

# Innovative Power Distribution for Hospitals

Concept for profitable and  
safe power distribution



## Totally Integrated Power

Answers for infrastructure.

**SIEMENS**

# Requirements and Trends in the Healthcare Sector

For a long time, medical care in Europe was shaped by public authorities. The healthcare reform made it easier for private providers to engage in this market. Today, around 27 percent of all hospitals are run by private operators. In the USA, by way of comparison, 80 percent of the hospitals are already privately owned. Experts, as well as trends forecast similar conditions in Europe in the not too distant future. Even today, new hospital buildings are being planned and erected in accordance with entrepreneurial and process-oriented considerations. The tasks are clear: flexibility as regards medical equipment, improved patient comfort, greater safety and better quality at a lower cost.

What leeway is there in making hospitals run more efficiently? The recipe for success is: optimize processes and install purpose-oriented, flexible and future-proof building technology only. This is becoming increasingly important. As hospitals do not only exhibit the most complex processes compared to other buildings, such as office buildings, they also have the highest operating costs. For this reason, holistic concepts are gaining more and more ground. These are concepts which bring together the technical infrastructure of a hospital, thus permitting energy-efficient and cost-saving lifecycle management. These lifecycle costs are composed of the sum of all costs incurred during the construction of the hospital, the hospital operating costs and include multiple redevelopment work and the ultimate demolition of the hospital. In large hospitals, there are often up to a hundred different medical and building technical installations – up till now the majority of these are monitored, operated and managed individually. Here, in combination with electrical power supply, integrated building technology exhibits its full strength: all systems can communicate with one another, plus power supply, heating, ventilation, air conditioning, safety and fire protection are networked and can also be centrally controlled. Thanks to this intelligent networking with information and communication technology, patients' calls for more comfort and care can be met. In addition, hospital processes become faster and safer. What's more, this integrated systems approach even helps hospital operators cut down on energy and thus costs.



# Energy Efficiency in Sight

Buildings account for around 40 percent of the current global energy consumption. With Directive 2002/91/EC of December 16, 2002, on the total energy performance of buildings, the European Union is striving to improve the energy efficiency of real estate. The most important measures stipulated in this directive include the preparation of energy certificates for buildings ("energy passport") and the definition of minimum building requirements.

The energy passport must be submitted when buildings or parts of buildings are sold, leased or let. This also applies to a change in building operator for hospitals. The energy passport makes energy consumption in a building transparent and divides it into certain categories, similar to what we know from large household appliances. The aspects scrutinized in this certificate are energy loss in buildings as a result of building technology and the building shell, the final energy demand broken down into specific energy source categories and the CO<sub>2</sub> emissions.

Given the increasing scarcity of resources, rising energy prices and the call for reduced CO<sub>2</sub> emission levels, many countries outside Europe are also placing more emphasis on energy efficiency in buildings and passing relevant legislation. The "Green Building Council" in the United Arab Emirates stipulates, for example, that a building's energy consumption must be made transparent and energy consumption verification furnished for new buildings.

The energy consumption of a building is an all-important factor in relation to environmental compatibility. But this is not the only reason why hospital operators must keep overall energy consumption in mind.

Global price increases for oil, gas and electricity are major cost factors, contributing extensively to increased hospital operating cost bills. It is therefore vital for hospital operators to cut energy consumption or keep it at a low level. To have a leverage on future consumption, electrical power supply planning is essential.

### Saving from the start

Great cost saving potential lies in the operation of hospital facilities that run on electricity. Systems and tools for power management, as well as innovative building automation systems are instrumental in cutting consumption costs. As early as in the planning stage of a hospital development and the design stage for electrical power distribution systems, the course is already set for the economic efficiency of electrical power supply. At this point, the dimensioning requirements for the given purpose of the electrical installations is defined, as are the components that are required for this. Innovative software tools by Siemens provide electrical engineering consultants with vital dimensioning support. Planning and tendering for power distribution components geared to demand are the key to keeping investment costs as low as possible. It must be kept in mind, however, that savings in investment for power supply equipment often result in compromised energy efficiency in operation.

### Paving the way for energy passports

The member states of the European Union must define the minimum requirements for the total energy efficiency of new and existing buildings and provide for the preparation of energy passports for buildings. This, among other things, is the content of Directive 2002/91/EC by the European Parliament and the Council on the energy profile of buildings, dated December 16, 2002. This directive is transformed into national legislation. In Germany, the energy passport for new buildings was already introduced in 2002. In 2007 the amended Energy Saving Ordinance (EnEV) implementing the regulations of the EU Directive 2002/91 came into effect. In connection with this, energy passports are also being introduced for existing buildings. Since July 2008, energy passports have been mandatory for buildings which were completed before 1965. As of January 01, 2009 newer buildings are also to be included into this passport regulation.

# Technology Platform Totally Integrated Power

## Integrated power distribution from the feed-in to the consumer

Totally Integrated Power™ (TIP) refers to integrated electrical power distribution in commercial and industrial buildings; from the medium voltage supply fed in by the utility company right up to the final electrical consumer.

Totally Integrated Power is underpinned by an array of helpful tools and support for accurate design, dimensioning and configuration of electrical power distribution within buildings. A coordinated product and systems portfolio for the construction of these systems is rounded off by standardized interfaces between the system components and the higher-level human-machine interface systems as well as for the connection to control and management systems.

In this way considerable savings can be made across the whole project cycle – from the planning stage, installation and start-up right through to operation. The necessary investments in the electrical infrastructure of the hospital can be optimized in line with demand and also with subsequent operating costs in mind. This optimization potential represents significant added value for all owners/developers and hospital operators.

## Optimum planning for cost and time-effective solutions

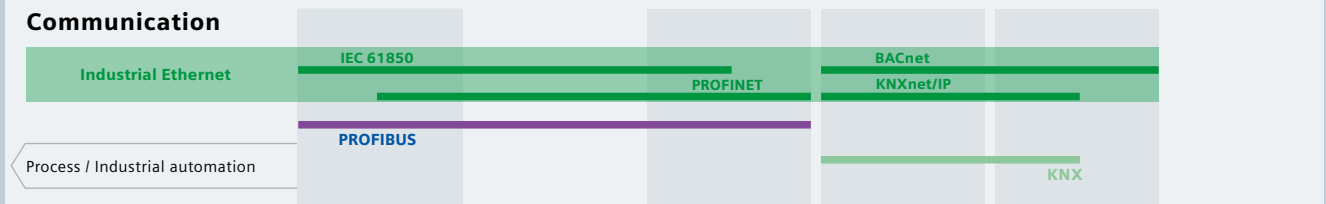
An optimally dimensioned power distribution system is a key economic factor in edible oil production. Unused capacities cost money. The tried-and-tested, TÜV-certified SIMARIS design® dimensioning software from Siemens provides electrical engineering consultants with an indispensable tool for dimensioning the electrical network for a new construction or expansion of a production plant.

SIMARIS design brings many benefits, including simpler network calculation and selectivity verification as demanded by DIN VDE 0100 Part 710. The software also recommends suitable coordinated devices from the integrated Siemens power distribution product portfolio. Electrical network upgrade reserves can be incorporated right from the planning stage to allow for later changes of use or extensions. The integration of reserves in defined supply sections contributes in a purposeful manner to increasing the energy efficiency and thus reducing operating cost. When systems are configured, the use of the SIMARIS tool family can provide time savings of up to 85% in the various network planning stages. These tools support everyone involved from the planner, switchgear manufacturer and electrician to the hospital operator. The SIMARIS design tool serves for planning and erecting, but also for maintaining the electrical system including power consumers. SIMARIS project is used for system configuration and the resulting budgeting of the switchgear and system components. SIMARIS configuration and ALPHA SELECT support the detailed planning of the SIVACON switchboards and small and normal-sized distribution boards up to production engineering.

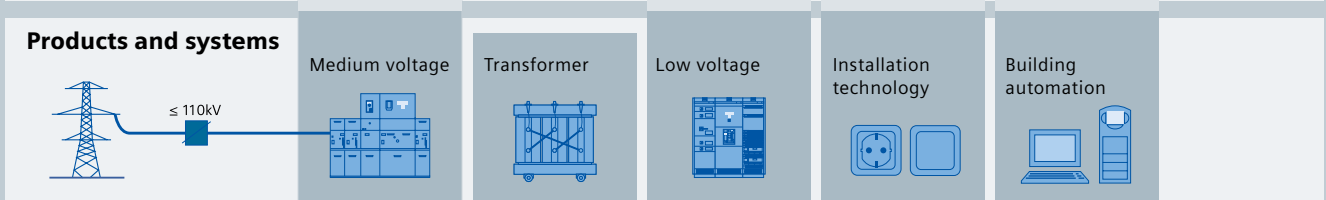
In questions of detail which exceed the possibilities of the above described tools, Siemens renders comprehensive support through all planning stages by providing personal advice - on site, if necessary. For this purpose, competent employees are available who know the implications of industrial plant business beyond product business and are capable of rendering individual advice.



## Communication



## Products and systems



## Planning and dimensioning



# Basic Considerations on Electrical Power Distribution Design in Hospitals

In a hospital, planning is characterized by medical processes and their interrelations, which focus on the benefit of the patient at all times. In line with this, the aim to “protect the patient” is the highest priority for electrical engineering of installations, too. Electrical power distribution directly and indirectly plays a central part in this context. The patient must be directly protected from the straight impact of an electric current during treatment. The patient must also be indirectly protected in terms of providing minimum medical care at all times. This also applies in the event of failure of normal power supply, even if this were to last a number of days.

In a professional planning scheme, hospital requirements cannot simply be broken down into the individual installations owing to the complexity of processes; rather, they must be harmonized. By networking the individual requirements, an optimal solution is achieved.

### Power distribution exemplified

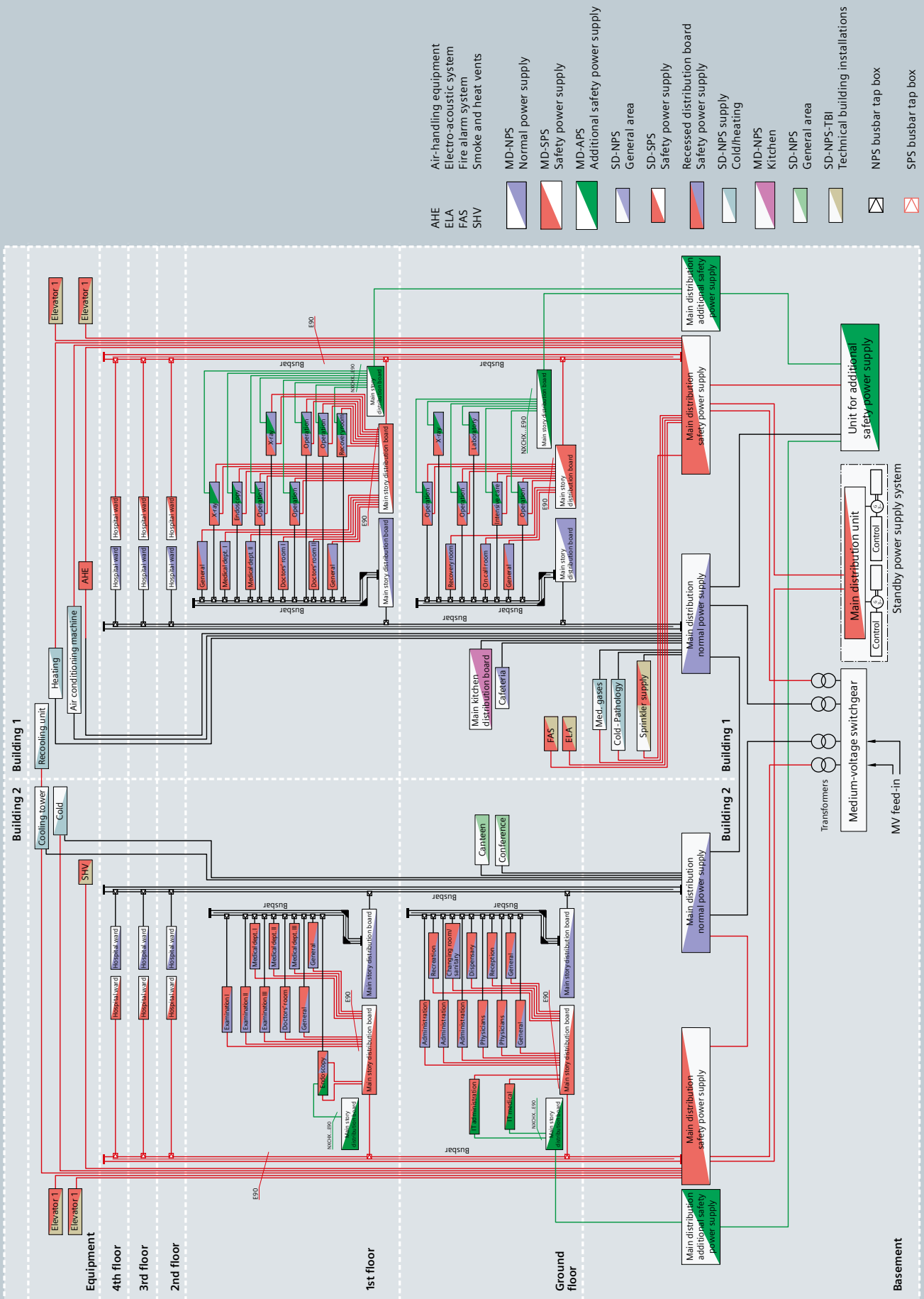
The schematic line diagram below outlines relevant departments in a hospital and exemplifies power distribution.

Depending on the different supply tasks that are required in a hospital, the network structure is determined. It is important to bring the power sources as close to the power consumers as possible in order to prevent losses due to power transmission.

In line with the specifications made by the installation company and the mandatory regulations for building use, the power output of the different sources of supply, such as normal power supply, safety power supply and additional power supply must be divided up. Energy efficiency cannot be the sole focus of attention when power sources for a hospital are being designed. Availability plays a superior role and often requires redundancies which impede energy efficiency. Precise dimensioning while strictly considering all consumer data and their properties in overall performance is an absolute must here, as under-dimensioning will result in malfunctions of far-reaching consequences.

By default, all installation sections are powered by transformers which feed into normal power supply NPS (blue) and safety power supply (red). From here, the additional safety power supply APS (green) is backed.





- AHE Air-handling equipment
- ELA Electro-acoustic system
- FAS Fire alarm system
- SHV Smoke and heat vents
- MD-NPS Normal power supply
- MD-SPS Safety power supply
- MD-APS Additional safety power supply
- SD-NPS General area
- SD-SPS Safety power supply
- Recessed distribution board
- Safety power supply
- SD-NPS supply Cold/heating
- MD-NPS Kitchen
- SD-NPS General area
- SD-NPS-TBI Technical building installations
- NPS busbar tap box
- SPS busbar tap box

When a supply structure is built up, the internal processes which can be covered with the installed network topology must be observed at all times. Owing to the short service life of medical technology (often < 6 years) compared to electrical installations (> 25 years), a certain amount of requirements for flexible reconstruction work should be factored into the network planning. Load centers should therefore not be oversized in terms of their load volume and catchment area. This also helps meet the stipulation that it must be possible for electrical distribution systems at the “last level” to be operated by the medical personnel. This means that they must be accessible, as is the case with recessed distribution boards on the corridors of the medical departments.

Safety power supply and additional power supply with its connected network play an important part in the supply structure. In contrast to other commercial buildings in which the safety power supply systems are used for evacuating people and to aid fire fighting, the hospital calls for additional requirements which go far beyond standard requirements. Functional endurance and a selective protection concept are some of the many elements which are mandatory under the given regulations in order to ensure that safe and reliable supply is provided.

The safety power supply is fed by standby power generating sets which must meet the specific demands of hospital operation in terms of availability, standby time and bridging time, overload capability and reliability. Those consumers which are necessary for alarm, rescue and risk reduction purposes are powered by this supply. Power is transmitted through special cables or enhanced cable routes which guarantee functional system endurance up to 90 minutes (red lines). Typical power consumers connected to this supply are safety and escape route lights and parts of the technical building installations which fulfill safety-relevant functions. Fire alarm systems (FAS) and electro-acoustic systems (ELA) ensure early fire detection and sound our alarm signals. Building evacuation is aided by smoke and heat vents (SHV), ELA and smoke discharge systems. Sprinklers, elevators for the fire brigade, SHV and smoke discharge systems help ensure targeted fire fighting.



In addition, the safety power supply has further consumers which are necessary to maintain a defined operational emergency supply status in the hospital. This involves not only a bridging time until evacuation is executed, but also the maintenance of medical operations to a certain extent for several days or weeks. Parts of the technical building installations, such as cold, gases, sanitary system, air conditioning and heating are then assigned a different relevance. When SPS load groups are dimensioned, the need for consumers to be safety supply consumers must be most carefully scrutinized and harmonized in accordance with operation.

If the standby time of the safety power supply (< 15s) is not sufficient, operation must rely on the additional safety power supply (APS). This system is often designed as a static UPS system and ensures uninterrupted power supply by additional buffers using storage batteries. This type of power supply is relied on in certain medical areas where an interruption of up to 15 seconds is not permissible, as this would amount to a particular risk for the patient (OT light, devices with life-supporting functions etc.).



Medical power consumers are allocated to the supply standards of power supply by assigning them to the groups 0, 1 and 2. The highest standard is given in Group 2 where no responsibility can be taken for an interruption to examination or treatment. This is where ASP is applied. If power outage is acceptable over a certain period of time (<15s), the consumers are in Group 1. Additionally, IT isolating transformers can be encountered in parts of Group 2 and Group 1 which provide an additional safety standard. The first fault, which would result in power outage in typical supply networks elsewhere, remains without consequence. Only the second fault results in disconnection and thus in power outage. This network configuration is generally used in OTs, for example.

A further increase of the safety standard is attained in Group 2 by supplying from two independent sub-networks. Combinations are, for example, supply from NPS/SPS or SPS/APS. Power consumers supplied in such a way are fed from a sub-distribution board which is supplied by two separate lines from the NPS and SPS (from the building's main distribution board). Cabling is laid locally with the cables separated from each other in order to further increase safety. In the sub-distribution board, both sub-networks are connected by means of a changeover switch which has been tested and approved for medical areas.

The changeover switch monitors the supply voltage of the preferred and second line for undervoltage and voltage failure. As soon as a voltage drop to a defined value has been detected, the changeover switch switches over to the second line automatically. When the voltage in the preferred line returns, it switches back.

Besides bearing cost savings potential, well-thought-out power routing concepts bring about certain pluses in terms of supply reliability. Specialist solutions which opt for busbar trunking systems offer additional advantages when things get serious. Longer electricity supply times, as well as lower fire and smoke loads speak for themselves and ensure a higher level of safety during operation or a lower risk during evacuations.

Any other power consumer or distribution board which is not connected to the "red network" as illustrated in the diagram will be supplied from the normal power supply with transformer feed-in.

Owing to operational requirements, selected power consumers in the normal power supply are often also assigned to a standby power supply system. What is important here is that, if the safety and standby networks are supplied by one generator, the safety power supply has absolute priority; this can be ensured by way of suitable measures such as load shedding. The safer and more flexible approach is to separate these power consumers from the safety power supply by providing the standby supply power via an additional standby generating set. Here, it is not necessary for the same safety standards to apply as for the safety power supply.

## Grouping for areas for medical use

DIN VDE 0100-710 published in 2002 divides areas for medical use into three groups. Among other things, this standard requires a TN-S network configuration for areas belonging to Group 0 and 1, as well as protection from excessively high contact voltages by means of residual-current protective devices (RCD).

### Group 0

From an electrical point of view, rooms in Group 0 are not equipped any differently from other rooms for normal use outside medical facilities. An allocation to this group, however, implies that these rooms nevertheless are of considerable importance to the course of medical processes.

### Group 1

Group 1 includes all rooms and areas in which patients whose condition and type of medical treatment places substantial demands on the electrical installation are cared for. An unexpected interruption to the power supply does not expose the patient to immediate danger and a repetition of the examination is possible at any time.

### Group 2

In rooms and areas which are assigned to Group 2, diagnoses and therapy are performed on the patient where the type of medical treatment may directly or indirectly be dangerous for the patient.

Areas in Group 2 are defined as follows:

- Repetition of treatment is unacceptable for the patient or the procurement of examination results is not possible again.
- An irregularity (a fault) in the power supply may cause danger to life.
- A facility for medical use which is occasionally used for applications as per DIN VDE 0100-710.2.7 must be assigned to Group 2.

## Changeover switches

DIN VDE 0100-710 determines the following:

- Continuous monitoring of the the voltage supply of the preferred line and the second line
- Automatic changeover to the second line if the preferred line fails within a defined time ( $< 0.5s$  or  $< 15s$ , respectively)
- Safe operation even when a fault occurs (one-fault-safety)

The changeover switch monitors the supply voltage of the preferred and the second line for undervoltage and voltage failure. As soon as a voltage drop to a defined value is detected, the voltage relays respond and the changeover switch switches over to the second line automatically. As soon as the voltage in the preferred line returns, it switches back.



## Medical IT systems

For a medical IT system within Group 2, the DIN VDE 0100-710 standard defines the following:

- The medical IT system shall be used for power outlet circuits in the patient environment.
- Every group of rooms shall have at least one IT system.
- Multi-way power outlets shall have circuits of their own.
- Initial single faults must not result in system disconnection.

The IT system is supplied by an isolating transformer. The specialty of this system is that in this system no live conductor is directly connected to ground. The high reliability of an IT system is ensured by continuous insulation monitoring. The insulation watchdog detects insulation faults when they occur and signals in due time when a limit value is undershot, before a further insulation fault will result in the unforeseen interruption of operation. In addition, the transformer temperature and load are continuously monitored. If limit values are exceeded, this will be signalled immediately.

Insulation monitoring and voltage monitoring are differentiated between. When insulation monitoring is used, insulation watchdogs monitor the insulation resistance of IT networks in areas for medical use. At the same time, they monitor the load current and temperature of the IT isolating transformer. When voltage monitoring is used, device operation is no longer ensured when undervoltage is present. On account of the hazard to human beings, for example during an operation, the preferred type of feed-in must be switched over to the second system feed-in when undervoltage occurs. The voltage relays switch if the voltage drops below 90% of the system voltage.

## The electrical safety concept in areas for medical use

All electrical equipment and systems in areas for medical use are subject to exceptional requirements, because the life and health of the patient may already be endangered if very low currents flow through his body or if life-supporting equipment which is used for patient examination, monitoring or treatment breaks down.



# Power Distribution Components in Hospitals

In hospital operation, savings in the areas of electrical energy and maintenance costs for power distribution components can also be achieved by using efficiency-enhanced products and systems, as well as efficient building automation systems.

### Medium-voltage switchgear

The medium-voltage switchgear is the optimal backbone of power supply in a hospital complex. The type-tested and gas-insulated Siemens switchgear 8DH is particularly suited for this purpose. Gas insulation of the switchgear enables an appreciably more compact design compared to air-insulated switchgear and thus requires little space. No maintenance for life, owing to gas insulation, provides for low operating costs.



- Single panels and switchgear panel blocks can be lined up as required and can be extended on site without any gas works
- Type-tested and routine-tested
- Safe-to-touch, hermetically sealed encapsulation, independent of environmental impact, high personal safety
- High availability, as maintenance is not required
- No maintenance costs, hence minimized operating costs
- Switchgear interlocking with logic interlocks
- Compact design owing to SF<sub>6</sub> insulation, tight for life, lower space requirements, efficient use of space (ca. 30-50% less space)
- Reduced fire load
- Requires only small pressure relief openings in case of accidental arcs, as the pressure increase is only around 30% of the value of air circuit-breaker technology

## Distribution transformers

Siemens GEAFOL transformers are energy-saving, as they have low losses and are therefore designed especially for economical long-time use. They are low-flammable, self-extinguishing and do not emit toxic gases in the event of fire in the building, which is both essential and extremely important for continued hospital operation in the event of a fault.



- Highly profitable in continuous operation due to loss-optimized characteristics
- Profitable thanks to aluminum rather than copper windings
- The choice of installation site is facilitated because transformers comply with the most stringent of safety classes regarding surroundings, climate and fire (e.g. low-flammable and self-extinguishing)
- Performance increase by up to 50% thanks to the installation of cross-flow fans
- Installation in the switchgear room together with the low-voltage main distribution board due to separation by means of fire protection walls F90A (no additional firewalls necessary)
- Low noise thanks to high-quality magnetic core design
- Long service life due to minimized air and dirt infiltration to the coil core
- Pre-assembled, type-tested transformer connection pieces for busbar connection to optimize operational safety (EMC, fire load, short-circuit capacity etc.)

## SIRIUS isolating transformer

Special requirements are placed on electrical installations in rooms for medical use in order to ensure the safety of patients and medical personnel. In particular the product standard EN 61558, Part 2-15 contains regulations for single-phase and multiple-phase isolating transformers for the supply of rooms for medical use.



Single-phase SIRIUS isolating transformers in rooms for medical use comply with these standard requirements and offer much more: high reliability, profitability and a long service life of the electrical installations and installation parts.

- Low heating-up and high service life owing to specially loss-optimized core and winding design
- Reliability by means of a transformer design for 100% overload
- Very low electro-magnetic stray fields
- Static shield between primary and secondary winding with insulated connection
- Thermistor transformer protection to warn in case of thermal overload
- Short-circuit voltage and no-load current are max. 3%
- The max. inrush current is 8 times the threshold value of the rated input current, thus it is noticeably lower than the max. value defined in the standard

# Power Distribution Components

## Low-voltage main distribution boards

Type-tested SIVACON low-voltage switchboards provide a high degree of safety for man and machinery and limit the effects of accidental arcs and fault propagation to a minimum in the event of a fault.

Flexible, withdrawable-unit or plug design is excellently suited to the needs of hospitals, as components can quickly and easily be replaced without extended service interruptions.

A worldwide network of SIVACON partners safeguards service and availability.



- Maximum installation safety thanks to the use of type-tested switchgear assemblies
- Space saving with installation areas of 400 mm x 500 mm or above
- Variable busbar position (top/rear)
- Cable/ busbar connection from the top, bottom or rear
- Combination of different mounting technologies possible within one panel
- The degree of protection is maintained (up to IP54) in switch test and disconnection position when the door is closed
- Maximum personal safety thanks to arc-fault-proof lock system
- Flexible adaptation of the internal partitioning to individual needs
- Uniform operating interface for all withdrawable units
- Universal hinge for easier subsequent change of the door hinge (left/right)
- High-efficiency ventilation system with maintenance benefits

## Busbar trunking systems

In order to substantially reduce the risk of fire in the hospital complex and to almost rule out supply failure due to outer impact, SIVACON 8PS busbar trunking systems by Siemens provide an alternative to cables in many places. Owing to their high short-circuit strength, their minimal fire load and their flexibility in enabling the later connection of current taps virtually anywhere, they provide important advantages over cables. They are type-tested and safe as a connection for power transmission between the transformer and the low-voltage switchgear or between switchgear cabinets.



If equipped with tap-off units, they also are an ideal power distribution system at the last installation level. In addition, communication-capable modules allow for an interfacing to building control systems.

The SIVACON 8PS busbar trunking system...

- has ca. 20 % less fire load than cables
- is easy to install and expand as complex support constructions are not necessary
- is low-weight (aluminum conductor)
- is profitable owing to easy installation
- enables clear current routing
- complies to short-circuit-proof cabling; unlike cables, no additional measures are necessary
- provides a high level of operational safety
- is part of the integrated power supply concept by Siemens as a type-tested unit (transformer/ low-voltage main distribution, low-voltage main distribution/subdistribution)

## Air circuit-breakers

SENTRON 3WL air circuit-breakers are used as incoming/outgoing feeder circuit-breakers, tie breakers and distribution switches in electrical installations. They are used for switching and protecting generators, transformers, busbars and cables, distribution boards, motors and capacitors.

- Easy engineering, configuration and retrofitting due to modular design with only 3 sizes, few components and uniform accessories
- Integrated communication concept for PROFIBUS and MODBUS
- 4 switching capacity categories of the short-circuit switching capacity for all applications
- Very reliable and long-lasting
- Effective diagnosis management, measured values form the basis for efficient load management to produce power demand profiles and allocate costs to cost centers



## Molded-case circuit-breakers

SENTRON 3VL molded-case circuit-breakers are used as incoming/outgoing feeder switches in low-voltage switchgear. They are also used as switching and protective devices for motors, transformers and capacitors and as power switches with features for stopping and disconnecting in conjunction with lockable rotary operating mechanisms and connection covers.

- Easy engineering, configuration and retrofitting thanks to modular design, few components and uniform accessories
- Fully communication-capable via PROFIBUS DP and MODBUS
- Wide product range from 16 to 1,600 A
- 3 switching capacity categories for making and breaking capacity: low-priced solution for all customer requirements
- Customer-specific solutions available ex works



# Power Distribution Components

## Switch-disconnectors with fuses

SETRON 3NJ62 pluggable switch-disconnectors with fuses are installed wherever many cable outlets for power distribution must be fitted in low-voltage distribution boards in a very confined space.

- Easy engineering, configuration and retrofitting
- Type-tested in compliance with IEC EN 60947-3
- Conversion, retrofitting and replacement without disconnecting the switchgear
- Developed for switchgear in plug-in design
- Fuse replacement in de-energized state
- No maintenance
- High degree of operator protection
- Operating handle only in OFF position
- Unambiguous switch position indication



## Multi-function measuring instrument

The SETRON PAC3200 multi-function measuring instrument is a built-in device for power distribution systems and control cabinets. It precisely and reliably acquires current, voltage, power factor as well as energy and power values for electric feeder circuits or individual loads. In addition, it is equipped with an Ethernet interface (with Modbus TCP) as standard and optionally with PROFIBUS DP or Modbus RTU. The free SETRON powerconfig software is available for configuration, which facilitates the configuration of several measuring instruments at a time.

- Basis for exact cost allocation, due to high measuring accuracy
- Wide range of functions, hence only one instrument variant required for different measuring tasks
- Easy handling due to intuitive user prompting with multi-language clear-text display
- Fast installation owing to quickly latching holder; installation also possible without tools



## Sub-distribution boards and small distribution boards

ALPHA distribution boards by Siemens are also synonymous with maximum personal safety. They are equipped with low-voltage circuit-protection technology from Siemens. Being a renowned technology leader for residual-current protective devices, Siemens also provides a comprehensive protection concept with a well-matched, broad device range for protecting, switching, measuring and monitoring.

Floor-mounted distribution boards are on every floor. They link the low-voltage main distribution system to the small distribution boards in the various hospital areas.

- TTA and PTTA-tested distribution system
- End-to-end product range for all distribution boards from 63 A to 630 A
- Fast and easy configuration of the distribution boards using the ALPHA SELECT software

ALPHA small distribution boards are specially suited as sub-distribution boards in hospitals. Thanks to their low mounting depth, they are particularly suited for installation in the patient wards and can thus be specifically used close to the respective load centers.



## Low-voltage circuit-protection devices

A further challenge that is met in connection with power supply in hospitals is the protection of human life. Our products and systems are designed in such a way that the affected installation parts and power consumers are immediately disconnected from the supply, thus ensuring that people and property remain unharmed. Siemens BETA low-voltage circuit-protection technology provides fuse systems and protective switches that isolate the fault current and provide protection from hazardous personal and material damage.

Well-matched protective features ensure that only the circuit which is affected by a fault is disconnected. Siemens circuit-protection devices - built into switchgear and distribution boards - provide the integrated solution for power distribution. In this way, the high requirements set down by standards in terms of type-tested switchgear and controlgear assemblies (TTA) and partially type-tested switchgear and controlgear assemblies (PTTA) can be easily met.

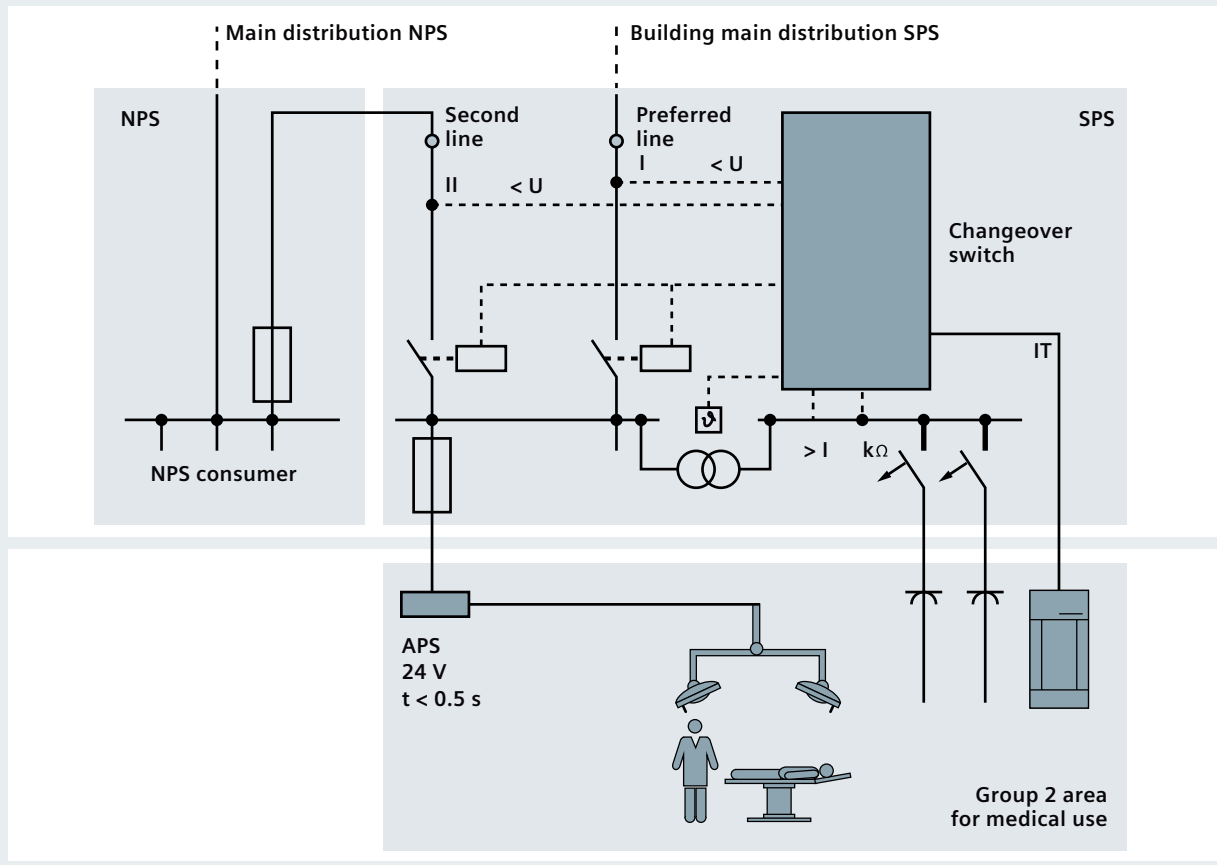


# Power Distribution Components

## Monitoring devices and changeover switches

In order to guarantee electrical power supply in Group 1 and 2 areas for medical use, Siemens provides changeover switches, signaling and testing units and further monitoring devices. The TÜV-approved changeover switches provide a high degree of functionality and system reliability. As system states are passed on through floating contacts, these changeover switches can flexibly be interfaced to any control system

Owing to easy handling using potentiometers and conventional wiring, costs for commissioning and maintenance by the technical personnel are very low. In order to ease the workload of the medical staff, displays and operator control elements have been designed in such a way that the system state or the fault message can be recognized immediately and patient care is not delayed unnecessarily.



## More Selected Products & Systems



### Switches and power outlets

Besides a broad product range of switches and outlets for all types of rooms in a hospital, the DELTA switches and outlets system also provides hospital-based solutions. For example, colored power outlets in operating theaters and intensive care wards ensure that the normal (green) and emergency-power-protected network (orange) can be distinguished between. In emergency situations there is no time for lengthy searches, which is why switches and power outlets have to be clearly distinguishable, labeled either with text or symbols.

Hospitals have strict hygiene requirements, which also apply to switch surfaces. DELTA switches and GAMMA operator control surfaces made from robust and environmentally compatible thermoplastic are especially hygienic because they can be easily cleaned.



### Low-voltage motors

The IEC low-voltage motors made by Siemens are compact and highly efficient motors in efficiency class EFF1 (High Efficiency). As they are equipped with copper rotors, they attain very high efficiency ratios at low losses. Compared to conventional motors, they can reduce the power loss by up to 40%.

Owing to their broad range of application, they promise to be a success in virtually any hospital area. They are particularly well suited for applications with pumps, fans, elevators and revolving doors.

## More Selected Products & Systems

### Building automation system

Building automation systems monitor, optimize and control the products and systems in the individual installations - such as the heating, ventilation, air conditioning, lights and blinds control - and thus create an optimal climate in the room for the utmost of comfort. The DESIGO building automation system from Siemens helps to operate the hospital efficiently and optimally control room conditions.

Building automation solutions save energy, reduce operating costs and go easy on the environment by reducing the CO2 load.

With Directive 2002/91/EC, the Energy Performance of Buildings Directive (EPBD), the European Union pursues the goal of improving the energy efficiency of buildings. Among the most important measures stipulated by this directive are the preparation of energy certificates for buildings (energy passport) and the definition of minimum building requirements. The standard EN 15232 - "Energy performance of buildings, Impact of Building Automation, Controls and Building Management" evaluates building

automation components as regards their impact on the energy consumption of buildings.

This standard divides building automation systems into four different performance classes:

- Class A corresponds to highly efficient systems.
- Class B denotes advanced systems.
- Class C corresponds to the average standard to be encountered today.
- Class D corresponds to systems which are not energy-efficient; buildings incorporating such systems must be modernized; new buildings must not be equipped with such systems.

Using the DESIGO building automation system, this standard can be fulfilled in the the highest energy performance classes (BACS performance class A or B). In detail this means that by using pre-defined energy saving functions up to 30% energy savings are possible compared to the given norm (BACS performance class C).

#### Performance classes of building automation acc. to EN 15232

#### BACS Performance Classes



**Class A:**  
Highly energy-efficient BACS and TBM

**Class B:**  
Advanced BACS and TBM

**Class C:**  
Standard BACS  
(usually used for reference)

**Class D:**  
No energy-efficient BACS

BACS = Building Automation and Controls System,  
TBM = Technical Building management System, article de-online

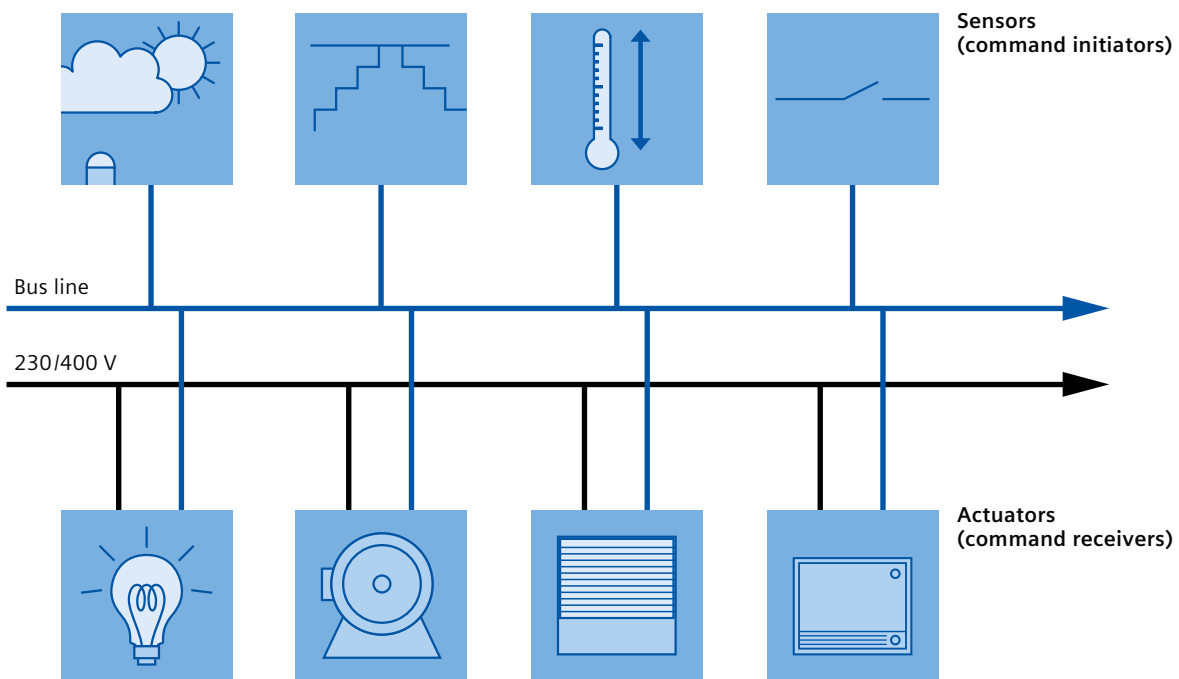
## Building management systems

The GAMMA instabus building management system creates an intelligent connection between electrical functions. This helps reduce operating costs, ensures safe and smooth operation and provides modern comfort of use. Thanks to its central visualization terminal, GAMMA instabus provides a current image of all building functions and allows for the operation of these at the same time. The highly user-friendly system includes conventional switches, remote control, operating displays, touch panels or a central visualization terminal.

For example:

- Automatic blinds control creates an agreeable climate in patient wards and prevents glare in laboratories. Energy is saved in cooled rooms, because the aircon doesn't have to work hard to balance out heat from the sun.
- If light in corridors and stairwells is switched in presence-dependent mode, continuous light can be omitted. This saves costs without compromising safety and comfort.
- In rooms which are not used at night, such as a therapy center, lights and equipment can be switched off centrally.

### Controlling, monitoring, signalling



## More Selected Products & Systems

### IP Nurse Call System including voice communication in hospitals

New communication platforms are solely implemented using IP technology. Only this technology enables an easy integration of data and voice services.

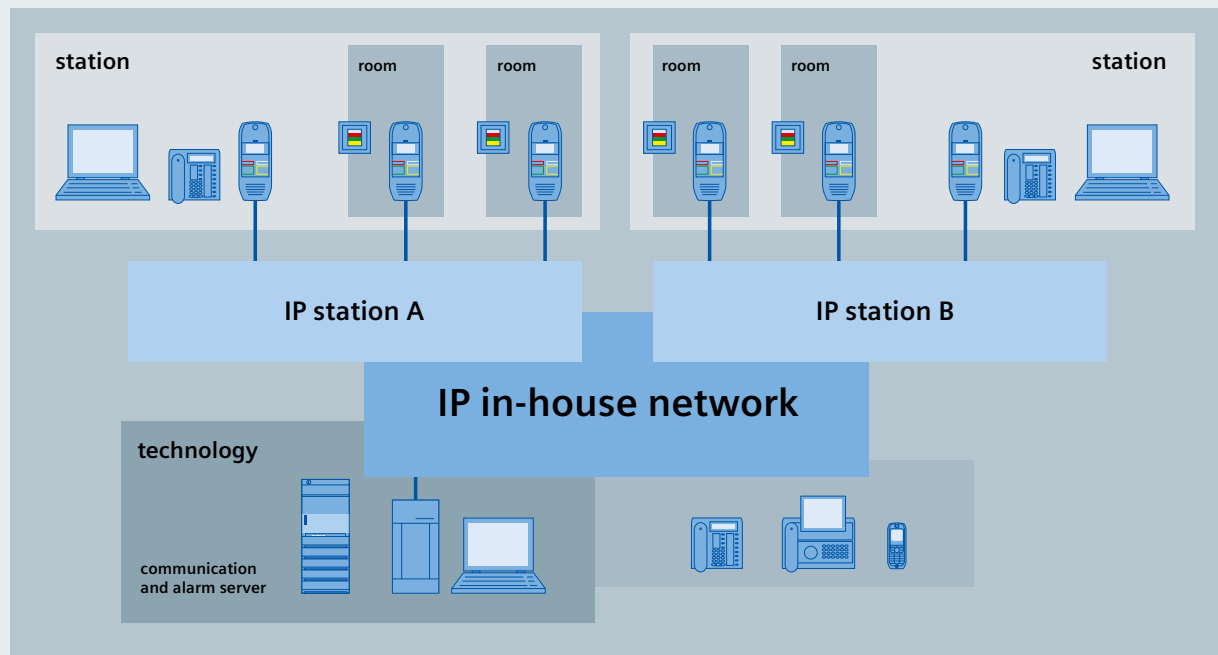
This helps to optimize invest and operating costs. With HiMed\* IP Nurse Call System, Siemens provides a modern and reliable call system solution for hospitals which complies with the DIN VDE 0834 call system standard.

Using the existing standard IP communications for nurse calls results in savings for infrastructure and maintenance. In addition efficient information functions based on IP become available through standard products.

With HiMed IP Nurse Call System and HiMed Infotainment hospital operators obtain a future-oriented, comprehensive hospital communication portfolio that can be integrated in existing systems.

- Easy installation: Room installation can be checked without requiring special knowledge or special tools.
- Voice over IP
- Mobile phone integration
- Central emergency call server
- Centralized configuration of the entire hospital
- Simple communication among wards
- Autonomous decentral operation in case communication faults

\* HiMed is the market leader for healthcare communication solutions and the first supplier to offer an integrated, fully IP-based platform.



## References



Hospital da Luz,  
Lissabon, Portugal

Berufsgenossenschaftliche Unfallklinik,  
Duisburg, Germany



Acibadem Hospital, Maslak, Turkey



# Integration is the Trump Card

In co-operation with the consultant for electrical engineering, Siemens develops solutions for power distribution in hospitals which take into account all operator requirements from the outset. Here, the well-matched products and systems for an integrated solution are provided by a single supplier.

The following projects may serve as excellent models for the successful use and benefits of Totally Integrated Power for power distribution in hospitals:

### Hospital da Luz, Lisbon, Portugal

- Integrated power distribution system for high degree of operational safety
- All deliveries managed and coordinated by a single Siemens partner
- High degree of comfort thanks to building automation system and easily adaptable building management system for the conference area

### Berufsgenossenschaftliche Unfallklinik (Casualty Hospital), Duisburg, Deutschland

- Reconstruction, redevelopment and expansion of the hospital complex with operations running
- Integration of the power distribution systems into the central control system
- Optimized network configuration for normal operation and in the event of a fault thanks to central control system
- High degree of power supply availability and transparency

### Acibadem Hospital, Maslak, Turkey

- High degree of operational safety thanks to integrated power distribution concept
- Dimensioning for entire power distribution system using the SIMARIS design tool
- All orders for power distribution components co-coordinated and supplied by a Siemens SIVACON Technology Partner
- The DESIGO building automation and control system for heating, ventilation and air conditioning creates optimal climatic conditions in the hospital building

# Professional Planning Aids

Planning electrical power distribution for commercial and industrial buildings has never been as complex as it is today. The planning process demands a great deal of specialized knowledge and experience. With an experienced partner at their side, electrical engineering consultants can implement their conceptual expertise more quickly and easily and concentrate on the important things. SIMARIS design and technical manuals from Siemens offer comprehensive support, from the preliminary planning stage right through to implementation planning.

### SIMARIS design

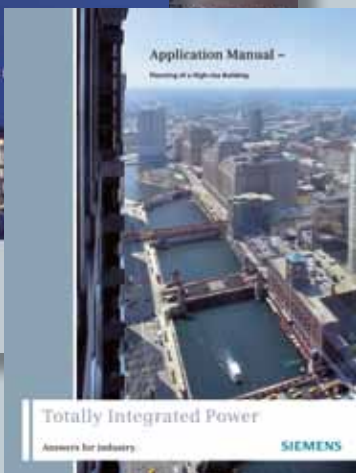
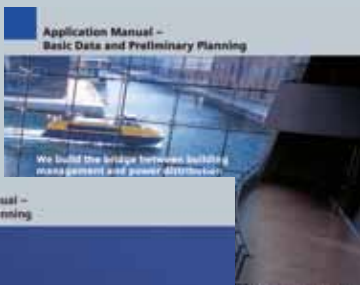
The SIMARIS design dimensioning software supports our complete, integrated and high-quality portfolio from medium voltage technology through to wall outlets. The user-friendly TÜV-certified tool also generates the necessary selectivity verification, for instance for emergency power supply systems. It also lightens the load enormously in routine work such as implementing changes and considering variants.

### Application manuals

Siemens application manuals offer electrical engineering consultants a wide knowledge and information base to draw on when designing electrical power distribution systems.

There are three volumes, available from regional Siemens contact partners ([www.siemens.com/tip/support](http://www.siemens.com/tip/support)):

- The application manual “Basic Data and Preliminary Planning of Power Distribution Systems” provides electrical designers with in-depth information to support them in their work during these two phases.
- The application manual “Draft Planning of Power Distribution Systems” provides useful information on this project phase.
- The application manual “Planning a High-Rise Building” documents concrete applications of the power distribution products and systems using the example of an office tower.



## Further Information

You can find more information on  
Totally Integrated Power on the Internet at:  
[www.siemens.com/tip](http://www.siemens.com/tip)

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