BECKHOFF New Automation Technology

All components for explosion protection up to Zone 0

Explosion protection at a glance: Zones and factors

Areas exposed to explosion hazards and terminology

To create an explosion, a combustible mix of oxygen and fuel must get in contact with an ignition source. Explosion protection involves taking measures that prevent explosions by excluding one of these three risk factors.

Since many processes use materials that are flammable and create an explosive atmosphere in combination with air, preventing the atmosphere from becoming potentially explosive is often not feasible. This is why hazardous areas must be marked as such in order to ensure that no electrical equipment will be used that can cause an ignition as a result of factors such as sparks or high surface temperatures, for example.

In compliance with European explosion protection regulations, such areas are divided into zones that reflect the degree of the explosion hazard. For gases, the Zones are 0, 1, and 2. For dust, they are Zones 20, 21, and 22. Zone 0/20 (gas, dust) describes areas in which an explosive atmosphere exists permanently or frequently or for long periods of time. Areas that are occasionally subject to explosion hazards are marked as Zone 1/21. Zone 2/22 describes areas in which
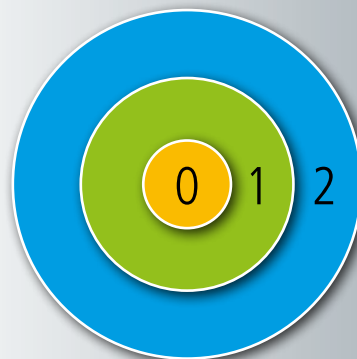
an explosive atmosphere exists never or only for short periods of time.

With its broad portfolio of components, Beckhoff makes it possible to build integrated explosion protection solutions through to Zone 0/20 with EtherCAT Terminals, high-quality Control Panels and Panel PCs, as well as Embedded PCs and Bus Couplers for easy integration with all common fieldbus systems. With Beckhoff, users can implement any explosion protection application involving explosion hazards, including the retrofitting of existing systems.
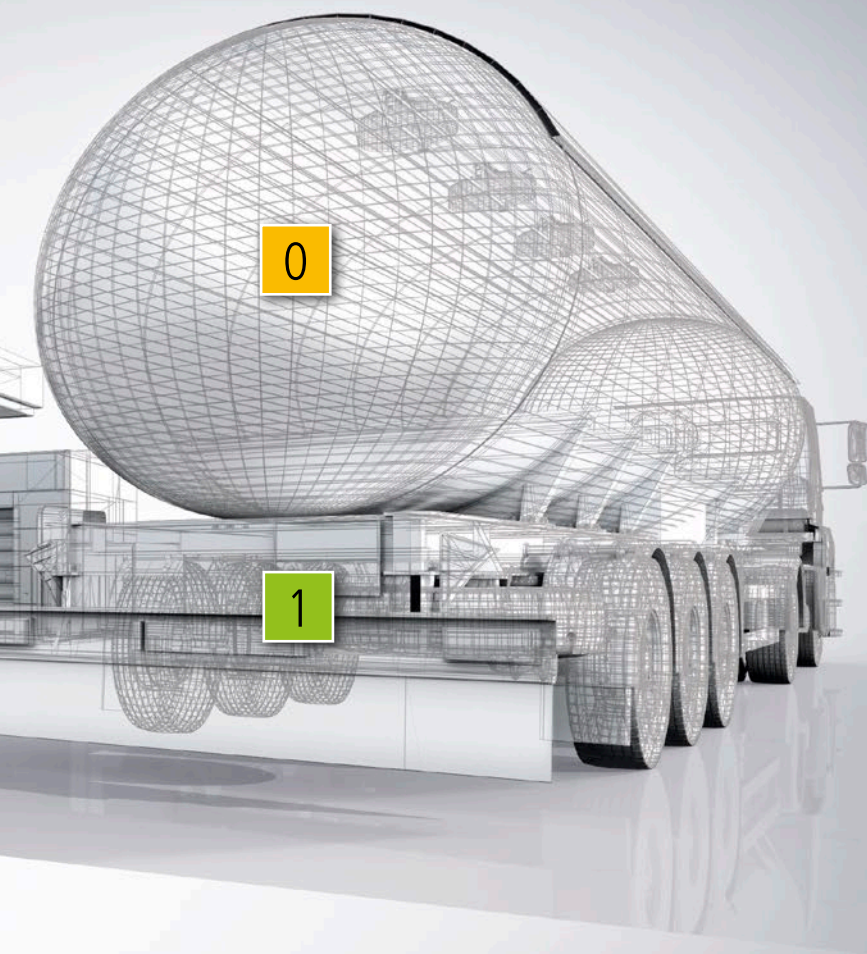
Explosion protection zones

Zone 0/20
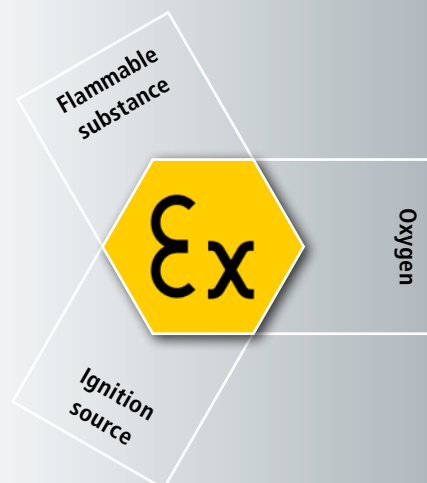The explosive atmosphere is permanent, frequent or long-term.

Zone 1/21
The explosive atmosphere is present occasionally.

Zone 2/22
The explosive atmosphere is never present or only for short periods of time.

Explosion protection

Flammable substance

Oxygen

Ignition source

Ex

To prevent an explosion, one of the three explosion factors must be excluded. In most cases, this is the ignition source.

For all markets: approved as per ATEX, IECEx, NEC/CEC

For use worldwide:
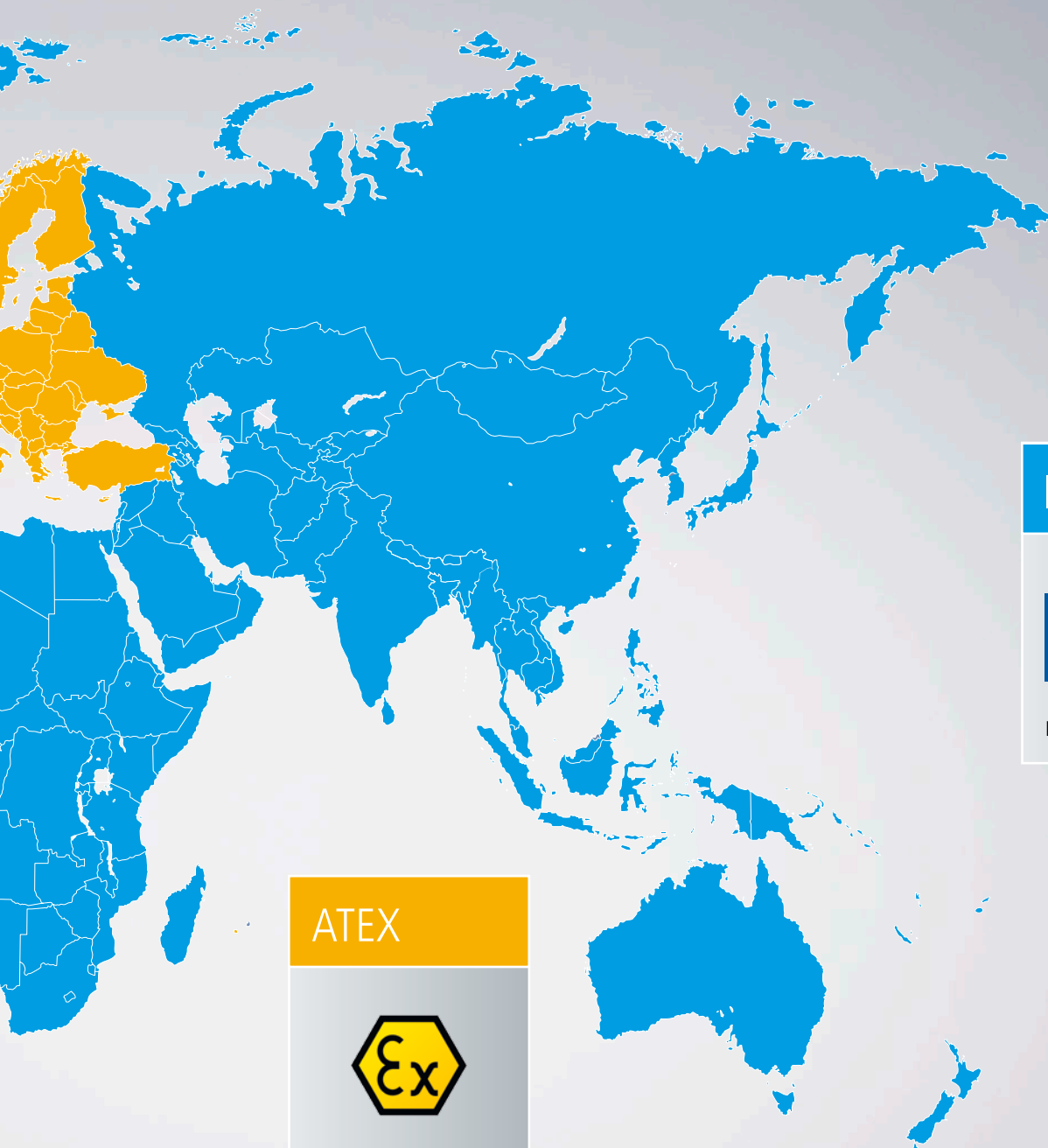**the explosion protection portfolio**
For systems and equipment in areas exposed to explosion hazards, different standards apply all over the world:

- International explosion protection (IECEx)
- European explosion protection (ATEX)
- North American explosion protection (NEC/CEC)

Country-specific approvals such as IA for South Africa may also be required. Users must make sure that their installations meet applicable guidelines and standards. The Ex component portfolio

from Beckhoff meets all listed standards and is certified for the intended use in hazardous areas in compliance with applicable regulations. As a result, PC-based control makes globally uniform solution concepts possible for barrier-free system integration up to Zone 0/20.

NEC/CEC

NEC
certified

North America

4

IECEx

IEC IECEx

International

ATEX

Ex

Europe

5

# Potential savings by eliminating the need for separate safety barriers

Reduced effort and costs
The conventional implementation of standard-compliant explosion protection involves connecting field devices from Zone 0 via separate safety barriers. Installing such barriers in the control cabinet, however, requires a relatively high cabling effort and takes up a lot of space.

Using highly compact ELX-Series EtherCAT Terminals eliminates the need for such separate safety barriers, because these I/O modules can be connected directly to intrinsically safe sensors and actuators that are installed in hazardous areas up to Zone 0.

In contrast, the cost and space savings made possible by ELX terminals allow users to build machines and systems that are as compact as they are efficient. The bottom line: the control cabinet space requirements along with costs and effort involved can be reduced significantly.
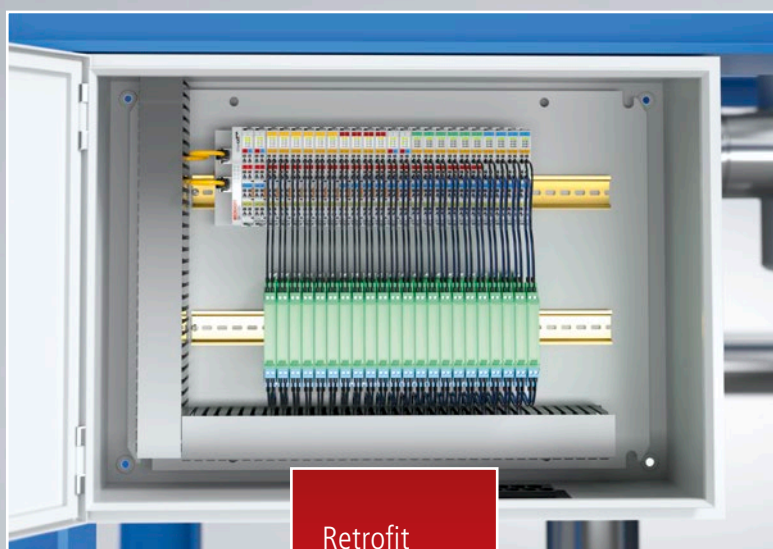
Retrofit
with ELX
components
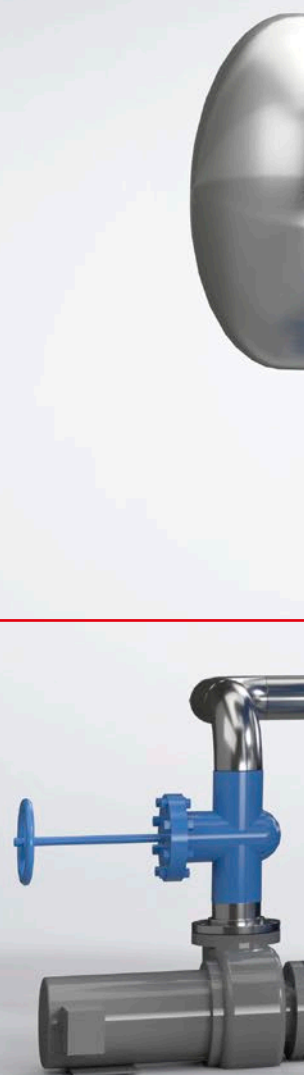
ELX EtherCAT terminals:

- I/O modules with integrated barriers for direct connection of intrinsically safe field devices
- compact, space-saving design
- fewer components means simplified diagnostics
- reduced cabling effort

System-integrated explosion protection through to Zone 0/20 with ELX terminals
Currently applicable explosion protection standards and guidelines specify the requirements for using electrical equipment in areas that are subject to explosion hazards. To prevent explosions, users must ensure that electrical equipment does not provide an ignition source e.g. in the form of sparks or high temperatures. Accordingly, electrical equipment must be properly certified for the intended use in areas that are subject to explosive hazards.

To implement these explosion protection measures, certain types of ignition protection have been defined. These include:
- intrinsic safety (Ex i)
- increased safety (Ex e)
- flame-proof enclosure (Ex d)
- non-sparking apparatus (Ex nA)

Equipment gets approved for use in areas subject to explosive hazards based on the above-mentioned types of ignition protection. As a rule, such equipment may also be used in less hazardous areas. For example, devices that

Ex ic

Ex ec

Ex db

Ex ib

Ex ia
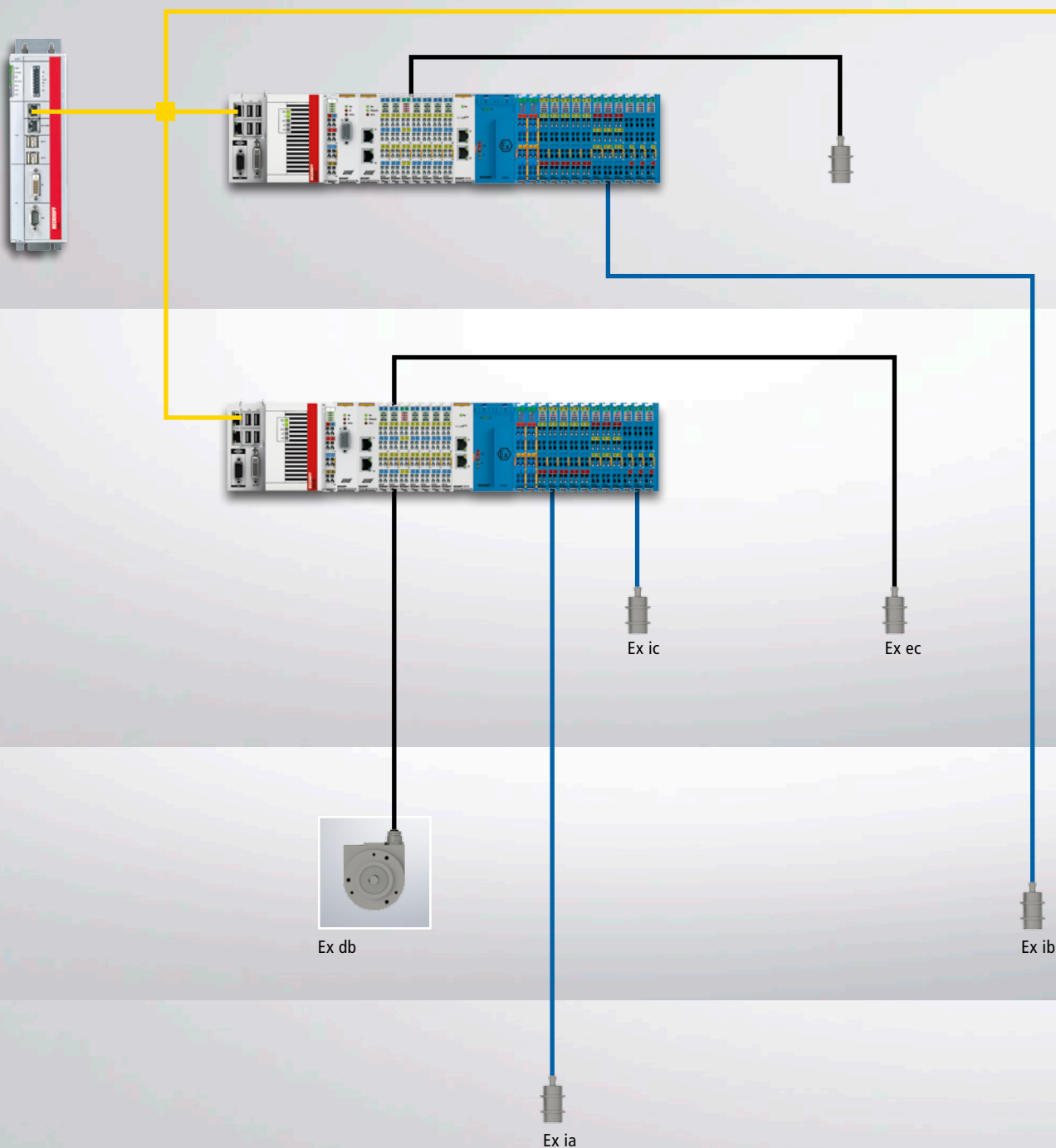
are certified for Zone 0/20 may be used in all other zones.

The Beckhoff portfolio comprises many products that are certified for use in Zone 2/22, including various embedded controllers, Control Panels and Panel PCs in the CPX series, as well as most IP20 terminal blocks and IP67 box modules. Beckhoff is continuously expanding its certifications along with its product portfolio.

Besides being certified for use in Zone 2, ELX series EtherCAT terminals feature intrinsically safe interfaces, which means that intrinsically safe field devices in Zone 0/20 or Zone 1/21 can be directly connected to them. Compared to the traditional connection method with a combination of non-intrinsically safe I/Os and dedicated safety barriers, the ELX terminals feature the well-known EtherCAT performance, streamlined diagnostics, and savings in terms of space and wiring requirements.

Zone 2/22

Ex ec

Safety barrier

Safety barrier

Zone 1/21

Ex db

Zone 0/20

Ex ia

Ex ia

9
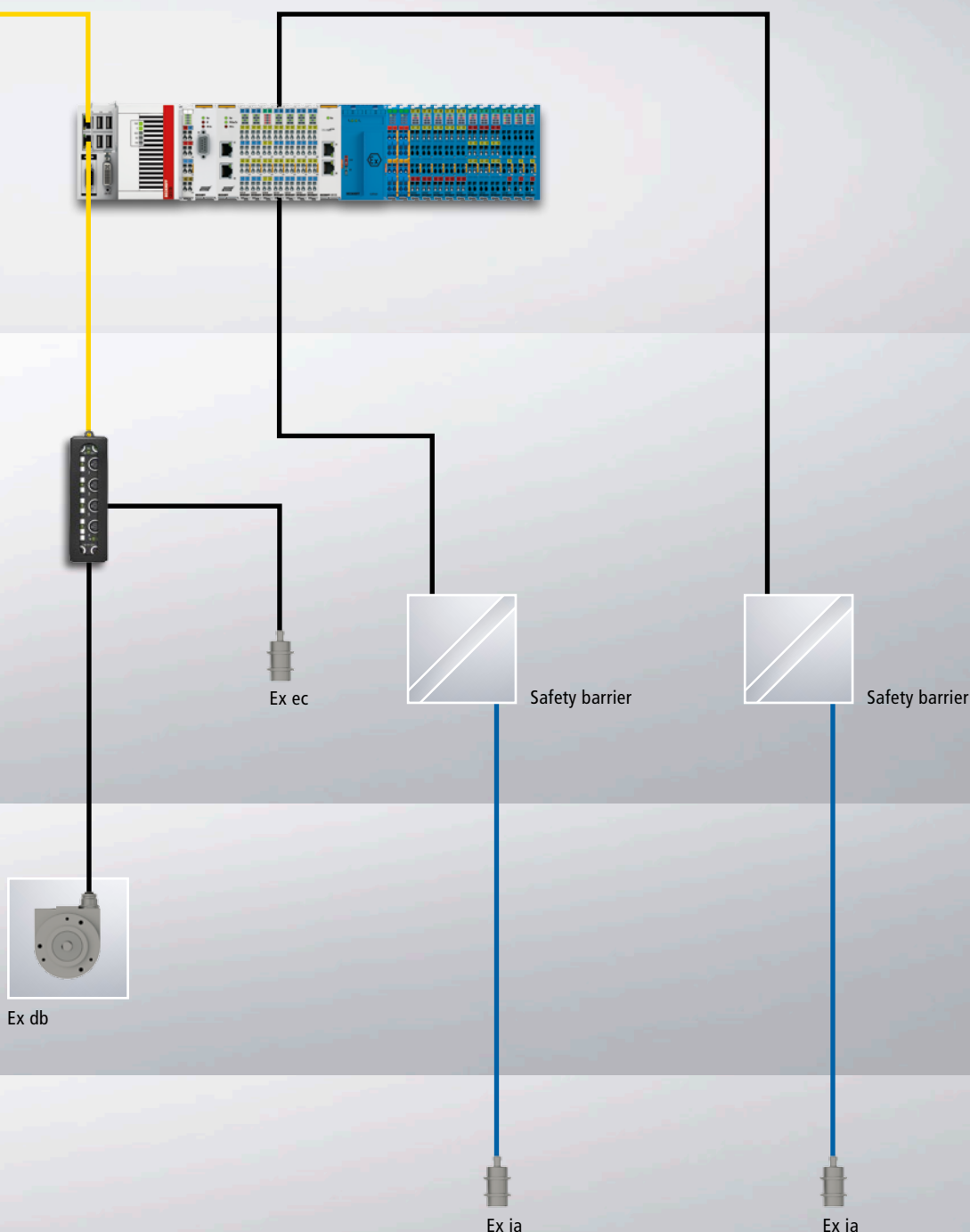
Safety, explosion protection, measurement technology: integrated in real time

One platform, one CPU, one bus
One control platform and one high-performance fieldbus for all control tasks. With its PC-based control technology, Beckhoff makes it possible to combine the widest range of I/O components in a single system. With only a single CPU and a single fieldbus, all EtherCAT Terminals for measurement tasks, functional safety and explosion protection can be easily integrated into a comprehensive control system for real-time applications. Users no longer have to rely on multiple standalone solutions, but can benefit from the efficiencies of an integrated solution.
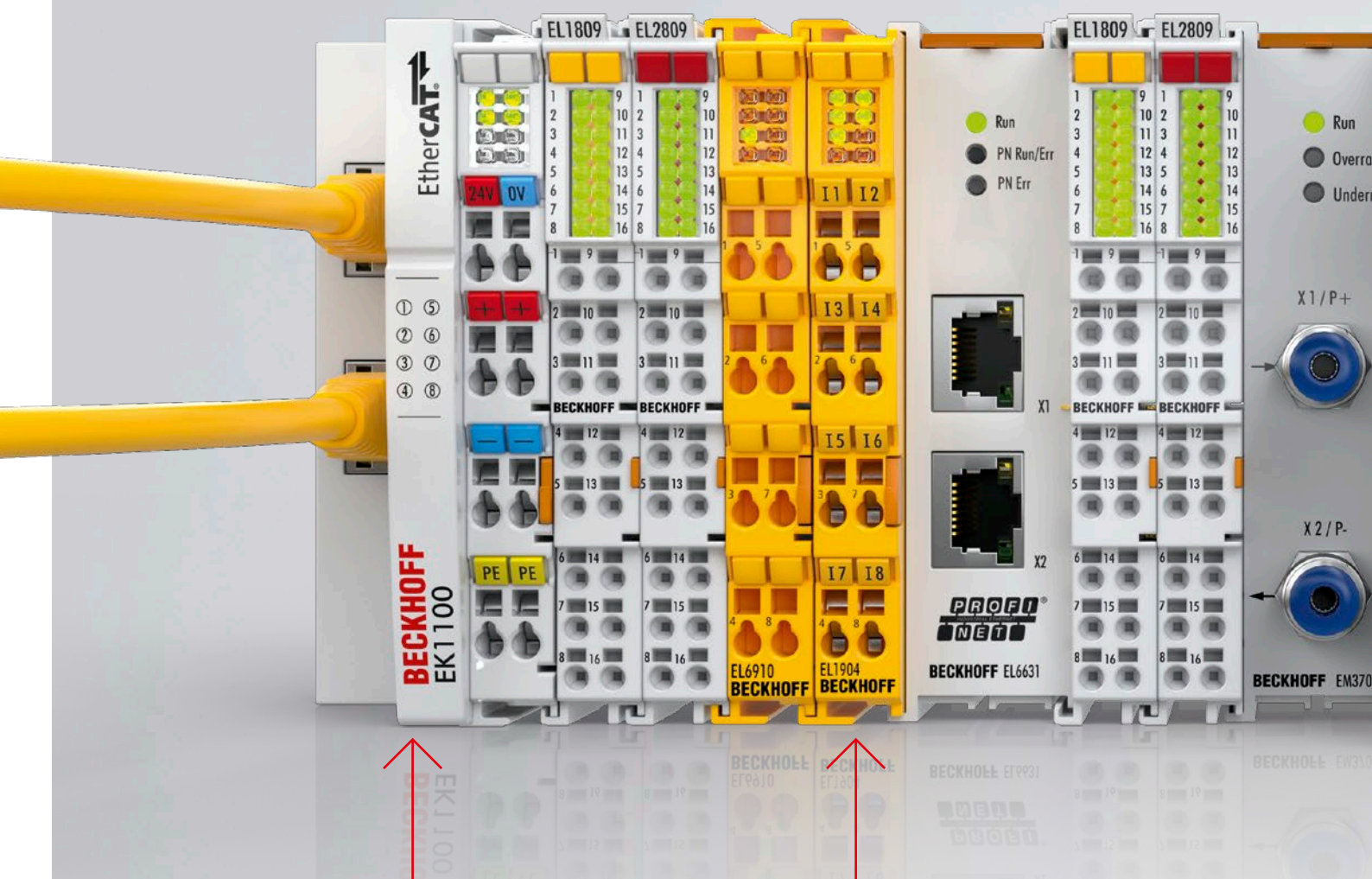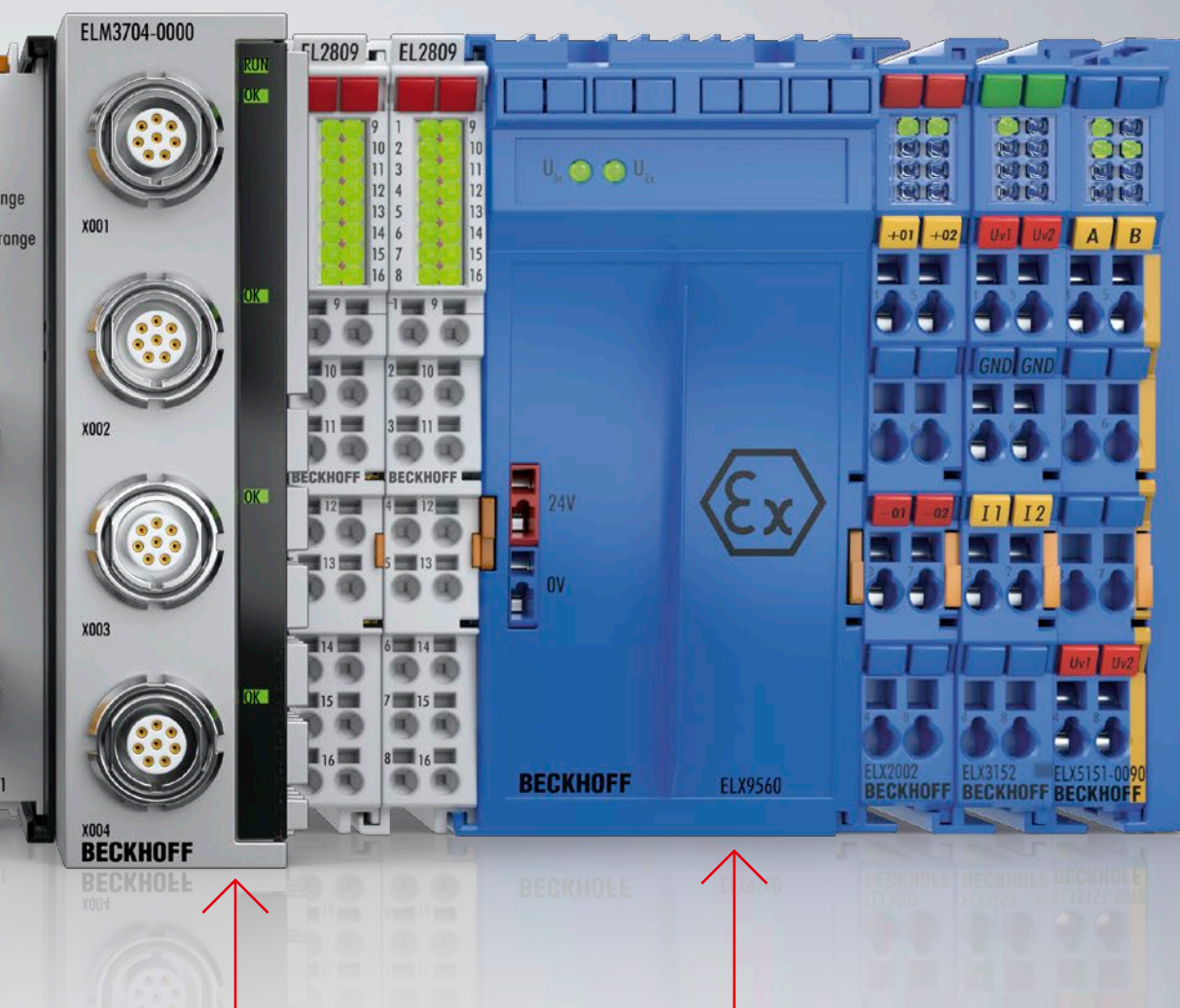
Fieldbus couplers

With controllers or fieldbus couplers, multiple topologies are possible

Safety

Integration of functional safety into the control system with TwinSAFE

Measurement technology

ELM modules in metal housings for precision and high-speed measurement technology

Explosion protection

Highly compact I/O modules with integrated safety barriers for the direct connection of intrinsically safe field devices

Easy integration into common fieldbus systems

Ideal for explosion protection retrofits
Openness is the underlying principle of each Beckhoff control architecture, which is why Beckhoff components support various communication protocols such as EtherCAT, PROFINET, PROFIBUS, Modbus, EtherNet/IP, and more. Via these standardized interfaces, Beckhoff hardware can be integrated with the process control systems that are common in most industries. This opens the door to the benefits of PC-based control technology even in cases where existing systems are meant to be upgraded and/or expanded by retrofits.

Based on the application needs, various control system topologies may be advisable. Classically, a central control system, which can be supplemented with remote I/O stations to reduce wiring, will be used to handle the process management of an entire system. For more extensive and distributed installations, however, a more decentralized concept offers the possibility to map individual subsystems on a dedicated controller.

The modular Beckhoff control system supports both versions. Powerful Industrial PCs provide the basis for a central control station from which the
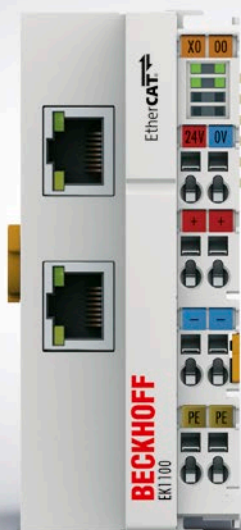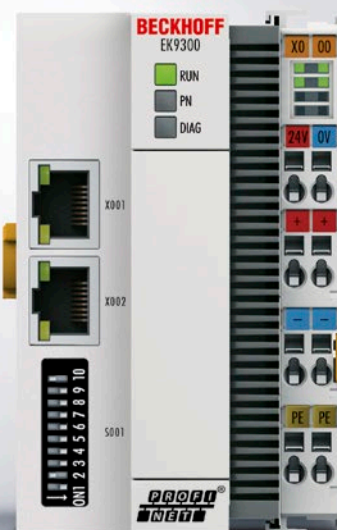
Modbus
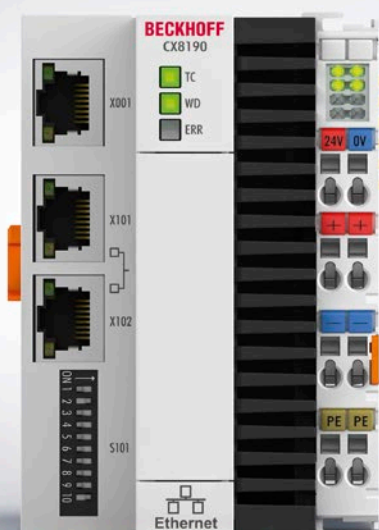
**EtherNet/IP™**
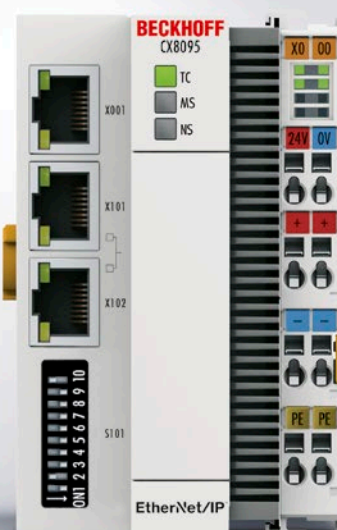
Embedded PCs

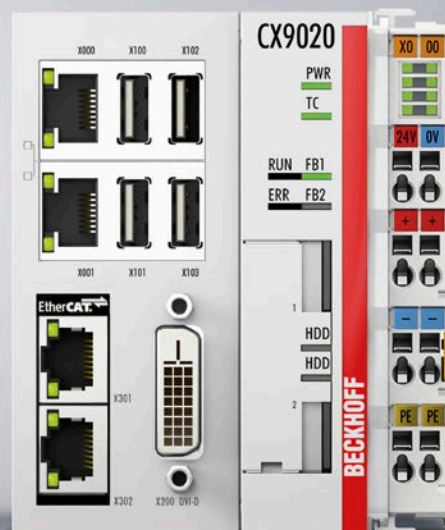**EtherCAT®**

PROFINET®

Bus Couplers

entire system can be managed and monitored. Sensors and actuators are connected via remote I/O that use a fieldbus coupler to transmit data from the field to the control center. With embedded controllers on the other hand, a segment of the system can be controlled locally via an Embedded PC installed in the control cabinet. Such modularization opens the door to more efficient process automation and makes the many functionalities of the TwinCAT automation software usable in the field. In both cases, however, the communication to a higher-level system via a specific protocol can be ensured by selecting the appropriate controller or coupler.
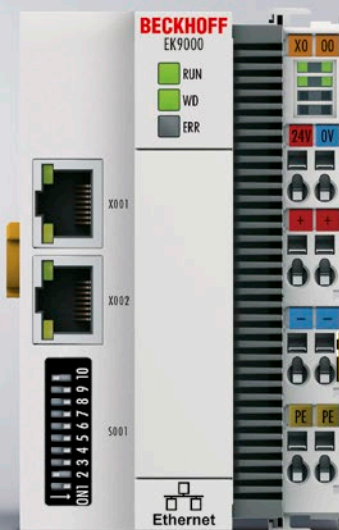
OPC UA

RS232 RS485

PROFIBUS®
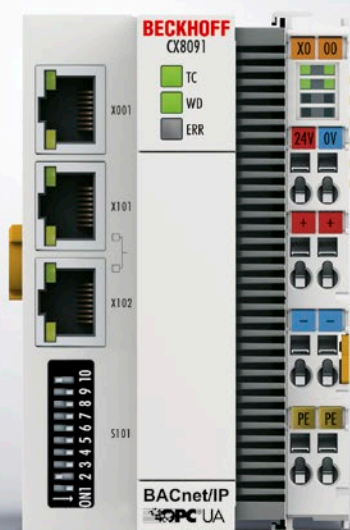
Modbus

Highly compact and intrinsically safe: EtherCAT Terminals for explosion protection

The ELX series: intrinsically safe according to IECEx, ATEX and NEC/CEC

With the ELX terminals Beckhoff combines highly compact remote I/O modules with isolating barriers for the direct connection of intrinsically safe field devices. The result: very slim EtherCAT Terminals for direct connection of intrinsically safe sensors and actuators. The high resolution and accuracy of the Beckhoff ELX terminals guarantee the same measuring quality that is familiar from the non-hazardous areas.. The compact design of the I/O terminals provides a further advantage: there are up to four intrinsically safe inputs avail-

able in the 12 mm housing and up to eight in the 24 mm housing. Dispensing with interconnected external barriers leads to a significant reduction in the space requirements inside the control cabinet and thus to cost advantages. With ATEX, IECEx and NEC/CEC certification, the ELX terminals comply with all industry-specific guidelines for explosion protection and can be used in nearly all markets worldwide, which reduces the user's dependence on different suppliers for different regions. The wide range of uses is also supported by the enormous variety of signals handled by the Beckhoff I/O range: there is a suitable I/O

System ELX9410	System ELX9560	Digital output ELX2002/08	Analog input ELX3152/58	Analog input ELX3162	Analog input ELX3181/84
1 A E-bus refresh	24 V Ex power supply	2/8-channel	2/8-channel	2-channel	1/4-channel
		24 V	0/4…20 mA	0…10 V	4…20 mA
			16 bit	16 bit	HART
					16 bit

Digital input ELX1052/54

2/4-channel

NAMUR

module for every application. Using the ELX terminals, process technology users can realize extremely compact and economical control architectures where the outstanding diagnostic function of EtherCAT helps to minimize system downtimes.

The ELX terminals optimize virtually all process technology applications:

- Highly compact design of 12 mm housing width reduces space requirement by up to 50%.
- safety barrier and signal terminal combined
- direct connection of intrinsically safe field devices
- EtherCAT right up to the terminal
- wide variety of signals
- fulfils a comprehensive range of certificates
- considerable cost advantages

Analog input ELX3202/04	Analog input ELX3252	Analog input ELX3312/14	Analog input ELX3351	Analog output ELX4181	Encoder ELX5151	System ELX9012
2/4-channel	2-channel	2/4-channel	1-channel	1-channel	1-channel	Bus end cap
Resistance sensor (RTD)	Potentiometer	Thermo-couple/mV	Strain gauge	0/4…20 mA	NAMUR	
16 bit	16 bit	16 bit	24 bit	HART	32 bit	
				16 bit		

Explosion-proof panel solution: the elegant CPX series in robust aluminium design

Control Panels and Panel PCs for multi-touch operating concepts in Zone 2
With the models from the CPX Panel series, the proven multi-touch technology of the Beckhoff Control Panel and Panel PCs is available in a particularly robust version and thus fulfils the requirements for use in in hazardous areas of Zone 2/22. The high functionality and high quality of workmanship ensure the durability of the CPX panel even under harsh environmental conditions. Local operation is comfortable as usual thanks to the capacitive touch technology. The appealingly aesthetic appearance of the

Beckhoff Panel with regard to feel and design of the aluminium housing is virtually unchanged, making it a visual highlight in the explosion-proof system environment. The extensive CPX range includes a large selection of formats, sizes, mounting options and performance features. Depending on the area of application, panels for control cabinet installation and stand-alone panels for free mounting in the room are available in the CPX29xx and CPX39xx series. The fanless Panel PCs from the CPX27xx and CPX37xx series additionally offer a reliable system controller.
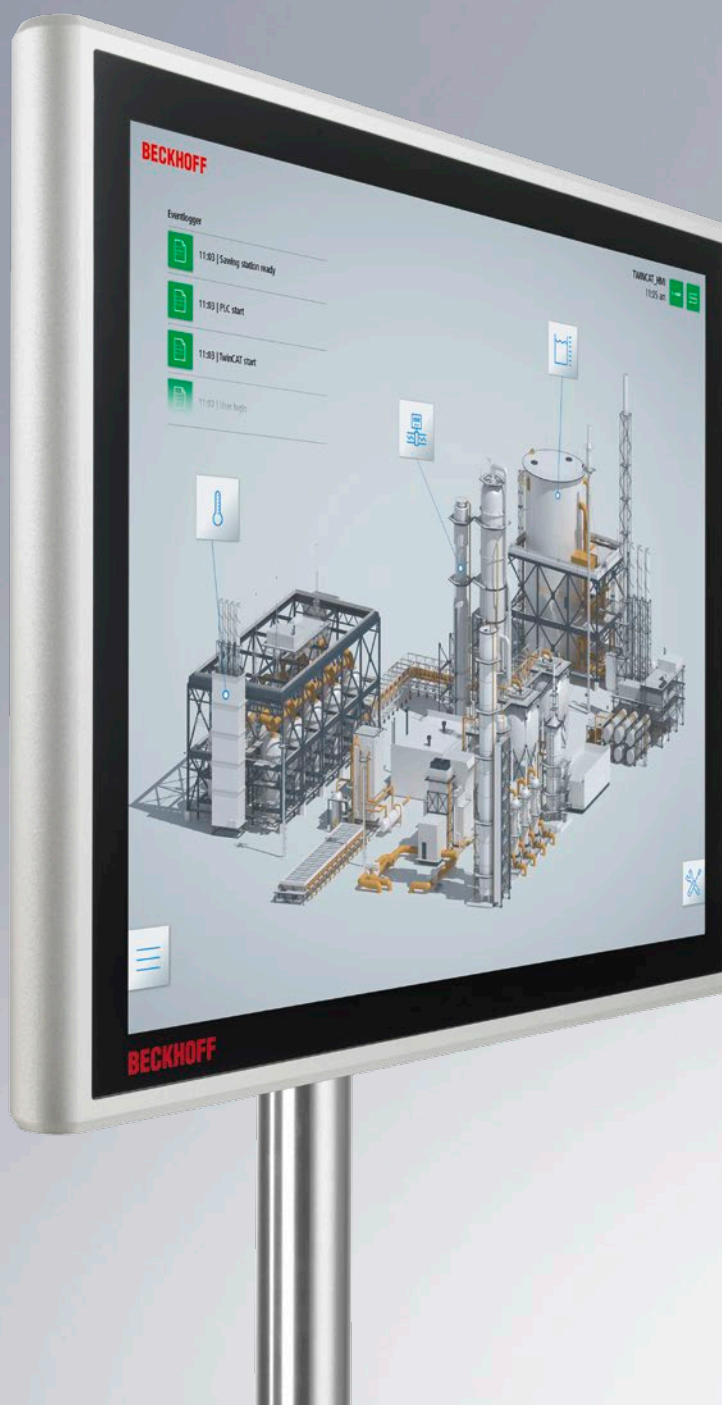
Robust:
All CPX models have a high-quality, resistant aluminium housing.

Intuitive:
All CPX models offer the advantages of the Beckhoff multi-touch technology.

Adaptable:
All CPX models impress with a wide variety of mounting concepts.

Multi-touch for process technology:
- capacitive touch technology for optimized operation
- high-grade design
- robust and durable
- large selection of Control Panels and Panel PCs
- flexible mounting
- Up to 100 m of distance between an explosion-proof panel and an Industrial PC can be bridged with CP-Link 4, which transmits video signals, USB 2.0 and power over a standard Cat7 cable.

Installation

CPX29xx/CPX27xx series
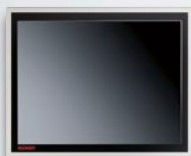
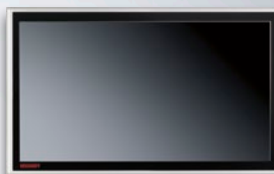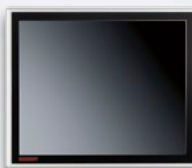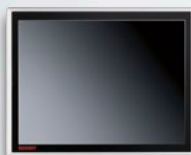|			
CPX29xx multi-touch built-in Control Panel:	**CPX2915-0000** 15-inch display 1024 x 768 resolution 4:3 format	**CPX2919-0000** 19-inch display 1280 x 1024 resolution 5:4 format	**CPX2921-0000** 21.5-inch display 1920 x 1080 resolution 16:9 format
CPX27xx multi-touch Panel PCs for control cabinet integration:	**CPX2715-0010** 15-inch display 1024 x 768 resolution 4:3 format Intel® Atom™	**CPX2719-0010** 19-inch display 1280 x 1024 resolution 5:4 format Intel® Atom™	**CPX2721-0010** 21.5-inch display 1920 x 1080 resolution 16:9 format Intel® Atom™

Stand-alone

CPX39xx/CPX37xx series

CPX39xx multi-touch Control Panels:	**CPX3915-0010** 15-inch display 1024 x 768 resolution 4:3 format	**CPX3919-0010** 19-inch display 1280 x 1024 resolution 5:4 format	**CPX3921-0010** 21.5-inch display 1920 x 1080 resolution 16:9 format
CPX37xx multi-touch Panel PCs:	**CPX3715-0010** 15-inch display 1024 x 768 resolution 4:3 format Intel® Atom™	**CPX3719-0010** 19-inch display 1280 x 1024 resolution 5:4 format Intel® Atom™	**CPX3721-0010** 21.5-inch display 1920 x 1080 resolution 16:9 format Intel® Atom™

Count on Beckhoff for maximum global availability and continued support: your automation partner

New Automation Technology

Beckhoff implements open automation systems using PC-based control technology. The product portfolio comprises these main areas: Industrial PCs, I/O and fieldbus components, drive technology and automation software. Product lines are available for all areas and can be used as individual components or as a complete system. The New Automation Technology philosophy from Beckhoff represents innovative and open control and automation solutions that are used worldwide in a variety of applications ranging from CNC machine tools to intelligent building automation.

Worldwide presence on all continents

With local presence in 75 countries, Beckhoff ensures fast service worldwide and technical support in the local language for globally operating customers. In addition, Beckhoff sees close geographic proximity to customers as a prerequisite for a profound understanding of the technical challenges facing customers.

Beckhoff at a glance

- headquarters: Verl, Germany
- 2018 sales: € 916 million (+13%)
- employees worldwide: 4300
- offices in Germany: 22
- subsidiaries/representative offices worldwide: 38
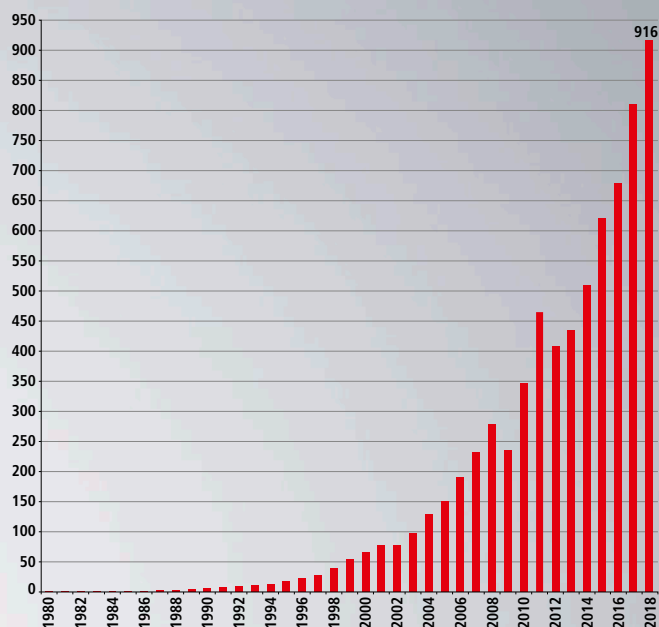- distributors worldwide: in 75 countries

(as of 04/2019)

Further information

The Beckhoff catalogs and flyers are available for download on our website.

▶ **www.beckhoff.com/media**

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Kunming Changsha
Quanzhou New Taipei City
Guangzhou Taichung
Kolkata Shenzhen

Bangkok
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vatha
Penang
Kuala Lumpur
Singapore Kuching

Jakarta

AUSTRALIA AND OCEANIA

Sydney
Melbourne Auckland

Million €

Sales development

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- ● Subsidiary
- ■ Distributor

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