High-level healthcare thanks to electric power availability

Secure power distribution and monitoring solution for operating theatres
Improving the performance of operating theatres...

To ensure the safety of patients, the availability and quality of electric power are essential. The electrical installations of operating theatres should enable the continuity of healthcare in all circumstances.

99.999%
Electric power availability for patient safety

Enhancing patient safety
Ensuring the satisfactory operation of operating rooms is essential for a hospital.

Ensuring continuity of service
Because nothing must disturb the medical team during operations.

Improving the efficiency of hospital personnel
A controllable environment and perfectly functioning equipment mean more comfort and less stress for calmer work.
Secure power distribution and monitoring solution for operating theatres

A reliable, efficient solution from a single manufacturer ...

A solution you can trust ...

- All the components of this solution are designed, manufactured, and tested by Schneider Electric to operate together and be implemented by trained and approved partners.
- Schneider Electric provides maintenance plans and operating procedures linked to this solution.
- Schneider Electric ensures the continuity of the components throughout the installation’s life.

... thanks to secure power distribution ...

- The Schneider Electric solution incorporates an isolating transformer and a continuous insulation monitor in conformity with the required standards to ensure the supply of power to medical equipment in the event of a first insulation fault.
- The continuity of the electric power supply is ensured thanks to total coordination of all the Schneider Electric components, including an uninterruptible power supply.
- The Schneider Electric solution is designed, wired, and tested to attenuate electromagnetic disturbances in accordance with the IEC 60364-4-44 standard.

... to event monitoring and traceability

The Schneider Electric solution incorporates a monitoring system to:

- Inform maintenance and medical personnel in real time in the event of an electrical fault in the operating room.
- Monitor the operating room environment and record all environmental events and data.
- Provide data to the hospital building management system.

What do the standards say?

- In Group 2* rooms for medical use, the medical IT system† should be used for the circuits powering medical electrical equipment and systems for survival and surgical applications, and the other equipment located in the environment of the patient.
- An audible and visual alarm must be provided for in the room in question to alert medical personnel.
- For Class ≤ 0.5, special safety power supply source shall maintain luminaries of operating theatre tables and e.g. endoscopes, for a minimum period of 3 h. It shall restore the supply within a changeover period not exceeding 0.5 s.
- For the satisfactory operation of medical equipment, prevention of electromagnetic disturbances may be necessary.

‡ Class 0.5 (according to IEC 60364-7-710): anaesthetic room, operating theatre, operating recovery room, intensive care room, etc.

IEC

Our solution complies with international standard IEC 60364-7-710, and with national standards and regulations.

* Group 2 (according to IEC 60364-7-710): rooms for medical applications in which the parts applied are designed to be used in applications such as intracardiac procedures, operative fields, and vital treatments where discontinuity (failure) of the power supply could entail danger for life.

† The medical IT system does not require automatic cutoff of the power supply whenever an insulation fault occurs. In this type of system, the exposed conductive parts of the installation are connected to the installation’s neutral point.
A power distribution and monitoring solution to meet the needs of all users

Our solution offers an optimal level of safety and comfort for both medical personnel and maintenance personnel. Everyone can concentrate on their jobs and optimize their work.

The nurse
- tests the insulation monitoring system at start-up of the operating room.
- is warned of an electrical fault or insulation fault.
- uses the Magelis touch screen panel to monitor environmental conditions.
- is notified of any work performed by maintenance personnel.
- generates an insulation test.

The surgeon
- remains concentrated on what is essential, his/her patient.
- benefits from the stability and security of the electric power supply.

The maintenance personnel
- is notified by SMS text message of the presence of an electrical fault in an operating room.
- consults via PC the electrical state of each operating room.
- performs servicing on the cabinet indicated as at fault.
- can indicate handling of the fault.

The supervision personnel
- views the states of each operating room via PC.
- generates event reports.
- sets alarm thresholds for the temperature and relative humidity values of operating rooms.

Our power distribution and monitoring solution consists of:
- a switchboard,
- a monitoring system,
- an uninterruptible power supply.

- Real-time information for decision-making and action.
- Traceability of events.
- Monitoring of each operating room.
- Continuity of service for patient safety.
An electrical distribution cabinet designed with the best equipment from Schneider Electric

Organized by zones for efficient servicing operations and to prevent electromagnetic disturbances.

Prisma Plus switchboard
> Physical separation between zones.
> Pivoting front panels.
> Separation of weak currents and heavy currents.
> Power distribution by distribution blocks with spring terminals.

Connection zone for outgoing and incoming cables
> The terminals are grouped together in 3 zones identified by labels.
> Servicing operations on connections limited to a single zone.
> Clear markings for servicing operations.

Data acquisition and communication zone
> Real-time monitoring of the state of circuit breakers, the insulation level, and the transformer of the IT system.
> Acquisition of temperature, pressure, and relative humidity values for the operating room and comparison with thresholds.
> Information on medical gas states.
> Data and alarm transmission to the touch screen panel in the operating room and to the supervision and maintenance PCs.
> LON, Modbus, and TCP/IP protocols support connection to the hospital network.

Protection from electromagnetic disturbances, in accordance with IEC 60364-4-44 and IEC 61000-6-2 and -3 thanks to:
> Physical separation of sensitive and interfering components, and of low and high current cables.
> Metal screen separation between functional units.
> Linking of exposed conductive parts to reduce the common impedance between the devices.
> Low emissions and high immunity of the devices.

TNS system feeder zone
> Isolation switch-disconnector for maintenance operations.
> C60L circuit breakers with magnetic trip units for non-critical feeders with failsafe contact for electrical fault detection.
> Backed-up 24 VDC power supply (battery life: 1 hour) for the touch screen panel in the operating room and the data acquisition system.

> Reliable fault detection on feeders.
> Data monitoring system and touch screen panel in operating theatre backed up for 1 hour.

Isolating transformer zone, 6.3/8 and 10 kVA
> Isolating transformer for IT system in compliance with IEC 61558-2-15:
  - Strengthened galvanic isolation between primary and secondary: 100 MΩ.
  - Leakage current between secondary and frame: < 0.5 mA.
  - Limited inrush current: < 12 In.
  - Low no-load current and reduced voltage drop under load (< 3%).
> Temperature monitoring by bimetallic strip and overload monitoring by thermal relay.
> No electric shock for patients.
> Stability of medical instrumentation power supply.
> No cabinet ventilation, no noise.

IT system feeder zone and insulation monitoring
> EM9BV insulation monitor in compliance with the IEC 61557-8 standard and the requirements of the IEC 60364-7-710 standard.
> C60N circuit breakers with magnetic trip units for critical feeders with failsafe contact for electrical fault detection.

> No power cutoff on first fault.
> Permanent digital display of insulation value.
> Fault indication by failsafe contact.

Uninterruptible power supply
> Protects the switchboard against mains power cuts, voltage dips, and overvoltages.
> Filters slight current fluctuations and isolates the switchboard from major mains disturbances.
> Ensures a continuous supply of power until the mains supply returns to normal (standby power supply at full load: 5 minutes).

> Quality of electric power supply.
> Continuity of service.
Secure power distribution and monitoring solution for operating theatres

A monitoring system...

With its monitoring system, our solution provides access to all information concerning the electrical and environmental state of rooms.

Personnel in operating room

Magelis touch screen panel
- Visual and audible indications of electrical faults.
- Audible alarm stoppage.
- Display of environmental parameters and state of medical gases.
- Information on fault handling by the maintenance personnel.
- Testing of the insulation monitoring system.

Supervision personnel

PC with the supervision system software pre-installed
- Display of parameters for each operating room.
- Recording of all electrical events and environmental parameters, with reporting capabilities.
- Temperature and pressure threshold setting.

Maintenance personnel

PC with a Web browser
- Display of parameters for each operating room.
- Notification to medical team that the fault is being handled.

Alarm by SMS text message

... for information in real time

12" Magelis touch screen panel

Welcome page
- Time.
- Display of temperature, relative humidity, pressure and state of medical gases (O2, N2O, and vacuum).
- Hours/minutes/seconds display.
- Access to other functions and locking of the touch screen panel.

Environmental management
- Temperature and relative humidity value setting.
- Day/night screen lighting.

Insulation fault
- Electrical and insulation fault indication.
- Indication of fault handling by the maintenance personnel.
- Audible alarm stoppage.

Vigilohm HRP: an alternative to Magelis

Simple and efficient
- Audible and visual alarm for an insulation or electrical fault (transformer overload or circuit breaker tripping).
- Testing of the insulation monitoring system.
- Audible alarm stoppage.

- Be informed to take decisions.
- Event traceability.
- Be informed in order to take action.
- Reassure the medical team.

- Flush mounted.
- Antibacterial.
- Resistant to cleaning products.
Secure power distribution and monitoring solution for operating theatres

One coherent electrical system architecture dedicated to continuity of service

> An uninterruptible power supply for quality of power.
> A changeover switch in the event of loss of the UPS and for maintenance.
> Total coordination between equipment contributes to long life and continuity of service of the installation.

Three levels of information for the monitoring system

The Schneider Electric offer

<table>
<thead>
<tr>
<th>Control and signalling panel</th>
<th>Basic</th>
<th>Advanced</th>
<th>Full</th>
</tr>
</thead>
<tbody>
<tr>
<td>Type of display</td>
<td>Vigilorn HRP</td>
<td>Magelis touch screen</td>
<td>Magelis touch screen</td>
</tr>
<tr>
<td>State of temperature, pressure, relative humidity, medical gases</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
</tbody>
</table>

Maintenance access

| Access to operating theatre data | Yes | Yes | Yes |
| SMS alarm                      | -   | -   | -   |

Supervision personal access

| Access to operating theatre data | - | - | - |
| Event traceability             | - | - | - |
| Event report                   | - | - | - |

UPS

| If normal power supply not backed up | Yes | Yes | Yes |

Two cabinet sizes depending on the space available

Prisma Plus P enclosure

> Integrated transformer.
> Floor mounting.

<table>
<thead>
<tr>
<th>Height</th>
<th>Width</th>
<th>Depth</th>
</tr>
</thead>
<tbody>
<tr>
<td>2256 mm</td>
<td>696 mm</td>
<td>454 mm</td>
</tr>
</tbody>
</table>

Prisma Plus G floor standing enclosure

> External transformer with IP21/IK07 cover.
> Floor mounting.

<table>
<thead>
<tr>
<th>Height</th>
<th>Width</th>
<th>Depth</th>
</tr>
</thead>
<tbody>
<tr>
<td>1860 mm</td>
<td>900 mm</td>
<td>243 mm</td>
</tr>
</tbody>
</table>

Transformers with IP21/IK07 cover

<table>
<thead>
<tr>
<th>Power</th>
<th>Height</th>
<th>Width</th>
<th>Depth</th>
</tr>
</thead>
<tbody>
<tr>
<td>6.3/8 kVA</td>
<td>710 mm</td>
<td>470 mm</td>
<td>540 mm</td>
</tr>
<tr>
<td>10 kVA</td>
<td>740 mm</td>
<td>470 mm</td>
<td>540 mm</td>
</tr>
</tbody>
</table>

APC Smart-UPS RT uninterruptible power supply

<table>
<thead>
<tr>
<th>Power</th>
<th>Height</th>
<th>Width</th>
<th>Depth</th>
<th>Weight</th>
</tr>
</thead>
<tbody>
<tr>
<td>6/10 kVA</td>
<td>432 mm</td>
<td>263 mm</td>
<td>736 mm</td>
<td>111 kg</td>
</tr>
</tbody>
</table>
Secure power distribution and monitoring solution for operating theatres

**Technical characteristics**

<table>
<thead>
<tr>
<th><strong>Electrical characteristics</strong></th>
<th><strong>Environmental conditions (operating room or electrical premise)</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>Operational voltage 230 V / 50-60 Hz</td>
<td>Location Indoor</td>
</tr>
<tr>
<td>App.</td>
<td>20 kVA</td>
</tr>
<tr>
<td>In</td>
<td>63 A maximum</td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Atitude ≤ 2000 m</td>
</tr>
<tr>
<td></td>
<td>Maximum ambient air temperature 30°C</td>
</tr>
<tr>
<td></td>
<td>Relative humidity 95%</td>
</tr>
<tr>
<td></td>
<td>Switchboard power losses 465 W</td>
</tr>
</tbody>
</table>

**Electrical switchboard enclosure: Prisma Plus**
- Steel sheet, cataphoresis treatment + hot polymerized polyester epoxy powder, RAL 9001 colour
- Degree of protection IP66
- Degree of protection against mechanical shocks IK07
- Ventilation: Natural ventilation
- Cable inlet and outlets: In duct, through the bottom or top
- Cable connection: To terminals

**IT system feeders**
- Isolating transformer 6.3 kVA or 10 kVA with temperature and overload monitoring
- Insulation monitor + display of insulation value
  - Internal resistance in alternating current: 100 kΩ
  - Injection voltage: 24 V DC max.
  - Injected current: 240 μA DC max.
  - Fault indication threshold setting: 50 kΩ
- Modular circuit breakers: Up to 6 feeders on 3 phases (protection for 4 or 3 power outlets per feeder)

**TNS system feeders**
- Modular circuit breakers: Up to 6 feeders

**Monitoring**
- Data acquisition and communication modules: TAC Xenta 731, 421, 321
- Protocols: LonWorks, LonMark, Modbus, and TCP/IP
- Temperature, pressure, and relative humidity sensors: Schneider Electric
- Alarm backup time: 1 hour
- Magelis touch screen panel: 12” backlit active-matrix TFT LCD isolated with Anios products
- Vigilohm HMP: Plastic case: IP54, IK10
  - Tested with Anios products

**Conformity with standards**
- Solution for operating theatres: IEC 60364-7-710
- Switchboard: IEC 61439-1 and -2
- Isolating transformer: IEC 61566-2-15
- Continuous insulation monitor: IEC 61567-8
- Electromagnetic compatibility: IEC 60364-4-44 and -3

**Uninterruptible power supply**
- Efficiency at full load: 98%
- Minimal voltage interruption: < 3%
- Standard duration of power supply at full load: 5 min.

**Environmental conditions**
- **Location**: Indoor
- **Altitude**: ≤ 2000 m
- **Maximum ambient air temperature**: 30°C
- **Relative humidity**: 95%
- **Switchboard power losses**: 465 W

**High value-added services**

Throughout the world, our Schneider Electric service experts and our local partners are attentive to your needs and will deliver a comprehensive and unique service offering.

**Expert services**
- **For improved performance…**
  - Energy efficiency.
  - Installation reliability and safety.
  - Reduced capital expenditure.
  - Reduced power consumption.
  - Reduction in the number of failures.
  - Reduction in downtime and repair time.
  - Training of operation and maintenance teams.
  - Longer equipment service life.
  - …over the entire life cycle of the installation
  - Installation design.
  - Commissioning.
  - Operating aid.
  - Maintenance and revamping.
  - Energy efficiency audit.
  - Customized services.

**Customer support and online services**
- Call centres, online diagnosis services, and technical assistance.
- Services via Internet: electronic catalogues, downloadable software, information, and training.

**A close relationship with our customers**
- We have a strong international footprint with 105,000 employees in 130 countries. With our partners, distributors, panelbuilders, contractors, and engineering offices, we want to establish with you a relationship of trust and help you achieve an optimal level of performance.

**A strong social commitment**
- Sustainable development is a key part of the Schneider Electric strategy. Our solutions help those without electricity obtain access to it and favour a reduction in energy consumption by both industrial firms and private consumers.
- 91% of our plants are certified ISO 14001. The Schneider Electric product offering complies with all existing standards worldwide.
Make the most of your energy

To find out more, please visit: www.schneider-electric.com