Central power supply solutions

EMEX

- Reliable central back up power
- Available for AC/AC and AC/DC power supply systems
- Exceptional overload performance
- Entire modular build for quick and simple component replacement
Emergi-Lite
Experts in central power supply systems

When choosing a partner for emergency lighting, you need a supplier capable of delivering a solution whenever the need arises. Emergi-Lite focuses on supporting our customers at all points of the emergency lighting life-cycle, whether planning, installing, managing or renewing.

By choosing Emergi-Lite as your emergency lighting partner, you’ll be placing your projects, your systems, and essentially your people, in safe hands. As a leading life safety solutions provider, we deliver state-of-the-art systems and products into the emergency lighting marketplace.

1. Advice and information during the design phase
From project consultations at customer premises, to drafting certified technical drawings, Emergi-Lite is ready to support all your emergency lighting needs.

In the design phase, it is important for you to have all the information. If desired, we can provide you with that in the form of specific project advice, based on the most recent regulations, standards and safety requirements.

2. Speed and materials during the installation phase
The right products, delivered at the right time, to ensure your installations run smoothly - on time and within budget. Emergi-Lite offers you practical solutions to give you an immediate advantage, which only makes everything so much easier for you.

3. Support during the utilisation phase
The clear and precise after-sales support you would expect from a leading emergency lighting supplier, including servicing, maintenance and readily-available replacement parts.

4. Altering and separating during the renovation phase
Keeping you up-to-date with the latest standards, industry developments and new product innovations, making renewing your emergency lighting a simple, straightforward process.
Introduction
What is a central power supply system?

A Central Power Supply system (CPS) is essentially a large set of batteries at a single central location. In the event of a mains failure in the building, the batteries are used to provide reliable power for emergency lighting purposes.

Central Power Supply System (CPS):
This is essentially a large set of batteries at a single central location.

Features:
• The CPS output will typically be 24V, 50V, 110V, or 220/230/240/380/400V, according to type & regional requirement.
• Output is usually AC/DC for the lower voltages, and AC when mains voltage.
• The CPS will be sized according to the load required.
• The battery will be rated to achieve a specified duration, typically 1, 2, or 3 hours.
• A larger project may use one single large CPS, or a number of smaller CPS units.

How does it work?
The CPS effectively stores energy in the battery set whilst the mains supply is healthy, and draws upon this reserve when required in times of mains failure. If the failure is limited to part of the building (local), the CPS may provide power using its incoming supply without discharging the battery.

Mains failures are detected by sub-circuit monitoring relays to ensure the automatic, fail-safe operation of the emergency lighting. These are situated around the building where required, or may be located within the CPS itself.

Power from the CPS is distributed to dedicated emergency luminaires and exit signs, or converted slave 230V luminaires. Standard, unmodified slave 230V luminaires can be used on a mains-voltage CPS. Distribution cables need to be fire protected, according to local regulations and/or risk assessment.

Who decides?
The voltage of the CPS is influenced by the size and nature of the project. The final decision may be taken by the consultant, end user, or contractor.

The duration or autonomy of the CPS is often dictated by national Standards (eg BS 5266), or local authority requirements.

What are its benefits?
A CPS system gives a higher light output per point when compared to a self-contained installation, and therefore will use fewer emergency lights per area.

A CPS solution offers great savings in ongoing testing, maintenance, and replacement battery costs when compared to a self-contained emergency lighting installation.
Introduction

Which category fits your needs?

Central systems fall into two categories: AC/AC static inverter systems and AC/DC power supply systems. Both types of central system operate on the same principle. The luminaire is fed, via emergency sub-distribution, from the central system.

Two categories central systems:
• AC/AC static inverter systems
• AC/DC power supply systems.

Same principal:
The luminaire is fed, via emergency sub-distribution, from a single supply source (the central system).

Static inverter:
The term ‘static inverter’ is derived from the lack of moving parts within the equipment, as opposed to rotary motor / generator converter designs.

Static Inverter Systems (AC/AC)
Static inverter systems operate in a similar manner to AC/DC Central Power Supply Systems, with the exception that the system constantly gives a 230V AC output. The advantages of this approach are numerous. Firstly, luminaires do not need to be converted, as any slave 230V luminaire can be used (there are some restrictions to this on the grounds of suitability for emergency lighting). Luminaires also operate at full light output, as they are being fed from a full mains voltage supply, meaning fewer luminaires are required for equivalent light outputs.

Advantages
• Suitable for medium to large installations
• Almost any luminaire may be used
• Easy to maintain
• 10 to 25 year design life batteries
• Distribution is standard 230V AC (standard DBs)
• Reduced volt-drop problems on output cabling
• Luminaires operate at full light output
• Ideal for modern LED lighting installations to capitalise on energy reduction

Disadvantages
• Bigger systems are physically large and may require a special battery room
• Smaller installations are ideal for EMEX mini installations (See EMEX mini section for suitable solution)

Central Power Supply Systems (AC/DC)
Central Power Supply Systems provide low voltage AC power (nominally 24V, 50V or 110V AC) whilst mains to the system is healthy, and low voltage DC (of the same voltage) when mains fails. The battery voltage selected will depend upon the number of luminaires, the rating, their type and their distance from the central system. Central Power Supply Systems require each emergency luminaire to be converted for use on the low voltage supply. The cost of this conversion may be prohibitive on larger installations. Another important factor is that converted luminaires only provide a small percentage of their normal light output when running in emergency mode.

Advantages
• Reduced cost for smaller installations
• Small physical size
• Easy to maintain
• 5 to 25 year design life batteries

Disadvantages
• Not cost effective for large numbers of luminaires
• Cable restrictions to avoid volt-drop
• Luminaires must be converted for use on AC/DC
• Reduced light output in emergency mode
Introduction
Practical insights on self contained battery life

Principle types of emergency lighting system are ‘self-contained’ or ‘centrally fed’. In a self-contained system, each emergency luminaire has an on-board battery and charger unit. A Central power supply system operates on the principle that the luminaires are fed, via sub-distribution, from a single supply source.

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Self-contained System
Batteries/charger contained in individual luminaires

Advantages
• Simple installation
• No special cabling
• Economic for smaller installations with a limited total number of luminaires

Disadvantages
• Limited light output
• Multi-point maintenance
• Battery replacement 3 – 5 years
• System design life 15 years maximum

Insights on battery replacement
A typical self-contained emergency power pack has an operational design life of 10 – 15 years, and will require a replacement battery every 3 – 5 years. The installation is straightforward and, by definition, each luminaire is installed and maintained independently of all others on the site.

Battery life 3-5 years:
The instance of battery failures may increase, resulting in the possibility of further unplanned maintenance visits to replace battery sets.

Battery life after 5 years:
It is recommended that battery condition is reviewed on a regular basis. Typically following 5 years use, a full battery replacement should be carried out.

Considerations
It can be considered that self-contained products will require 2 or more complete sets of replacement batteries during the first 10 years of operation. Approaching 15 years, it is likely that the luminaires within a self-contained system will need to be changed. It should be noted, that a more rigorous and beneficial planned maintenance schedule can be achieved, utilising a suitable automatic or controlled test and monitoring system, to check the luminaires and their batteries (‘Centrel’, IR2, Naveo®Pro: available from Emergi-Lite).
Introduction
Choosing the right system for emergency lighting

There are a variety of ways in which back-up power can be provided, however, even though certain methods are suitable for critical applications, they may not necessarily be suitable for emergency lighting.

General information on Uninterruptible Power Supply Systems (UPS), for guidance:

Why is it different?
This is because an Emergency lighting system has unique load characteristics. Since emergency lighting is a critical lifesafety installation, it is vital that a central power supply system selected to power emergency lighting is designed with these load characteristics in mind.

EMEX Power central inverter systems are specifically designed to provide emergency power for lighting systems in a mains fail or evacuation situation.

In choosing the right AC system to support emergency lighting it is important to consider the following questions:

Cold load startup performance
BS EN 50171 requires that an inverter must be able to start the full load without the mains supply present. How does the system perform in a total power failure (ie is the system able to start the load without the bypass supply being available)?

Repeat duty
BS EN 50171 requires a Central power supply system to fully recharge within 24 hours. Is the charger able to recharge the batteries sufficiently quickly (80% in 12 hours or 100% after 24 hours)?

Energy consumption and heat dissipation
Is the inverter and charger permanently running, reducing the battery life, generating heat and wasting energy?

Are cooling fans running continuously, generating noise and reducing component life?

Maintenance
Is the system easy to service and maintain? Is the system designed in a modular format, or would the failure of even a minor component require the whole system to be shut down and stripped for repair?

Recharge period
UPS systems which are designed primarily for computer backup generally offer short back-up times, and consequentially employ small chargers. To provide the longer durations specified for emergency lighting, a much larger capacity battery is fitted. However, if the charger is not uprated then the system will not be capable of recharging sufficiently quickly. Hence the battery rating is sometimes increased even further so that it is not fully discharged at the end of the rated duration period (and is thus capable of “repeat duty” with limited further recharge). This results in a much larger system that is actually required for the load, increasing both the physical space required and future battery replacement costs.

Overload and short circuit performance
An emergency lighting load imposes large ‘in-rush’ currents when starting lamps from cold. However, UPS systems are often designed to shut down at only 125% overload and revert to the incoming supply. During a total power failure situation, this could result in total failure of the emergency lighting system. Furthermore, a UPS may fail to clear a protective device on a lighting circuit, meaning that a single short circuit fault could result in loss of the entire emergency lighting provision.

Energy consumption and battery life
Most UPS systems operate in the ‘on-line’ mode, whereby the inverter runs constantly to supply the load, and power is taken from the battery with the charger running constantly. This places an excessive ripple on the battery (in contravention of the advice given by most battery manufacturers). Also, the system is constantly generating heat which has a further detrimental effect on battery life. There are energy cost implications to run an on-line system, and deal with the heat generated.
Central power supplies
Reliable emergency power solutions

Our Central Power Supply Systems division offers a choice of reliable and high quality products which are designed to meet the relevant standards and specifications for both AC/AC and AC/DC applications. The ‘EMEX Power’ and ‘EMEX TS’ static inverters, ‘EMEX 110’ AC/DC and ‘Compact Power’ product ranges are manufactured in our Leeds facility, supported by an experienced engineering, sales and commissioning team.

EMEX – AC/AC Static inverter range:
220-230V 50/60Hz, 400V. 3ph 50/60Hz
Static inverters in this range are true passive stand-by emergency lighting units, designed and built to exceed current emergency lighting standards and technical requirements, something with which most UPS based central power products do not comply. EMEX Power, EMEX TS static inverters and EMEX Mini power systems offer a low maintenance and extremely reliable central power supply solution with low running costs and a high degree of functionality to serve individual customer needs.

- Modular design, which makes maintenance or repair a simple task
- Manufactured in the UK
- Normal mains luminaires with electronic starters/high frequency ballasts may be driven by the system (glow wire starters cannot be used in accordance with BS EN 60598.2.22)

- Ideal for task lighting projects where normal (high) lighting levels are required to minimise business disruption
- High efficiency: Low running cost. This AC/AC type of system has been designed for an inherently long service life with associated significant cost benefits over alternative emergency lighting solutions
- Cost conservancy and design: 1. Ventilation fan life is maximised, as they will only operate when required, during ‘battery charge’ or ‘inverter active’ cycles 2. Battery life conserved by a temperature compensated constant voltage charger circuit in conjunction with passive stand-by inverter operation
- Functional features include sub-circuit monitoring, final exit input, MCB monitoring, M/NM operation (user selectable), fire alarm input and two volt-free common alarm outputs
- MCB protection devices are used throughout the equipment, eliminating the need for fuse spares
- Digital display for battery and output metering V & I
- Fully compliant with EN 50171
- EMEX TS includes integral touch-screen with EMEX Test capability

BS EN 50171
KM542294
**Technical reference**

**Manufacturing & certification**

The emergency lighting system and all of its components shall be manufactured and certified to meet the requirements of BS EN 50171 and the system should be CE marked.

**Central inverter system**

The system should offer the following standard features as summarised below and further detailed in sections 3.0, 4.0, 5.0, 6.0 & 7.0:

- True AC/AC 50/60Hz output
- Ability to use standard proprietary AC distribution and protection devices on outgoing circuits
- Rated for any load power factor, zero to unity, at any output power up to the maximum rated kVA
- Compatibility with addressable test package using EMEX technology
- Excellent overload capability in full emergency mode: 200% for 10 seconds without reduction in output voltage
- Excellent recharge capability – 80% after 12 hours following rated discharge
- MCB protection throughout – no fuses

- EMEX Power true modular construction with common spares (inverter, charger, control PCB, and system interface common across the full system range)
- Individual MCB protection for each module – AC and DC circuits
- Individual cooling fans for all modules with on-demand operation (not continuously running)
- Split parallel charger above 10 amps – enhanced integrity with the ability to operate with one or more charger modules isolated (subject to increased recharge time)
- Integral maintenance bypass facility (ability to support output load in bypass mode whilst maintenance is performed)
- Temperature compensated charger
- Comprehensive display
- Charger and inverter alarm pack
- Momentary “push to test” button
- Fire alarm interface
- Final exit interlock
- Internal and external MCB monitoring
- Local/remote maintained circuit control
- Sub-circuit monitor connection
- Two sets of volt–free alarm relay contacts
- Inverter-inhibit engineers’ switch
- Remote Alarm Unit option
- Easy front panel access
- Inter-cabinet trunking for battery cables
- Fork-lift plinth
- Lifting eyes for crane lift as standard
- Cabinet levelling feet available
- Installation pack with tools included
- Detailed instruction manual
- Transfer time both directions max. 0.5 seconds
- Battery earth leakage monitor option
Technical reference

EMEX technology

The system should use EMEX Technology to provide full addressable monitoring of the complete emergency lighting system including the EMEX Power Central Power Supply System(s).

The system must be capable of monitoring fluorescent, cold cathode fluorescent, filament, LED, or halogen luminaires.

Software
System should use EMEX test software to schedule the automatic regular testing of emergency lighting system components. The system should automatically generate and collate test reports. These reports should be automatically date-stamped and should be available in a notepad format such that engineer's notes can be added.

CPS capacity
The system can support multiple Central Power Supply Systems (CPS). Each CPS must be able to communicate with up to 4,000 luminaires.

Communication
The system must use data cable to link the control computer to the CPS unit(s), and from each CPS to the associated luminaire interfaces only. Data cables will NOT be fitted direct to any luminaires. Up to 100 substations may be fed from the internal transmitter within the CPS.

MXD4 substation
The system must offer remote MXD4 substations each having 4 separate outputs, each capable of monitoring up to 4 no. fluorescent, filament, LED, or halogen luminaires completely without modification to the luminaire. The systems should be capable of monitoring a lamp wattage of up to 230 watts. The substation should provide minimum 8 no. monitoring inputs, free programmable switched or unswitched with mixed mode of operation (maintained, non-maintained, switched maintained).

MXC substation
The system must offer remote MXC substations each having 2 outputs, which are capable of monitoring up to 40 no. luminaires / 10 amps in total. The substation should provide minimum 8 no. monitoring inputs, free programmable switched or unswitched. Luminaires must share the same supply cable with mixed mode of operation (maintained, non-maintained, switched maintained).

LTC luminaire module
Luminaires for use with MXC each require a local LTC module. Each LTC must provide 1 no. switched and 1 no. unswitched local monitoring input to act directly on the luminaire in addition to any communication received from the substation. A full range of exit signs, bulkhead luminaires, decorative luminaires, and twospot units must be available ready fitted with LTC modules. LTC modules must also be available loose and in remote enclosures for the adaptation of standard slave 230V luminaires to the MXC system.

Each LTC must be capable of switching up to 230 watts. The LTC module must retain the existing mains ballast in the luminaire.

Flexibility
The system must permit both MXD4 and MXC solutions on the same system, controlled from a single PC.

Cable specification
Cable must be 2 core with additional earth or drain wire and must be a composite screened cable. The conductor cross section must be a minimum of 1.5 mm sq cable and must be rated for 230V AC. General data cables do not meet this requirement.

These requirements can be met by using FP200 or similar fireproof cable or LSFOH type cable.
## Technical reference

### Manufacturing & certification

#### Static inverter specification

<table>
<thead>
<tr>
<th>LED Indications</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Mains healthy</td>
<td>Green</td>
</tr>
<tr>
<td>Maintained circuit on</td>
<td>Green</td>
</tr>
<tr>
<td>Battery high volts</td>
<td>Amber</td>
</tr>
<tr>
<td>Battery low volts</td>
<td>Amber</td>
</tr>
<tr>
<td>Supply from battery</td>
<td>Red</td>
</tr>
<tr>
<td>Charge fail</td>
<td>Red</td>
</tr>
<tr>
<td>System fault</td>
<td>Red</td>
</tr>
<tr>
<td>Common alarm</td>
<td>Red</td>
</tr>
<tr>
<td>Battery discharged</td>
<td>Red</td>
</tr>
<tr>
<td>System inhibited</td>
<td>Red</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Inverter modules</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Nominal output</td>
<td>220V – 240V 50/60Hz AC</td>
</tr>
<tr>
<td>Rating</td>
<td>1.5kVA or 3kVA rating with Master or configuration Slave</td>
</tr>
<tr>
<td>Overload</td>
<td>120% continuous with full output</td>
</tr>
<tr>
<td></td>
<td>125% for 20 minutes with full output</td>
</tr>
<tr>
<td></td>
<td>150% for 1 minute with full output</td>
</tr>
<tr>
<td></td>
<td>200% for 10 seconds with full output</td>
</tr>
<tr>
<td>Short circuit</td>
<td>350% for 5 seconds</td>
</tr>
<tr>
<td>Cooling</td>
<td>Integral fan (on-demand operation)</td>
</tr>
<tr>
<td>Protection</td>
<td>AC 2 pole type D</td>
</tr>
<tr>
<td></td>
<td>DC 2 pole type B</td>
</tr>
<tr>
<td>Module dimensions</td>
<td>360mm x 170mm x 575mm</td>
</tr>
<tr>
<td>Handling</td>
<td>Recessed handles front and rear</td>
</tr>
<tr>
<td>Weight</td>
<td>50kg</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Charger modules</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Constant voltage current limited with temperature compensation. Voltage control to ±1% with full mains supply variations.</td>
<td></td>
</tr>
<tr>
<td>Rating</td>
<td>10 amp minimum</td>
</tr>
<tr>
<td>Cooling</td>
<td>Integral fan (on-demand operation)</td>
</tr>
<tr>
<td>Protection</td>
<td>AC 2 pole type D</td>
</tr>
<tr>
<td></td>
<td>DC 2 pole type B</td>
</tr>
<tr>
<td>Module dimensions</td>
<td>360mm x 170mm x 575mm</td>
</tr>
<tr>
<td>Handling</td>
<td>Recessed handles front and rear</td>
</tr>
<tr>
<td>Weight</td>
<td>50kg</td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>Metering</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>DC metering</td>
<td>Combined digital battery voltage and charge/discharge current</td>
</tr>
<tr>
<td>AC metering</td>
<td>Combined digital AC output Voltage and current</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Controls</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Final exit interlock</td>
<td>Requires volt-free contact</td>
</tr>
<tr>
<td>Sub-circuit monitor</td>
<td>24V control loop</td>
</tr>
<tr>
<td>Maintained circuit control</td>
<td>24V control loop</td>
</tr>
<tr>
<td>Fire alarm control</td>
<td>12/24V DC from fire panel</td>
</tr>
<tr>
<td>Remote MCB monitoring</td>
<td>24V control loop</td>
</tr>
<tr>
<td>Changeover device</td>
<td>Four pole contactor to BS 5424 and EN 60947</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Mechanical</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Input / output terminals</td>
<td>10mm/50mm dependant on rating</td>
</tr>
<tr>
<td>Control terminals</td>
<td>2.5mm</td>
</tr>
</tbody>
</table>

**Transient overvoltage protection**

To protect against damage caused by transient overvoltages, factory fitted Furse ESP transient overvoltage protectors available as an option.
Battery
Battery should be comprised of one or more strings of no more than 120V nominal voltage.

The batteries shall be maintenance free sealed lead acid, gas recombination type with a minimum design life of 10 years. They shall have extremely low gas generation, low self-discharge and have sealed pressure release vents. Other battery technologies to be available upon special request.

The batteries shall be sized to power the complete system for the rated duration following mains failure at 100% light output of all emergency lamps.

Environmental conditions
Ambient temperature of the installation (switch room) should be in the range 15 – 25°C. Air conditioning is required where normal ambient will exceed 25°C. This is to achieve optimum battery life expectations.

NOTE: Batteries must not be subject to prolonged extreme temperatures prior to installation and must be stored in a suitable environment.

### Indoor equipment categorized

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Temperature Range</th>
<th>Humidity (non-condensing)</th>
<th>Noise level at 1 metre</th>
<th>Altitude without extra ventilation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ambient temperature (Nominal)</td>
<td>5°C – 35°C</td>
<td>40 – 85%</td>
<td>55 dBA</td>
<td>2,500 metres</td>
</tr>
<tr>
<td>Extreme temperature</td>
<td>0 – 40°C</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Humidity (non-condensing)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Noise level at 1 metre</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Altitude without extra ventilation</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Inverter and battery cabinets

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nominal output</td>
<td>220V – 240V 50/60Hz AC</td>
</tr>
<tr>
<td>Construction</td>
<td>Modular without welds; battery cubicles can be flat-packed for ease of access to site</td>
</tr>
<tr>
<td>Ingress protection</td>
<td>Options up to IP41</td>
</tr>
<tr>
<td>Colour</td>
<td>RAL 5015 gloss (Medium Blue); Other RAL colour finishes available to special order</td>
</tr>
<tr>
<td>Lifting &amp; handling</td>
<td>M12 lifting eyes and 110mm plinth</td>
</tr>
<tr>
<td>Levelling</td>
<td>Levelling feet available</td>
</tr>
<tr>
<td>Access</td>
<td>Single door with 8mm square block key. Front access only required - opening angle 180° Key lockable doors on request. Removable top gland plate.</td>
</tr>
<tr>
<td>Ventilation</td>
<td>Ventilation in rear and front only – cubicles can be mounted adjacent to each other (no side ventilation)</td>
</tr>
<tr>
<td>Dimensions</td>
<td>1,800mm x 750mm x 725mm (Dimensions are inclusive of 75mm ventilation back-stop)</td>
</tr>
</tbody>
</table>