Royal sense of space in the new wing of Charlottenburg Palace in Berlin

The seven rooms in the eastern part of the new wing of Charlottenburg Palace were recently converted (with funding from the Prussian Palaces and Gardens Foundation of Berlin-Brandenburg to the tune of 1.6 million euros) and are now among the most advanced and safest exhibition rooms in Berlin. The highly efficient and complex building control system that deals with indoor climate and light & safety functions was implemented by IMAS Falkenberg Messtechnik GmbH in collaboration with Hermsdorf-Steuerungstechnik. At the core of the system are Ethernet components, Industrial PCs and Control Panels from Beckhoff.

Charlottenburg Palace in Berlin
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According to the modern sign at the entrance, the new wing was built by Frederick II. In 1740 the King of Prussia issued the order for the construction of this section of the building, the upper floor of which he used as a residence. Part of the new wing, which has a distinctly different style from the older main section, was recently refurbished as part of a 15-month design and construction project and equipped to meet the requirements of a modern, multi-functional exhibition space, taking due account of conservation requirements.

Museum exhibition rooms meet stringent requirements

On the eastern ground floor, below the magnificent "Golden Gallery" and the former residence of Frederick II, ultra-modern equipment was installed across an area of 570 square meters. The refurbishment had to meet strict building conservation criteria, while at the same time creating conditions that meet the requirements of the relevant standards for international artwork exchanges. All seven exhibition rooms are fully air conditioned. Room temperatures are maintained between 15 and 22 °C, while humidity can be controlled between 40 and 65 % RH. Advanced lighting technology in conjunction with motor-driven blackout and glare protection blinds enables an almost unlimited number of lighting scenarios to be created.

The tall, historic windows were fully refurbished. An advanced second window level was added on the inside, representing the separation level for the climatic zone from a building physics point of view. Some of the old window sash elements were equipped with electric drives for desmoking purposes.

Two climate sensors in each exhibition room measure temperature and humidity. The air quality in each room is monitored via CO_2 sensors. If a reduction in air quality is detected, additional ambient air is introduced.

Modern convector units with air humidification and heating & cooling registers operate in conjunction with an air supply and exhaust system with integrated

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heat recovery. The system is based on local air conditioning units installed in the window recesses. Room-based, full air-conditioning enables compliance with strict indoor climate requirements, while operating very efficiently.

The installation of individual air-conditioning units in the window recesses also led to a decentralization of the automation system. The different control elements were installed behind the skirting boards in the individual rooms, enabling full local air-conditioning, lighting and window control in line with conservation requirements.

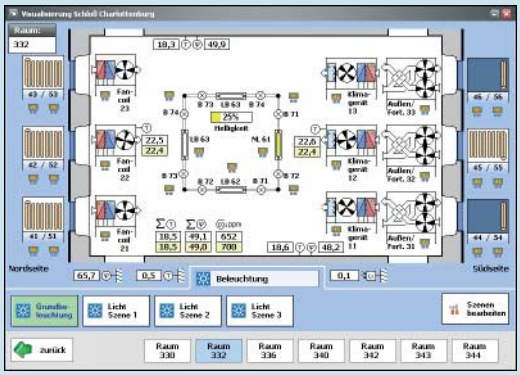
Underfloor power supply and communication connections were installed under the historic parquet floor that was fully restored as part of the project.

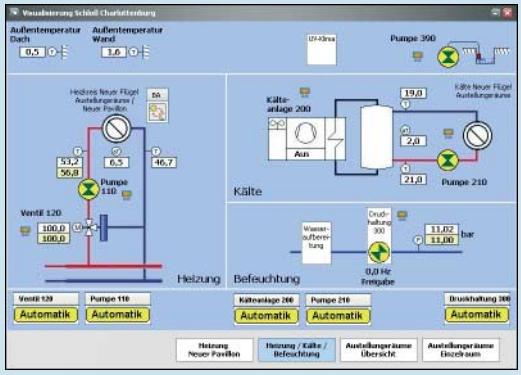
Playing field for exhibition architects

Three lighting track systems are suspended from the ceiling and can be controlled individually and equipped with different luminaires and reflector lamps for special effects and emphasis. The lamps installed in the upper section of the track system are dimmable. In conjunction with the ceiling, they enable excellently controllable indirect background illumination. The emergency lighting components are also integrated into the lighting system. All sockets can be switched separately via override control. Separate power supplies according to DIN VDE 108 ensure safe operation of the exhibition rooms.

The historic rooms have thus been turned into a "playing field for exhibition architects." The creative opportunities for temporary exhibitions of all kinds are al-

The system can be operated and monitored by different users (with associated user rights) via the network or a dial-up connection. Furthermore, all technical components can be operated separately and independent of the automatic mode via a software-based manual operating level.





Embedded PC CX1000 with modular Bus Terminal I/O.

most unlimited. This versatility is supported by the ability to parameterize the systems freely via the PLC control program in the software PLC.
The client required proper desk-based PC operating levels and a high-quality online climate monitoring system. These requirements could be quickly and easily met by integrating the control PCs in the existing IT structures and making them accessible across the whole corporate network via the TCP/IP protocol.

Division of tasks with the CX1000 Embedded PC

All data points are monitored via Beckhoff Bus Terminals. The individual I/O stations are linked via a Fast Ethernet network. For safety and operational reasons, the control and regulation tasks are distributed across three modular CX100x-type Embedded PCs. Together with 10 subsidiary BK9000 Ethernet Bus Couplers, including associated input and output terminals, the first CX1001 controls four of the seven exhibition rooms. The remaining three rooms are controlled by the second CX1001 with 9 subsidiary BK9000 and the associated Bus Terminals. A BC9000 Ethernet controller processes all status messages from the monitored zones. A third CX1000 deals with the spatially remote central building services installations. It deals with weather-dependent control of the heating circuit, demand-based precontrol of the cooling circuit, and control of the refrigeration and water softening units. Furthermore, it is responsible for logging hot & cold water and electricity consumption and provides numerous operational data for the automation system. It also acts as the master for a BK9000 with I/O terminals for controlling the heating system and logging the indoor climate in the new pavilion attached to the palace.

The individual substations are networked via optical fibers, standard cables, and a 32-port switch. A 19" slide-in C5102 Industrial PC and a 12" inch CP6801 built-in Control Panel with touch-screen form the visualization and control platform for the whole system. The system can be operated and monitored by different users (with associated user rights) via the network or a dial-up connection. Furthermore, all technical components can be operated separately and independent of the automatic mode via a software-based manual operating level.
The control system transfers all measured values and all relevant process data with different sampling rates to an SQL application that also runs on the central C5102. Compliance with the temperature and humidity setpoints can be monitored continuously and all measured values can be archived in digital form. Operational data and the system control dynamics can be monitored via SQL from different PCs in the customer network, with the aim of maximizing the energy efficiency of the advanced system.

→ Hermsdorf Steuerungstechnik: **www.steuerungs-technik.com**
→ Prussian Palaces and Gardens Foundation Berlin-Brandenburg: **www.spsg.de**
→ **www.beckhoff.com/CX**