

## Energy Efficient and Modern with Heat Pumps and KNX

A young family from Berlin invested in KNX and is relaxed about increasing energy costs. The higher these costs, the faster their investment into sustainable and intelligent building technology will pay off.

As an employee of an electric power company, this home owner understands increasingly high energy rates from first hand experience. The fact is that oil and natural gas will increase in price due to diminishing resources and increasing demand. Well informed about this development and current government support programs, family H. from Berlin decided on an energy efficient design for their home. The building owner, not only an electric power company employee but also an electrical engineer, is well informed about this state-of-the-art technology and was very involved during the design of the house. Today, almost 18 months after the family moved into their new 220m<sup>2</sup> house, it was already worth taking another look at the additional investment. With an electric bill of 50 EUR per month for the entire building, including all electric appliances, the family can be rest assured that the investment into energy efficient technology, intelligence and security will pay off within the planned time frame. The energy costs are just for electricity, as the heating and domestic warm water supply is covered by a heat pump.

The photovoltaic system of the building further reduces the costs for electricity. The 3.82 kW photovoltaic system produces approximately 3.400KWh in the last year electrical energy from 30m<sup>2</sup> of photovoltaic modules.

### Two Heat Pumps

The building heating is provided by a 6.5kW ground water heat pump by Wotkotte. The energy recovery system of the ventilation system provides the energy for the domestic warm water heating. A 1.3kW AEREX air-water heat pump was installed into the ventilation system (Figure 1). Fresh air is supplied through decentralized outside air grills. The heat pump withdraws heat from the exhaust air stream and uses the energy for the hot water accumulator. This way the available heating energy can be almost completely recovered and reused. At the same time, fresh outside air enters the building without a draft.

The control of the heat pump is provided by a HomeServer. Different logic functions are responsible for the control of the heat pump. The passive cooling system is only activated if the room temperature exceeds 25°C. The reversal of the heat pump principle allows the heating pump to run in cooling mode to extract heat from the building. The cooler temperature of the ground is used to dissipate the heat from the rooms.



Figure 1. The air-water heat pump withdraws energy from the exhaust air stream for the heating of domestic water

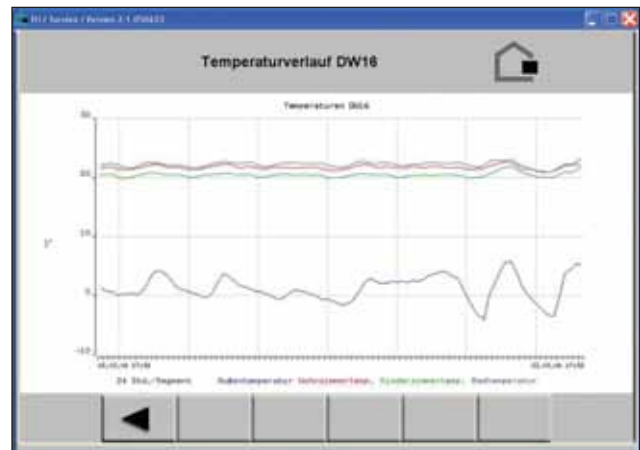


Figure 2. Data from the Gira HomeServer: The PC in the home office shows the energy consumption data

During this function, also known as "natural cooling", the heat pump is turned off with the exception of the pump and controls. This is an energy saving and cost-effective method to cool the building. The cooling is constant and without a draft. The HomeServer tracks and visualizes the energy use (Figure 2). The PC in the home

office can be used to centrally control the system and to monitor the entire building installation.

### Intelligence in the HomeServer

The HomeServer contains all the logic functions for the entire KNX system. Physical KNX logic modules that are normally necessary



**Figure 3.** Motion detectors function as sensor for the lighting control and the alarm system.

were not required. The sun shading system is tracked after the sun (time program) and lighting controlled (light sensors). Additional functions of the KNX system are lighting control through switches, occupancy sensors, motion detectors, the alarm system, and switching of power outlets.

The alarm system uses (aside from window and door switches) the same motion detectors that are used for the lighting control system (Figure 3). An info display next to the main entrance shows status messages of the building and the building system.



**Figure 4.** The Info-Display 2.0 show status messages

It shows date, time, alarm messages, measurement values and the status of devices that are connected to the KNX system.

The info display also serves as control center: at the push of a button the light can be dimmed or switched. Before someone leaves the house, the info display can be checked to see if windows or doors are still open (Figure 4).

The connection of an IP camera to the HomeServer also allows remote visual information about the building condition via a web browser.