



▲ VGH's new buildings use weather forecast data to control concrete core tempering.

Image: © Homebase2.com ...ist visuelle Kommunikation!

## Weather controls building automation Concrete core tempering controlled using weather forecast data

VGH is an insurance group organised under public law and is the biggest regional insurance company in Lower Saxony. Around 4,600 people work for the regional market leader. Together with cooperation partners, Sparkasse banks and LBS, they look after around 1.9 million customers. In order to replace a number of old buildings, VGH invested in three new buildings located at Prinzenstraße 19–23 in Hanover. SBC products were installed to control the HVAC system including individual room controllers, a monitoring system and a concrete core tempering system.

The Prinzenareal building complex was built on an area of land measuring 3,036 m<sup>2</sup>. It was completed in 2017 and VGH moved into it in the same year. With three six, five and four storey buildings, it has a total gross floor area of 11,940 m<sup>2</sup>. The adjacent underground car park covers another 9,623 m<sup>2</sup> and offers 54 car parking spaces, while there

are 13 extra parking spaces above ground. The new buildings are located in the very centre of Hanover between the main railway station, Ägidientorplatz and Opernplatz within eyeshot of the VGH management building on Schiffgraben and are used as office premises for lease by outside companies.

### Brief description

#### Requirements

VGH Versicherungen built the Prinzenareal office complex in the very centre of Hanover. The HVAC system was equipped with individual room controllers and a concrete core tempering system divided into zones geared to the needs of building tenants.

A monitoring system assisted by the building management system was also provided.

An unusual feature is the concrete core tempering system which is charged on a zone-specific basis according to weather forecast data.

#### Project data

- ▶ 8x PCD1.M2120R1
- ▶ 16x PCD2.M4560
- ▶ 24x PCD7.D450WTPF web panels
- ▶ HKW Elektronik GmbH weather forecast station
- ▶ 2x 21.5" PC panels with BMS software
- ▶ Modbus
- ▶ M-Bus
- ▶ S-Bus
- ▶ Management software: Saia Visi.Plus
- ▶ Number of physical data points: 2300

## Sustainability and energy efficiency

For the project managers, it was important that the new buildings and their façades enhance that particular section of Prinzenstraße and fit harmoniously into the surrounding architecture. At the same time, great importance was attached to measures to ensure energy efficiency and the careful use of resources. Evidently, these efforts have paid off: the building has since been awarded the DGNB Gold certificate. In order to receive certification, not only the DGNB's organisational requirements must be met. Ecological, economic, sociocultural and functional quality requirements must also be satisfied. The building automation systems with their control and regulating concepts played a key role in meeting the demanding planning requirements.

## From an energy concept to a concrete core tempering system

The incorporation of an energy-efficient geothermal heat pump for heating and cooling the offices plays a key role in implementing the energy concept for the Prinzenareal developed by Ingenieurbüro Low-E- (Prof. Dr.-Ing Kühl, FH Wolfenbüttel). In addition to conventional sources of heating and cooling to cover peak loads, the heat pump with its free and active cooling modes as well as a heating mode helps to cover the thermal base load.

## Concrete core tempering – simple technology, demanding control

Tempering concrete cores can be achieved easily and inexpensively by integrating plastic pipes into the supporting concrete ceiling. Thermally charging the large thermal concrete core masses with long time constants is a planning and control cha Unlike with radiators which

are controlled by thermostats, the concrete cores must be charged long before the thermal load occurs. When the temperature of the heating or cooling water in the concrete core changes, it takes a few hours before the surface temperature of the concrete core changes and a heating or cooling effect is felt in the room. The concrete cores must therefore be charged or discharged according to the weather forecast before the thermal load owing to people, solar radiation or convective losses into the environment occurs. This is the only way to ensure a constant room temperature.

## Weather forecast data control concrete core temperature

With this method for heating and cooling with a forecast-oriented concrete core tempering system, heating and cooling are controlled on the basis of energy quantities. With conventional room heating and cooling systems, this is achieved by regulating the flow or return tempera-

ture. The energy quantities are calculated on the basis of weather forecast data every 12 hours so that the room temperature can be kept constant. A zone-specific energy quantity is calculated depending on the location and use of the zone and the concrete core is then charged with this energy. Once the planned energy quantity has been fed into the zone, the supply of fluid for the zone is stopped until the next forecast interval begins. In the specific case of the VGH building project, the programme-related implementation work was carried out by SBC in accordance with the plans provided by the IMF engineering office.

SBC's system partner GLT Service GmbH & Co. KG installed the building systems, set up all necessary components such as the heating meter and the weather station, and commissioned the control and forecast-oriented regulating system. Fine adjustment, a particularly important procedure, was also carried out in close consultation with the IMF planning office during the first operating phase of the system.



**For us as building system planners, working closely with GLT Service and SBC was a huge success.**

Dr.-Ing. Erik Bertram  
Ingenieurgesellschaft Meinhardt Fulst.



▲ The higher-level Saia Visi.Plus SCADA system is installed in an IFP in the control cabinet door.



▲ Thanks to the compact design and the fact that part of the IO level has been moved to the control cabinet door, all components can be accommodated in one control cabinet field.



▲ One of the key parts of the project: the heat pump from Zent Frenger (left) as well as the distributor for the concrete core tempering system for the various parts of the buildings.



▲ The Saia PG5 V2.2.140 programming software provides all functions in the DDC controller. The clear graphical display makes it easier to maintain the systems later on and to optimise or extend them as necessary.

## Coping with demanding tasks

GLT Service used 16 Saia PCD2.M4560 controllers to achieve a space-saving and flexible control solution. Thanks to their generous memory resources and ample CPU power, they can cope with even demanding communication tasks. The version of the PCD2.M4560 used by VGH features a 2 MB user programme memory and sufficient processor power for demanding tasks.

Eight PCD1.M2110R1 were also installed. The Saia PCD1.Room is a freely programmable room controller for room automation and HVAC applications. In addition to the integrated I/Os, it offers a free I/O slot for individual expansion. Further systems can also be incorporated via standard communication interfaces. As a result, energy-efficient and individual room automation in accordance with EN15232 is possible. In conjunction with a Wi-Fi device, the integrated Web+IT functionality also allows mobile operation.

## Faults rectified quickly with no lost time

In order to operate the system, a Saia Visi.Plus management system was installed as the SCADA software. The Saia Visi.Plus software in a technical centre is installed on a panel PC in the control cabinet door. The system is essentially autonomous and reboot-proof. Nevertheless, the option of secure remote access at any time must be provided.

Remote access is possible via the service portal used by GLT Service on the basis of a VPN connection with access to the HTML5-based web server of the Saia Visi.Plus software. Via this secure VPN connection, the PG5 programming software can also access the DDC controllers. As a result, complete remote administration of the system is possible. The complete system allows access via VPN. As a result, the system integrator can access the lowest programming level at any time. Regular fault reports from GLT are forwarded via e-mail.

The Saia Visi.Plus software is also responsible for archiving and recording all historical data. All data from the heating meters as well as the analogue inputs and outputs of the DDC controllers are recorded and stored.

The data required for DGNB certification are automatically produced for the engineering office that assesses them and sent via e-mail every month. The data are sent in CSV format as an e-mail attachment and thus allow a straightforward data import into any programmes. A total of 24 web panels (PCD7.D450WTPF) are installed in the IFPs of the rented units. Among other things, these have embedded micro browsers, touchscreens, FTP servers and systems for installation in front panels. The micro browser panels can be integrated into any environment, e.g. the control cabinet, quickly and easily or installed in any situation using flush or surface installation kits. At VGH, the panels are used to operate the components individually

in the rented unit of the relevant IFP. In addition, an HKW Elektronik GmbH weather forecast station, two panel PCs with the BMS software and a bus-capable Romotec manual operating system were installed.

## All requirements met

"Thanks to the high performance and flexibility of SBC products, it was easily possible for us as a long-standing certified SBC system integrator to satisfy the stringent requirements imposed on the regulating and control systems," said Andy Krüger, Managing Director of GLT Service GmbH & Co. KG. "Furthermore, we could rely on support from the SBC product managers at all times."

"For us as building system planners, working closely with GLT Service and SBC was a huge success. I particularly enjoyed picking up on developments and investigations from research and universities and then applying and implementing them successfully when planning. I know from experience that projects like this are not automatically a success – this is the result of the hard work of everyone involved. I'm looking forward to seeing the results of the monitoring," said Dr.-Ing. Erik Bertram from the engineering company Meinhardt Fulst. The client too has nothing but praise for GLT's work: "With the SBC products that they used, Mr Krüger and his team made a significant contribution towards the success of the project," emphasised Rainer Webersinn, the supply engineer responsible at VGH Projekt GmbH und Co. Prinzenareal KG.

## The challenge

VGH Projekt GmbH & Co. Prinzenareal KG invested in a new building to replace existing buildings. High standards were very important as offices were to be let out to outside companies and the company was aiming to achieve DGNB Gold certification. A key requirement was the installation of an HVAC regulating system which would enable heat and cold to be generated in an intelligent manner geared to the needs of tenants and operators and allow monitoring at the same time. A particular challenge was the forecast-oriented regulation of concrete core tempering.

## The solution

Instead of conventional temperature regulation, the charging of the concrete cores is carried out using a predicted quantity of energy. Every 12 hours, the energy needed for each zone is calculated on the basis of planners' requirements and the forecast weather conditions. Heating meters record the heat and cold quantities in the concrete core zones. SBC system partner GLT Service GmbH & Co. KG installed a total of 16 PCD2-M4560 and eight PCD1.M2110R1 as well as 24 PCD7 panels, a weather forecast station from HKW Elektronik GmbH and two panel PCs with the Saia Visi.Plus management system software.

## Summary

The new complex is a high-quality, energy-efficient building with a DGNB Gold certificate. Successfully putting in place building automation systems played a key role in achieving this aim. All criteria for EN 15232 and DGNB certification were met and a demanding energy concept allowing not only detailed zoning according to usage units and letting circumstances but also great convenience was put in place.

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## Project

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