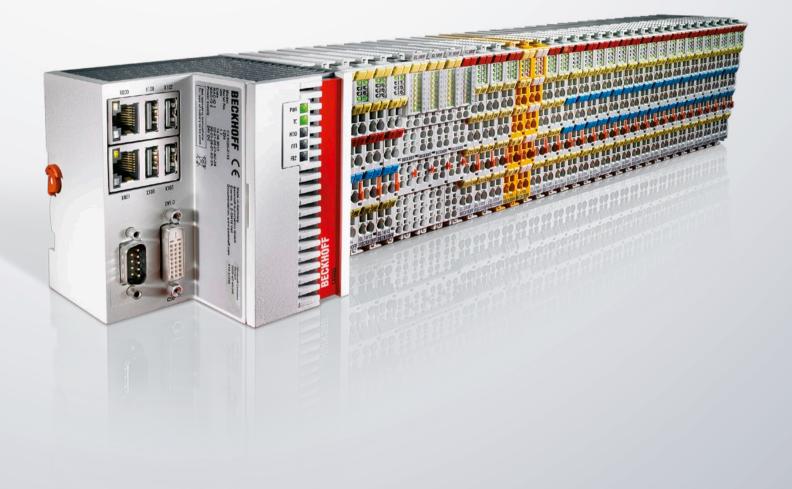**BECKHOFF** New Automation Technology
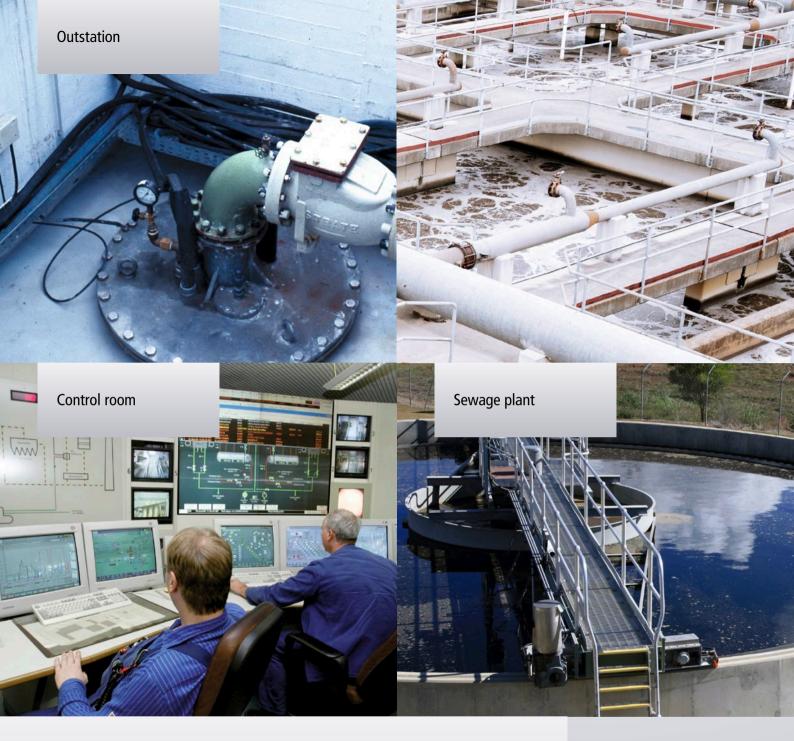
PC-based Control
for Water Management

PC-based Control from Beckhoff …

For over 30 years Beckhoff has been realising automation solutions on the basis of PC-based control technology, which have proven themselves in the most diverse industries and applications on account of their openness and high performance. The globally operative company, whose headquarters and production site are in Verl, Germany, is represented by 38* subsidiaries and distributors in over 75 countries and employs around 4,300* people worldwide. Beckhoff achieved a total turnover of 916 million Euros in 2018.

The constant technological development, economic growth, high production depth and production capacities of Beckhoff guarantee robustness, long-term availability and delivery reliability of PC-based control technology.

*April 2019

We reserve the right to make technical changes.

Outstation

Control room

Sewage plant

… trims water and wastewater management to efficiency and sustainability.

Planners and engineers in the field of water management are faced today not only with the challenge of guaranteeing the supply of clean potable water and reliable wastewater disposal. In view of the demographic change and the increasing world population, sustainability in dealing with water as a resource and energy efficiency in the cleaning of wastewater are becoming increasingly important. At the same time the costs of building new plants or modernising existing ones are playing an ever increasing role in the municipalities. The PC-based control system from Beckhoff offers the solution: Through the use of the latest processors, PC-based Control makes a powerful automation platform available for the acquisition and processing of all process data. Due to the open interfaces and the support of communication standards, the PC-based controller is suitable both for the central control of a wastewater treatment plant and for the decentralised control of the outstations.

3

BECKHOFF New Automation Technology

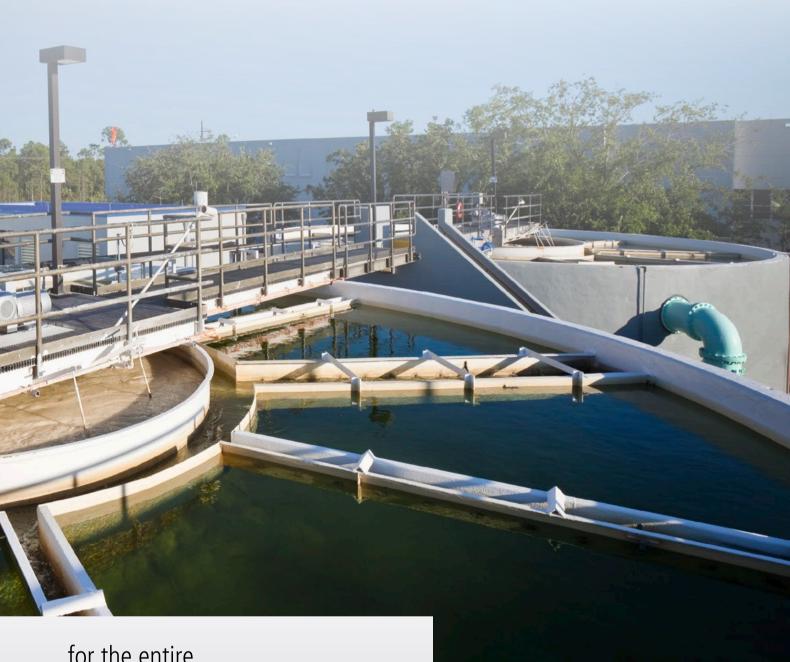# Scalable performance, universality and modularity

Industrial PC

Embedded PC

Embedded controller

Automation and
engineering software

Scalable automation technology as a universal control platform …

In addition to the I/O components for the acquisition of all data points and TwinCAT automation software, the Beckhoff product range offers a universal, scalable and modular control system that provides a suitable solution for every task with regard to computing performance, complexity and costs. With their wide performance range, the DIN rail-mountable Beckhoff embedded controllers with direct I/O interface cover all control tasks from the mid to the highest segment. The devices are compact; they save space and costs and on top of that they are modular and flexible. The even more powerful Beckhoff Industrial PCs can be used as the central controller of a large plant. The modular I/O system consists of electronic terminal blocks for direct sensor/actuator wiring and a Bus Coupler for connection to the respective bus system. With over 400 types of signals, all sensors and actuators can be coupled.

… for the entire
water treatment process.

Efficient water management requires fast and precise access to and processing of an abundance of process data. The Beckhoff Embedded PC series is optimally suited to this: The connected Bus Terminals support the connection of all common sensors and actuators for the precise acquisition of the different process parameters, such as levels, temperatures, flow rate, pH value, oxygen or nitrogen content, etc., at the various water treatment stations. The compact embedded controllers have sufficient performance to control the decentral outstations of a wastewater treatment plant. Apart from control technology they also take care of data storage and processing as well as local visualisation. The scalability and modularity of the PC-based controller provides the operating company with the possibility to adapt its plant to the many different or changing requirements without having to accept high implementation costs and expenditure of time on each occasion.

Control room

IEC 60870-5-10x
OPC UA

Open interfaces simplify communication …

Due to the variety of open software and hardware interfaces, the PC-based controller serves all common communication media and standards into the higher process level, for example via OPC and the IEC 60870-5-10x telecontrol protocols, as well as at field level via Ethernet, PROFINET, PROFIBUS, EtherNet/IP etc. Communication over long distances takes place via analog modem, radio, PC networks or mobile telephone networks. The communication standards required for this, such as GPRS, UMTS or also LTE, are supported by the PC-based platforms.
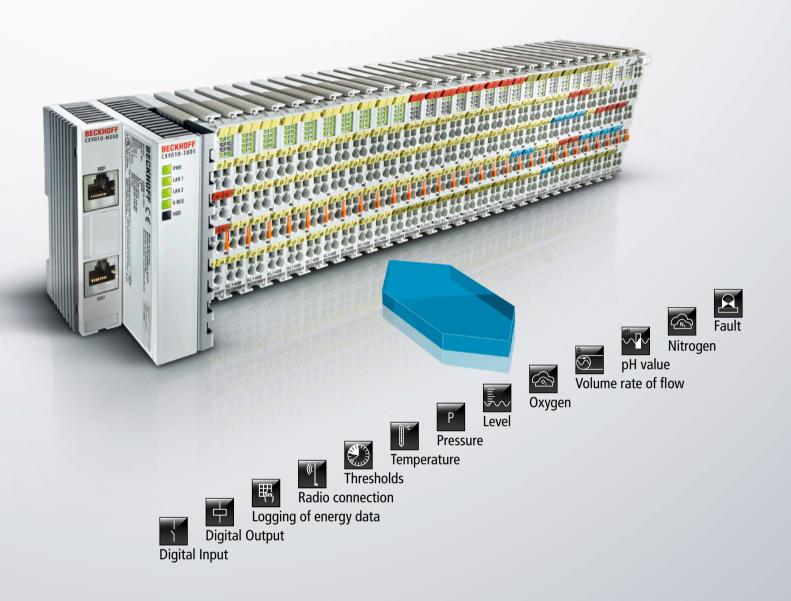
Outstation/sewage plant

- wells
- pump stations
- storm water basins
- water towers
- grid/sand catcher/mechanical purification
- primary clarification
- biological cleaning
- sludge treatment
- final clarification

DeviceNet
EtherCAT
EtherNet/IP
Ethernet TCP/IP
Modbus TCP, RTU
PROFIBUS
PROFINET
RS232/RS422/RS485

GPRS/UMTS/LTE
IEC 60870-5-10x
IEC 61850
OPC UA

… at the process level and the outstations.

Due to its open interfaces, PC-based control is suitable as a universal control platform both for the central control of a wastewater treatment plant and for the decentral control of outstations. Support for all common communication standards produces a highly efficient, available and powerful network for the transmission, storage and processing of the data, based on standard technologies. The energy sector has already created a term for this: Smart Grid. The openness of PC-based automation also enables adaptation to existing systems, so that a plant retrofit for improving the energy efficiency can be realised without problem.

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BECKHOFF New Automation Technology

Fault

Nitrogen

pH value

Volume rate of flow

Oxygen

Level

Pressure

Temperature

Thresholds

Radio connection

Logging of energy data

Digital Output

Digital Input

▶ www.beckhoff.com/BusTerminal

The modular Beckhoff I/O system offers …

The modular Beckhoff I/O system consists of the electronic terminal blocks for the direct sensor/actuator wiring and a Bus Coupler, Bus Terminal Controller or Embedded PC for connecting to the bus systems commonly used in water management, such as EtherCAT, EtherNet/IP, Ethernet TCP/IP, Modbus TCP, RTU, PROFIBUS, PROFINET and RS232/RS422/RS485. With over 400 types of signals, all common sensors and actuators can be seamlessly integrated into the controller. All ranges of application are covered, from the drive controller to measuring and safety technology. The fine-grained implementation of 1 to 16 channels per terminal allows the user to tailor his automation solution precisely to the required inputs and outputs. In addition, the modular structure offers high flexibility in the configuration of the controllers for the individual systems of a wastewater treatment plant. The use of standard components ensures economical complete solutions as well as integration into existing systems.
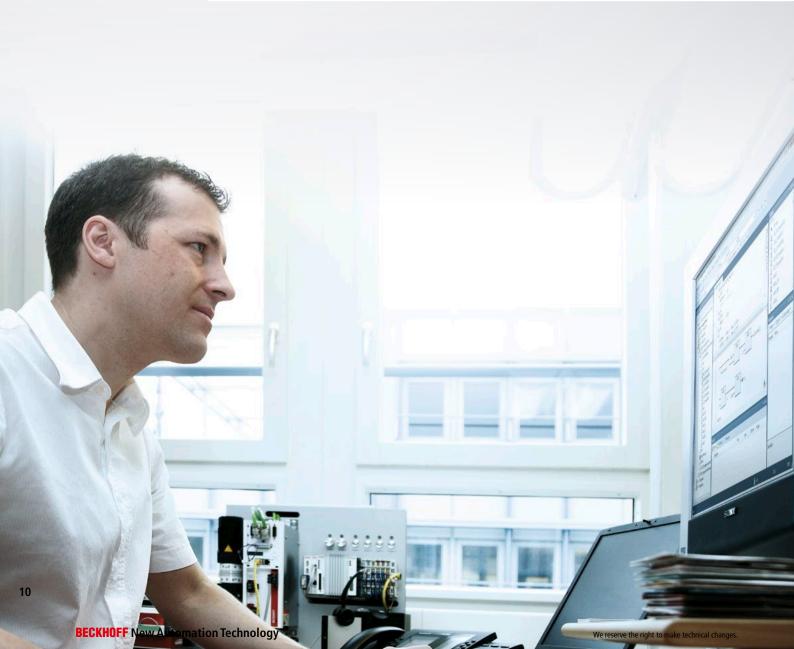
… tailor-made solutions for water management.

PC-based automation technology integrates extensive measuring, control and regulating technology on one platform and, together with the local and decentralised acquisition and storage of a large number of process parameters, offers the necessary conditions for the precise control of all processes in the cleaning of wastewater as well as the outstations, such as wells, pumps and storm water tanks. Process parameters such as levels, temperatures, flow rate, pH value, oxygen or nitrogen content are recorded by the Bus Terminals and processed further in the intelligent Bus Terminal Controllers or Embedded PCs. The integrated Beckhoff control solution not only has the advantage of a compact design; it also impresses through lower system costs, simplified engineering and flexibility. Substations or outstations of wastewater treatment plants can be connected via Ethernet, fieldbus, analog modem, ISDN, network radio, GSM and UMTS and allow remote access.

BECKHOFF New Automation Technology

TwinCAT as a universal control platform …

TwinCAT, the open, scalable Beckhoff automation software on the basis of Windows operating systems, forms the heart of the PC-based controller. It transforms a PC-compatible platform into a real-time controller with multi-PLC system, programming environment and operator station. TwinCAT is universally usable, from the controller of the wastewater treatment plant to the decentral outstations, and allows simple programming and commissioning. Numerous PLC libraries with function blocks compliant with the PLCopen standard facilitate programming and allow the use of standards. Connectivity to all popular fieldbuses and PC interfaces is supported. TwinCAT version 3 includes – alongside IEC 61131-3 – C/C++ and Matlab®/Simulink® as programming languages for real-time applications.

▶ **www.beckhoff.com/TwinCAT**

BECKHOFF New Automation Technology

… provides for more efficiency in engineering.

A uniform tool is available for universal configuration, programming and diagnostics in TwinCAT and a tool for the design and simulation of controllers in Matlab®/Simulink®. TwinCAT allows connection to all common fieldbuses and PC interfaces as well as data connection by means of open standards such as OPC UA, the IEC 60870-5-10x telecontrol protocols or Modbus. The seamless integration of Condition Monitoring into the automation platform enables the monitoring of the states of pumps, centrifuges, etc. without the use of additional hardware. Engineering is simplified and system costs are lowered as a result. Depending on requirements, further necessary software components can be installed on the PC in addition to TwinCAT. With Windows as a uniform platform, communication between the individual components is very simple.

BECKHOFF New Automation Technology

PC Control for water and waste water treatment systems

Control room

Data server

Remote maintenance

Ethernet

Ethernet Switch

Workstation lab

Workstation control room

Ethernet TCP/IP, Wireless

Fieldbus

Ethernet TCP/IP

Connection of outstation via Internet standards

Control Panel

DVI/USB

Embedded PC

Bus Terminal Controller

Connection of outstation via fieldbus systems

Embedded PC

Bus Terminals

Industrial PC

Connection of outstation via network

Embedded PC

Outstation

Ethernet TCP/IP

Control Panel

DVI/USB

Bus Terminals, EtherCAT Terminals

Wireless
Modem
GPRS
UMTS

We reserve the right to make technical changes.

In the water system outstations, such as wells, pumping stations or storm water tanks, process data must be acquired, processed, stored and transmitted via a communication network to a control station. Small controllers or DIN rail-mountable Embedded PCs are often used here, depending on the field of application. These controllers can optionally be equipped with larger storage media. This way, large amounts of data can be buffered if transmission to the control station is not possible for an extended period of time. A large range of different Bus Terminals for the acquisition of the various signals allows precise and efficient control of the processes. The only requirements for this are one of the above-mentioned PC-based controllers with TwinCAT automation software and – according to the existing infrastructure and the location – an interface to the respective data transmission system.

Beckhoff – New Automation Technology

Beckhoff implements open automation systems using PC-based control technology. New Automation Technology from Beckhoff stands for innovative and industry-independent control and automation solutions that are used in a wide variety of applications worldwide, ranging from CNC-controlled machine tools to intelligent building control and to wind turbines. Continuous technological development, economic growth, high-level vertical integration, and extensive production capacities ensure the industrial strength of our components, long-term availability and delivery reliability that our customersvalue.

▶ **www.beckhoff.com**

Beckhoff at a glance

- Headquarters: Verl, Germany
- Sales 2018: 916 million € (+13%)
- Staff worldwide: 4,300
- Branch Offices Germany: 22
- Subsidiaries/Branch Offices worldwide: 38
- Distributors worldwide: in more than 75 countries

(As of 4/2019)

Million €

950
900
850
800
750
700
650
600
550
500
450
400
350
300
250
200
150
100
50
0

916

1980 1981 1982 1983 1984 1985 1986 1987 1988 1989 1990 1991 1992 1993 1994 1995 1996 1997 1998 1999 2000 2001 2002 2003 2004 2005 2006 2007 2008 2009 2010 2011 2012 2013 2014 2015 2016 2017 2018

Turnover development

Vancouver
Seattle
Minneapolis
Milwaukee
Chicago London
Denver
San Jose
San Diego

Montreal
Mississauga
Toronto
Boston
Philadelphia
NORTH AMERICA Cincinnati
Charlotte
Dallas
Houston
Mexico City

Bogotá
Quito
Lima

Santiago de Chile

BECKHOFF New Automation Technology

We reserve the right to make technical changes.

Worldwide presence
on all continents

The worldwide presence of Beckhoff in more than
75 countries ensures fast service and support for
globally-operating customers in their local language.
Moreover, geographical proximity helps us develop an
in-depth understanding of the technical challenges our
customers are faced with around the world.

Further information

The web pages "PC-based Control for Water
Management" offer further information, e.g.
application reports or industry-specific solutions.

▶ **www.beckhoff.com/water**

The Beckhoff catalogs and flyers are available
for download on the Internet.

▶ **www.beckhoff.com/media**

■ **Headquarters** ■ **Headquarters Distributor**

● **Subsidiary**

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Contact us:

▶ **www.beckhoff.com/water**

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