

**BECKHOFF** New Automation Technology

Solutions for energy-efficient  
building automation





# Building automation: the key to sustainable buildings

Anyone whose mind is on sustainability, CO<sub>2</sub> savings, and the social responsibility to achieve global climate goals has a crucial question to ask themselves: What solutions are available to significantly reduce a large share of global energy consumption – that is to say, energy consumption in buildings? This question is not only an ecological one, it is increasingly also an economic one. Investors and operators have overlapping interests: Only buildings that have been optimized in terms of energy efficiency and feature appropriate energy monitoring and metering solutions are buildings that are fit for the future. This applies not only to new buildings, but also

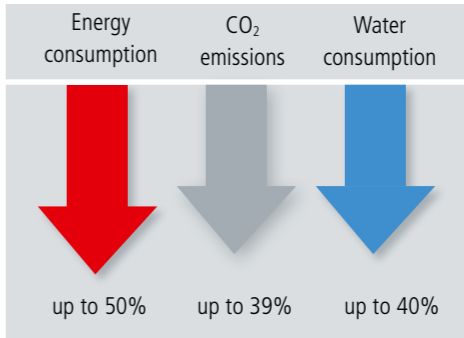
to refurbishments and retrofit concepts. And it is exactly where building automation comes in. In principle, the higher the degree of automation in a building, the higher the potential for saving energy. The key to achieving optimum energy efficiency is to integrate and link all technical systems on a central control platform – just like Beckhoff offers with its intelligent building automation. With the PC-based control solution from Beckhoff, the requirements of energy efficiency class A as indicated in DIN EN ISO 52120/ DIN EN 15232 can be met. As a specialist in integrated control solutions with building-specific hardware and software components, Beckhoff

enables both individual technical systems and complete buildings to be automated. Forming the basis of energy metering, all collected data is provided and analyzed via the central control platform.

► [www.beckhoff.com/building](http://www.beckhoff.com/building)



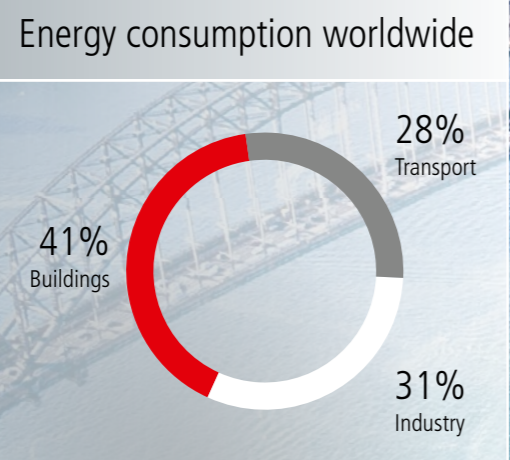
### Savings potential with building automation:



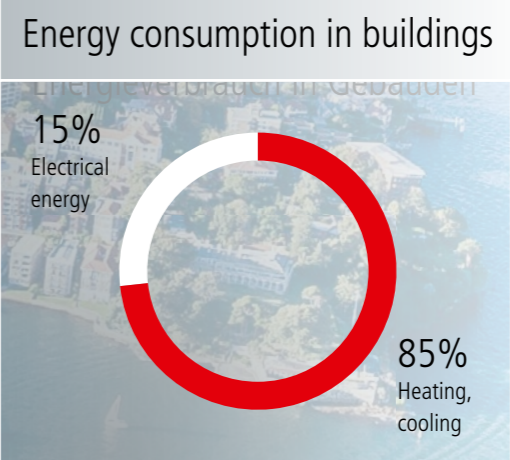
Source: Kats G. Report to California's Sustainable Task Force

### With control technology from Beckhoff, guidelines and standards for sustainable buildings can be implemented:

- energy standards: DIN EN ISO 52120/ DIN EN 15232 BACS, ISO 16484 BACS
- smart readiness indicator of the European Energy Performance of Buildings Directive (EPBD)
- support for standardized protocols such as BACnet, MQTT, OPC UA, etc.



Source: Arbeitsgemeinschaft für sparsamen und umweltfreundlichen Energieverbrauch e. V.



Source: Arbeitsgemeinschaft für sparsamen und umweltfreundlichen Energieverbrauch e. V.



# Universal: building automation with PC-based control

As a specialist in PC-based control, Beckhoff offers an integrated system comprising software, controllers, and bus terminals for the automation of all types of buildings. Due to their modularity, flexibility, and long-term availability, integrated automation solutions from Beckhoff are used worldwide in a wide range of industries and sectors. PC-based control and the TwinCAT control software are used to automate complete office, commercial, or industrial buildings, as well as hotels and cruise ships with their additional requirements for local room automation functions tested in line with standards. Specific lighting concepts in factories and logistics halls

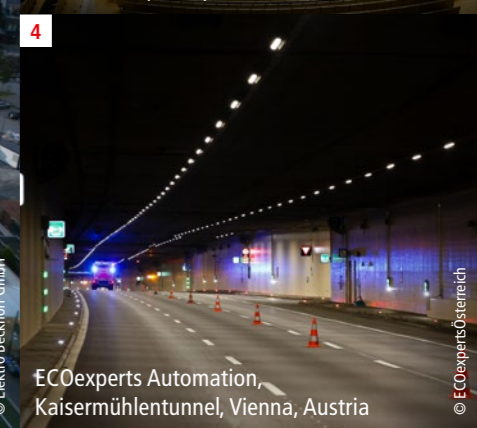
can be implemented just as easily as integrated automation concepts in research or educational establishments. The range of applications includes everything from cultural facilities such as theaters, stages, or concert halls to infrastructure buildings such as tunnels or railway stations. Beckhoff technology is used in hospitals as well as in sports facilities and institutional buildings, in new buildings as well as in revitalization projects. The ability to integrate external systems also opens up further application scenarios: for example, online weather data, booking systems, wireless communication, subsystems such as DALI-2, M-Bus, SMI, KNX/EIB, MP-Bus, EnOcean,

BACnet, Modbus or DMX. The Beckhoff system enables the realization of edge and cloud scenarios with private or public providers.

► [www.beckhoff.com/building-applications](http://www.beckhoff.com/building-applications)

## Application areas for the Beckhoff control solution

- 1 Industrial buildings
- 2 Stadiums
- 3 Theaters and stages
- 4 Infrastructure
- 5 Office buildings
- 6 Industrial buildings
- 7 Research facilities
- 8 Educational facilities
- 9 Hotels





# From individual technical systems to energy-efficient complete solutions

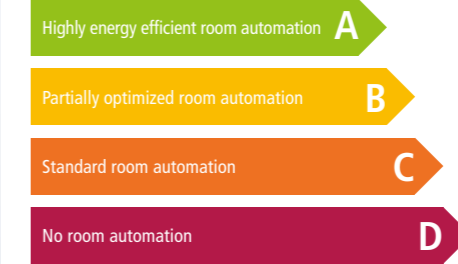
Whether an application involves HVAC, room automation, energy data acquisition, media technology or operating and monitoring, each individual system can be controlled with building automation from Beckhoff. Maximum scalability is guaranteed thanks to a portfolio ranging from single controllers up to systems with many controllers for multiple technical systems. What's more, open communication allows the flexible integration of Beckhoff automated individual systems into existing higher-level third-party systems. On top, IoT solutions can be realized with regard to current security standards.

However, the PC-based control system only achieves its full potential in terms of energy efficiency class A with a comprehensive, cross-system complete solution: All technical systems are integrated on one platform, coordinated with each other in real time, and continuously optimized through integrated energy metering and cloud connectivity. PC-based control aggregates all data points in one system, generating synergy effects. It is only this type of integration that enables sustainable, energy-efficient construction and living in the sense of a green building – with control software for all functions and software libraries for all technical systems.

Connecting all the sensors and actuators in a building to one system generates huge potential for savings with respect to the infrastructure components of the automation system, such as communication networks and control cabinets. Interoperability of the building automation system can also reduce operating and life cycle costs.

► [www.beckhoff.com/building-systems](http://www.beckhoff.com/building-systems)

Energy efficiency class A of DIN EN ISO 52120/ DIN EN 15232 can be achieved with Beckhoff. Operators can obtain partial exemption from electricity and energy tax by recording all energy consumptions (DIN EN ISO 50001).



All technical systems integrated in one control system:

- HVAC
- lighting, shading, facade control
- energy metering and cloud integration
- media technology
- security and access control
- operating and monitoring





# One central platform, simplifying engineering and operation

Beckhoff enables all technical systems to be controlled via the TwinCAT automation software, which serves as an engineering and control platform. All building functions and functional changes can be implemented using a software-based approach via TwinCAT. With a large number of software modules, TwinCAT offers users maximum flexibility, modularity, and security for the future. New or additional features are mapped directly in software – and libraries for cloud integration, analytics, and machine learning further expand the range of applications for building automation.

The TF8040 TwinCAT 3 Building Automation software library offers ready-made and field-proven templates for typical building automation applications such as HVAC, and room automation. These significantly reduce the effort required for engineering and commissioning. The use of standard software components, which integrate all key building functions, reduces the engineering costs significantly. At the same time, the use of established and tested templates increases safety and security during design and commissioning.

Specially developed tools provide optimum support for the entire workflow – from program creation through commissioning and data point checking right up to adjustment. The seamless integration of the TwinCAT HMI in TF8040 TwinCAT 3 Building Automation enables the largely generic creation of a building navigation structure, including web-based pages for operating all technical systems. The intelligent functions of TF8040 TwinCAT 3 Building Automation increase comfort and convenience for the building's users and ensure that all desired room conditions are achieved at all times.

► [www.beckhoff.com/building-twincat](http://www.beckhoff.com/building-twincat)



## Ready-made functions for easy engineering:

- simple programming and ready-to-use HMI with TF8040 TwinCAT 3 Building Automation
- The DALI-2 TF8050 TwinCAT 3 Lighting Solution offers further ready-to-use functions.
- TwinCAT integrates all important subsystems such as DALI-2, M-Bus, SMI, KNX/EIB, MP-Bus, EnOcean, BACnet, Modbus and DMX.
- support for BACnet Rev. 14 with TF8020 TwinCAT 3 BACnet

The image displays the TwinCAT software interface on the left and a room automation HMI screen on the right.

**Left Panel (Software Interface):** Shows the TwinCAT Project Explorer, Solution Explorer, and a ladder logic diagram for a room automation function block. The diagram includes various inputs and outputs for sensors, actuators, and control logic.

**Right Panel (HMI Screen):** Displays the HVAC Room automation interface. The screen shows the following data:

- General Settings:**
  - Pressure: 100.0 Pa, 87.9 Pa
  - Temperature: 22.1 °C
  - Humidity: 44.2 % r. f.
- Room 1 Data:**
  - Pressure: 995.1 Pa, 6940.1 m³/h
  - Temperature: 16.4 °C
  - Humidity: 85.0 Pa, 21.0 °C, 38.5 % r. f.
- Room 2 Data:**
  - Temperature: 20.8 °C, 20.1 °C
  - Humidity: 59 %
- System Status:**
  - System control: operation
  - Sequence control temperature: control

The HMI screen also features a "Heating & Cooling" control panel and a "BECKHOFF" logo at the bottom right.

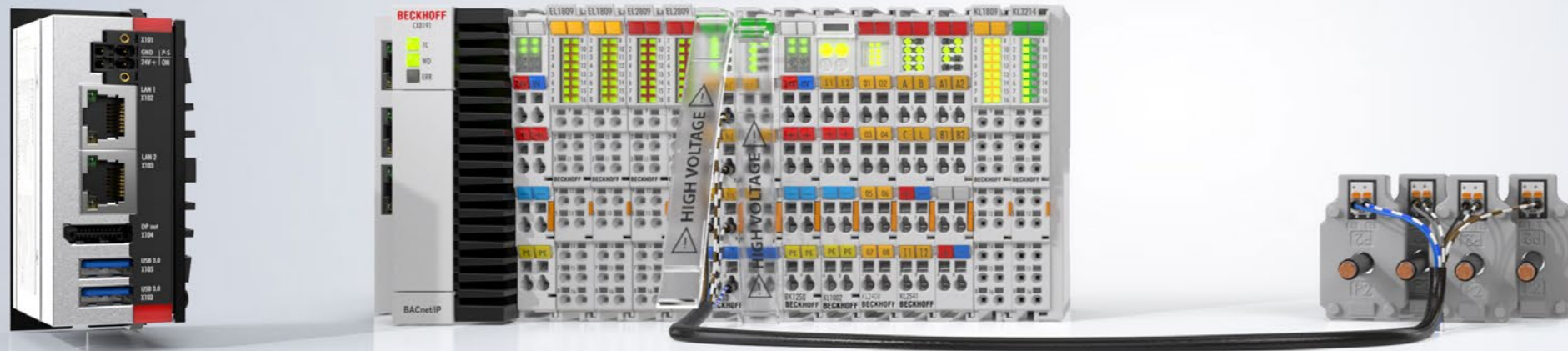


# Energy-optimized, open, and ideal for retrofitting

The modular Beckhoff automation toolkit includes all components for integrated PC-based control concepts: industrial, panel, and embedded PCs, bus terminals, drive technology, and TwinCAT automation software. The openness and the broad, scalable product portfolio ensure that the right control solution is available for every application. For example, the industrial PCs are scalable in terms of performance – allowing them to meet the requirements for controlling a single room or a complete high-rise building. The I/O spectrum offers a wide range of signals – from digital input bus terminals to intelligent current measurement. With the C6015 ultra-compact Industrial PC as

the edge device and TwinCAT as the automation software, data can be transferred from the bus terminal to the cloud in an integrated measurement chain and evaluated for energy metering with TwinCAT Analytics. Flexible expansion options for the system over the entire life cycle also facilitate the integration of third-party systems via a large number of open interfaces. All important subsystems in the field of building automation can be connected communicatively. Long-term investment protection is ensured by the long-term compatibility of software and hardware.

► [www.beckhoff.com/building-products](http://www.beckhoff.com/building-products)



## TwinCAT 3

- end-to-end software platform, integrating all technical systems
- provision of all data on one platform
- TwinCAT IoT for cloud integration
- TwinCAT Analytics for data evaluation
- Interfaces to machine learning algorithms allow the use of AI methods.

## Ultra compact Industrial PCs

- C60xx series offers maximum performance scalability: from single to multi-core.
- enables cloud integration as edge device (also ideal for retrofitting)
- compact design, extremely space-saving
- high power density with optimum price/performance ratio
- C7015 as variant with IP67 protection rating (waterproof)

## Embedded PCs

- control and data platform in one system
- space-saving integration into the terminal segment, direct right-hand side mounting of terminals possible
- Scalability of performance enables optimum adaptation to the control task.
- easy modular expandability
- low-maintenance (fanless)

## Panels and Panel PCs

- for control and/or visualization of all building functions
- scalable display size from 7 to 24 inches
- single or multi-touch
- connection types: DVI/USB Extended technology (cable lengths up to 50 m) or CP-Link 4 (cable lengths up to 100 m)
- high-quality aluminum housing

## Bus terminals and bus couplers

- wide range of signals: the right connection point for every sensor/actuator
- extensive portfolio with around 1,000 different terminals
- freely selectable signal mix possible, high degree of flexibility
- bus couplers for all leading fieldbus systems and subsystems
- Long-term availability increases investment protection.





# Securing a head start: from the architect to the operator

With a control solution from Beckhoff, benefits can be achieved along the entire building value chain. As an automation specialist, Beckhoff sees its role as a partner for everyone involved in a project: we provide technical advice and support, make our know-how available for the design of new projects, and ensure compliance with the relevant standards. Architects can make groundbreaking green building concepts a reality, while investors enjoy investment security thanks to energy-efficient buildings that can be repurposed for many years to come simply by making software enhancements. For system integrators and specialist engineers, the Beckhoff automation

toolkit makes the implementation and engineering processes much simpler. Operators, meanwhile, benefit from energy-efficient buildings and maximum comfort and convenience for building users.

► [www.beckhoff.com/building](http://www.beckhoff.com/building)

### Investors

- can secure investment through future-proof building automation
- Economical and sustainable: opportunities to save energy are fully exploited.
- The building becomes digital-ready.
- Long-term availability offers investment protection.
- Monitoring of buildings enables predictive maintenance.

### Architects

- maximum planning freedom for flexible changes of use
- modular system for simple planning changes
- function mapping in software instead of hardware
- integrated and comprehensive automation of all technical systems on one platform

### Specialist engineers/planners

- Openness and flexibility increase planning security.
- simplified handling of product compatibilities
- reduced complexity: all technical systems on one control platform
- Decoupling of function and hardware simplifies the handling of follow-up orders/modifications.

### System integrators

- simplified engineering: all building functions in one integrated software
- recording of all data points in one system
- Scalability of software and hardware ensures that all tasks and functions can be implemented.
- maximum flexibility for extensions, ability to accommodate planning changes, direct integration of all fieldbus systems

### Operators

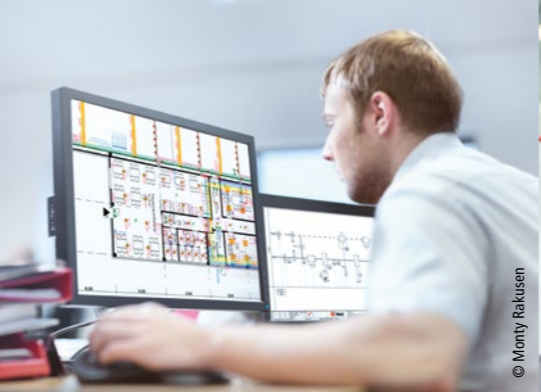
- support through central plant monitoring, predictive maintenance, and ongoing energy optimization
- easy maintenance, simple handling due to decoupling of function and hardware
- Long-term availability offers investment protection.
- high efficiency and high level of convenience
- simple linking with the IoT world



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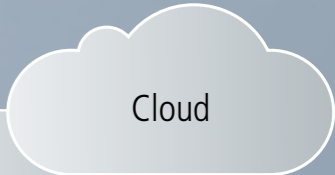


# All components for intelligent building automation

The open Beckhoff control system for building automation integrates all technical systems on one platform and provides all data for energy metering, cloud integration, and analysis. All important subsystems and sensors or actuators can be connected, and the integration of external systems such as weather stations or booking systems can be implemented directly. The Beckhoff measurement technology and the associated software tools can also be used to implement all energy-related tasks such as monitoring, analysis, load and charge management.

All in all, this means that even highly complex building concepts can be automated in a comprehensive and future-proof manner with the Beckhoff automation toolkit. And there is another winning detail: Bus couplers enable the cost-effective integration of decentralized inputs and outputs as well as subsystems. This significantly reduces the cabling effort – and thus also the fire loads.

► [www.beckhoff.com/building-components](http://www.beckhoff.com/building-components)



OPC UA  
AMQP  
MQTT  
HTTPS/REST-API

TwinCAT | ADS  
OPC UA  
BACnet  
Ethernet TCP/IP  
Modbus

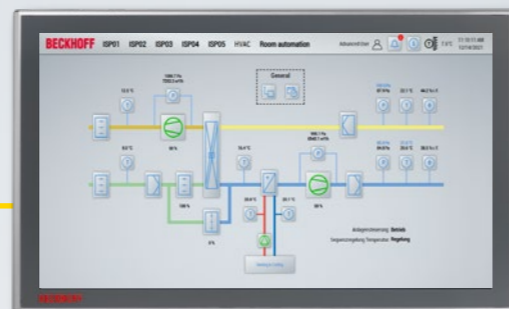
Management level



TwinCAT automation software



C6030 ultra-compact Industrial PC



Multi-touch Panel PC



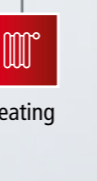
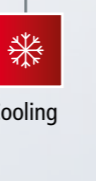
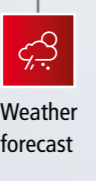
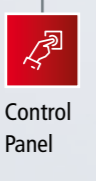
C5240 19" built-in Industrial PC

Ethernet or EtherCAT

## Operating and monitoring



Embedded PC, EtherCAT Terminals, bus terminals



## HVAC

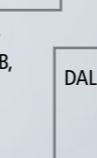


Embedded PC, bus terminals

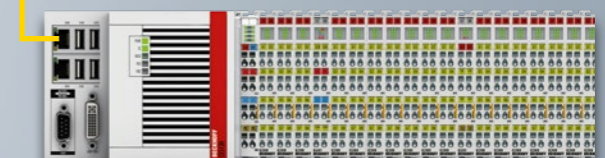
## Lighting



Embedded PC, bus terminals



## Infrastructure



Embedded PC, bus terminals



Field/automation level



# Office, industry, hotel sector, infrastructure: the references

References for office buildings and educational institutions:

▶ [www.beckhoff.com/offices](http://www.beckhoff.com/offices)

References for hotels, cruise ships and stages:

▶ [www.beckhoff.com/hotels](http://www.beckhoff.com/hotels)

References for commercial and industrial buildings:

▶ [www.beckhoff.com/industrialbuildings](http://www.beckhoff.com/industrialbuildings)

References for infrastructure buildings:

▶ [www.beckhoff.com/infrastructure](http://www.beckhoff.com/infrastructure)



Złota 44, Warsaw, Poland



Alsik Hotel & Spa, Sønderborg, Denmark



Building H, Wuhan, China



Sportclub Arena, Verl, Germany



Tower 185, Frankfurt am Main, Germany



Marmaray rail tunnel, Istanbul, Turkey









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