is operating in Bypass Operation, if frequency/waveform/rms value of mains voltage go beyond Bypass limits,
- If Inverter enabled: "YES"; Rectifier enabled: "NO" are selected through the front panel (Authorisations Menu for authorized Service Staff).

KEOR T EVO UPS operates with one or several parallel strings of 1 x 60pcs 12VDC battery with common neutral.

You may see the battery string connection as below;



Two Serial Strings with Central Point – Neutral Potential –

#### Battery Management and Battery Back-Up Time

When UPS operates in Online or Bypass Operation; it continuously calculates and displays the remaining back-up time.

Autonomy time depends on battery type, quantity, capacity, situation and load level. UPS stops supplying the loads if the battery voltage decreases under a specific value.

Battery life depends on some parameters such as battery type, charge-discharge cycle, and depth of discharge, ambient temperature, conditions. Please check Technical Specifications for the ideal environmental conditions for the batteries. Using the batteries outside this temperature range will decrease battery operation time and battery life.

### 4.3. Bypass Mode

UPS transfers the loads automatically to the mains voltage in order to protect them during abnormal conditions.

While UPS operates in Online Operation, UPS switches to bypass automatically (in case the mains voltage and frequency is within the limits of bypass) in the following conditions;

- During start-up
- Bypass Priority
- Inverter Fault
- Prolonged Overload, output short circuit
- High Heatsink Temperature

After these conditions are eliminated, the UPS automatically returns to inverter.



Prolonged overloads in Bypass Operation may cause the thermal/magnetic protection act. In this case, all loads will be de energized.

### Bypass Operation Voltage Range

The mains voltage is required to be in certain range for Bypass Operation. Voltage tolerance is set 18% of the output voltage in the factory. For instance; if the output voltage is Ph-Ph: 400V, the tolerance range of bypass voltage would be Ph-Ph: 328V – 472V. In case the input voltage decreases below Ph-Ph: 328V or increases above Ph-Ph: 472V; if UPS runs in Bypass Mode UPS switches to Online Mode Operation; if UPS runs in Online Mode Operation it cannot switch to Bypass Mode Operation even if a fault occurs. If the batteries and the inverter are suitable to supply the loads, UPS switches to Battery Mode Operation.

Bypass Mode Operation voltage tolerance limit can be adjusted in certain ranges depends on the customer's request on site by Legrand UPS Technical Service Personnel.

To return to Bypass Mode Operation; the mains voltage should turn back to +5V above of lower limit, -5V down of upper limit of bypass limits. Default settings are Ph-Ph: 333V – 465V for Ph-Ph: 400V UPS.

#### 4.4. Eco Mode

Eco Mode Operation can be chosen through the Commands Menu.

The purpose of using this mode is to increase the efficiency up to 98% and to provide energy saving; since the loads are supplied by the mains voltage directly, the loads are unprotected against any possible future risks. (e.g. surge voltage, etc.). In devices with auxiliary mains supply; energy is drawn from the auxiliary mains supply.

As long as the mains voltage and frequency within the limits, the load is supplied by the auxiliary voltage in a controlled manner; double conversion chain is on standby while ensuring the recharge of the batteries.



Eco Mode Operation does not provide perfect stability in frequency/waveform/rms value of the output voltage as in Online Operation. Thus, the use of this mode should be carefully executed according to the level of protection required by the application.

UPS switches to another mode in case the mains voltage or frequency goes beyond the Bypass limits. UPS returns to Eco Mode Operation when the auxiliary voltage returns to the limits.



Eco Mode Operation does not provide electronic short circuit current limitation. If a short circuit occurs downstream distribution panel supplied by the UPS, the magnetic protection off the Bypass line MCCB may act if not selective with downstream protection and all loads will be de energized. Check discrimination applies between upstream and downstream switchboard.

#### 4.5. No Operation

This mode is used to make settings through Front Panel or by Service Software. To start-up UPS in No Operation mode; all the circuit breakers must be at "0" position except **Q1** Input circuit breaker and **Q4** Bypass circuit breaker. In this mode UPS does not apply output voltage to supply the loads. After all settings done during No Operation Mode, UPS should be restarted for the new service settings to be saved and valid. It is not necessary to restart UPS for user settings to be valid.

#### 4.6. Operation with Maintenance Bypass



This procedure may only be executed by trained Personnel.

Maintenance Bypass enables the user to isolate the electronic circuitry of the UPS from the mains voltage and the load without interrupting the load operation by connecting the loads directly to the bypass utility supply. This feature is useful while waiting service staff and should only be executed by trained Personnel.



During Maintenance Bypass operation; in case of any mains voltage interruption occurs, all loads on the output will be deenergized. Maintenance Bypass Operation should not be preferred for long time use.

#### 4.7. Operation with External Maintenance Bypass (Optional)





The external manual maintenance bypass may be installed in the general distribution panel where KEOR T EVO is installed, or in an external bypass panel that is supplied on request.

This operating mode enables the user to isolate the electronic circuitry of the UPS from the mains voltage and the load without interrupting the load operation by connecting the loads directly to the bypass utility supply. This feature is useful while performing maintenance or service and should only be executed by trained Personnel.



## 5. Requirement

### 5.1. Transportation

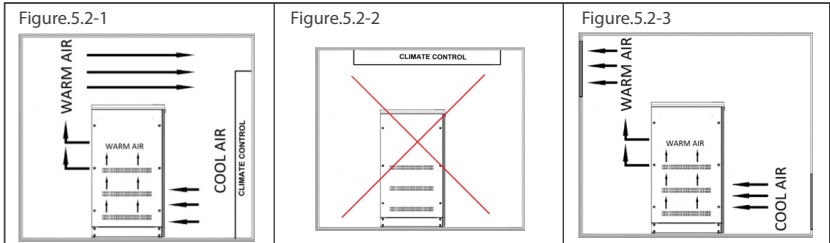
|   |   |
|---|---|
|  | The UPS must be placed and stand in a vertical position throughout the transportation.  |
|  | Use suitable equipment to remove the UPS from the pallet.   |
|  | The equipment shall be packed properly during transportation. Therefore it is recommended to keep the original package for future need. |
|  | All packing material must be recycled in compliance with the laws in force in the country where the system is installed.                |

### 5.2. Placement

This product meets the safety requirements for devices to be operated in restricted access locations according to EN 60950-1 safety standard, which states that the owner should guarantee the following:

- Access to the equipment can only be gained by service persons or by users who have been instructed about the reasons for the restrictions applied to the location and about any precautions that shall be taken and,
- Access is through the use of a tool or lock and key, or other means of security and is controlled by the authority responsible for the location.
- UPS is not designed for outdoor application.
- The equipment and the batteries should not be exposed to direct sunlight or placed near to a heat source.
- Recommended operating temperature and humidity values are listed on the [Appendix-4 Technical Specifications](#).
- Avoid dusty environments or areas where dust of conductive or corrosive materials is present.
- The connection and the circuit breakers are at the front of UPS. Leave access at the front of the UPS for maintenance. (Refer to Figure.4.2-4)
- Air outlets of the UPS are at the front, back and on both sides. Leave access at the front side, back side and from both lateral sides for ventilation and battery replacement. (Refer to Figure.4.2-1, 4.2-2, 4.2-3 and 4.2-4)
- Recommended environmental humidity condition is between 20-95% (non-condensing).

| Environment Requirement           |   |      |      |      |      |      |       |
|-----------------------------------|---|------|------|------|------|------|-------|
| Model (kVA)                       |   | 10   | 15   | 20   | 30   | 40   | 60    |
| Max. dissipation at no load       | (W)   | 180  | 208  | 208  | 208  | 490  | 480   |
|                                   | (BTU)   | 614  | 710  | 710  | 710  | 1672 | 1638  |
| Max. dissipation at full load     | (W)   | 621  | 890  | 1198 | 1579 | 2105 | 3559  |
|                                   | (BTU)   | 2120 | 3036 | 4087 | 5388 | 7183 | 12145 |
| Storage temperatures              | -25/+55 °C (-13/131 °F) (15-25 °C for maximum battery life) |      |      |      |      |      |       |
| Working temperature               | 0/40 °C (32/104 °F) (15-25 °C for maximum battery life)     |      |      |      |      |      |       |
| Maximum relative humidity         | 95% max. without condensation                               |      |      |      |      |      |       |
| Maximum altitude without derating | 1.000 m (3.300 ft)  |      |      |      |      |      |       |
| Degree of protection              | IP 20 (other IP as option)                                  |      |      |      |      |      |       |
| Colour cabinet                    | RAL 7016@enclosure RAL 9005@front door metal                |      |      |      |      |      |       |
| <b>Table.1</b>                    |   |      |      |      |      |      |       |



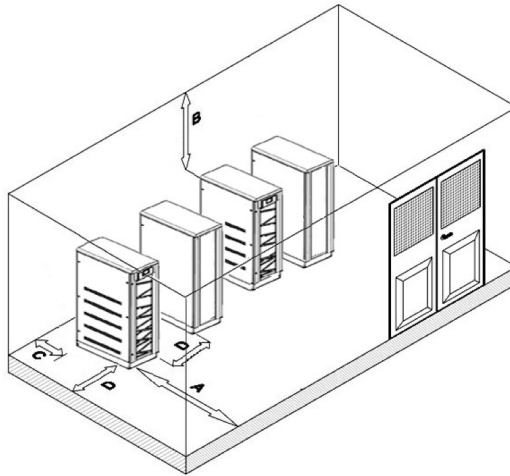
**Air conditioning**

**Ventilation**

**Direction of ventilation is front/sides to back.**

The room should be equipped with ventilation system or air conditioning to collect warm air from the top of the room and provide cool air at the bottom.

Figure.5.2-4



**ROOM LAYOUT RECOMMENDATION TABLE (for UPS with Internal Battery)**

| A (mm) | B (mm) | C (mm) | D (mm) |
|--------|--------|--------|--------|
| >1400  | 500    | 250    | 30     |



Ensure the stability of UPS by fixing the feet to the floor.



The UPS should be mounted on a concrete surface and non-combustible surface.



In order to profit from optimal ventilation, the side panels must remain in place for UPS with internal battery.



Optimal battery life time is reached when battery ambient temperature is kept between 15°C and 25°C. Operating battery at 30°C ambient temperature compared to 20°C will divide by factor 2 battery life time. Room thermal management as specified above is then necessary to avoid battery life time reduction. The Battery warranty does not apply if the temperature in the room exceeds 25°C.

### 5.3. Storage

Please store the UPS in an environment where the temperature is between -25 °C + 55 °C, no receipt of direct sunlight, far from the heating, in a dry place.

Environmental humidity must be between 20-95% (non-condensing).

Recommended storage temperature, humidity and altitude values are listed on the [Appendix-1 Technical Specifications](#) section.

If the batteries will be stored for longer than 6 months, they shall be charged periodically. Charge period depends on the storage temperature, as shown below:

- Every 9 months if the temperature is below 20°C,
- Every 6 months if the temperature is between 20°C and 30°C,
- Every 3 months if the temperature is between 30°C and 40°C,
- Every 2 months if the temperature is over 40°C

For long storage duration; please follow up the instructions of installation described in [Section 6](#), start-up UPS described in [Section 8](#) and charge the batteries at least 10 hours.

### 5.4. Electrical Requisites

The installation must comply with national installation regulations.

The electrical distribution panels for common mains supply voltage and auxiliary mains supply voltage inputs must have a protection and disconnection system. Disconnection devices used in these panels shall disconnect all line conductors simultaneously. The following table shows the recommended size of common mains supply voltage and auxiliary mains supply voltage input protection devices (thermal, magnetic and differential) and the cable cross-sections for the linear loads. The energy quality of the electrical network should comply with the individual voltage harmonics compatibility levels defined by IEC 61000-2-2. For more severe conditions, a power quality audit is required to check compatibility during UPS commissioning by authorized LEGRAND UPS Technical Service Personnel.

of common mains supply voltage and auxiliary mains supply voltage input protection devices (thermal, magnetic and differential) and the cable cross-sections for the loads.



#### When dual inputs is used:

- Separate Neutral conductor is necessary to be supplied for each input: Common Mains Input and Auxiliary Mains Input
- The two inputs should be supplied by the same MV/LV transformer source. If this is not the case, an insulation transformer should be added in the auxiliary mains line upstream the UPS.
- Separate protection is necessary for each input line.

| Installation Parameters  |  |       |       |     |       |     |    |
|--|--|-------|-------|-----|-------|-----|----|
| Model (kVA)  | 10   | 15    | 20    | 30  | 40    | 60  |    |
| Phase in/out   | 3Ph+N+PE / 3Ph+N+PB  |       |       |     |       |     |    |
| Rated output apparent power (kVA)  | 10   | 15    | 20    | 30  | 40    | 60  |    |
| Rated output active power (kW)   | 10   | 15    | 20    | 30  | 40    | 60  |    |
| Rated input current (A) at 400V nominal input voltage  | 15   | 23    | 31    | 46  | 61    | 92  |    |
| Maximum input current (A) at 340V input voltage + full load + battery charging                                     | 18   | 27    | 36    | 54  | 72    | 108 |    |
| Rated bypass current (A) at 400V nominal input voltage   | 15   | 22    | 29    | 44  | 58    | 87  |    |
| Maximum bypass current (A) at 400V, 125% overload 10 min   | 19   | 28    | 36    | 55  | 73    | 109 |    |
| Inverter output current @ 400V (A)   | 15   | 22    | 29    | 44  | 58    | 87  |    |
| Maximum Inverter output current (A) at 400V, 125% overload 10 min  | 19   | 28    | 36    | 55  | 73    | 109 |    |
| Overload tolerated by the inverter (with mains power present) (kW)   | 10 min   | 12.5  | 18.8  | 25  | 37.5  | 50  | 75 |
|  | 1 min  | 15    | 22.5  | 30  | 45    | 60  | 90 |
| Recommended Protection Devices - Rectifier/Mains Supply -*   |  |       |       |     |       |     |    |
| D curve circuit breaker (A) (3 or 4-pole according neutral system)   | 20   | 32    | 40    | 63  | 80    | 125 |    |
| GG fuse (A)  | 20   | 32    | 40    | 63  | 80    | 125 |    |
| Recommended Protection Devices – General Bypass/Auxiliary Mains Supply -*  |  |       |       |     |       |     |    |
| D curve circuit breaker (A) (3 or 4 poles according neutral system)  | 20   | 32    | 40    | 63  | 80    | 100 |    |
| Maximum I <sub>2t</sub> supported by the bypass (A <sup>2</sup> s) (10ms)  | 6700   | 11200 | 15000 |     | 25300 |     |    |
| I <sub>cc</sub> max (A)  | 1200   | 1500  | 1700  |     | 2300  |     |    |
| Protection Devices – Battery Fast Fuse –   |  |       |       |     |       |     |    |
| Ferrule style high speed fuses and with indicating striker (High Speed FWP Bussmann Fuse 22x58mm 690VAC (IEC)) (A) | 25   | 32    | 50    | 63  | 80    | 100 |    |
| Output max recommended Protection Devices to assure discrimination in battery mode operation                       |  |       |       |     |       |     |    |
| C curve circuit breaker (A) (3-pole) ** (3 or 4 poles according neutral system)                                    | ≤3   | ≤4    |       | ≤6  | ≤10   | ≤13 |    |
| B curve circuit breaker (A) (3-pole) (3 or 4 poles according neutral system)                                       | ≤6   | ≤8    |       | ≤13 | ≤20   | ≤25 |    |
| Maximum inverter short circuit current for 50 ms: IK1=IK2=IK3 =IF  | 2.1xIn   |       |       |     |       |     |    |
| Max. Cable Cross-Section for Terminals**   |  |       |       |     |       |     |    |
| Rectifier (mm <sup>2</sup> )   | 35   |       |       |     |       |     |    |
| General Bypass (mm <sup>2</sup> )  | 35   |       |       |     |       |     |    |
| Battery (mm <sup>2</sup> )   | 16   |       |       | 35  |       |     |    |
| Output (mm <sup>2</sup> )  | 35   |       |       |     |       |     |    |
| Neutral (mm <sup>2</sup> )   | 35 (Battery Neutral: 16)   |       |       |     | 35    |     |    |
| Protective Earth/Bonding   | Recommended cross section for ground wire at least half of the section of cable phases AND shall comply with the standards of the country (for example NFC 15100 in France).             |       |       |     |       |     |    |
| Leakage Current Protection ***   | Minimum 300 mA delayed (Type-B). When used, the residual current earth leakage protection system must be common for the two AC inputs (common & auxiliary mains) and installed upstream. |       |       |     |       |     |    |

**Table.2**

\*Rectifier protection alone should only be considered in the event of separate inputs; if the bypass and rectifier inputs are combined, the general input protection rating (bypass + rectifier) must reflect the recommended rectifier protection rating.

\*Recommended discrimination of UPS downstream distribution with inverter short-circuits current (battery mode).

\*\* Cables must be selected 1.2 times larger than the recommended size for parallel topologies.

\*\*\*Must be selective with residual current circuit breakers downstream of the UPS connected to the UPS output. If the bypass network is separate from the rectifier circuit, or in the event of parallel UPS, use a single residual current circuit breaker upstream of the UPS.



If the load generates high rate of third harmonic current (THDI > 33%), the current on the common mains supply voltage and auxiliary mains supply voltage input and output neutral conductors may have a value that is 1.5-2 times the phase value during operation. In this case, size the neutral cables and the input/output protection adequately.

## 6. Installation

When the UPS is delivered, examine the packaging and product carefully to see if any damage occurred during transport.

If either possible or ascertained damage is found report it immediately to:

- the carrier;
- LEGRAND Technical Assistance Centre.

Make sure that the unit received corresponds to the material specified on the delivery document. The UPS KEOR T EVO packaging protects the equipment against mechanical and environmental damages. For greater protection it is also wrapped in a transparent film.

Check if the following are provided with the equipment

- UPS
- Installation & Operating Manual
- Key for door
- Battery fuses (three pieces)
- Plinths



Before the installation, please check if your UPS is customized following your special requirements (if any).

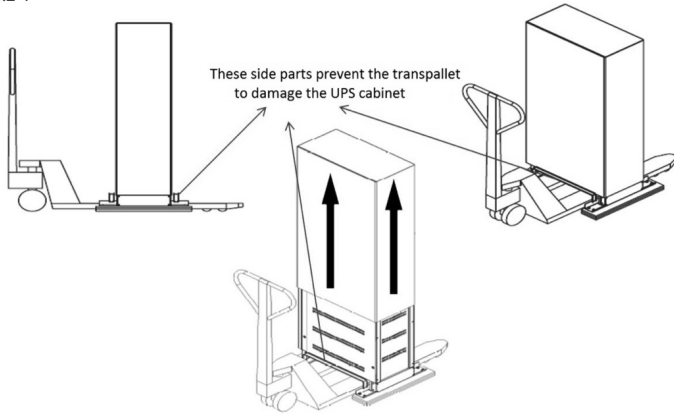
### 6.1. Models and Dimensions

| UPS Type                       | Dimension (HxWxD) (mm) | Net Weight (Kg) | Internal Batteries Type |
|--------------------------------|------------------------|-----------------|-------------------------|
| UPS KEOR T EVO 10 KVA 1345H P0 | 1345 x 400 x 800       | 122             | No battery              |
| UPS KEOR T EVO 10 KVA 1345H P1 | 1345 x 400 x 800       | 261             | 60 blocks 7 AH          |
| UPS KEOR T EVO 10 KVA 1345H P2 | 1345 x 400 x 800       | 283             | 60 blocks 9 AH          |
| UPS KEOR T EVO 10 KVA 1650H P3 | 1650 x 400 x 800       | 426             | 120 blocks 7 AH         |
| UPS KEOR T EVO 15 KVA 1345H P0 | 1345 x 400 x 800       | 127             | No battery              |
| UPS KEOR T EVO 15 KVA 1345H P1 | 1345 x 400 x 800       | 268             | 60 blocks 7AH           |
| UPS KEOR T EVO 15 KVA 1345H P2 | 1345 x 400 x 800       | 288             | 60 blocks 9 AH          |
| UPS KEOR T EVO 15 KVA 1650H P3 | 1650 x 400 x 800       | 431             | 120 blocks 7 AH         |
| UPS KEOR T EVO 20 KVA 1345H P0 | 1345 x 400 x 800       | 134             | No battery              |
| UPS KEOR T EVO 20 KVA 1345H P1 | 1345 x 400 x 800       | 275             | 60 blocks 7AH           |
| UPS KEOR T EVO 20 KVA 1345H P2 | 1345 x 400 x 800       | 296             | 60 blocks 9 AH          |
| UPS KEOR T EVO 20 KVA 1650H P3 | 1650 x 400 x 800       | 477             | 120 blocks 9 AH         |
| UPS KEOR T EVO 30 KVA 1345H P0 | 1345 x 400 x 800       | 141             | No battery              |
| UPS KEOR T EVO 30 KVA 1345H P1 | 1345 x 400 x 800       | 302             | 60 blocks 9 AH          |
| UPS KEOR T EVO 30 KVA 1650H P2 | 1650 x 400 x 800       | 441             | 120 blocks 7 AH         |
| UPS KEOR T EVO 30 KVA 1650H P3 | 1650 x 400 x 800       | 484             | 120 blocks 9 AH         |
| UPS KEOR T EVO 40 KVA 1650H P0 | 1650 x 600 x 900       | 238             | No battery              |
| UPS KEOR T EVO 40 KVA 1650H P1 | 1650 x 600 x 900       | 538             | 120 blocks 7 AH         |
| UPS KEOR T EVO 40 KVA 1650H P2 | 1650 x 600 x 900       | 573             | 120 blocks 9 AH         |
| UPS KEOR T EVO 40 KVA 1650H P3 | 1650 x 600 x 900       | 740             | 180 blocks 9 AH         |
| UPS KEOR T EVO 60 KVA 1650H P0 | 1650 x 600 x 900       | 258             | No battery              |
| UPS KEOR T EVO 60 KVA 1650H P1 | 1650 x 600 x 900       | 590             | 120 blocks 9 AH         |
| UPS KEOR T EVO 60 KVA 1650H P2 | 1650 x 600 x 900       | 755             | 180 blocks 9 AH         |

Table.3

## 6.2. Unpacking Procedure

Figure.6.2-1



Remove the wrap and the package.

Figure.6.2-2

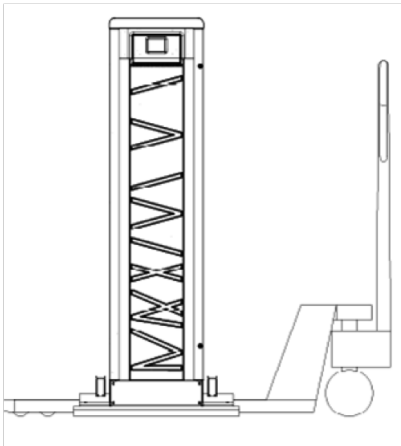
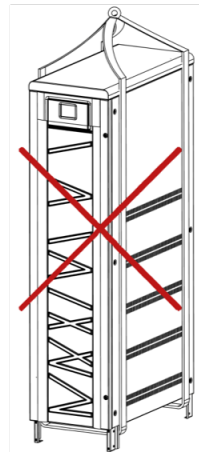
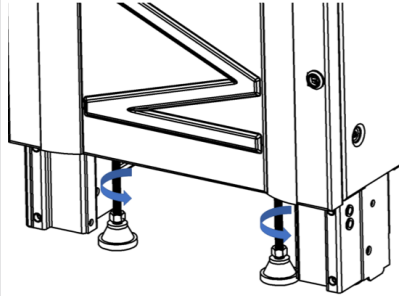
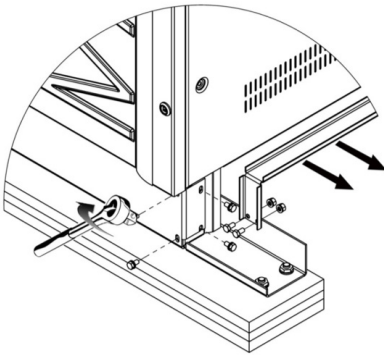


Figure.6.2-3



Place UPS in the installation area.

Figure.6.2-4



**Remove the side parts which prevent the transpallet to damage the UPS.  
Unload the UPS from the pallet and move UPS to final position using the wheels.  
Unscrew the 2 feet to block the UPS in final position.**



It is recommended to store the original UPS packaging for future needs.

### 6.3. Installation Procedures and Instructions



The equipment may only be installed and commissioned by authorized LEGRAND UPS Technical Service Staff or authorized LEGRAND distributor Technical Service Staff.



When the UPS is brought from a cold place to a warmer place, humidity of the air may condensate in it. In this case, wait minimum for 2 (two) hours before powering the UPS.



KEORT EVO must be protected from voltage surge with devices that are suited to the installation; the mains voltage surge must be limited to 2kV. These protective devices must be sized to take into account all the installation parameters (geographical position whether or not there is a lightning rod, whether or not there are other suppressors in the electrical installation, etc.)



Do not connect the output neutral to the protective ground or protective bonding (except the TNC Option). KEORT EVO does not modify the neutral arrangements of the system; the use of an isolation transformer is required should it be necessary to modify the neutral arrangements downstream KEORT EVO.



Power cables and communication cables shall be installed on trays according to the standards of the country.



## 6.3.1. Power Connections of Single Systems



Make sure that all circuit breakers are "OFF" before starting with the installation.

The power screw terminals are located on the lower front side of the UPS. Firstly, open the UPS door, screw out of the metal cover, afterwards open plastic cover of terminals. After the covers are removed, the cables shall be passed through the hole under the terminals. After all connections done, replace the covers in order.

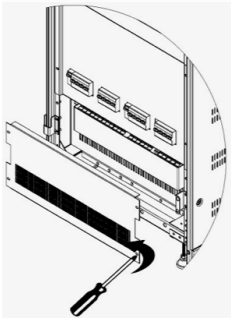


Figure.6.3.1-1

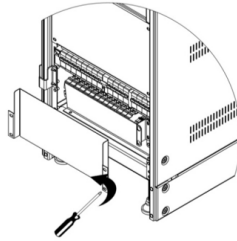


Figure.6.3.1-2

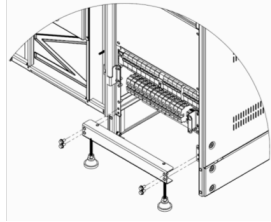


Figure.6.3.1-3

### 10-30kVA KEORT EVO

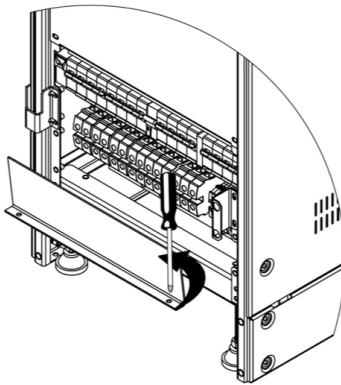


Figure.6.3.1-4

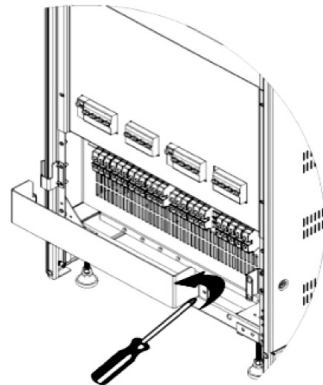
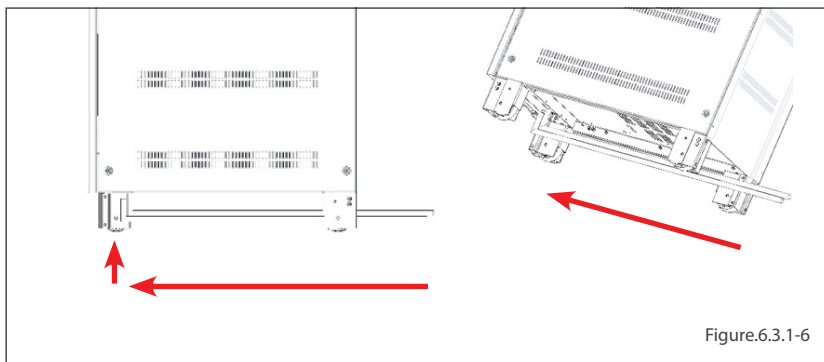
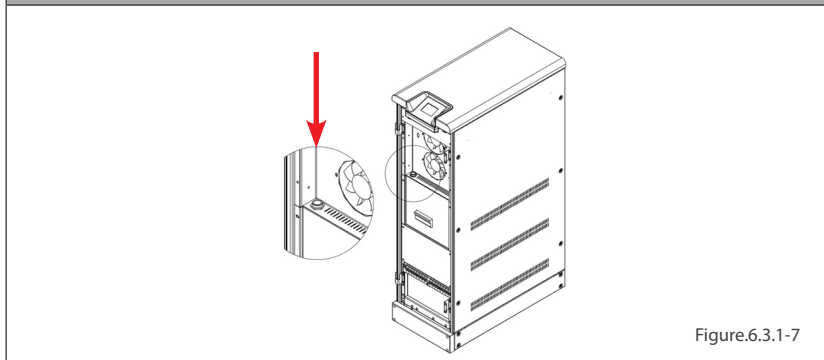


Figure.6.3.1-5

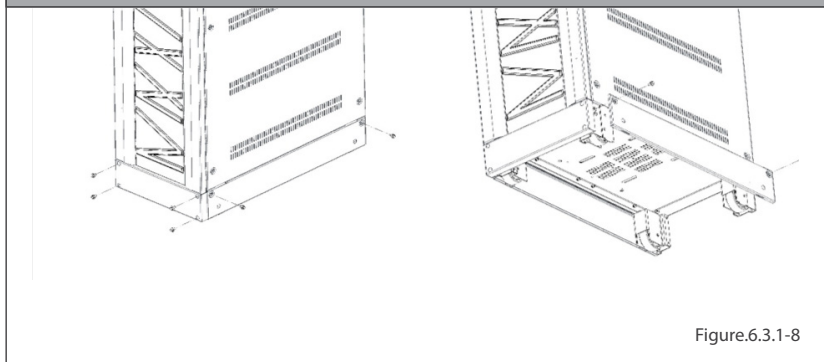
### 40-60kVA KEORT EVO



**Power Cables Path**



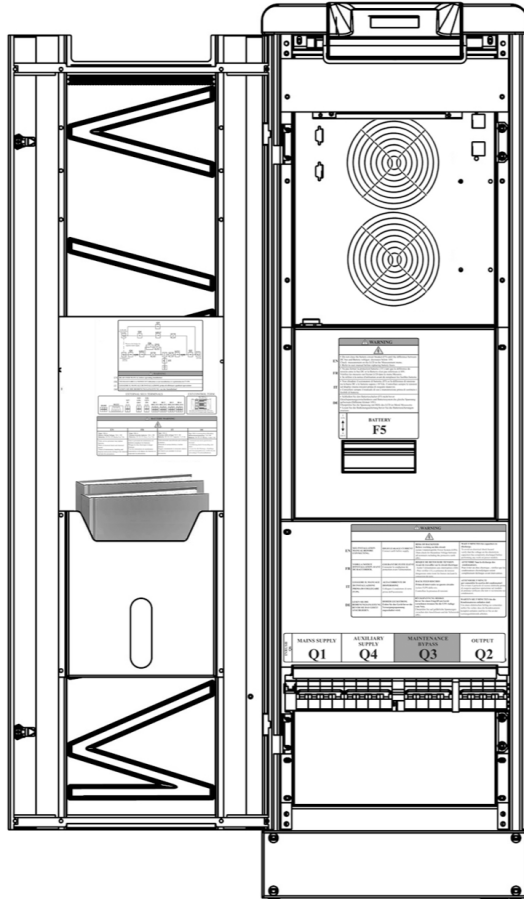
**Communication Cables Path**



**Fix the plinths delivered with the UPS after all cable installation done.**

## KEORT EVO 10-30kVA (3Ph Input – 3Ph Output) Circuit Breakers

Figure.6.3.1-9

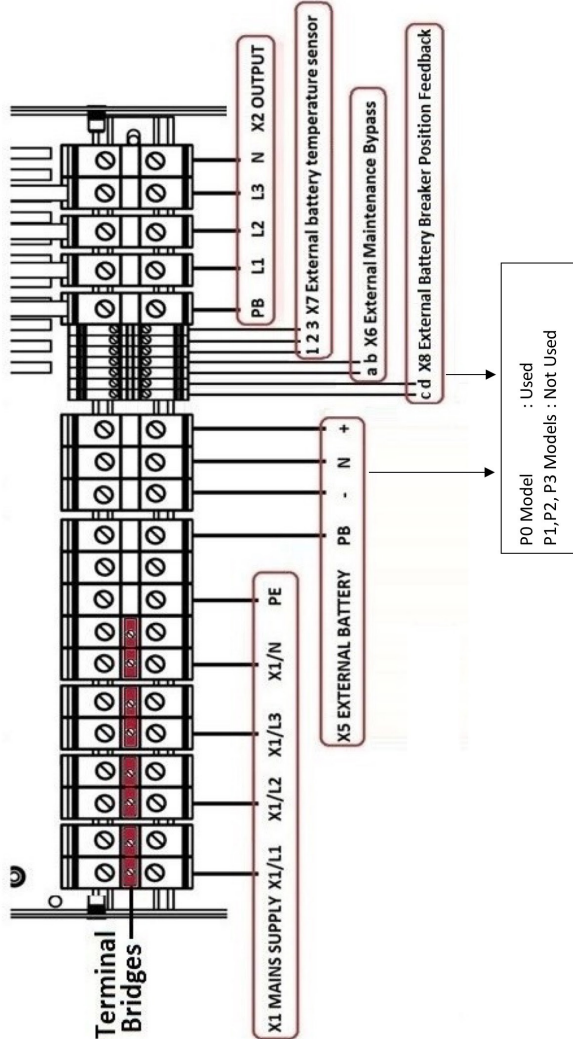


**Q1:** Common Mains Supply Circuit Breaker  
**Q2:** Output Circuit Breaker  
**Q3:** Maintenance Bypass Circuit Breaker

**Q4:** Auxiliary Mains Supply Circuit Breaker  
**F5:** Battery Fast Fuse  
**Q6:** Inrush Circuit Breaker

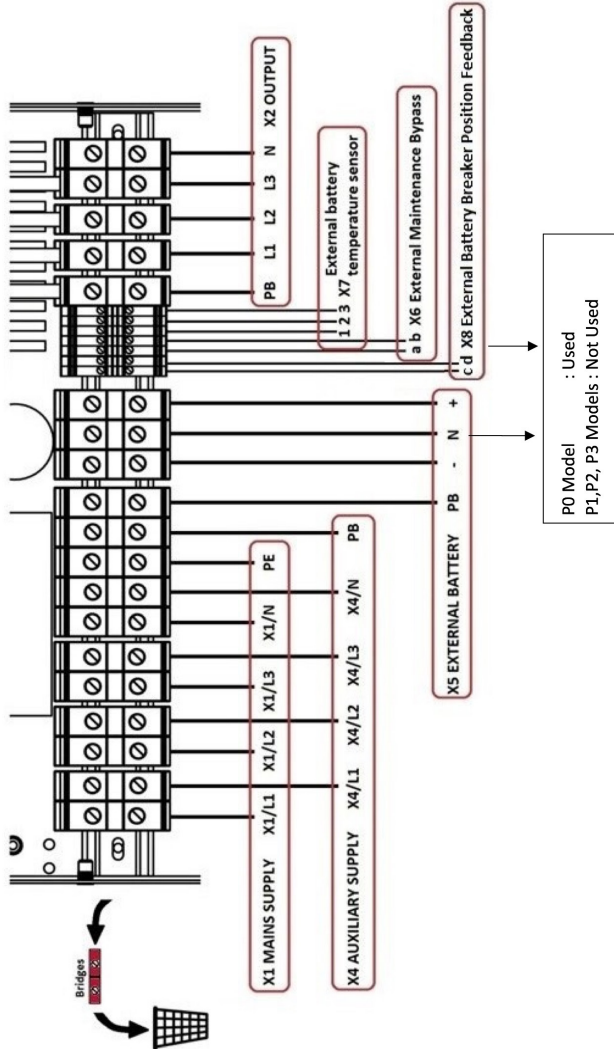
**KEORT EVO 10-30kVA (3Ph Input – 3Ph Output)**  
**Connection if the MAINS and AUX Supply are connected in COMMON**

Figure.6.3.1-10



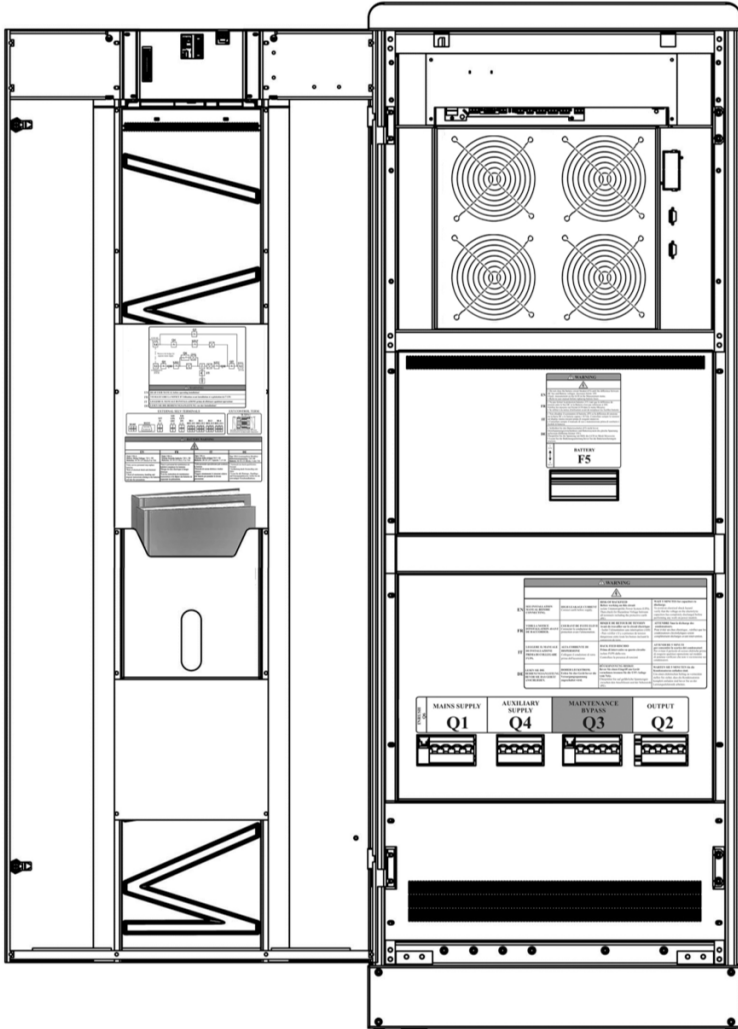
**KEORT EVO 10-30kVA (3Ph Input – 3Ph Output)**  
**Connection if the MAINS and AUX Supply are connected in COMMON**

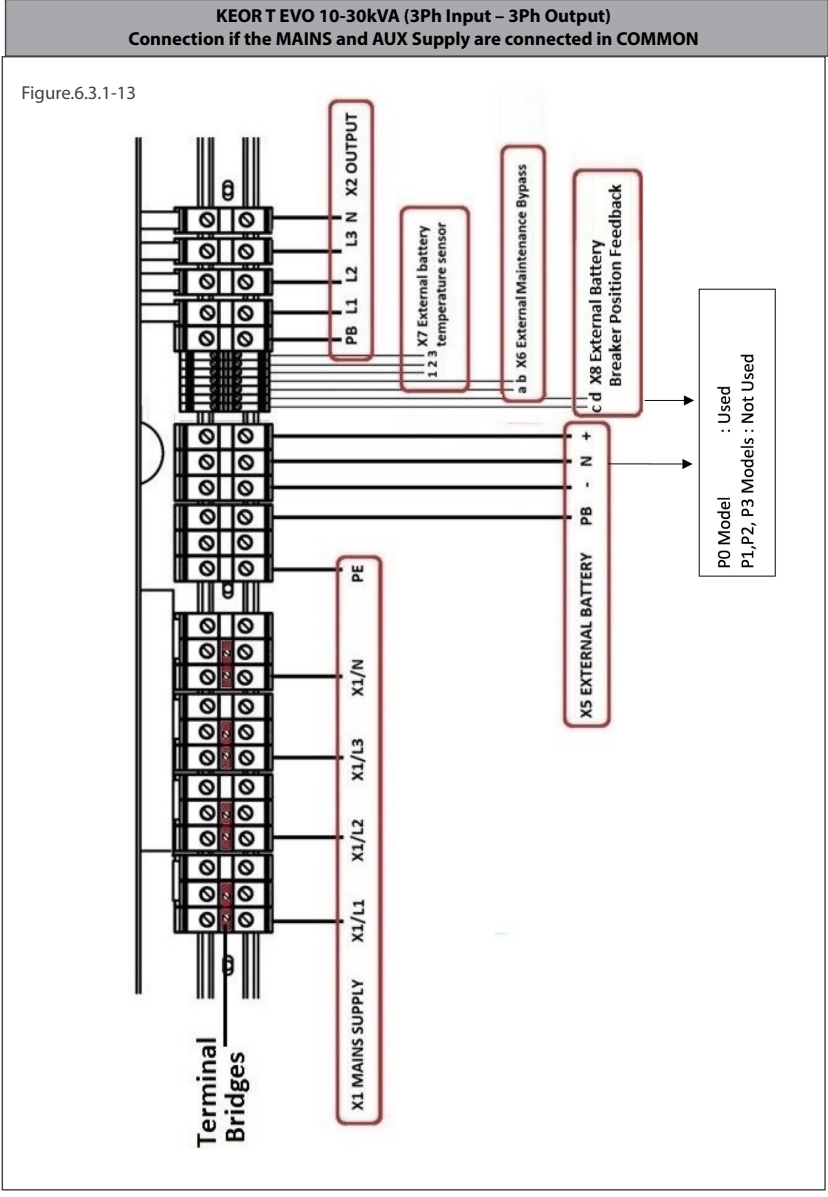
Figure.6.3.1-11



**KEORT EVO 40-60kVA (3Ph Input – 3Ph Output) Circuit Breakers**

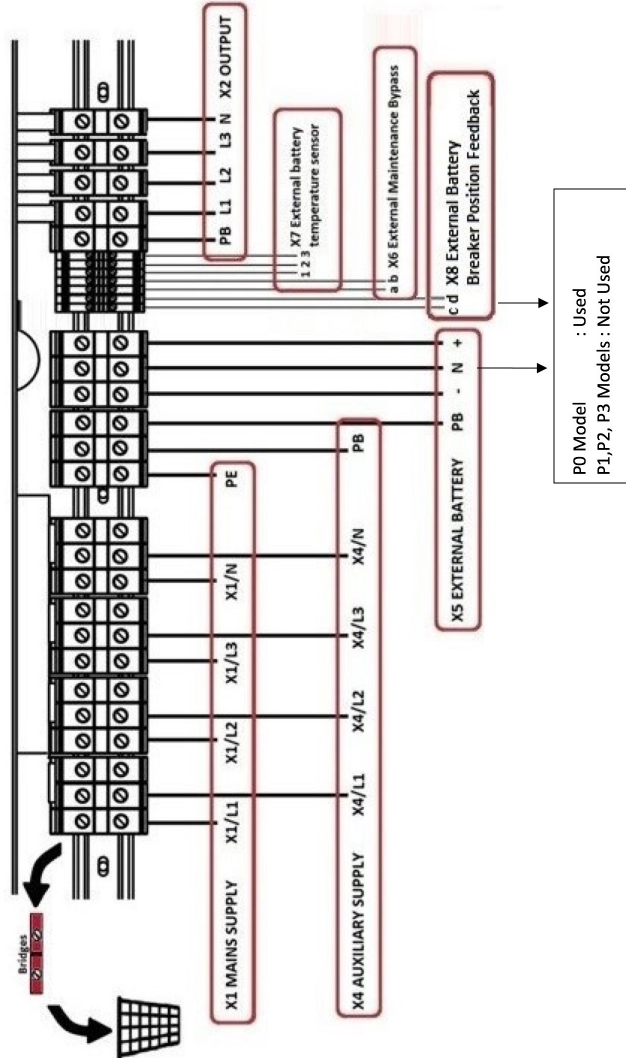
Figure.6.3.1-12





**KEORT EVO 10-30kVA (3Ph Input – 3Ph Output)**  
**Connection if the MAINS and AUX Supply are connected in COMMON**

Figure.6.3.1-14





Connections shall be made in the following order;

### 6.3.1.1. Earth Connection



The device shall be earthed for a safe and reliable operation. Connect the PE/ PB ground terminals before connecting any other cable.

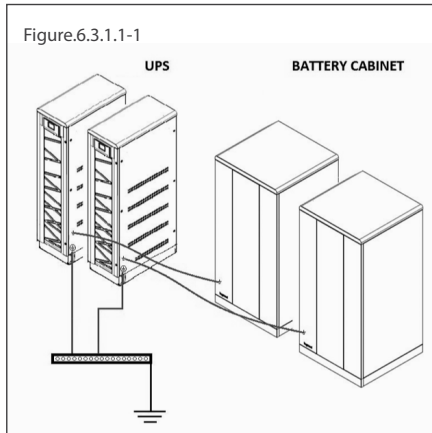


Figure.6.3.1.1-1

Input Mains Supply's Protective Earth terminal **PE** of the UPS shall be connected to the ground with a low impedance connection.

As the Auxiliary Supply Protective Bonding **PB** and Input Mains Supply's Protective Earth **PE** terminals are short-circuited inside UPS, it is not needed any connection.

Load ground should be connected to output **X2/PB** terminal of the UPS.

If there is an external battery cabinet present, it should be grounded via battery **X5/PB** terminal of the UPS.

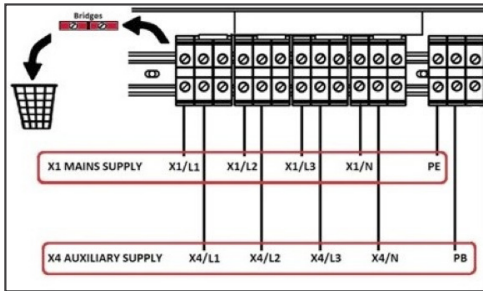
### 6.3.1.2. Mains Supply (Rectifier) Connection



The installation and adjustment of distribution panel should be done by specialized technician.

| Electrical Characteristics - Rectifier Input        |   |    |    |    |    |    |
|---|---|----|----|----|----|----|
| Model (kVA)   | 10  | 15 | 20 | 30 | 40 | 60 |
| Rated mains supply voltage (V)                      | 400 (3Ph+N+PE)  |    |    |    |    |    |
| Voltage tolerance (V) (ensuring battery recharge)   | 208-459 (at half Load, without battery recharge)<br>338-459 (at full Load, with battery recharge) |    |    |    |    |    |
| Rated frequency (Hz)                                | 50/60   |    |    |    |    |    |
| Frequency tolerance (Hz)                            | from 45 to 65   |    |    |    |    |    |
| Power factor (input at full load and rated voltage) | ≥ 0,99  |    |    |    |    |    |

Table.4



Connect the phase cables to X1 **MAINS SUPPLY: X1/L1 - X1/L2 - X1/L3** terminals, the neutral to X1 **MAINS SUPPLY: X1/N** terminal.

Cables must be protected by fuses or MCCB, refer to [Section 4.4](#)



**If auxiliary supply exists, remove all bridges.** When used, the residual current earth leakage protection system must be common for the two AC inputs and installed upstream.



According to EN 62040-1, the user should place a warning label on the input distribution panel and the other primary power isolators, in order to prevent the risk of voltage backfeed.

This label is supplied with the Installation Manual. It indicates:

**RISK OF VOLTAGE BACKFEED**

- Isolate Uninterruptable Power Supply before working on this circuit.
- Then check for Hazardous Voltage between all terminals including the protective earth (PE).

|  |  |  |
|--|--|--|
|  |  | <b>WARNING</b>   |
|  |  | <p><b>RISK OF BACKFEED</b><br/> <b>Before working on this circuit</b><br/>         isolate Uninterruptible Power System (UPS),<br/>         Then check for hazardous Voltage between<br/>         all terminals including the protective earth<br/>         (PE)</p> |

|  |  |   |
|--|--|---|
|  |  | <b>WARNING</b>  |
|  |  | <p><b>RISQUE DE RETOUR DE TENSION</b><br/> <b>Avant de travailler sur le circuit électrique</b><br/>         Isoler l'alimentation sans interruption (ASI)<br/>         Puis vérifier s'il y a présence de tension<br/>         dangereuse entre toutes les bornes incluant la<br/>         connexion de terre.</p> |

|  |  |  |
|--|--|--|
|  |  | <b>WARNING</b>   |
|  |  | <p><b>BACK FEED RISCHIO</b><br/> <b>Prima di intervenire su questo circuito</b><br/>         isolare l'UPS dalla rete .<br/>         Controllare la presenza di tensioni<br/>         pericolose tra tutti i terminali</p> |

|  |  |  |
|--|--|--|
|  |  | <b>WARNING</b>   |
|  |  | <p><b>RÜCKSPANNUNG RISIKO</b><br/> <b>Bevor Sie einen Eingriff am Grät</b><br/> <b>vornehmen trennen Sie die USV - Anlage</b><br/> <b>vom Netz.</b><br/>         Überprüfen Sie auf gefährliche spannungen<br/>         zwischen den Anschlüssen und der<br/>         Schutzerde (PE).</p> |

**6.3.1.3. Auxiliary Supply Connection**

| Electrical Characteristics - Bypass |  |    |    |    |    |    |
|-------------------------------------|--|----|----|----|----|----|
| Model (kVA)                         | 10   | 15 | 20 | 30 | 40 | 60 |
| Bypass frequency slew rate          | 2 Hz/s settable from 1 to 3 Hz/s             |    |    |    |    |    |
| Bypass rated voltage                | Nominal output voltage $\pm 18\%$ (settable) |    |    |    |    |    |
| Bypass rated frequency              | 50/60 Hz (selectable)                        |    |    |    |    |    |
| Bypass frequency tolerance          | $\pm 3\text{Hz}$                             |    |    |    |    |    |

**Table.5**



If auxiliary supply exists, remove all bridges.

Connect the phase cables to **X4 AUXILIARY SUPPLY: X4/L1 - X4/L2 - X4/L3** terminals, the neutral to **X4 AUXILIARY SUPPLY: X4/N** terminal.

Cables must be protected by fuses or MCCB, refer to [Section 5.4](#)

### 6.3.1.4. Battery Connection

You may find more information about KEORT EVO Models and Battery capacity in [Section 6.1. Models and Dimensions](#).



Danger of explosion and fire if the batteries of the wrong type are used.



The batteries must be charged min. 10 hours before first-use.



Battery fast fuses shall only be replaced with fuses of the same type and rating.

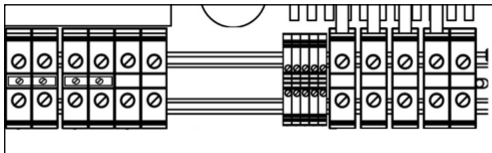


Do not use internal and external battery together!

### Internal Battery Connection:



If UPS with internal battery; there are no **X5** and **X8** terminals mounted on the UPS.



If the batteries are already built-in inside the UPS cabinet; in order to avoid any danger during transportation, some battery connections are left unconnected.

Thus, remove the left & right covers of UPS; disconnect the side panels' earth cables. Connect the unconnected battery cables to the related battery connectors. The unconnected cables are labelled. You may find detailed information about battery connection as follows.

There is no need for any further connection, so reconnect the side panels' earth cables and replace the covers.



**LETHAL VOLTAGE** of nominal 720 VDC is present when the external battery connections are made.

**KEORT EVO 10-30kVA 1x60pcs 7-9Ah BATTERY WIRING DIAGRAM**

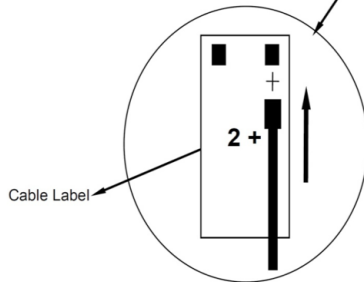
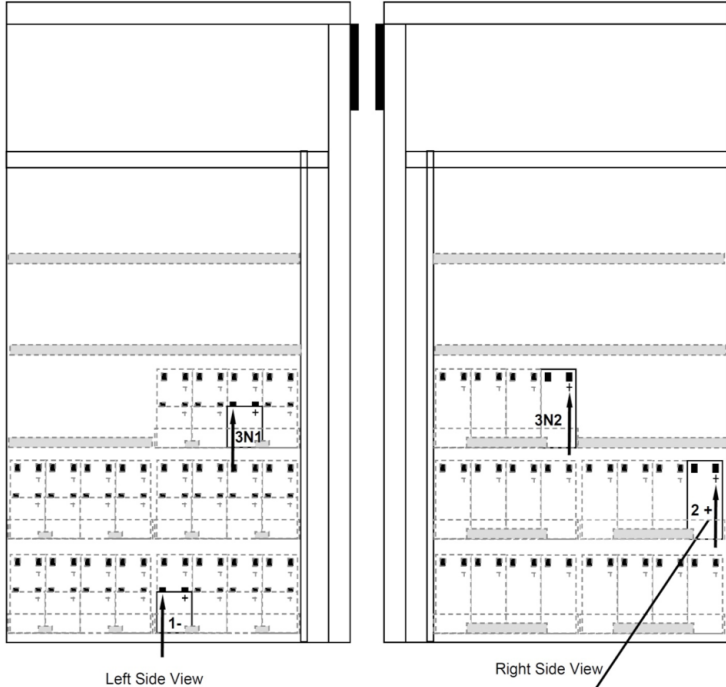
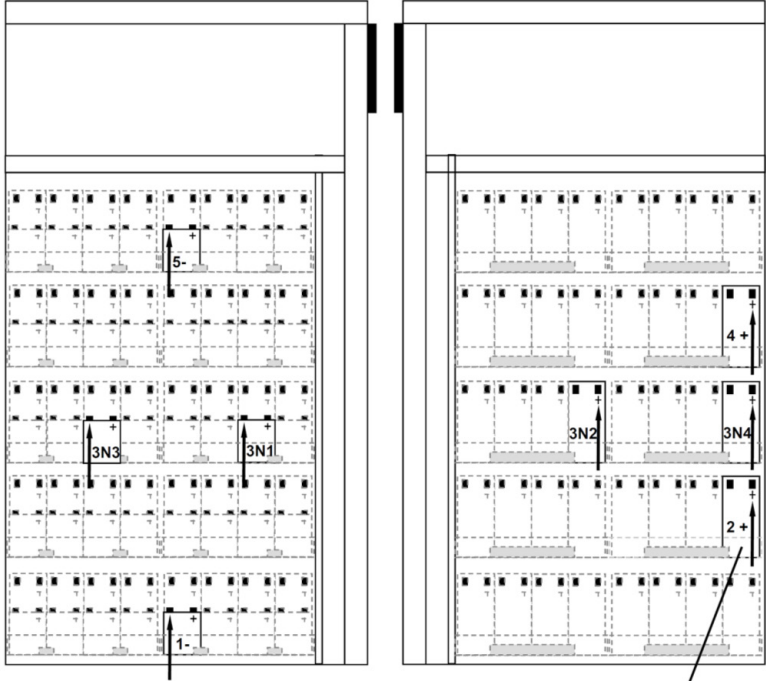


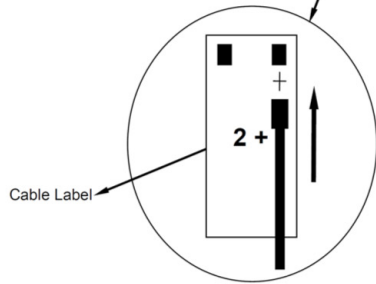
Figure.6.3.1.4-1

## KEORT EVO 10-30kVA 2x60pcs 7-9Ah BATTERY WIRING DIAGRAM



Left Side View

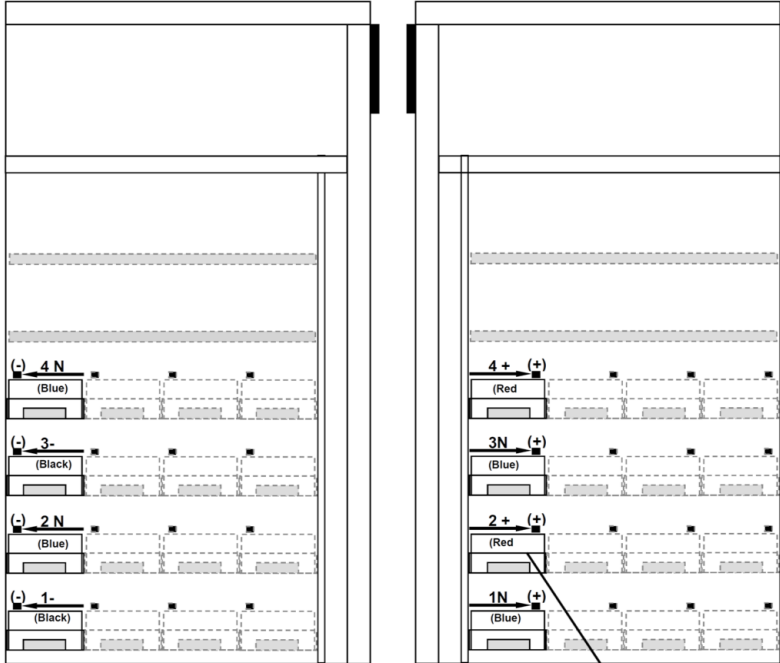
Right Side View



Cable Label

Figure.6.3.1.4-2

**KEORT EVO 40-60kVA 2x60pcs 7-9Ah BATTERY WIRING DIAGRAM**



Left Side View

Right Side View

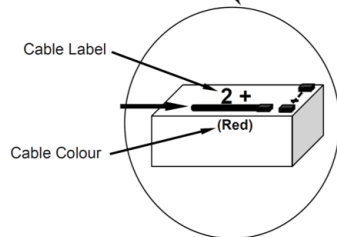


Figure.6.3.1.4-3

# KEORT EVO

## KEORT EVO 40-60kVA 3x60pcs 7-9Ah BATTERY WIRING DIAGRAM

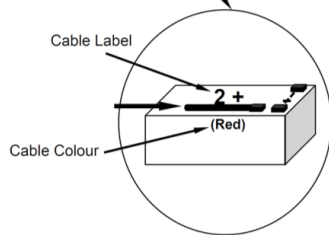
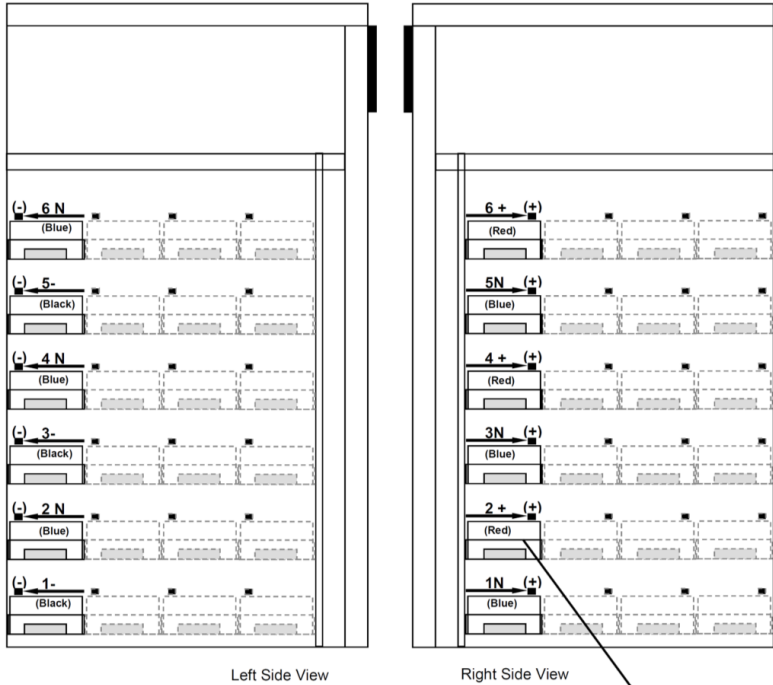


Figure.6.3.1.4-4

### External Battery Connection:

KEOR T EVO Battery Cabinet comes with the following cables;

- 3 meters 4 x 16mm<sup>2</sup> power cables for battery connection
- 4 meters 2 x 0.5mm<sup>2</sup> double insulated cables for external battery breaker position feedback signal
- 4 meters 3 x 1.5mm<sup>2</sup> double insulated cables for external battery cabinet temperature sensor signal
- 3 x Field-mountable Battery Fast Fuses (rating & type depending on the cabinet model)
- 2.9 meters spiral for power cables for protection



If battery cabinets not supplied by LEGRAND, it is the installer's responsibility to check the electrical compatibility and the presence of appropriate protection devices between the cabinet and KEOR T EVO.



Read the **KEOR T EVO Service Manual** carefully for **Battery Wiring Diagram in External Battery Cabinet!**



To avoid risk of electromagnetic interference, separate the battery cables from Input and Output cables.



**LETHAL VOLTAGE** of nominal 720 VDC is present when the external battery connections are made.

For UPS and External Battery Cabinet Connections, please follow up the instructions below;

- Unplug the cable of Thermal Sensor Board on the UPS.
- Switch all battery cabinets circuit breaker (**F5**) to **"OFF"** position.
- **Ground:** Connect all **"PB"** on the battery cabinets directly to **X5 EXT. BATTERY: "PB"** on the UPS.
- **Negative String:** Connect the **"-"** on Battery Cabinet #1 to **X5 EXT. BATTERY: "-"** on the UPS. Connect the **"-"** on Battery Cabinet #2 to **X5 EXT. BATTERY: "-"** on the Battery Cabinet #1 and so on...
- **Positive String:** Connect the **"+"** on Battery Cabinet #1 to X5 EXT. BATTERY: **"+"** on the UPS. Connect the **"+"** on Battery Cabinet #2 to **X5 EXT. BATTERY: "+"** on the Battery Cabinet #1 and so on...
- **Neutral:** Connect the **"N"** on Battery Cabinet #1 to **X5 EXT. BATTERY: "N"** on the UPS. Connect the **"N"** on Battery Cabinet #2 to **X5 EXT. BATTERY: "N"** on the Battery Cabinet #1 and so on...
- External Battery Cabinet Temperature Sensor: Only connect the **X7: "X7/1 – X7/2 – X7/3"** on the Battery Cabinet #1 to X7: **"X7/1 – X7/2 – X7/3"** on the UPS. (Not extended 25m length is recommended)
- External Battery Breaker Position Feedback:

For one battery cabinet & UPS configuration: Connect the **X8: "X8/c – X8/d"** on the UPS to **X8: "X8/c – X8/d"** on Battery Cabinet #1.

For two battery cabinets & UPS configuration: Connect the **X8: "X8/c – X8/d"** on the UPS to **X8: "X8/c – X8/e"** on Battery Cabinet #1. Connect the X8: **"X8/d – X8/e"** on Battery Cabinet #1 to X8: **"X8/c – X8/d"** on Battery Cabinet #2.

For three battery cabinets & UPS configuration: Connect the **X8: "X8/c – X8/d"** on the UPS to **X8: "X8/c – X8/e"** on Battery Cabinets #1. Connect the **X8: "X8/d – X8/e"** on Battery Cabinet #1 to **X8: "X8/c – X8/e"** on Battery Cabinet #2. Connect the **X8: "X8/d – X8/e"** on Battery Cabinet #2 to **X8: "X8/c – X8/d"** on Battery Cabinet #3.

**Battery Fast Fuses:** Mount the battery fast fuses into battery fuse holder on the battery cabinet. (fast fuse indicator side must be placed upper side of the holder) Do not close the battery circuit breaker!





Double check the polarity of battery connection!

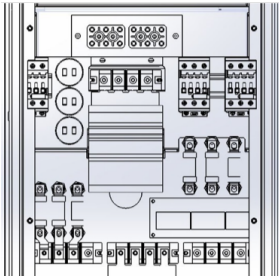


Figure.6.3.1.4-5

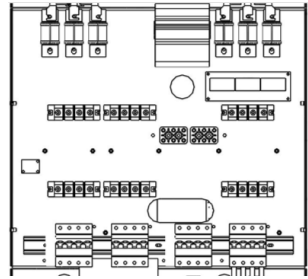


Figure.6.3.1.4-6

**KEORT EVO 10-30kVA UPS**

**KEORT EVO 10-60kVA**

**Unplug the cable of Thermal Sensor Board on the UPS**

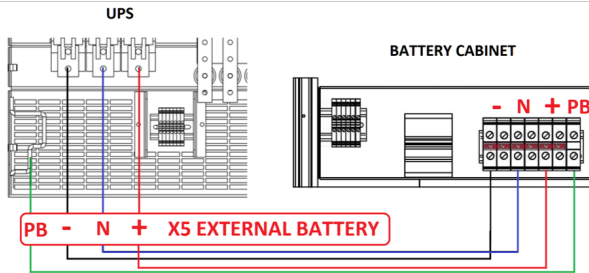


Figure.6.3.1.4-7

**Power Connection of Single Battery Cabinet**

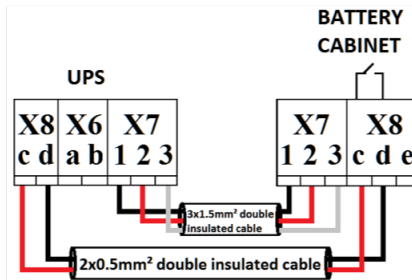


Figure.6.3.1.4-8

**Signal Connection of Single Battery Cabinet**

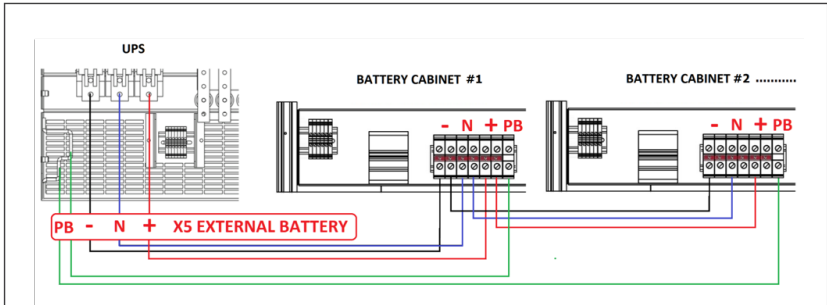


Figure.6.3.1.4-9

**Power Connection of Two and More Parallel Battery Cabinets**

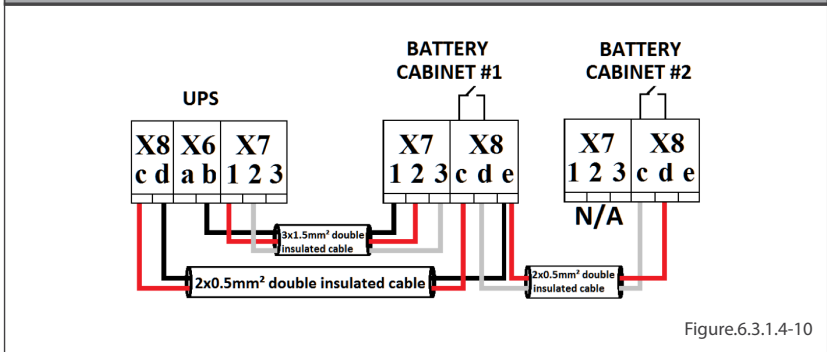


Figure.6.3.1.4-10

**Signal Connection of Two Parallel Battery Cabinets**

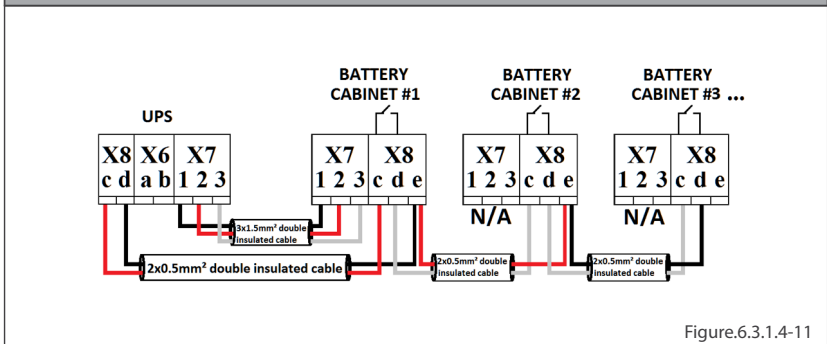


Figure.6.3.1.4-11

**Signal Connection of Three and More Parallel Battery Cabinets**

### 6.3.1.5. Battery Connection Configurations for Model 0

Battery connection configuration can be adjusted as internal or external battery by changing jumper position.

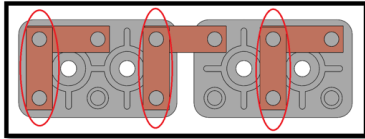


Figure.6.3.1.5-1

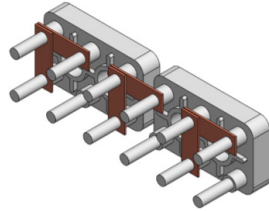


Figure.6.3.1.5-2

#### 10-60kVA Internal BATTERY Connection

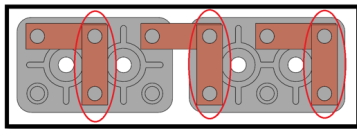


Figure.6.3.1.5-3

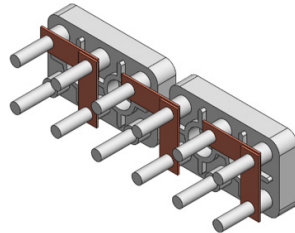


Figure.6.3.1.5-4

#### 10-60kVA External BATTERY Connection

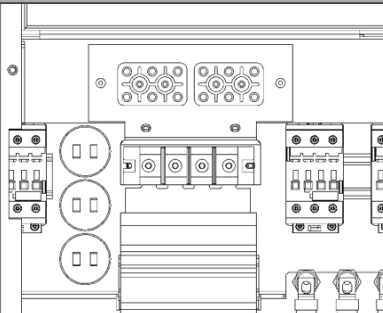


Figure.6.3.1.5-5

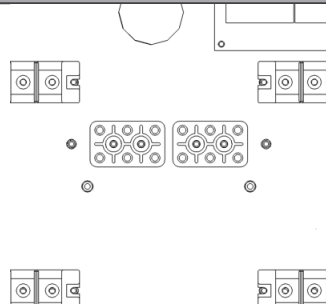


Figure.6.3.1.5-6

10-30kVA Model 0 Battery Selection Terminal

40-60kVA Model 0 Battery Selection Terminal

### 6.3.1.6. Output Connection

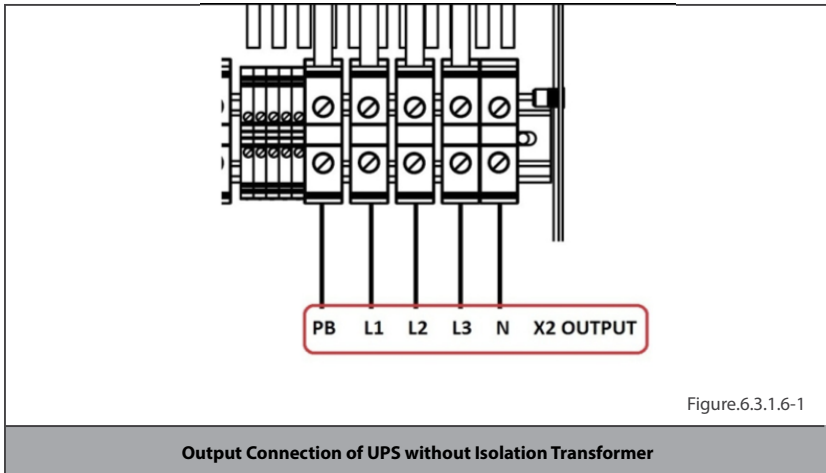


Make sure that all circuit breakers are at "OFF" position before starting with the installation.

#### Electrical Characteristics - Inverter

| Model (kVA)                           | 10   | 15 | 20 | 30 | 40 | 60 |
|---------------------------------------|--|----|----|----|----|----|
| Rated output voltage (selectable) (V) | 400 3Ph+N+PB (380/415 configurable)                      |    |    |    |    |    |
| Output voltage tolerance              | static load $\pm 1\%$ , dynamic load VF-SS-111 compliant |    |    |    |    |    |
| Rated output frequency (Hz)           | 50/60 Hz (selectable)                                    |    |    |    |    |    |
| Autonomous frequency tolerance        | $\pm 0.02\%$ on mains power failure                      |    |    |    |    |    |
| Harmonic voltage distortion           | < 2% with linear load, < 4% with nonlinear load          |    |    |    |    |    |

Table.6



Connect the phase cable to **X2 OUTPUT: X2/L1 – X2/L2 – X2/L3** terminal and the neutral cable to **X2 OUTPUT: X2/N** terminal.

Cables must be protected by fuses or MCCB, refer to [Section 5.4](#)



#### NEUTRAL SYSTEM :

##### Versions without internal isolation transformer:

KEORT EVO does not modify the neutral system: output neutral system is the same as input neutral system. Do not connect the output neutral to the protective ground or protective bonding (PE or PB).

Installation of an external isolation transformer is required when necessary to modify the neutral system downstream KEORT EVO.



For KEORT EVO with internal output isolation transformer model; you can change Neutral Systems IT to TN by making short circuit **Output Neutral (X2/N)** and **Output Earth (X2/PB)**.  
Fix the short-circuit shunt (supplied in the fast fuses package attached to UPS) between **Output Neutral (X2/N)** and **Output Earth (X2/PB)**.



To enable the short circuit protection, feature of the UPS, each load should be supplied through a separate circuit breaker chosen according to the load current. This may provide quick disconnection of the short-circuited load and maintain operation continuity of the other loads.



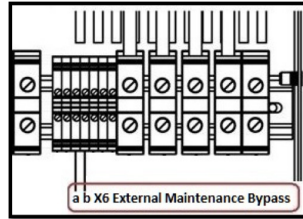
Each load should be supplied through separate circuit breaker and the cable cross section should be chosen according to the load current value.



Make sure that the UPS is not overloaded to provide a higher quality supply to the loads.

### 6.3.1.7. External Maintenance Bypass Connection

If External Maintenance Bypass would be used; connect normally open auxiliary contact of External Maintenance Bypass MCCB on the distribution panel to terminals **a/X6** and **b/X6** on UPS.



### 6.3.2. Power Connections of Parallel Systems

- The protection devices must be chosen properly as defined in Section 5.4 considering total parallel UPS power.
- Please check 6.3.1. Power Connections of Single Systems for detailed connection information.
- The cross section and length of the input and output cables must be identical for all units.
- The phase rotation must be the same for each unit connected in parallel and also on any external manual bypass line.
- Make sure that electrical connections and the communication cabling (CANBUS) have been made as shown in below diagrams. You may connect all 8pcs parallel UPS following these diagrams.
- For power connection and block diagram; refer to Appendix-6: Description of UPS and Block Diagram.



Parallel configuration must only be activated by LEGRAND UPS Technical Service Personnel.



**CAUTION:** Do not remove the communication cables between the UPS's during Parallel Operation.

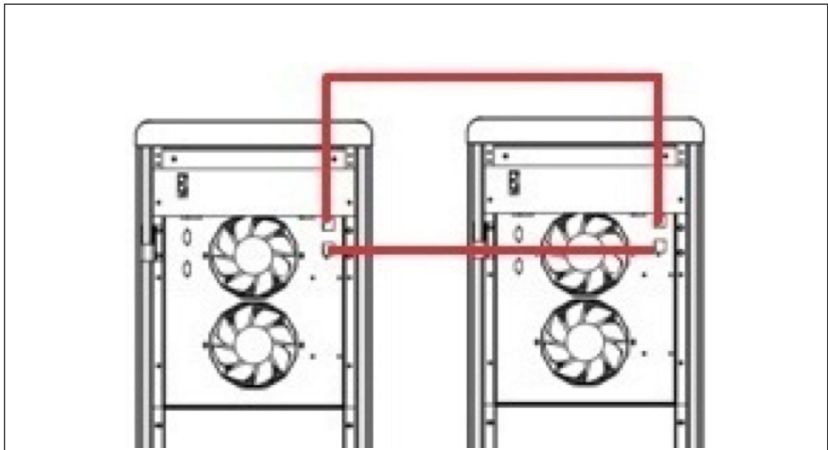


Figure.6.3.2-1

**CANBUS CONNECTION OF TWO PARALLEL UPS**

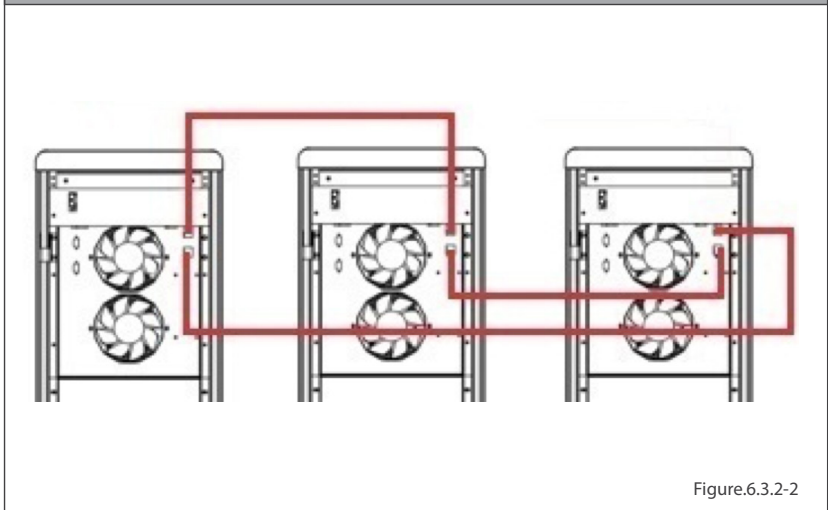


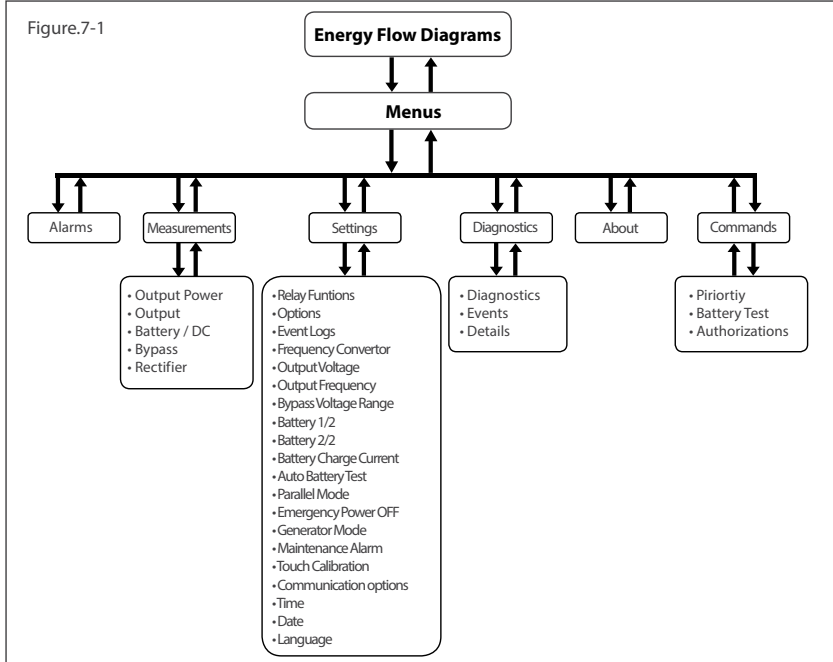
Figure.6.3.2-2

**CANBUS CONNECTION OF THREE AND MORE PARALLEL UPS**

## 7. Human Machine Interface

The front panel is located at the top of the UPS which informs the user about operating status, alarm conditions and measurements. It also provides access to control commands and user parameters settings.

Main screen image shows the energy flow path and Operation Modes. The information of the current operation is written at the upper side of the panel. Additionally, the energy flow path is given by a graphical animation.



2 Password protected menus for SETTINGS and COMMANDS;

| Password Authorizations        |  |
|--------------------------------|--|
| User Password by default: 1111 | Service Password: access only to LEGRAND UPS Technical Service Personnel |
| • Relay Functions              | • Options  |
| • Communication Options        | • Events Logs  |
| • Time                         | • Frequency Converter  |
| • Date                         | • Output Voltage   |
| • Language                     | • Output Frequency   |
| • Priority Mode                | • Bypass Voltage Range   |
| • Battery Test                 | • Battery 1/2  |
|                                | • Battery 2/2  |
|                                | • Battery Charge Current   |
|                                | • Auto Battery Test  |
|                                | • Parallel Mode  |
|                                | • ESD  |
|                                | • Generator Mode   |
|                                | • Maintenance Alarm  |
|                                | • Touch Calibration  |
|                                | • Authorizations   |

Table.1

### 7.1. Front Panel Segments

Front panel consists of two segments: **Colour Touch screen Graphical Control Panel** and **UPS Status LED Bar** offers detailed information about UPS.

### 7.1.1. Colour Graphical Touchscreen

**Energy Flow Diagram/Modes Of Operation** and **Menus** are displayed on LCD.

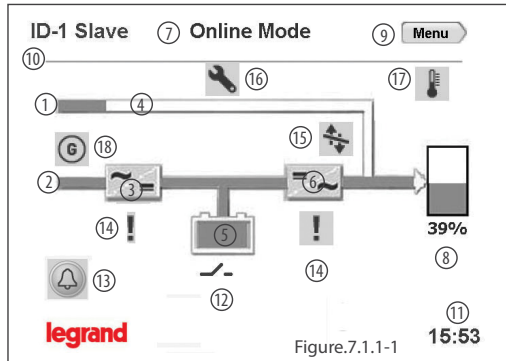


Figure.7.1.1-1

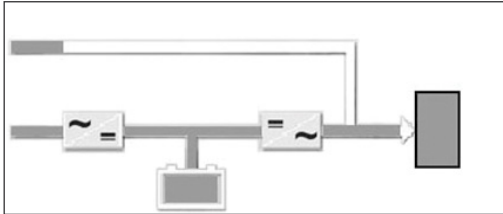
The description of the symbols in the energy flow diagram:

- ① **Bypass Input:** If Bypass voltage is OK and synchronizes with inverter; it lits Green, If Bypass voltage is OK and not synchronizes with inverter; it lits Orange.
- ② **Rectifier Input:** If Input voltage is OK, it lits Green.
- ③ **Rectifier:** Converts AC voltage at the input into DC voltage. You may reach the rectifier measurements by touching it.
- ④ **Bypass Line:** Shows that the loads are supplied via Bypass and line colour is Orange. If UPS is on Eco Mode it is Green.
- ⑤ **Battery:** Shows battery conditions. If it is discharging the indicator goes down, if it is charging the indicator goes up. You may reach the battery/DC measurements by touching it.
- ⑥ **Inverter:** Converts DC voltage into AC voltage. You may reach the output measurements by touching it.
- ⑦ **Operation Mode Information:** Shows UPS's current operation mode.
- ⑧ **Load:** Shows the percentage of the load as numerical and graphical information. If there is overload at the output the load graphic lits Red. You may reach the output power measurements by touching it.
- ⑨ **Menu:** You may reach the menus by touching it.
- ⑩ **Configuration:** It indicates if UPS is in parallel or single operation configuration. In Single Mode; there is no symbol.
- ⑪ **Time:** It indicates the time.
- ⑫ **Circuit Breaker:** It appears if battery Fuse is in "OFF" position or battery fuse has blown. If battery Fuse is in "ON" position; the circuit breaker icon is not displayed, instead battery capacity percentage is displayed.
- ⑬ **Alarms:** If there is an alarm on UPS this icon appears and informs the user by flashing. You may reach the alarms by touching it.
- ⑭ **Exclamation Mark:** Indicates that there is a problem where the icon appears.
- ⑮ **Transfer:** Indicates that transfer to bypass is disabled.
- ⑯ **Wrench:** Indicates that UPS requires Periodic Preventive Maintenance.
- ⑰ **Temperature:** Indicates ambient temperature of UPS is too high.
- ⑱ **Generator Mode:** Indicates UPS operates on Generator Mode.

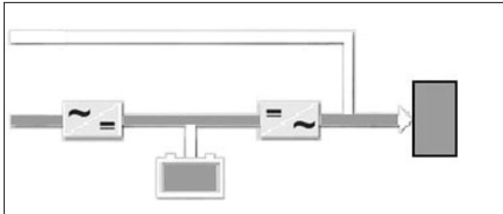


## Operation Modes of UPS and Energy Flow Diagram;

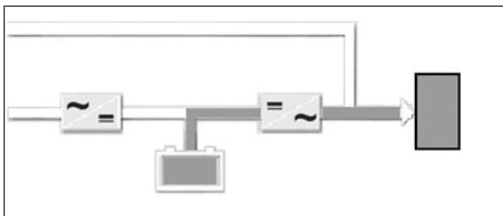
Online Mode:



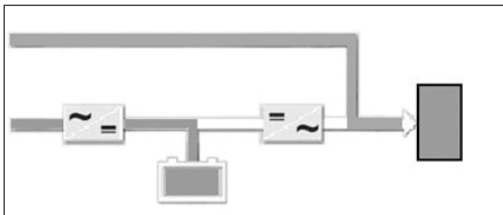
Frequency Converter Mode:



Battery Mode:

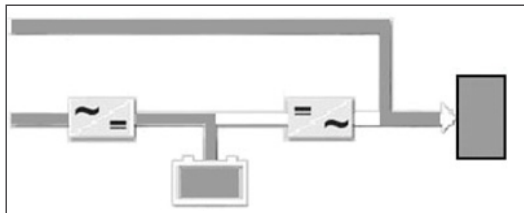


Bypass Mode:



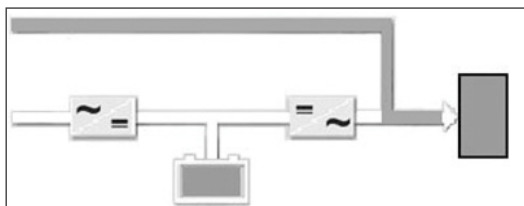
\*Bypass Line is Orange

Eco Mode:



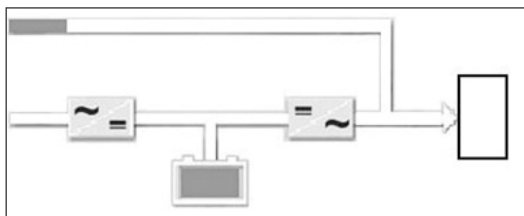
\*Bypass Line is Green

Maintenance Bypass Mode:



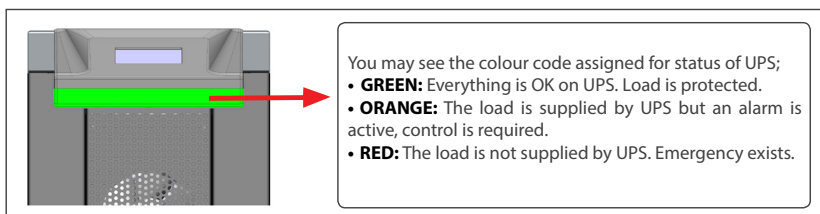
\*Bypass Line is Orange and no battery charging

No Operation:



### 7.1.2. UPS Status LED Bar

Status LED Bar under the front panel gives information of current UPS status.

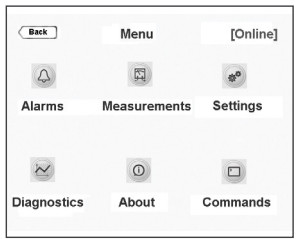


## 7.2. Menu

The related sub-menus under the main Menu can be reached by touching MENU icon while main screen image is displayed. They provide information to user about the measurements, about the UPS and status of UPS.

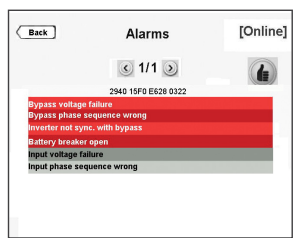
By touching **Back** icon you may exit from the menu.

You may see the sub-menus as shown below;

|   |   |
|---|---|
|  | <p>You may reach sub-menus by touching Menu; Alarms, Measurements, Settings, Diagnostics, About and Commands.</p> |
|---|---|

### 7.2.1. Alarms Menu

UPS displays 24 different alarms in Alarms menu. For detailed information about alarms please check [Appendix-1-Alarms List](#).

|  |   |
|--|---|
|  | <p>All active alarms present are displayed on the Alarms screen. They will appear in red colour and as soon as acknowledged by touching the hand icon at the right side of the screen, they switch to gray colour and the buzzer will stop.</p> <p>In case a new alarm occurs; the buzzer is activated, new alarm is displayed in red in addition with the remaining active alarms already acknowledged. It is necessary to acknowledge again the new alarm to stop the buzzer, then alarm text switch to gray colour</p> |
|--|---|

### 7.2.2. Measurements Menu

It provides useful measurements about the UPS and the load.

You may scroll to right and left by touching right and left keys through Measurements menu. The screens of MEASUREMENTS menu are as below:

| Output Power [Online] |        |        |        |
|-----------------------|--------|--------|--------|
| ◀ 1/5 ▶               |        |        |        |
|                       | L1     | L2     | L3     |
| % :                   | 39     | 39     | 39     |
| S :                   | 3.5kVA | 3.5kVA | 3.5kVA |
| P :                   | 3.5kW  | 3.5kW  | 3.5kW  |
| PF :                  | 1.00   | 1.00   | 1.00   |

Output load percentage, apparent power, real power and power factor information of each phase is displayed.

| Output [Online] |        |      |      |
|-----------------|--------|------|------|
| ◀ 2/5 ▶         |        |      |      |
|                 | L1     | L2   | L3   |
| V :             | 230V   | 230V | 230V |
| I :             | 15A    | 15A  | 15A  |
| F :             | 50.0Hz |      |      |

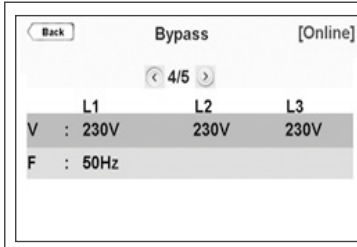
Output voltage (Ph-N), current, frequency information of each phase is displayed.

| Battery/DC [Online] |       |       |  |
|---------------------|-------|-------|--|
| ◀ 3/5 ▶             |       |       |  |
|                     | +     | -     |  |
| DC Voltage :        | 404V  | 404V  |  |
| Battery Voltage :   | 400V  | 400V  |  |
| Battery Current :   | +3.5A | -3.5A |  |
| Battery Temp. :     | 25°C  |       |  |
| Backup time :       | 10min |       |  |

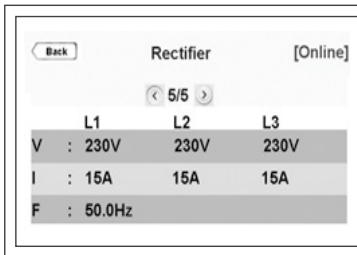
DC Bus and Positive-Negative string of battery voltage is displayed.

When the battery circuit breaker is closed, it gives just Battery Voltage measurements.

Charge (+) / Discharge (-) battery current, ambient temperature and back-up time are displayed.



Bypass voltage (Ph-N) and frequency information of each phase are displayed. If the MAINS and AUX Supply are connected in COMMON, Rectifier and Bypass values will be the same.



Rectifier voltage (Ph-N), current and frequency information of each phase are displayed. If the MAINS and AUX Supply are connected in COMMON, Rectifier and Bypass values will be the same.

### 7.2.3. Settings Menu

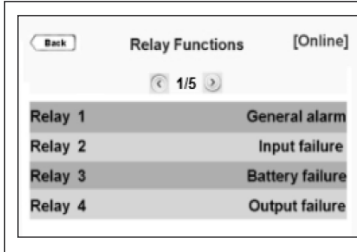
This menu is the section where all the settings related to UPS usage customization can be done.

User Password must be entered to make changes in this section.

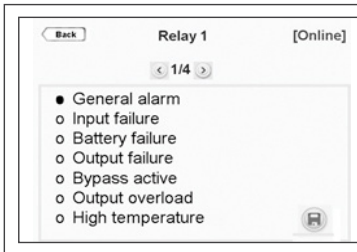
**User Password:** 1111 (the password cannot be changed)



When the Password Screen appears, enter 1111, touch **ENTER** to confirm.



There are 4 different relays and one alarm is assigned to each relay.

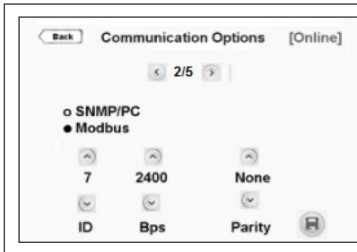


There are 7 different alarms defined.

By default, one alarm is assigned to each relay; however, this can be changed by the user. It is also possible to assign the same alarm to each of the 4 relays. You may set each relay via this menu.

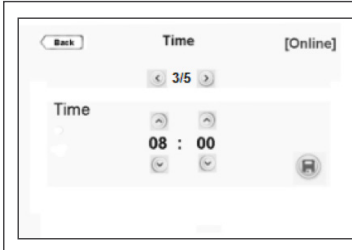
When you touch the **save icon** key, a confirmation pop-up bar will appear.

You should touch **Yes** to save the settings. Touch **No** to exit without saving the changes.



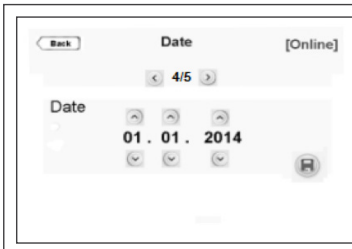
You may choose communication options here.

If Modbus is chosen; you may also make Modbus adjustments.



UPS records the event logs with the date and time information. Thus, the events can be followed chronologically.

When you touch the **save icon** key, a confirmation pop-up bar will appear. You should touch **Yes** to save the settings. Touch **No** to exit without saving the changes.



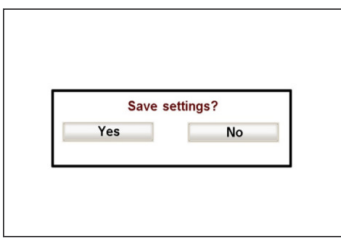
UPS records the event logs with the date and time information. Thus, the events can be followed chronologically.

When you touch the **save icon** key, a confirmation pop-up bar will appear. You should touch **Yes** to save the settings. Touch **No** to exit without saving the changes.



You may choose the language package installed in UPS.

When you touch the **save icon** key, a confirmation pop-up bar will appear. You should touch **Yes** to save the settings. Touch **No** to exit without saving the changes.



When you touch the save icon key, a confirmation pop-up bar will appear.

You should touch **Yes** to save the settings. Touch **No** to exit without saving the changes.



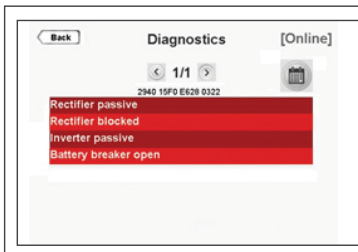
Set the date and time of UPS during pre-setting.

#### 7.2.4. Diagnostics Menu

All the alarms/notifications are logged real-time and can be reached via this menu.

UPS displays up to 380 last events. Events are stored in EEPROM using FIFO method. Order number of last occurred event is 001, the oldest event is erased.

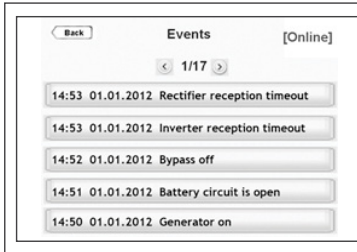
You may touch **right/left** arrow through the menu pages. When you touch any event log, you may reach the details of it.



You may see UPS status here. There are 17 different notifications.

When you touch the **calendar icon**; you may reach below Event Menu.

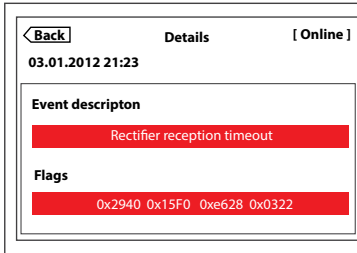




You may see the logged events with time and date stamp.

Events are stored in EEPROM using FIFO method.

When you touch any event log, you may reach the details of it as you see on the side.



You may see the details of the event with event code.

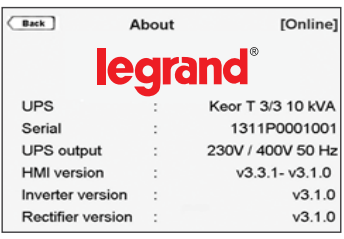


If Technical Support required; taking notes of current event logs would be useful.

You may reach detailed information about events from [Appendix-3: Event List](#).

### 7.2.5. About Menu

This menu provides information about the UPS itself.


|   |   |
|---|---|
|  | <ul style="list-style-type: none"><li>• <b>UPS:</b> UPS model and nominal power</li><li>• <b>Serial:</b> UPS serial number</li><li>• <b>UPS output:</b> UPS output voltage (Ph-N / Ph-Ph) and frequency</li><li>• <b>HMI version:</b> Human Machine Interface version</li><li>• <b>Inverter version:</b> Inverter firmware version</li><li>• <b>Rectifier version:</b> Rectifier firmware version</li></ul> |
|---|---|

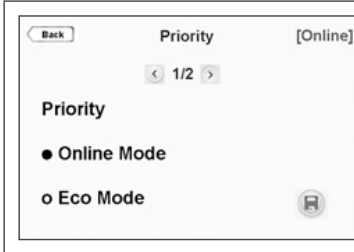
### 7.2.6. Command Menu

Through this menu; you may send some commands to UPS. User Password must be entered to make changes in this section.

**User Password:** 1111 (the password cannot be changed).

You may see the COMMAND Menu's screen as below;

|  |  |
|--|--|
|  | <p>When the Password Screen appears, enter 1111, touch enter to confirm.</p> |
|--|--|

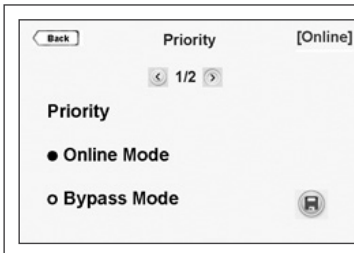


Via this menu; you may choose operation mode of UPS as Online or Eco Mode.

If system is configured as **Single**; you may choose operation mode of UPS Online or Eco Mode.

When you touch the **Save icon** key, a confirmation pop-up bar will appear.

You should touch **Yes** to save the settings. Touch **No** to exit without saving the changes.

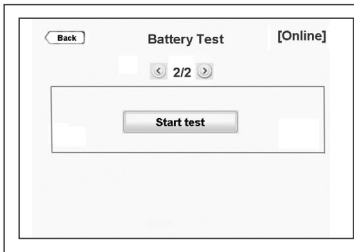


Via this menu; you may choose operation mode of UPS as Online or Bypass Mode.

If system is configured as Parallel; you may choose operation mode of UPS Online or Bypass Mode. It would be enough to set the priority on one of the UPS, all the UPSs will pass to Bypass Mode at the same time.

When you touch the **Save icon** key, a confirmation pop-up bar will appear.

You should touch **Yes** to save the settings. Touch **No** to exit without saving the changes.



With this command, UPS battery test feature can be started. When you touch the **Start test** key, a confirmation pop-up bar will appear.

You should touch **Yes** to start the test; otherwise touch **No**. UPS tests the battery automatically once each 90 days.

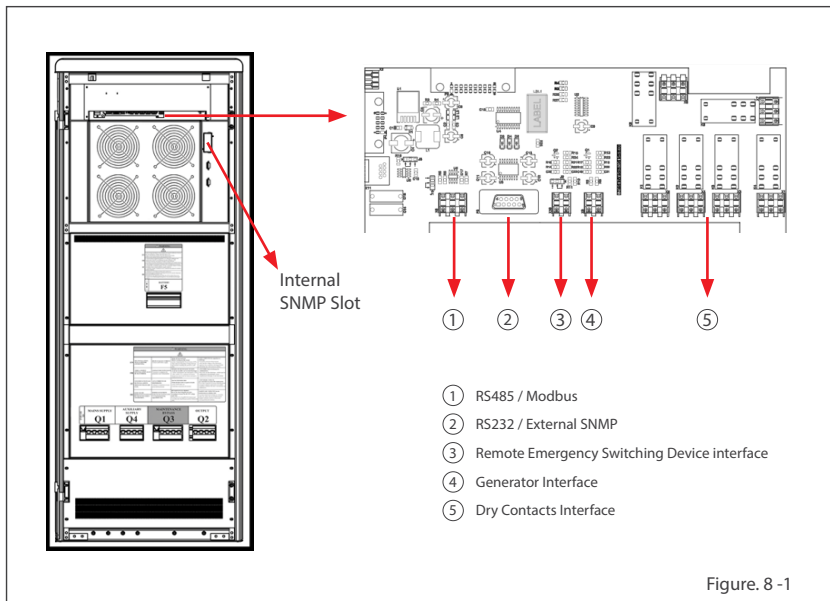
## 8. Communication

Interface connectivity cards allow UPS to communicate in a variety of networking environments and with different type of devices.

Standard and optional communication interfaces are listed below;

| Communication Interfaces                          |    |    |    |    |    |    |
|---|----|----|----|----|----|----|
| Model (kVA)                                       | 10 | 15 | 20 | 30 | 40 | 60 |
| RS232   |    |    |    | ●  |    |    |
| RS485 / MODBUS                                    |    |    |    | ●  |    |    |
| Dry Contacts                                      |    |    |    | ●  |    |    |
| Generator Interface                               |    |    |    | ●  |    |    |
| Remote Emergency Switching Device (ESD) Interface |    |    |    | ●  |    |    |
| Internal SNMP / Web Monitoring / e-mail           |    |    |    | ○  |    |    |
| External SNMP                                     |    |    |    | ○  |    |    |
| ● Standard<br>○ Option                            |    |    |    |    |    |    |

**Table.2**



Inverter and Rectifier connectors are used for Technical Service only.  
Do not connect RS232 or external SNMP, damage may occur to your equipment and cancel your warranty.

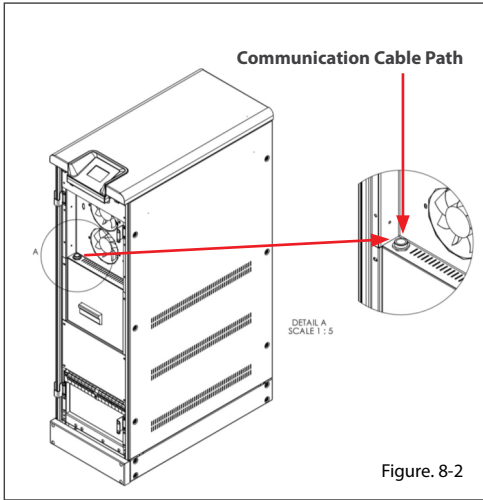
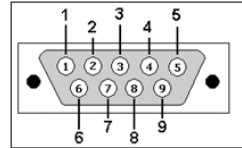


Figure. 8-2

### 8.1. Serial Communication (RS232)

UPS is equipped with Serial Communication as standard. RS232 cable shall be shielded and shorter than 25m.

**RS232:** DSUB-9 male connector with the following pin layout shall be used on the UPS side of the connection cable.



The communication solutions listed below can be used with this port:

- Monitoring Software (Optional)
- External SNMP Adapter (Optional)

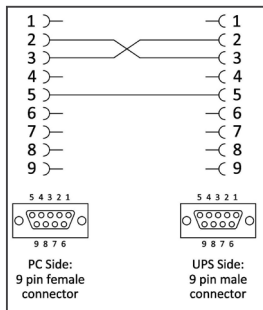
Via SNMP; the information listed below can be monitored;

- The Latest Battery Test Date
- UPS Information (example: 220V - 50Hz)
- Input Data ( $V_{in}$ ,  $F_{in}$ ,  $V_{max}$  etc.)
- Output Data ( $V_{out}$ , Load Percentge...etc.)
- Battery Situation ( $V_{batt}$ ...etc)

| RS232 Pin Layout |             |                    |
|------------------|-------------|--------------------|
| PIN#             | Signal Name | Signal Description |
| 2                | TX          | Transmit Data      |
| 3                | RX          | Receive Data       |
| 5                | GND         | Signal Ground      |

**Table.8**

Over SNMP communication, battery test can be started or current test can be cancelled. UPS can be shut-down or stand-by (stand-by duration is adjustable). Alarms can be discarded.



If Serial Communication cable is needed, it can be produced according to the pin configuration described at side.

### 8.2. Internal SNMP Communication

Internal SNMP card can be installed into SNMP slot placed at the front of UPS. As soon as SNMP installed, RS232 port would be disabled.

Internal SNMP has the same features as External SNMP; refer to [Section 8.1](#) for more information.

### 8.3. Emergency Switching Device and Generator Connections

UPS can be remotely switched off and can be configured for an input supply through genset. For this purpose, there are two digital inputs on the Interface card that can activate those functions.

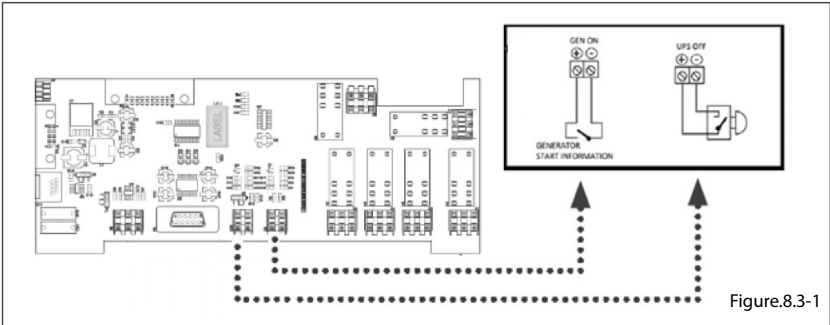


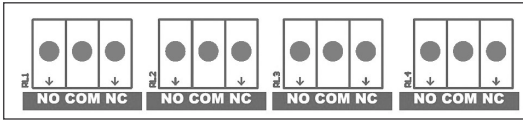
Figure.8.3-1

UPS output can be switched off immediately by Remote Emergency Switching Device interface (ESD) connection if desired. A remote latched switch can be used as described in above figure.

| Input   | Function   |
|---------|--|
| GEN ON  | If the GEN ON input is activated by Genset start relay, UPS transfers to Generator Mode, bypass and battery charging is disabled. Generator icon appears on Energy Flow Diagram screen. <b>The factory default setting of Generator contact is "Normally open".</b>  |
| UPS OFF | <p>If the UPS OFF (ESD) input is set by an ESD switch, UPS stops generating the output voltage and stops feeding the load. When the voltage on the digital input is removed, you have to restart UPS. <b>The factory default setting of ESD contact is "Normally open".</b></p> <div style="display: flex; justify-content: space-around;"> <div style="text-align: center;"> <p><b>J2: UPS OFF contact NO configuration.<br/>(No jumper)</b></p> </div> <div style="text-align: center;"> <p><b>J2: UPS OFF contact NC configuration.</b></p> </div> </div> |

Table.9

## 8.4. Dry Contacts



There are 4 dry contact sockets on the Interface Board. The relays can be programmable from Relay Functions menu (under **Settings** menu). “General alarm, Input failure, Battery failure, Output failure, Bypass active, Output overload, High temperature” alarms can be assigned to the contacts. Each alarm can be assigned to separate relays but also one alarm may be assigned to all relays.

Each output socket 3-pin and middle pin is fixed, the upper pin is normally closed and lower pin is normally open.

You may see the relay numbers as above.

Free contact relay connection cables shall have a cross-section of 1.5 mm<sup>2</sup>.



Maximum voltage to be applied to the relay contacts is 42VAC rms (sinus) or 60VDC. Maximum contact current depends on the applied voltage and the load characteristic. Both maximum voltage and maximum contact current corresponding to the applied voltage shall not be exceeded.

Maximum allowed resistive contact currents for several voltages are given on the table below:

| Applied voltage | Maximum contact current for resistive load |
|-----------------|--|
| Up to 42 VAC    | 16 A                                       |
| Up to 20 VDC    | 16 A                                       |
| 30 VDC          | 6 A  |
| 40 VDC          | 2 A  |
| 50 VDC          | 1 A  |
| 60 VDC          | 0.8 A                                      |

**Table.10**

Each relay has both a normally open (NO) and a normally closed (NC) contact. One end of these contacts is common.

Relay functions are described below:

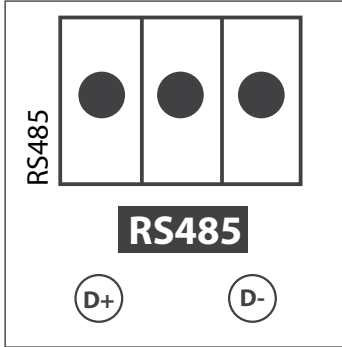
| Relay   | Default Function |
|---------|------------------|
| Relay 1 | General Alarm    |
| Relay 2 | Input failure    |
| Relay 3 | Battery failure  |
| Relay 4 | Output failure   |

**Table.11**

Relay functions can be changed through front panel.

### 8.5. RS485

RS485 with MODBUS protocol is used in a wide range of automation systems for Industrial Process monitoring or for Building Management Systems. This communication link allows monitoring UPS status and measurements with such systems.



The RS485 differential line consists of three pins:

- D+ is non-inverting pin (TxD+/RxD+)
- D- is inverting pin (TxD-/RxD-)
- Middle Pin is reference pin (optional GND)

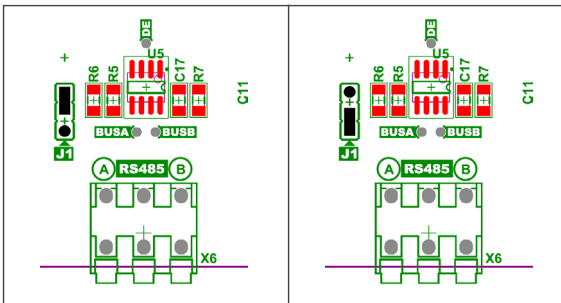
Middle Pin is the reference potential used by the transceiver to measure the D+ and D- voltages.

| Communication Parameters |                 |
|--------------------------|-----------------|
| Baud Rate                | 2400            |
| Data Bits                | 8               |
| Stop Bits                | 1               |
| Parity                   | No Parity       |
| Flow Control             | No Flow Control |
| Communication Type       | RTU             |

**Table.12**

#### DEFAULT

#### MODBUS END



#### MODBUS END JUMPER (J1):

If the UPS is connected at the end of the bus line ; the jumper should be configured as described.

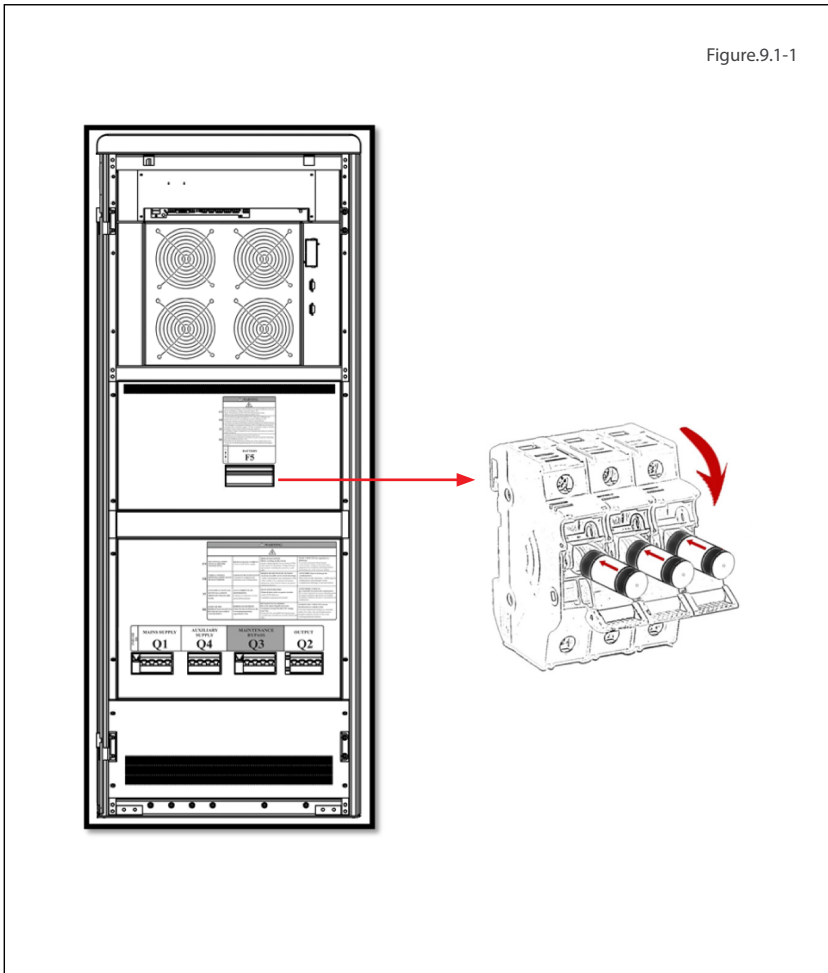


## 9. Operating Procedures For Single Systems

### 9.1. Preparations

UPS is shipped with 3pcs of battery fast fuses in a plastic package attached to the front side of UPS.

After all connections are completed as described in KEORT EVO Installation Manual, the battery fuses must be placed as shown below. Use only the fuses delivered with the UPS.





Do not close battery fuse holder **F5** before reading Commissioning procedure [Section 9.2](#)



Mount the battery fast fuses into battery fuse holder on the UPS.

**Do not close battery fuse holder F5 before reading Commissioning procedure Section 9.2**

## 9.2. Commissioning

After all connections and settings have been done, UPS can be started-up.



Even without connections on UPS terminals, residual voltages may exist on these terminals and inside the UPS. Do not touch these parts.



If you work on terminals; all circuit breakers in the input/bypass distribution panel, and all battery circuit breakers (F5 inside UPS and in the external battery cabinet, if any) should be brought to "OFF" position.

### 9.2.1. Start-Up UPS With Internal Battery

1. Put the battery fast fuses into the battery circuit breaker on the UPS (F5). **Do not close the circuit breaker yet!**
2. Switch the auxiliary supply circuit breaker on the distribution panel to "ON" position.
3. Switch the mains supply circuit breaker on the distribution panel to "ON" position.
4. Switch the auxiliary supply circuit breaker on the UPS (Q4) to "ON" position.
5. Switch the mains supply circuit breaker on the UPS (Q1) to "ON" position.
6. Switch the inrush circuit breaker on the UPS (Q6) to "ON" position.
7. Touch Battery icon to see **Battery / DC** menu measurement. Do not close the battery circuit breakers (F5) until the difference between DC bus and Battery voltages decreases below 10V.
8. Switch the output circuit breaker on the UPS (Q2) to "ON" position.
9. Switch the output circuit breaker on the distribution panel to "ON" position.  
Afterwards UPS starts to supply the loads.

### 9.2.2. Start-Up UPS with External Battery

1. Put the battery fast fuses into the battery circuit breaker on the UPS (F5). **Do not close the circuit breaker yet!**
2. Switch the auxiliary supply circuit breaker on the distribution panel to "ON" position.
3. Switch the mains supply circuit breaker on the distribution panel to "ON" position.
4. Switch the auxiliary supply circuit breaker on the UPS (Q4) to "ON" position.
5. Switch the mains supply circuit breaker on the UPS (Q1) to "ON" position.
6. Switch the inrush circuit breaker on the UPS (Q6) to "ON" position.
7. Switch only the fuses on the external battery cabinet to "ON" position.
8. For the first start up after external battery cabinet installation, you need to check if no polarity inversion between battery cabinet and UPS. You can control voltages with multimeter on external battery connection terminals
9. Touch Battery icon to see **Battery / DC** menu measurement. Do not close the battery circuit breakers (F5) until the difference between DC bus and Battery voltages decreases below 10V.
10. Switch the output circuit breaker on the UPS (Q2) to "ON" position.
11. Switch the output circuit breaker on the distribution panel to "ON" position.  
Afterwards UPS starts to supply the loads.

### 9.3. Decommissioning

Follow the order written below to decommission the UPS:

1. Switch the output circuit breaker on the distribution panel to "OFF" position.
2. Switch the output circuit breaker on the UPS (Q2) to "OFF" position.
3. Switch the battery circuit breaker on the UPS (F5) to "OFF" position.
4. If exists, switch the fuses on the external battery cabinet to "OFF" position.
5. Switch the mains supply circuit breaker on the distribution panel to "OFF" position.
6. Switch the auxiliary supply circuit breaker on the distribution panel to "OFF" position.
7. Switch the inrush circuit breaker on the UPS (Q6) to "OFF" position.
8. Switch the mains supply circuit breaker on the UPS (Q1) to "OFF" position.
9. Switch the auxiliary circuit breaker on the UPS (Q4) to "OFF" position.

Wait a few minutes till UPS completely turn off.



Even without connections on UPS terminals, residual voltages may exist on these terminals and inside the UPS. Do not touch these parts.

**RISK OF BACKFEED:** Before working on UPS terminals, check for Hazardous Voltage between all terminals including the protective earth (PE).

### 9.4. Maintenance Bypass Commissioning Instructions (Transfer Load Supply from UPS to Internal Maintenance Bypass)



This procedure may only be executed by trained Personnel.

Maintenance bypass enables the user to isolate the electronic circuitry of the UPS from the mains voltage and the load without interrupting the load operation by connecting the loads directly to the bypass supply. This feature is useful while waiting service staff and shall only be executed by trained Personnel.

In order to transfer to Maintenance Bypass without interruption, do the following instruction respectively;

1. On the display, select **Menu / Command**, enter password (1111) .
2. In page **Priority**, select Eco Mode, save and confirm, go back to Energy Flow Diagram screen
3. Check that UPS is in Eco Mode operation.
4. Open the front door with the UPS key.
5. Switch the maintenance bypass circuit breaker on the UPS (Q3) to "ON" position.
6. See "M. Bypass Mode" written on LCD of UPS.
7. Switch to "OFF" position the output circuit breaker (Q2), the battery circuit breakers (F5), the fuses on external battery cabinets if any, the mains supply circuit breaker (Q1) and the inrush circuit breakers (Q6) on the UPS.
8. Switch the auxiliary supply circuit breaker on the UPS (Q4) to "OFF" position.
9. LCD would be off and the alarms would be silenced.

The loads will be continued to be supplied directly from the mains voltage.



Some parts inside the UPS including terminals are still energized during maintenance bypass operation.

All the maintenance operations should be done by authorized LEGRAND UPS Technical Service Personnel.



During Maintenance Bypass operation; in case any mains voltage interruption occurs, all loads supplied downstream the UPS will be de-energized. Maintenance Bypass Operation should not be preferred for long time use.

### 9.5. Maintenance Bypass Decommissioning Instructions

In order to transfer the loads from Maintenance Bypass to UPS without interruption, do the following instruction respectively;

1. Switch the auxiliary supply circuit breaker on the UPS (Q4) to "ON" position, after 30s check if fans are running.
2. Switch the mains supply circuit breaker on the UPS (Q1) to "ON" position.
3. Switch the inrush circuit breaker on the UPS (Q6) to "ON" position.
4. LCD will be ON. See "M. Bypass Mode" written on LCD of UPS.
5. Switch the fuses on the external battery cabinet to "ON" position.
6. Touch Battery icon to see **Battery / DC** menu measurement. Do not close the battery circuit breakers (F5) until the difference between DC bus and Battery voltages decreases below 10V.
7. Switch the output circuit breaker on the UPS (Q2) to "ON" position.
8. Switch the maintenance bypass circuit breaker on the UPS (Q3) to "OFF" position.
9. Check on Energy Diagram screen that UPS is in **Eco Mode** operation.
10. On the display, select **Menu / Command**, enter password (1111).
11. In page **Priority Mode**, select Online Mode if requested, save and confirm, go back to Energy Flow Diagram screen.
12. See "Online Mode" written on LCD.
13. Close the front door of UPS.


## 10. Operating Procedures For Parallel Systems

### 10.1. Introduction

KEOR T EVO UPS Systems are designed according to high MTBF figures with increased reliability.

To increase the output power or the UPS system availability a second (or more) KEOR T EVO UPS can be connected in parallel redundant/power. Maximum of 4 identical power KEOR T EVO unit can be connected in parallel.

You may see the block diagrams of Parallel Systems in [Appendix-6: Description of UPS and Block Diagram](#).



Parallel configuration must only be activated by LEGRAND UPS Technical Service Personnel.

There are two paralleling modes you may choose via Front Panel. **You may reach this menu with service password, only.**

#### 10.1.1. Redundancy

The UPS parallel system is redundant when one or more UPS units can be stopped by failure or maintenance operation without affecting the load supply by the remaining operating UPS units.

N+1 redundancy means than one UPS unit can be stopped without affecting secured load supply.

N+2 redundancy means than up to two UPS unit can be stopped without affecting secured load supply.

#### Maximum Load per parallel UPS unit to keep redundancy:

| Number of Parallel UPS Units |     |     |     |     |
|------------------------------|-----|-----|-----|-----|
|                              |     | 2   | 3   | 4   |
| Redundancy                   | N+1 | 50% | 66% | 75% |
|                              | N+2 | ... | 33% | 50% |

**Table.13**

#### 10.1.2. Power Increase

If Power Increase Mode is selected, the total capacity of the system is N times the capacity of each UPS unit. Maximum load per unit can reach 100% in normal operation. All running UPS units in parallel share the load equally.

In case of any problem on one of the units, the remaining units may operate in overload and the loads supplied through bypass after certain time.

## 10.2. Procedure for Commissioning and Start-Up

If the UPSs are not factory parallel configured; the initially started-up UPS will operate as master and the remaining UPSs will operate as slave. According to ID numbers defined for each UPS, Master and Slave messages should be observed on the LCD panel. On the master unit, candidate master UPS is also shown as CX.

CX represents the best available master candidate UPS among the slave UPSs. X represents the ID number of this slave UPS. In case the master UPS fails, then this candidate assigned UPS becomes Master.

**ID-1 Master / CX Online Mode**

**Menu**

### Start up for "PARALLEL" UPSs not on Maintenance Bypass Mode;

1. Switch the auxiliary supply circuit breaker on the distribution panel to "ON" position.
2. Switch the mains supply circuit breaker on the distribution panel to "ON" position.
3. Switch **Q4** (Auxiliary Supply) circuit breakers of all UPSs "ON" position.
4. Switch **Q1** (Mains Supply) circuit breakers of all UPSs to "ON" position.
5. Switch **Q6** (Inrush) circuit breakers of all UPSs to "ON" position.
6. Touch Battery icon to see Battery / DC menu measurement. Do not close the battery circuit breakers (F5) until the difference between DC bus and Battery voltages decreases below 10V.
7. If exists, switch external Battery circuit breaker to "ON" position.
8. Switch **Q2** (Output) circuit breakers of all UPSs to "ON" position.
9. If exists, switch the output circuit breakers on the distribution panel to "ON" position (o unit output switch and OS General Output switch).

### Start up for "PARALLEL" UPSs on Maintenance Bypass Mode;

1. Switch **Q4** (Auxiliary Supply) circuit breakers of all UPSs "ON" position.
2. Switch **Q1** (Mains Supply) circuit breakers of all UPSs to "ON" position.
3. Switch **Q6** (Inrush) circuit breakers of all UPSs to "ON" position.
4. LCDs will be ON. See "**M. Bypass Mode**" written on LCD of all UPS.
5. Touch Battery icon to see Battery / DC menu measurement. Do not close the battery circuit breakers (F5) until the difference between DC bus and Battery voltages decreases below 10V.
6. If exists, switch external Battery circuit breakers to "ON" position.
7. Switch **F5** (Battery) circuit breakers of all UPSs to "ON" position.
8. Switch **Q2** (Output) circuit breakers of all UPSs to "ON" position.
9. If exists, switch the output circuit breakers on the distribution panel to "ON" position (o unit output switch and OS General output switch).
10. Switch **Q3** (Maintenance Bypass) circuit breakers of all UPSs to "OFF" position.
11. If exists, Switch **Q** ( External Maintenance Bypass) circuit breaker to "OFF" position.
12. See "**Online Mode**" written on LCDs.



**CAUTION:** Do not remove the communication cables between the UPSs during parallel operation.

In case the communication cable is removed or damaged during parallel operation and the communication is lost then the slave UPS which cannot communicate with the master UPS will disconnect from the output bus and turn off. The other UPSs will continue normal operation. In such a case, this UPS should be turned off completely in order to insert its communication cable again and then switched on again.



**CAUTION:** Do not try to insert its communication cable while it is operating.



The Redundancy System expects to have at least one more UPS than N value. Otherwise it shall provide "**Redundancy Lost**" alarm. The same alarm shall also appear in case:  $\text{Load \%} > N / (N+1) * 100$

### 10.3. Procedure for Decommissioning

#### Decommissioning "PARALLEL" UPS without switching to Maintenance Bypass Mode;

1. If exists, switch the output circuit breakers on the distribution panel to "**OFF**" position (o unit output switch and OS General Output switch).
2. Switch **Q2** (Output) circuit breakers of all **Slave** to "**OFF**" position.
3. Switch **Q2** (Output) circuit breaker of **Master** to "**OFF**" position.
4. Switch **F5** (Battery) circuit breakers of all **Slave** to "**OFF**" position.
5. If exists, switch external Battery fuses of all **Slave** to "**OFF**" position.
6. Switch **F5** (Battery) circuit breaker of **Master** to "**OFF**" position.
7. If exists, switch external Battery fuses of **Master** to "**OFF**" position.
8. Switch **Q6** (Inrush) circuit breakers of all **Slave** to "**OFF**" position.
9. Switch **Q6** (Inrush) circuit breaker of **Master** to "**OFF**" position.
10. Switch **Q1** (Mains Supply) circuit breakers of all **Slave** to "**OFF**" position.
11. Switch **Q4** (Auxiliary Supply) circuit breakers of all **Slave** to "**OFF**" position.
12. Switch **Q1** (Mains Supply) circuit breaker of **Master** to "**OFF**" position.
13. Switch **Q4** (Auxiliary Supply) circuit breaker of **Master** to "**OFF**" position.

#### Decommissioning "PARALLEL" UPS with switching Maintenance Bypass Mode;

1. Go to **Commands** menu of **Master** UPS, enter User password (**1111**).
2. In page **Priority**, select Bypass Mode, save and confirm, go back to Energy Flow Diagram screen.
3. Check that UPS is in Bypass Mode operation. See all UPSs switch to Bypass Operation.
4. If exists, Switch **Q** (External Maintenance Bypass) circuit breaker to "**ON**" position and keep internal Maintenance Bypass **Q3** circuit breakers of all units to "**OFF**" position.
5. If External Maintenance Bypass **Q** is not present, then Switch **Q3** (Maintenance Bypass) circuit breakers of all **Slave** to "**ON**" position, then Switch **Q3** (Maintenance Bypass) circuit breaker of **Master** to "**ON**" position.
6. If exists, switch the output circuit breakers on the distribution panel to "**OFF**" position (o unit output switch and OS General Output switch).
7. Switch **Q2** (Output) circuit breakers of all **Slave** to "**OFF**" position.
8. Switch **Q2** (Output) circuit breaker of **Master** to "**OFF**" position.
9. Switch **F5** (Battery) circuit breakers of all **Slave** to "**OFF**" position.
10. If exists, switch external Battery fuses of all **Slave** to "**OFF**" position.
11. Switch **F5** (Battery) circuit breaker of **Master** to "**OFF**" position.
12. If exists, switch external Battery fuses of **Master** to "**OFF**" position.
13. Switch **Q6** (Inrush) circuit breakers of all **Slave** to "**OFF**" position.
14. Switch **Q6** (Inrush) circuit breaker of **Master** to "**OFF**" position.
15. Switch **Q1** (Mains Supply) circuit breakers of all **Slave** to "**OFF**" position.
16. Switch **Q4** (Auxiliary Supply) circuit breakers of all **Slave** to "**OFF**" position.
17. Switch **Q1** (Mains Supply) circuit breaker of **Master** to "**OFF**" position.
18. Switch **Q4** (Auxiliary Supply) circuit breaker of **Master** to "**OFF**" position.

## 11. Troubleshooting

The aim of this chapter is to identify potential issues, understand the root cause of the problems and provide solution to them.



Residual voltage and high temperature metal parts inside even if the UPS is disconnected. Contact may cause electric shock and burns. All operations except replacing battery fuses shall be carried out by the authorized Legrand UPS Technical Service Personnel only.

### 11.1. Bypass Voltage Failure Alarm

It means that auxiliary mains supply voltage is out of the limit. Make sure that the auxiliary mains supply circuit breaker is "ON" and the voltage / frequency is between the bypass limit.

### 11.2. Bypass Phase Sequence Wrong Alarm

It means that phase sequence of auxiliary mains supply voltage is not OK. Phase sequence of the auxiliary mains supply should be changed. Please contact the LEGRAND Technical Assistance Center.

### 11.3. Inverter not sync. with bypass Alarm

Frequency of auxiliary mains supply voltage is beyond the frequency range for online operation or auxiliary mains supply voltage is out of limit. Check if the auxiliary mains supply voltage is in specified limits.

### 11.4. Input phase sequence wrong Alarm

It means that phase sequence of common mains supply voltage is not OK. Phase sequence of common mains supply input should be changed. Please contact the LEGRAND Technical Assistance Center.

### 11.5. Rectifier Not Sync. With Input Alarm

Frequency of common mains supply voltage is beyond the frequency range of rectifier or common mains supply voltage is out of limit. Check if common mains supply is in specified limits.

### 11.6. Dc Voltage Failure Alarms

Any of the DC bus voltages is out of the limit. If you encounter this alarm during start-up, check if the inrush circuit breaker is at "ON" position. Check polarity of external battery connections if any. If it still exists contact the LEGRAND Technical Assistance Center.

### 11.7. ESD active Alarm

It means that Emergency Switching Device (ESD) is activated (digital input "UPS OFF" is set high). Check if ESD switch is ON or not and also check input configuration is correct or not.

### 11.8. Ambient temperature high Alarm

It is shown "Ambient temperature high" on Diagnostics Menu. If the ambient temperature is high, it causes a rise in the internal temperature of UPS and this alarm appears. In this case; the first thing to do is cool the environment.

### 11.9. Overload Alarms

Loads connected to the output of the UPS exceed the nominal power of the unit so it gives "Rectifier overload" and/or "Output overload" alarms. Check if there is an overload and origin, remove the excessive load. Hence the alarm would switch to off.



Make sure that the UPS is not overloaded to provide a higher quality supply to the loads.



## **11.10. Maintenance Bypass Active Alarm**

If Maintenance Bypass circuit breaker is brought to "ON" position, this alarm appears. Refer to [Section 9.5](#) to check if Maintenance Bypass decommissioning procedure has been respected.

### **11.11. Battery test failure Alarm**

UPS tests the batteries periodically. In case the batteries failed in the battery test, this alarm appears. Perform the test again when the batteries have been charged for min. 10 hours and verify the battery circuit breaker is at "ON" position.

If the alarm continues, contact to Legrand UPS Technical Service.

### **11.12. Input Voltage Failure Alarms**

If the input voltage is not in specified limits, these alarms appear and In this case UPS operates in Battery Operation mode. As soon as the mains voltage returns to specified limits, the alarms will disappear.

### **11.13. Inverter Temperature High/ Rectifier Temperature High Alarms**

If temperature of the inverter or rectifier block rises, these alarms appear. The reasons can be: overload, fan failure, high ambient temperature, and dusty environment. If fans failed or any other problem is identified, contact Legrand UPS Technical Service.

If any other alarm occurs or if the above alarms cannot be cleared, contact Legrand UPS Technical Service.

Please prepare the following information before you contact Legrand UPS Technical Service:

- Ensure you read and apply troubleshooting procedure carefully
- UPS Model Type
- Serial Number
- Firmware version
- Date of failure or problem
- Date of commissioning
- Symptoms of failure or problem
- Customer site address and contact information
- Service contract references if any

## 12. Preventive Maintenance



All the maintenance operations should be done by authorized LEGRAND UPS Technical Service Personnel.



Residual voltage and high temperature metal parts inside even if the UPS is disconnected. Contact may cause electric shock and burns. All operations except replacing battery fuses shall be carried out by the authorized LEGRAND UPS Technical Service Personnel only.

Preventive Maintenance includes extended control of all the electronic and mechanical components in UPS and permits to replace components before their end of life to assure optimum availability of your UPS system for your critical load.

Periodic maintenance also ensures safe and efficient operation of your UPS system.

LEGRAND recommends a minimum yearly periodic maintenance visit by authorized LEGRAND UPS Technical Service.

### 12.1. Batteries

The life of batteries strongly depends on the usage and environmental conditions. (ambient temperature, frequency of mains outage, etc.). There are also other factors like the number of charge-discharge cycles and discharge depth. Performing battery test can provide you information about battery health condition, but not to avoid any risk of battery failure during mains outage.

The batteries should be maintained and checked periodically by authorized LEGRAND UPS Technical Service Personnel and replaced before their end of life.



Batteries should always be replaced by authorized LEGRAND UPS Technical Service Personnel. Danger of explosion and fire if incorrect battery type is used.

Risk of electrical shock, injuries and chemical hazard, lethal voltage present. When replacing batteries, the same quantity and type that were originally fitted should be used.



Do not open or mutilate batteries. Released electrolyte is harmful to the skin and eyes. It may be toxic.



Batteries must always be disposed of according to local environmental laws.

### 12.2. Battery Fuses

There is a risk to blow battery fuses if the battery circuit breaker is closed before DC bus voltage has not reached +/- 372 V.

Please check commissioning procedure in [Section 9](#).



Battery fuses should only be replaced with the same rating and type.

## **12.3. Fans**

The life of fans used to cool the power circuits depends on the usage and environmental conditions (temperature, humidity, dust, pollution)

Please look at [Appendix-4 Technical Specifications](#) for detailed environment conditions.

Preventive maintenance and replacement before end of life shall be done by authorized LEGRAND UPS Technical Service Personnel periodically.

## **12.4. Capacitors**

The life of the DC electrolytic capacitors and AC filter capacitors used for output and input filtering purposes depends on the UPS usage and environmental conditions.

Preventive maintenance and replacement before end of life shall be done by authorized LEGRAND UPS Technical Service Personnel periodically.

## Appendix-1: Alarms List

| No | Alarms                         | Description   |
|----|--------------------------------|---|
| 1  | Bypass voltage failure         | Bypass voltage is out of the limit  |
| 2  | Bypass phase sequence wrong    | Phase sequence of bypass mains voltage is not OK  |
| 3  | Inverter not sync. with bypass | Frequency of bypass voltage is beyond the frequency range for online operation or bypass voltage is out of limit.             |
| 4  | Battery breaker open           | Battery fuses blown or breaker opened by user   |
| 5  | Battery test failure           | Battery failure   |
| 6  | Rectifier temperature high     | Rectifier IGBT module temperature high  |
| 7  | Rectifier overload             | RMS current drawn from any of the input lines exceeds its nominal value.  |
| 8  | Rectifier communication lost   | Front panel can not communicate with rectifier  |
| 9  | Input voltage failure          | Input voltage is out of the limit   |
| 10 | Input phase sequence wrong     | Phase sequence of input mains voltage is not OK   |
| 11 | Rectifier not sync. with input | Frequency of input mains voltage is beyond the frequency range of rectifier or input mains voltage is out of limit.           |
| 12 | Rectifier not precharged       | DC voltage not charged by inrush circuit  |
| 13 | DC voltage failure             | DC Bus voltage is out of the limit  |
| 14 | Inverter temperature high      | Inverter IGBT module temperature high   |
| 15 | Output overload                | RMS current drawn from any of the output lines exceeds its nominal value.   |
| 16 | Inverter DC component high     | Inverter voltage's DC component is out of the limit   |
| 17 | Inverter communication lost    | Front panel can not communicate with inverter   |
| 18 | Output DC component high       | Output voltage's DC component is out of the limit   |
| 19 | Output voltage failure         | Output voltage is out of the limit  |
| 20 | Output short circuit           | Short circuit at the output   |
| 21 | Master communication lost      | Slave cannot communicate with master  |
| 22 | Slave not sync. with master    | Slave lost the synchronization with the master  |
| 23 | N number failure               | Parallel UPS count is below the adjusted N number   |
| 24 | Redundancy lost                | Parallel system alarm. The total load is more than the redundancy load.<br>The formula is: $\text{Load \%} > N / (N+1) * 100$ |
| 25 | Ambient temperature high       | Maximal ambient temperature reached   |

## Appendix-2: Diagnostics List

| No | Diagnostics               | Description  |
|----|---------------------------|--|
| 1  | Bypass active             | UPS is on Bypass operation.                                    |
| 2  | Bypass blocked            | Bypass is blocked by UPS                                       |
| 3  | Bypass disabled           | Bypass is disabled by user                                     |
| 4  | Eco mode active           | Eco mode is selected   |
| 5  | Battery test active       | Battery test is running now                                    |
| 6  | Battery discharging       | Rectifier overload and can not feed DC enough or mains failure |
| 7  | Ambient temperature high  | Ambient temperature exceeds the upper limit                    |
| 8  | Rectifier passive         | Rectifier is not running now                                   |
| 9  | Rectifier blocked         | Rectifier is blocked by UPS                                    |
| 10 | Rectifier disabled        | Rectifier is disabled by user                                  |
| 11 | Inverter passive          | Inverter is not running now                                    |
| 12 | Inverter blocked          | Inverter is blocked by UPS                                     |
| 13 | Inverter disabled         | Inverter is disabled by user                                   |
| 14 | Generator mode active     | Generator friendly operation is activated                      |
| 15 | ESD active                | Emergency Switching Device interface is activated              |
| 16 | Maintenance bypass active | Maintenance bypass switch is at "ON" position                  |
| 17 | Output breaker open       | Output circuit breaker is at "OFF" position                    |

## Appendix-3: Event List

| No | Events                   | Description   |
|----|--------------------------|---|
| 1  | Bypass voltage ok        | Bypass voltage is within its limit.   |
| 2  | Inv. sync. with Byp.     | Frequency of bypass mains voltage synchronized with output frequency.             |
| 3  | Bypp. ph. seq. ok        | Phase sequence of bypass mains voltages is OK.                                    |
| 4  | M. Bypass passive        | Manual bypass switch is at "0" position.  |
| 5  | Inverter temp. ok        | Inverter block temperature is within the limits.                                  |
| 6  | Inverter load ok         | RMS current drawn from any of the output lines does not exceed its nominal value. |
| 7  | Bypass passive           | Bypass does not operate now.  |
| 8  | Inverter active          | Inverter operates now.  |
| 9  | Output voltage ok        | Output voltage is within the limits.  |
| 10 | Master com. ok           | There is no communication problem with master UPS.                                |
| 11 | Input voltage ok         | Input voltage is within the limits.   |
| 12 | Rec. sync. with Inp.     | Rectifier is synchronized to input frequency.                                     |
| 13 | Inp. ph. seq. ok         | Phase sequence of input voltages is OK.   |
| 14 | Rectifier temp. ok       | Rectifier block temperature is within the limits.                                 |
| 15 | Rectifier load ok        | RMS current drawn from any of the input lines does not exceed its nominal value.  |
| 16 | DC voltage ok            | DC bus voltage is within the limits.  |
| 17 | DC voltage ok            | DC bus voltage is within the limits.  |
| 18 | Rectifier active         | Rectifier operates now.   |
| 19 | Output breaker closed    | Output circuit breaker is at "I" position.  |
| 20 | Batt. test completed     | Battery test is completed.  |
| 21 | Redundancy ok            | All parallel UPS are OK.  |
| 22 | N number ok              | All parallel UPS are OK.  |
| 23 | Rectifier enabled        | Rectifier enabled is set as "YES" from front panel.                               |
| 24 | Inverter enabled         | Inverter enabled is set as "YES" from front panel.                                |
| 25 | Bypass enabled           | Bypass enabled is set as "YES" from front panel.                                  |
| 26 | Eco mode passive         | Eco Mode enabled is set as "NO" from front panel.                                 |
| 27 | Batt. not discharging    | Battery is not discharging.   |
| 28 | Ambient temp. ok         | Ambient temperature is within the limits.   |
| 29 | Gen. mode passive        | Generator friendly operation is passive.  |
| 30 | ESD inactive             | Emergency Switching Device interface is inactive.                                 |
| 31 | Battery test succeed     | Battery test result is success.   |
| 32 | Battery breaker closed   | Battery circuit breaker is at "I" position.                                       |
| 33 | Rec. precharged          | DC bus voltage is equal to input voltage.   |
| 34 | Inverter com. ok         | Communication between the inverter and the front panel is OK.                     |
| 35 | Rectifier com. ok        | Communication between the rectifier and the front panel is OK.                    |
| 36 | Bypass voltage high      | Bypass voltage is higher than its limit.  |
| 37 | Bypass voltage low       | Bypass voltage is lower than its limit.   |
| 38 | Inv. not sync. with Byp. | Frequency of bypass mains voltage not synchronized with output frequency.         |
| 39 | Bypp. ph. seq. wrong     | Phase sequence of bypass mains voltages is not OK                                 |
| 40 | M. Bypass active         | Manual bypass switch is "ON"  |
| 41 | Inverter temp. high      | Inverter block temperature is very high.  |

|    |                          |  |
|----|--------------------------|--|
| 42 | Inverter overload        | RMS current drawn from any of the output lines exceeds its nominal value.  |
| 43 | Bypass active            | UPS is on Bypass Operation.  |
| 44 | Inverter passive         | Inverter does not operate now.   |
| 45 | Output voltage failure   | Output voltage is beyond its limits  |
| 46 | Master com. lost         | This alarm is observed when information flow from master ups is interrupted  |
| 47 | Input voltage high       | Input voltage is higher than its limit.  |
| 48 | Input voltage low        | Input voltage is lower than its limit.   |
| 49 | Rec. not sync. with Inp. | Frequency of input voltage is beyond the frequency range for bypass operation or bypass mains voltage is very low    |
| 50 | Inp. ph. seq. wrong      | Phase sequence of input mains voltages is not OK.  |
| 51 | Rectifier temp. high     | Rectifier block temperature is very high.  |
| 52 | Rectifier overload       | RMS current drawn from any of the input lines exceeds its nominal value.   |
| 53 | DC voltage high          | DC bus voltages are higher than its upper limit.   |
| 54 | DC voltage low           | DC bus voltages are lower than its lower limit.  |
| 55 | Rectifier passive        | Rectifier does not operate now.  |
| 56 | Output breaker open      | Output Circuit Breaker is at "OFF" position.   |
| 57 | Batt. test active        | Battery test is on progress.   |
| 58 | Redundancy lost          | Parallel system alarm. The total load is more than the redundancy load. The formula is :<br>Load % > N / (N+1) * 100 |
| 59 | N number failure         | Parallel system alarm. If the UPS number in parallel is less than the preadjusted N number, that alarm appears.      |
| 60 | Rectifier disabled       | Rectifier enabled is set as "NO" from front panel.   |
| 61 | Inverter disabled        | Inverter enabled is set as "NO" from front panel.  |
| 62 | Bypass disabled          | Bypass enabled is set as "NO" from front panel.  |
| 63 | Eco mode active          | Eco Mode enabled is set as "YES" from front panel.   |
| 64 | Batt. discharging        | Battery is discharging.  |
| 65 | Ambient temp. high       | Ambient temperature exceeds its upper limit.   |
| 66 | Gen. mode active         | Generator friendly operation is activated.   |
| 67 | ESD active               | Emergency Switching Device interface is activated.   |
| 68 | Battery test failure     | Batteries failed in the battery test.  |
| 69 | Battery breaker open     | Battery Circuit Breaker is at "OFF" position.  |
| 70 | Rec. not precharged      | DC bus voltage is not equal to input voltage.  |
| 71 | Inverter com. lost       | Communication between the inverter and the front panel is lost.  |
| 72 | Rectifier com. lost      | Communication between the rectifier and the front panel is lost.   |

## Appendix-4: Technical Specifications

| Tower Model (3Ph/3Ph)   | KEOR T EVO<br>10KVA                                 | KEOR T EVO<br>15KVA | KEOR T EVO<br>20KVA | KEOR T EVO<br>30KVA | KEOR T EVO<br>40KVA | KEOR T EVO<br>60KVA |
|---|---|---------------------|---------------------|---------------------|---------------------|---------------------|
| Output Power (VA)   | 10.000  | 15.000              | 20.000              | 30.000              | 40.000              | 60.000              |
| Nominal Active Power (W)  | 10.000  | 15.000              | 20.000              | 30.000              | 40.000              | 60.000              |
| <b>Rectifier Input</b>  |   |                     |                     |                     |                     |                     |
| Nominal Voltage   | 400V (Ph-Ph) 3Ph+N+PE                               |                     |                     |                     |                     |                     |
| Input Voltage Range (VAC) (at 50% Load)   | 242-459V  |                     |                     |                     |                     |                     |
| Input Voltage Range (VAC) (at full Load, with battery charging)   | ±15%  |                     |                     |                     |                     |                     |
| Frequency (Hz)  | 45 - 65   |                     |                     |                     |                     |                     |
| Power Factor  | ≥ 0.99  |                     |                     |                     |                     |                     |
| <b>Bypass Input</b>   |   |                     |                     |                     |                     |                     |
| Nominal Voltage   | 400V (Ph-Ph) 3Ph+N+PB                               |                     |                     |                     |                     |                     |
| Voltage Tolerance   | ±18% (Customizable)                                 |                     |                     |                     |                     |                     |
| Frequency Tolerance (Hz)  | ±3  |                     |                     |                     |                     |                     |
| Transfer Time (ms)  | <1  |                     |                     |                     |                     |                     |
| <b>Output</b>   |   |                     |                     |                     |                     |                     |
| Nominal Voltage (VAC) (Ph-Ph)   | 400V (Ph-Ph) 3Ph+N+PB (380/415 Adjustable)          |                     |                     |                     |                     |                     |
| Power Factor  | 1.0   |                     |                     |                     |                     |                     |
| Wave Form   | Sinusoidal  |                     |                     |                     |                     |                     |
| Frequency (Hz)  | 50 or 60 (Adjustable)                               |                     |                     |                     |                     |                     |
| Frequency Tolerance (Battery Operation)   | 0.01%   |                     |                     |                     |                     |                     |
| Voltage Regulation (Static)   | ±1%   |                     |                     |                     |                     |                     |
| Output voltage unbalance at reference unbalance load  | <0.5%   |                     |                     |                     |                     |                     |
| Maximum phase angle variation   | <0.1°   |                     |                     |                     |                     |                     |
| Crest Factor  | 3:1   |                     |                     |                     |                     |                     |
| Nominal Power (KVA)   | 10  | 15                  | 20                  | 30                  | 40                  | 60                  |
| Overload Protection (sec)   | 600 (at 100 - 125% Load)<br>60 (at 125 - 150% Load) |                     |                     |                     |                     |                     |
| THD <sub>v</sub>  | < 2%<br>Non-Linear Load < 4%                        |                     |                     |                     |                     |                     |
| <b>Battery</b>  |   |                     |                     |                     |                     |                     |
| Battery Type  | Maintenance-Free Lead Acid Batteries                |                     |                     |                     |                     |                     |
| Battery String (Blocks)   | 1x60  |                     |                     |                     |                     |                     |
| <b>Protection</b>   |   |                     |                     |                     |                     |                     |
| Overload Protection, High Temperature, Input Over Voltage, Input & Output Over Current, Back-Feed Protection, Intelligent Charging Algorithm - Deep Charge Protection - Battery Test (Automatic / Manual), Short-Circuit Protection |   |                     |                     |                     |                     |                     |



| Communication*                                 |  |         |         |         |                  |     |
|--|--|---------|---------|---------|------------------|-----|
| Standard Interface                             | RS232, ESD, Genseit, Modbus, 4 Programmable Relay Contacts |         |         |         |                  |     |
| Options  | USB Converter, SNMP  |         |         |         |                  |     |
| Environment                                    |  |         |         |         |                  |     |
| Operating Temperature Range (°C)               | 0 - 40   |         |         |         |                  |     |
| Battery Temperature Range (°C)                 | 20 - 25 (Recommended For Longer Battery Life)              |         |         |         |                  |     |
| Maximum Altitude without Derating (m)          | 1000   |         |         |         |                  |     |
| Relative Humidity Range                        | 20-95% (Non-Condensing)                                    |         |         |         |                  |     |
| Acoustic Noise (dBA)                           | < 55 (at 1m)   |         |         |         |                  |     |
| Physical                                       |  |         |         |         |                  |     |
| Dimensions (HxWxD) (mm)                        | 1345/1650 x 400 x 800                                      |         |         |         | 1650 x 600 x 900 |     |
| Weight (kg)<br>(without battery & transformer) | 121/140  | 132/151 | 144/162 | 148/169 | 241              | 276 |
| Paint  | RAL 7016@enclosure<br>RAL 9005@front door metal            |         |         |         |                  |     |
| Standards                                      |  |         |         |         |                  |     |
| Safety   | IEC/EN 62040-1   |         |         |         |                  |     |
| EMC  | IEC/EN 62040-2   |         |         |         |                  |     |
| Performance                                    | IEC/EN 62040-3   |         |         |         |                  |     |
| Design   | IEC/EN 62040<br>ISO 9001:2008 - ISO 14001:2004             |         |         |         |                  |     |
| Protection                                     | IP 20 (other IP as option)                                 |         |         |         |                  |     |

\* Please contact Legrand or your local authorized distributor for optional communication interfaces.

\*\* The manufacturer reserves the rights to change the Technical Specifications and design without notice.

## Appendix-5: Modbus List

While reading data through MODBUS, the following addresses can be used. "03 - Read Holding Registers" must be selected to read the MODBUS data.

We can send commands by using MODBUS. To do that function 06 - Write Single Register must be used. The data is defined as unsigned words (2 bytes).

| Address | Coefficient | Data Definition  | Read (R) / Write (W) |
|---------|-------------|--|----------------------|
| 100     | 1           | L1 Input Voltage   | R                    |
| 101     | 1           | L2 Input Voltage   | R                    |
| 102     | 1           | L3 Input Voltage   | R                    |
| 103     | 1           | L1 Input Current   | R                    |
| 104     | 1           | L2 Input Current   | R                    |
| 105     | 1           | L3 Input Current   | R                    |
| 106     | 0,1         | Input Frequency  | R                    |
| 107     | 1           | L1 Output Voltage  | R                    |
| 108     | 1           | L2 Output Voltage  | R                    |
| 109     | 1           | L3 Output Voltage  | R                    |
| 110     | 1           | L1 Output Current  | R                    |
| 111     | 1           | L2 Output Current  | R                    |
| 112     | 1           | L3 Output Current  | R                    |
| 113     | 0,1         | Output Frequency   | R                    |
| 114     | 1           | L1 Output Load Percentage  | R                    |
| 115     | 1           | L2 Output Load Percentage  | R                    |
| 116     | 1           | L3 Output Load Percentage  | R                    |
| 117     | 1           | L1 Bypass Voltage  | R                    |
| 118     | 1           | L2 Bypass Voltage  | R                    |
| 119     | 1           | L3 Bypass Voltage  | R                    |
| 120     | 1           | Positive Battery String Voltage  | R                    |
| 121     | 1           | Negative Battery String Voltage  | R                    |
| 122     | 1           | Positive Battery String Current  | R                    |
| 123     | 1           | Negative Battery String Current  | R                    |
| 124     | 1           | Battery / Ambient Temperature  | R                    |
| 125     | 1           | Positive DC Bus String Voltage   | R                    |
| 126     | 1           | Negative DC Bus String Voltage   | R                    |
| 127     | 1           | UPS Conditions and Alarms (***)  | R                    |
|         |             |  |                      |
| 201     | 1           | If "1" is sent then beeper will be on. If "0" is sent then beeper will be off. | R/W                  |
| 202     | 1           | If "1" is sent then a battery test will start.                                 | R/W                  |

Also we can use addresses 127 to get the UPS status. A decimal value will be received from address 127. If that value is converted to binary number, the UPS status can be read.

|        |                                    |
|--------|------------------------------------|
| bit 0  | UPS operates on Online Mode        |
| bit 1  | UPS operates on Bypass Mode        |
| bit 2  | UPS operates on Battery Mode       |
| bit 3  | Output voltage is out of limits    |
| bit 4  | Output overload                    |
| bit 5  | Inverter temperature is high       |
| bit 6  | Rectifier temperature is high      |
| bit 7  | Ambient temperature is high        |
| bit 8  | Bypass is not synchronized         |
| bit 9  | Maintenance Bypass Breaker is "ON" |
| bit 10 | UPS operates on Green Mode         |
| bit 11 | Battery Failure                    |
| bit 12 | ESD interface is activated         |
| bit 13 | DC Bus voltage is out of limits    |
| bit 14 | General Alarm                      |

**Example:** Let's receive 28673 (DEC) from address 127. If that value is converted to binary number, 11100000000001 will be obtained. Then the following status can be read from that number:

Online Mode

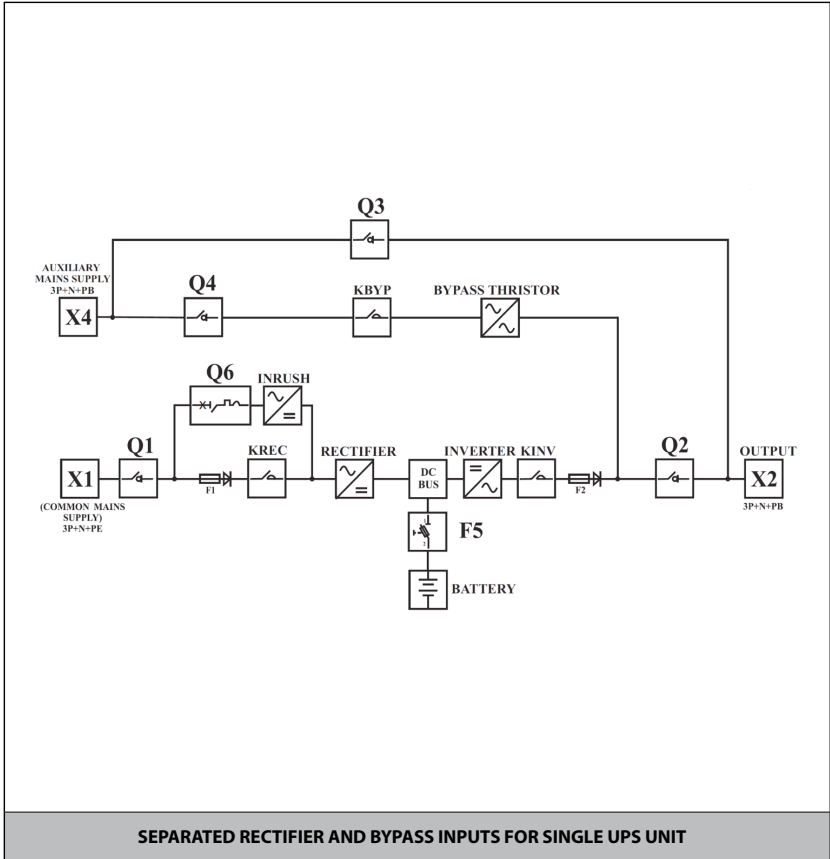
ESD interface is activated

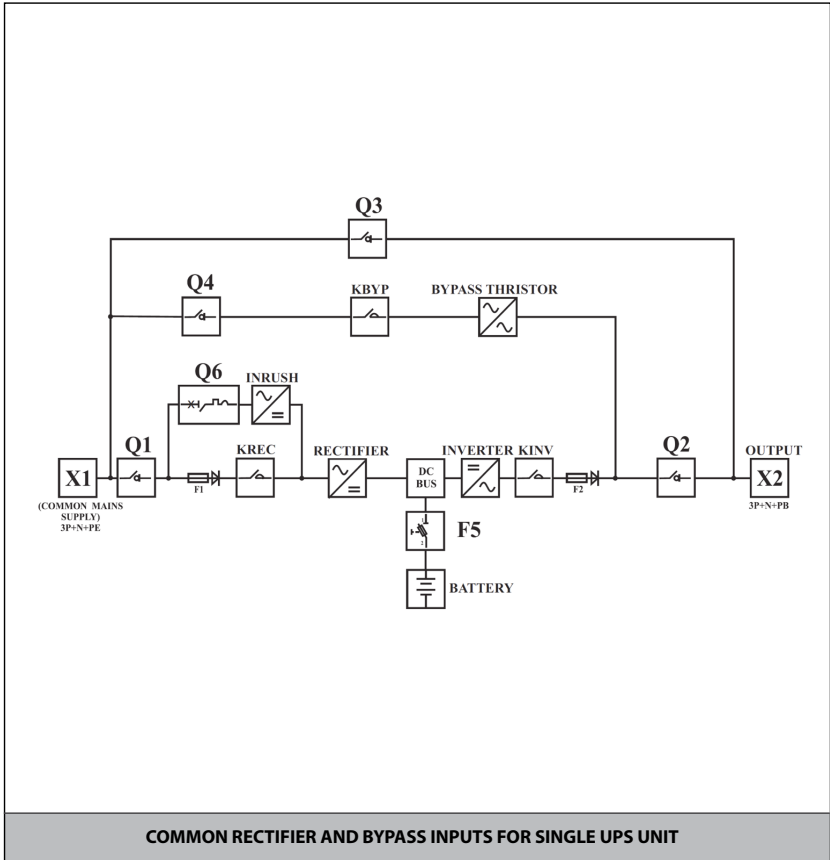
DC Bus voltage is out of limits

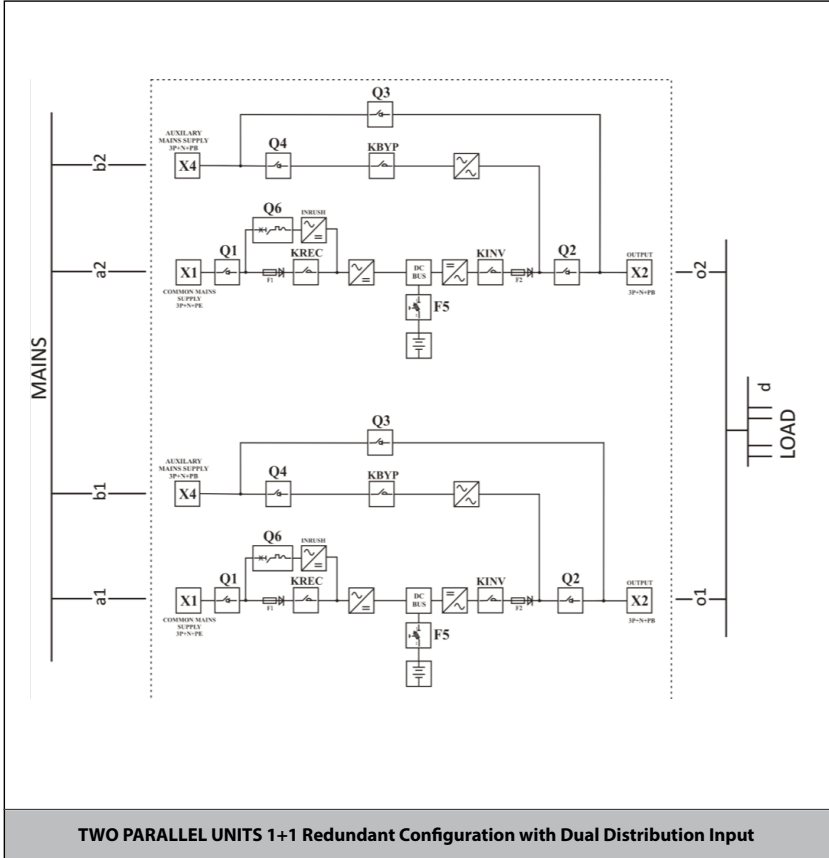
General Alarm

## Appendix-6: Description of UPS and Block Diagram

| Name             | Definition  |
|------------------|---|
| Q1               | Common Mains Supply Circuit Breaker   |
| Q2               | Output Circuit Breaker  |
| Q3               | Maintenance Bypass Circuit Breaker  |
| Q4               | Auxiliary Mains Supply Circuit Breaker  |
| F5               | Battery Fast Fuse   |
| Q6               | Inrush Circuit Breaker  |
| F1               | Rectifier Fast Fuse   |
| F2               | Inverter Fast Fuse  |
| KREC             | Rectifier Contactor   |
| KINV             | Inverter Contactor  |
| KBYP             | Backfeed Contactor  |
| X1               | Common Mains Supply Terminals   |
| X2               | Output Terminals  |
| X4               | Auxiliary Mains Supply Terminals  |
| BYPASS THYRISTOR | In case any inverter fault occurs; Bypass thyristors transfer the supply of the load electronically from inverter to Auxiliary Mains Supply without any interruption. |
| RECTIFIER        | The rectifier generates a very constant DC voltage level by drawing current from the input with a power factor close to 1.  |
| INVERTER         | The inverter generates a very constant AC voltage level at the output by using DC voltage source at the rectifier's output.   |
| BATTERY          | Supplies the necessary energy when the mains voltage is not available.  |







**a1, a2:** Mains Supply MCCB 4p

**d:** Distribution MCCB

**b1, b2:** Auxiliary Supply MCCB 4p

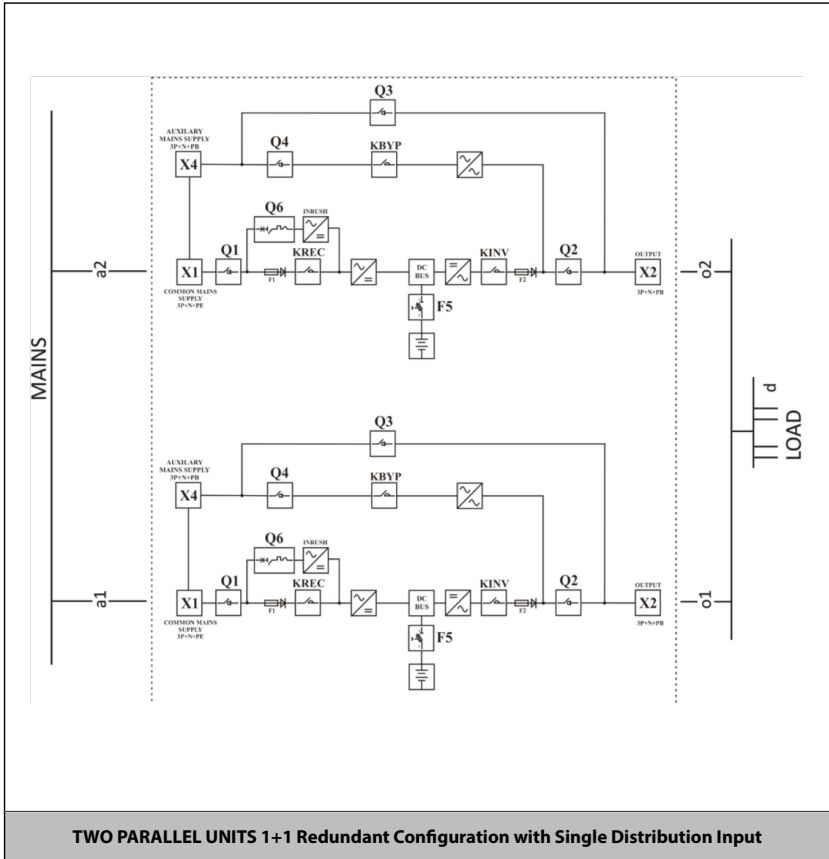
**o1, o2,** unit output switch 4p

**NOTE:**

**Q3=** Internal Maintenance Bypass can be used when total load < single unit rating (kVA)

Option **o1, o2=** unit output disconnect switch to enable single unit complete shut down for maintenance

**a, b, o** should be 4poles unless TN-C distribution is used



**a1, a2:** Mains Supply MCCB 4p

**d:** Distribution MCCB

**o1, o2** unit output switch 4p

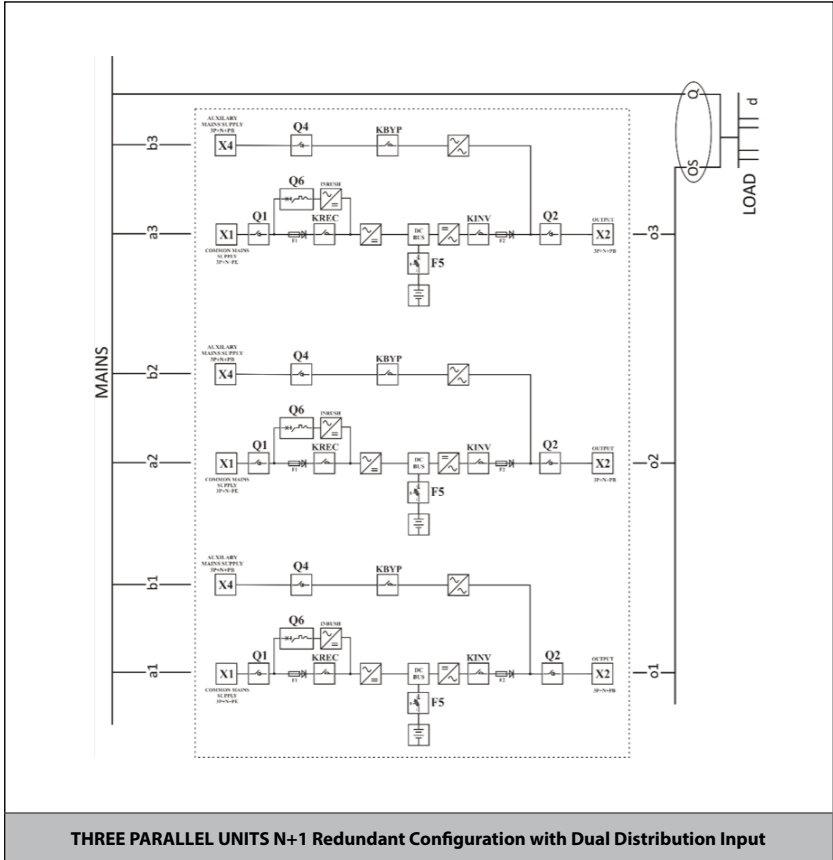
**NOTE:**

**Q3**= Internal Maintenance Bypass can be used when total load < single unit rating (kVA)

Option **o1, o2**= unit output disconnect switch to enable single unit complete shut down for maintenance

**a, o** should be 4poles unless TN-C distribution is used





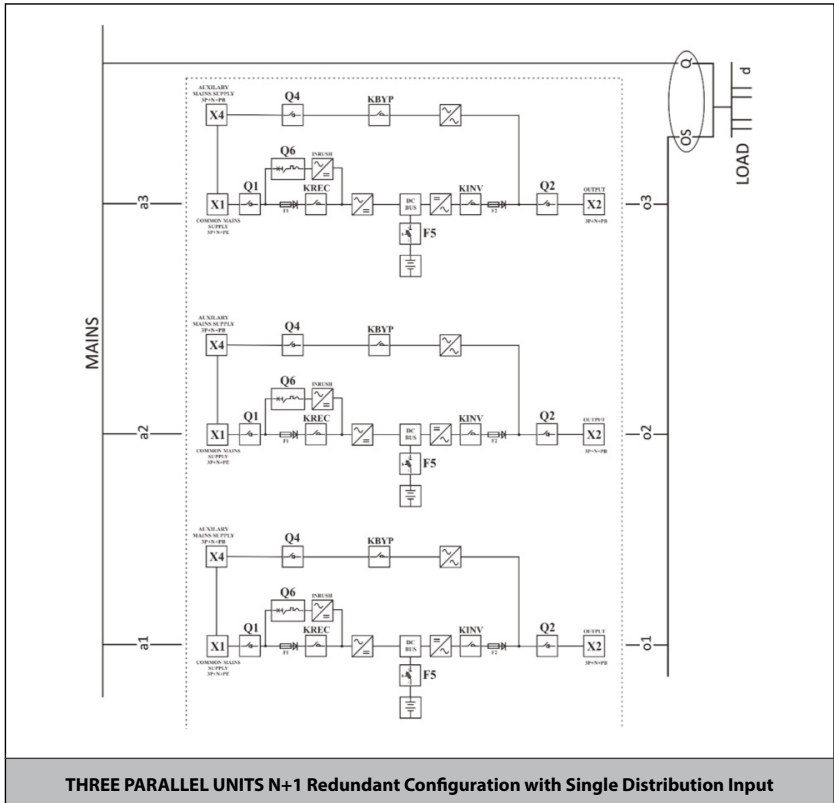
- a1, a2, a3:** Mains Supply MCCB 4p
- b1, b2, b3:** Auxiliary Supply MCCB 4p
- d:** Distribution MCCB
- o1, o2, o3** unit output switch 4p
- OS:** General output switch 4p
- Q:** External Maintenance Bypass MCCB 4p

**NOTE:**

- Q=** External Maintenance Bypass MCCB
- OS =** general output disconnect switch
- Rating = N X unit rating (kVA)

**Internal Maintenance Bypass Q3 cannot be used should be locked to avoid any misuse.**

Option **o1, o2, o3=** unit output disconnect switch to enable single unit complete shut down for maintenance **a, b, o, OS, Q** should be 4poles unless TN-C distribution is used



- a1, a2, a3:** Mains Supply MCCB 4p
- d:** Distribution MCCB
- o1, o2, o3** unit output switch 4p
- OS:** General output switch 4p
- Q:** External Maintenance Bypass MCCB 4p

NOTE:

- Q** = External Maintenance By pass MCCB
- OS** = general output disconnect switch
- Rating = N X unit rating (kVA)

**Internal Maintenance Bypass Q3 cannot be used should be locked to avoid any misuse.**

Option **o1, o2, o3**= unit output disconnect switch to enable single unit complete shut down for maintenance  
**a, o, OS, Q** should be 4poles unless TN-C distribution is used



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