

Case Study

Modular buildings benefit from energy saving air conditioning



When it was developing a new modular building solution, Wissen-based manufacturer KLEUSBERG GmbH & Co. KG placed great importance on sustainability and recyclability.

The company knew that to win new markets with the ModuLine® standardized construction system, it would need to deliver sophisticated, individual buildings with in-built comfort. By introducing Mr Slim air conditioning into the modules, the company has succeeded in combining high quality standards, a short planning and construction time as well as low energy consumption costs with an extraordinarily economical investment.

German modular building manufacturer, **KLEUSBERG GmbH & Co. KG** from Wissen has moved into the modular construction of buildings with a very high standard, realising that there is a lot of business potential in producing buildings faster, cheaper, more energy-efficiently and with more in-built comfort.

KLEUSBERG 

The traditional construction of buildings is usually complex, lengthy and costly, yet companies and public authorities often only plan their space requirements in the short and medium term.

This sees investors increasingly opting for temporary buildings, to match the increasing demand for project-related temporary space and a flexible location policy.

Using modular construction, investors, architects and planners can adapt to changing markets and requirements more easily and have fixed rental costs. Mobile rental buildings are room units that are connected to each other and allow free room division.

The room modules consist of steel frame constructions that are individually filled with drywall.

Building with industrially prefabricated room modules in standardised sizes is the core business of KLEUSBERG GmbH & Co. KG.



In addition to its classic rental container business, **KLEUSBERG GmbH & Co. KG** has developed the ModuLine® construction system to deliver sophisticated and individual office building solutions for long-term rentals, buy immediately or take over after the end of the rental.

This building solution is also a steel frame construction. But unlike modular construction, ModuLine® works on a modular principle with fixed module types. Based on a 133m³ room module, the system can be flexibly expanded with additional modules and can thus be individually adapted to the needs of the customer. These can then be used for office and administration buildings, schools, kindergartens, medical buildings, nursing homes and residential accommodation.

Designing flexibility

When designing the building, the company pays particular attention to the needs of builders and architects. In order to be able to build and plan individually with this building system, all of the various finishing trades have been standardised to offer customers three different options.

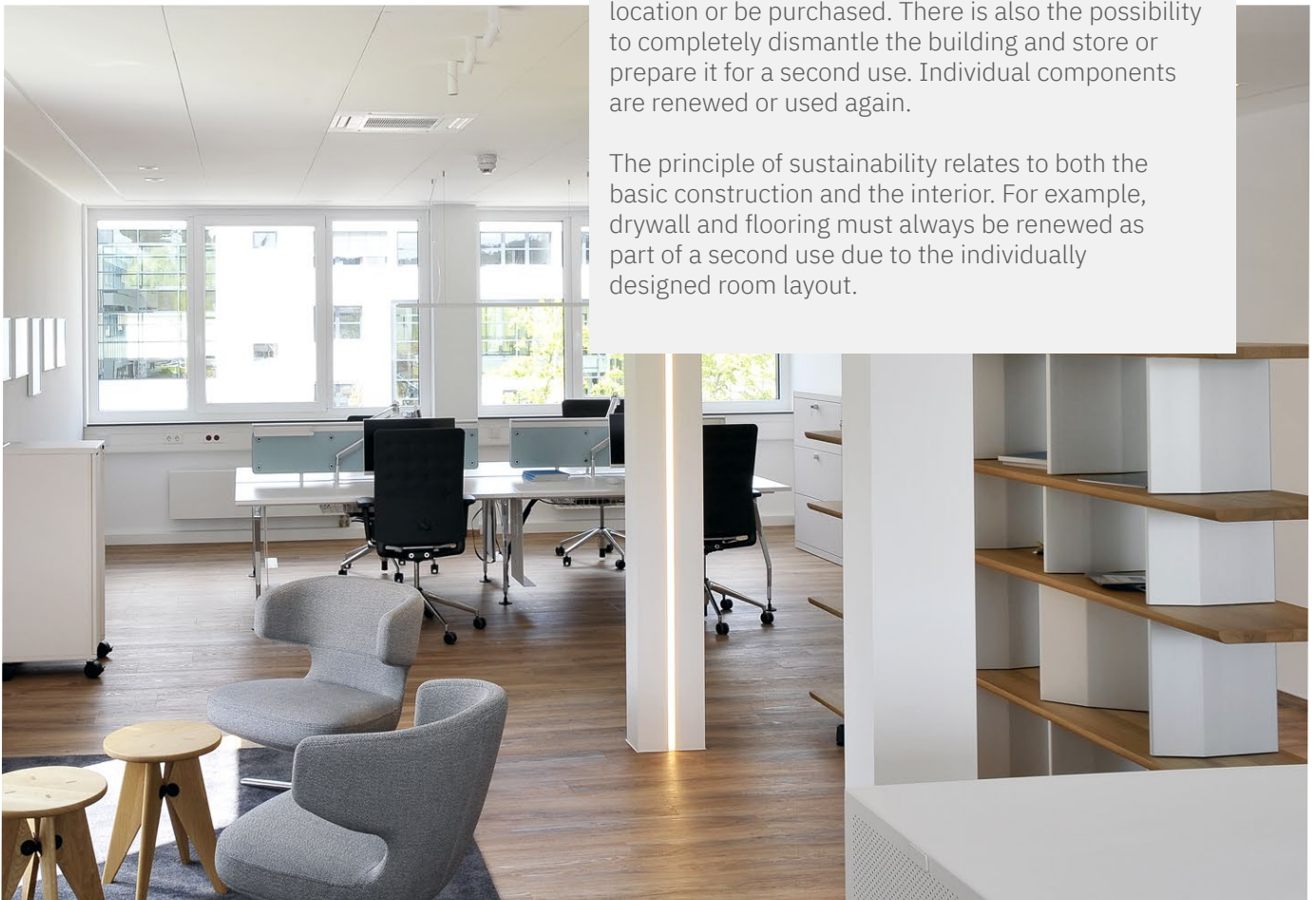
This meant the development of a programme in the project planning phase that enables the customer to use standardised equipment variants both in the planning and calculation as well as in the final build. A major focus of this building concept is on sustainability.

For this reason, the high quality of the products being used, the energy efficiency and a long-term guaranteed supply of spare parts play an important role.

ModuLine® is designed in such a way that multiple use is not only intended, but explicitly requested.

This means that the building can - after renting for several years - either be rented further at the same location or be purchased. There is also the possibility to completely dismantle the building and store or prepare it for a second use. Individual components are renewed or used again.

The principle of sustainability relates to both the basic construction and the interior. For example, drywall and flooring must always be renewed as part of a second use due to the individually designed room layout.



Recyclability to reduce cost

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For the air conditioning system however, it is often possible to continue using existing components. For customers, this offers significant benefits from an economic point of view, since the advantages of modular construction are retained without having to invest completely in a new property.

The Show House building on the company premises at the company's Wissen site has two floors and a total of 1,330sqm of office space. These are divided into a managing director's room, several single and multi-person offices, a spacious meeting room, a large room for project work, modern sanitary rooms and a kitchen.



When it comes to furnishing, attention is paid to high-quality materials from the outset, which meet the high requirements for commercial or public real estate. In addition to the already high-quality standard equipment, the customer has numerous options to cope with unusual or special requests.

The same requirements apply to technologies used throughout the building, which range from electrical engineering to heating and air conditioning. In principle, the building system is equipped with a convector electric heater as standard.

Hot water heating with a gas condensing boiler or an air to water heat pump can be selected as an option. In addition, additional air conditioning for cooling or for cooling and heating can also be implemented as a solution.

The most frequently chosen solution is heating with an air-water heat pump in combination with underfloor heating. Customers are also increasingly choosing the comfort of air conditioning as installed in the Show House building.

Energy efficiency is key

The standardised concept not only offers advantages in the planning processes, but also means the calculation of the investment and the build time can be simplified and accelerated. At the same time, the high quality standards can be maintained.

For the air conditioning, KLEUSBERG GmbH & Co. KG. chose the small **PUMY outdoor units** from the renowned City Multi-VRF range, and match the need for high energy efficiency.

When developing the new generation of PUMY outdoor units for cooling or heating, Mitsubishi Electric placed great emphasis on increasing energy efficiency values, with the series delivering energy efficiency class A ++ and achieving the highest EER and COP values on the market.

With low sound pressure levels and flexible connection options for up to 33 different indoor models, the series also offers optimal climate comfort. The added advantage over other cooling systems is that City Multi can also be used for heating in winter.

High quality detail

In addition to the particularly high efficiency, customer comfort and appearance of the indoor units were also decisive.

The latest generation of **City Multi ceiling cassettes** with a pure white surface are installed in the Show House on the premises in Wissen. With a panel height of only 10 mm, they adapt completely to the modules dimensions and fit harmoniously into the ceiling design. The air conditioning includes a sophisticated horizontal air flow that distributes the air under the ceiling evenly leading to a draft-free space.

A special feature is the automatic climate control in the room. Thanks to intelligent person recognition using a 3D i-see sensor and automatically adjustable slats, the 4-way ceiling cassettes direct the air flow directly at people present or past them without a draft.



The 3D i-see sensor recognizes the number of people in the room and adjusts the heating and cooling output as well as the fan output accordingly. This enables automatic energy-saving operation whenever the number of people changes. If no one is permanently in the room, the devices switch off automatically or switch to an extended energy-saving mode.

Another important area for the manufacturer is the integration of building systems in a higher-level building management system. This enables central control and monitoring and ensures a particularly high level of operating convenience. In addition, a higher-level building management system stops the heating and air conditioning system competing and optimises the energy consumption of the entire property.

The City Multi PUMY range offers almost unlimited possibilities for such applications. The connection of an air conditioning system can be implemented with all common communication protocols such as KNX, BACNET or Modbus to the higher-level building management system.

In the Show House, the data and information is transferred via a Modbus connection to a central control software. This is transferred via a suitable interface as an app to a tablet, via which the current operating status can be queried and adjusted at any time.

Summary

With the creation of the ModuLine® building solution, KLEUSBERG GmbH & Co. KG has developed a new business area and is opening up new markets and sales in the area of building systems for sophisticated and individual buildings in modular construction.

Using City Multi has allowed the manufacturer to standardise the air conditioning options. Not only do the systems achieve energy efficiency class A ++ and thus offer the highest EER and COP values in their market environment, the wide connectivity choices mean these outdoor units ensure optimum climate comfort, whatever the final configuration. Visually appealing and modern indoor units and a sophisticated control system enable further energy savings and particularly pleasant climate comfort for occupants.

Installation Summary

Outdoor Units:

- 1 x PUHZ-ZRP50VKAR1
- 1 x PUMY-P112YKM1
- 1 x PUHY-P200YKB-A1 TH
- 1 x PUHY-P250YKB-A1 TH

CITY MULTI

Mr. SLIM.



Indoor Units:

- 1 x PKA-RP50HAL
- 1 x PAC-SA88HA-EP
- 1 x PKFY-P15VBM-E
- 1 x PKFY-P20VBM-E
- 1 x PKFY-P25VBM-E
- 1 x PKFY-P32VHM
- 1 x PLFY-P15VCM-E
- 1 x PLFY-P20VCM-E
- 1 x PLFY-P25VCM-E
- 1 x PLFY-P32VCM-E

CITY MULTI

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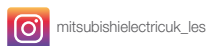
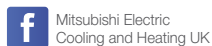


Controls:

- 10 x PAR-31MAA-J
- 1 x PAC-SH29TC-E
- 1 x PAC-SA88HA-EP



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Note: The fuse rating is for guidance only. Please refer to the relevant databook for detailed specification. It is the responsibility of a qualified electrician/electrical engineer to select the correct cable size and fuse rating based on current regulation and site specific conditions. Mitsubishi Electric's air conditioning equipment and heat pump systems contain a fluorinated greenhouse gas, R410A (GWP:2088), R32 (GWP:675), R407C (GWP:1774), R134a (GWP:1430), R513A (GWP:631), R454B (GWP:466), R1234ze (GWP:7) or R1234yf (GWP:4). *These GWP values are based on Regulation (EU) No 517/2014 from IPCC 4th edition. In case of Regulation (EU) No.626/2011 from IPCC 3rd edition, these are as follows. R410A (GWP:1975), R32 (GWP:550), R407C (GWP:1650) or R134a (GWP:1300).

Effective as of April 2021

