BECKHOFF New Automation Technology

All components for explosion protection up to Zone 0

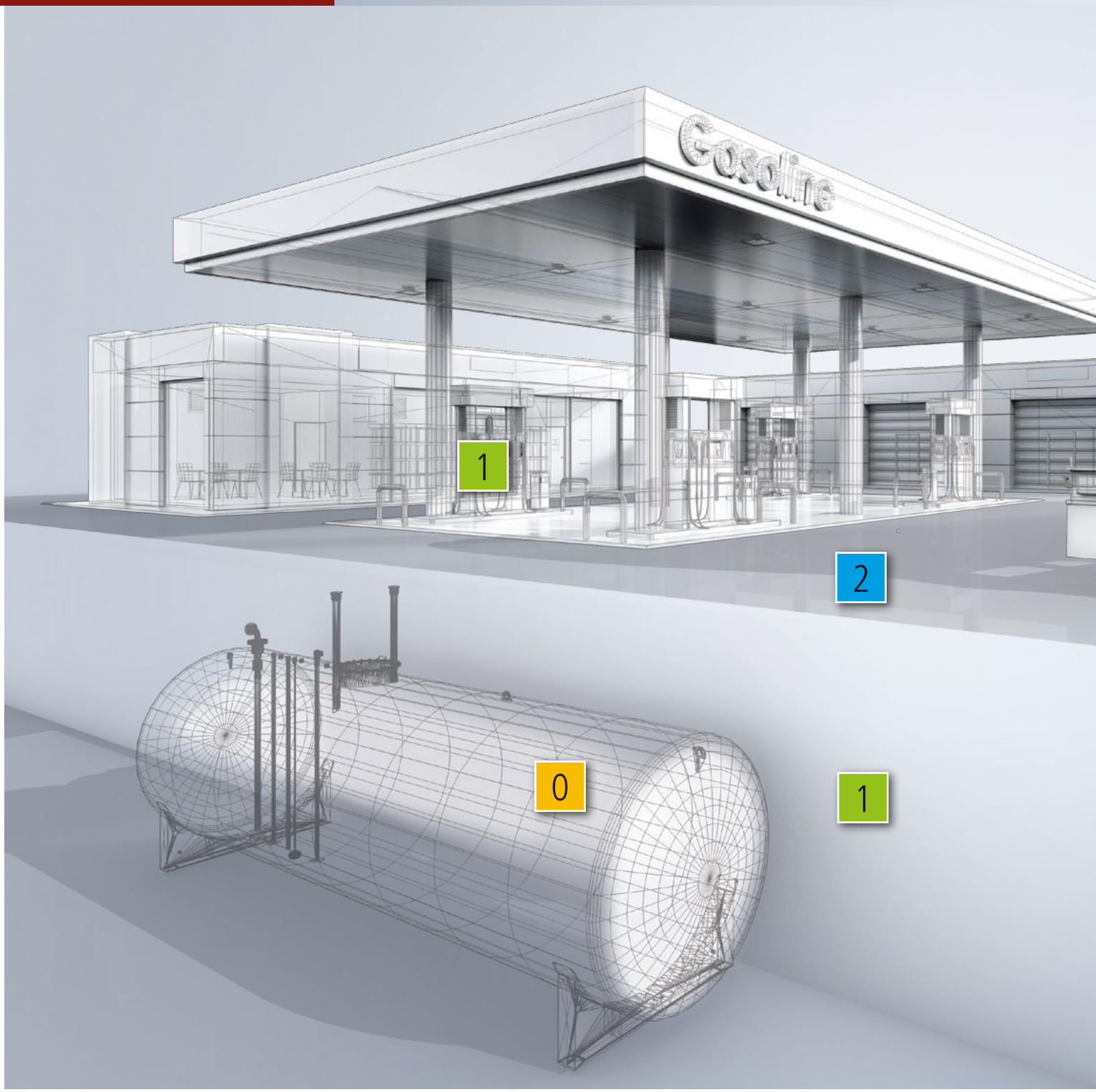
Explosion protection at a glance: Zones and factors

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.

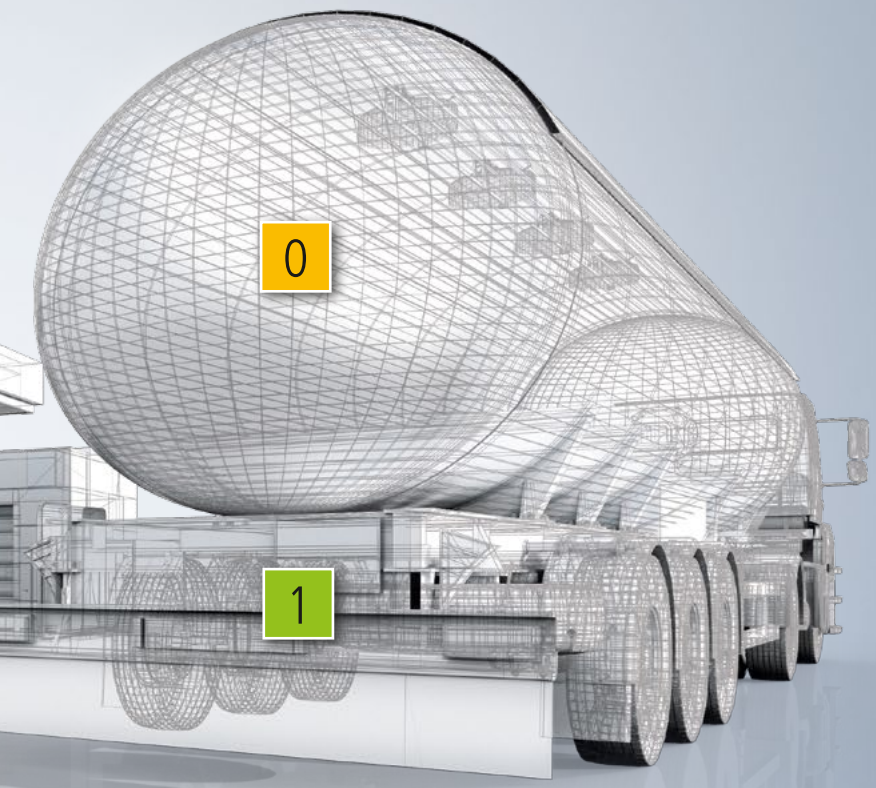
Since many processes use materials that are flammable and create an explosive atmosphere in combination with air, preventing the atmosphere from becoming potentially explosive is often not feasible. This is why hazardous areas must be marked as such in order to ensure that no electrical equipment will 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

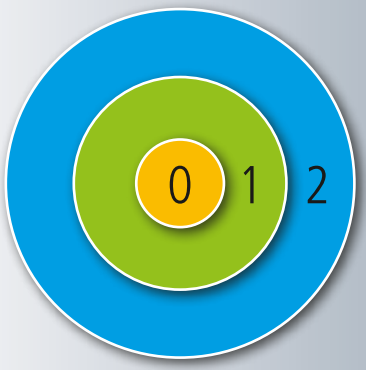


an explosive atmosphere exists never or only for short periods of time.

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

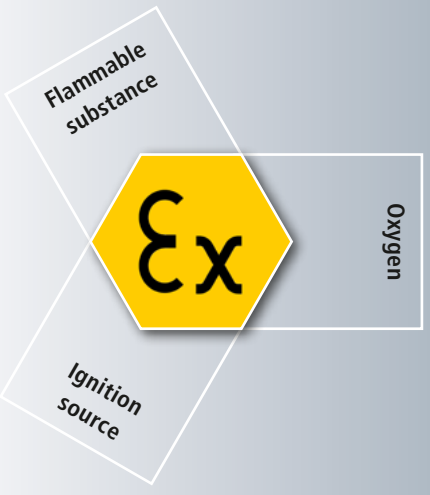


Zone 0/20
The explosive atmosphere is permanent, frequent or long-term.

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



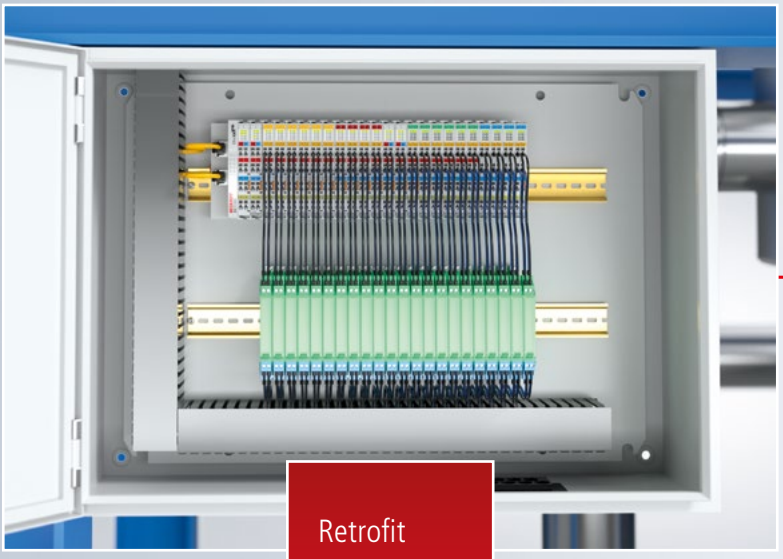
To prevent an explosion, one of the three explosion factors must be excluded.
In most cases, this is the ignition source.

Potential savings by eliminating the need for separate safety barriers

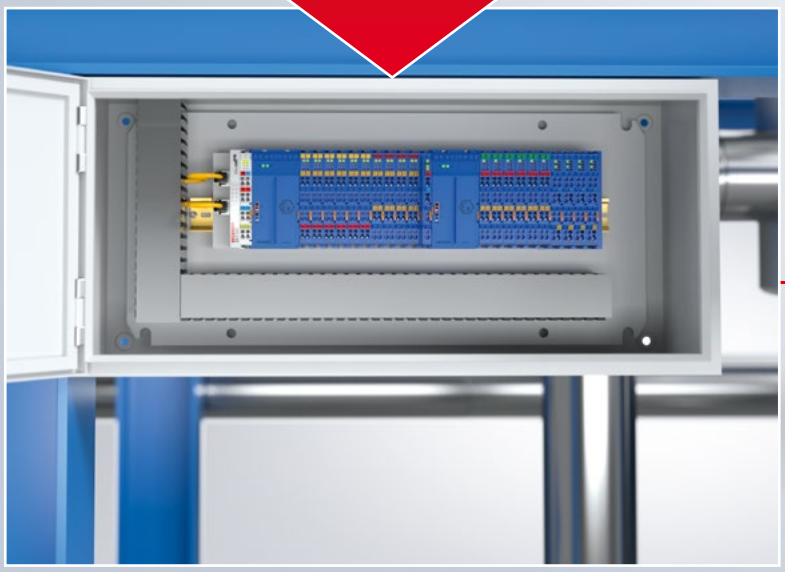
Reduced effort and costs
The conventional implementation of standard-compliant explosion protection involves connecting field devices from Zone 0 via separate safety barriers. Installing such barriers in the control cabinet, however, requires a relatively high cabling effort and takes up a lot of space.

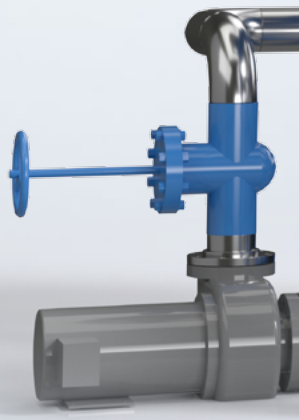
Using highly compact ELX-Series EtherCAT Terminals eliminates the need for such separate safety barriers, because these I/O modules can be connected directly to intrinsically safe sensors and actuators that are installed in hazardous areas up to Zone 0.

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

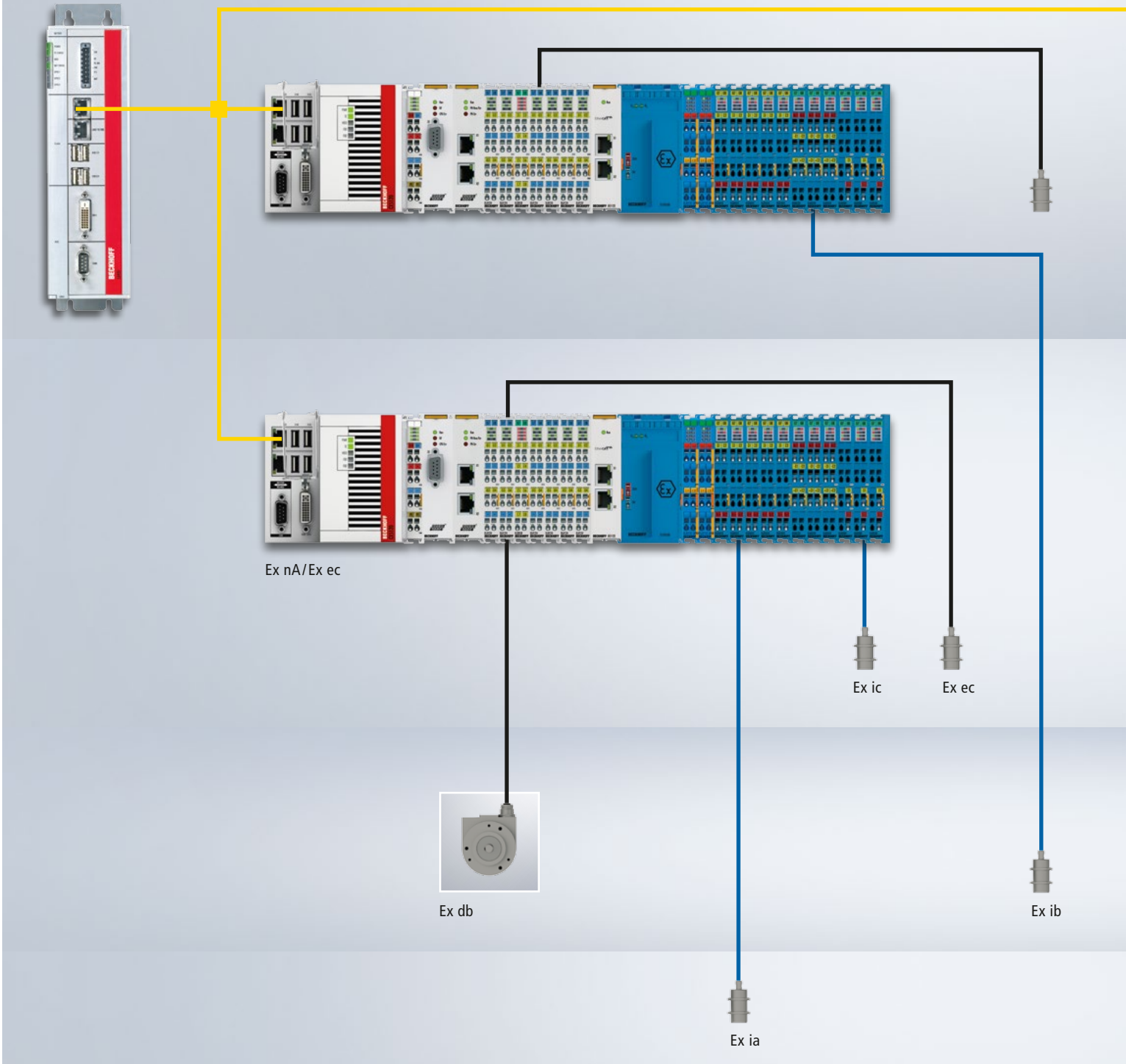
Direct connection to field devices in Zones 0/20, 1/21, and 2/22

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)

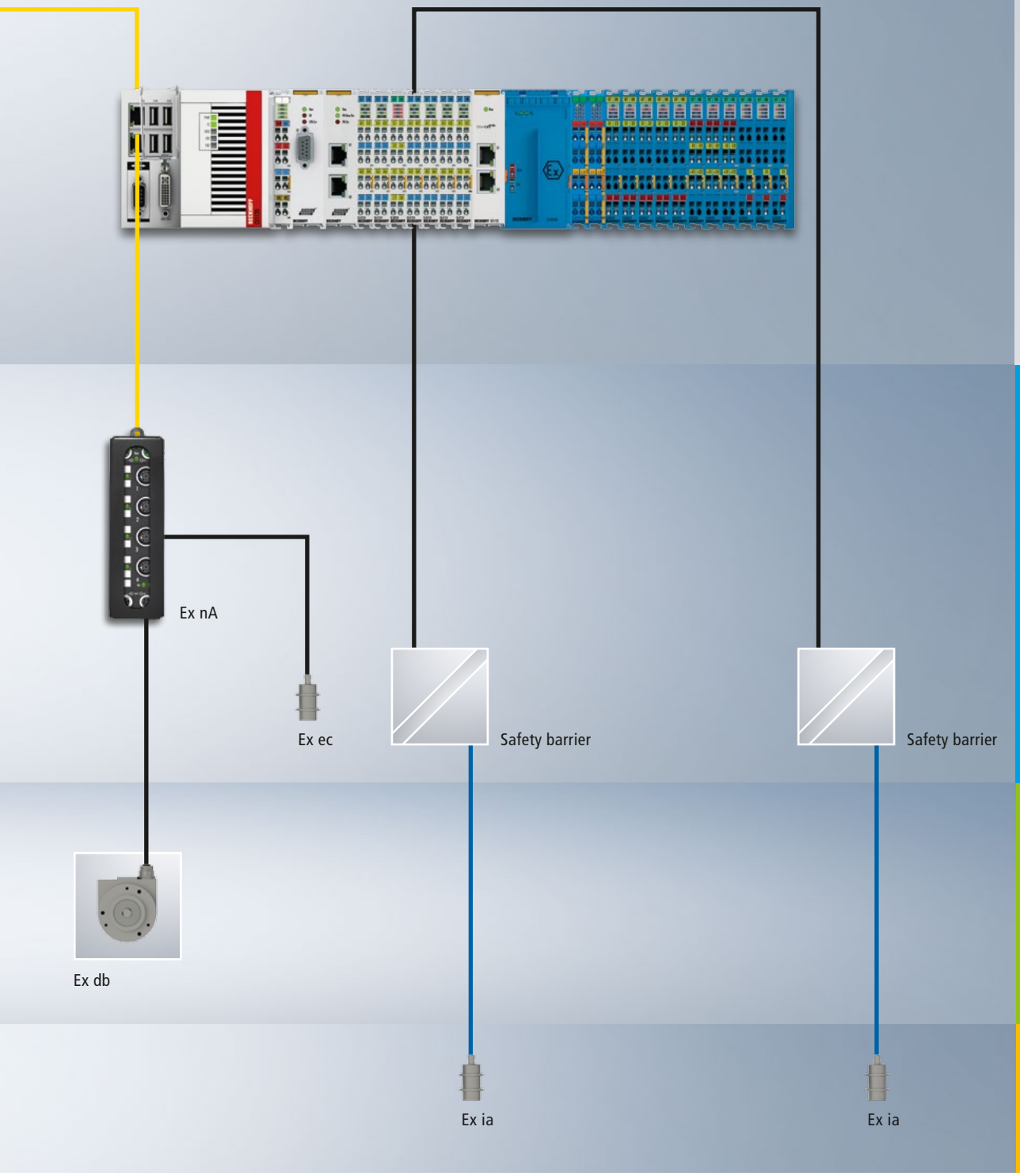
Equipment gets approved for use in areas subject to explosive hazards based on the above-mentioned types of ignition protection. As a rule, such equipment may also be used in less hazardous areas. For example, devices that



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

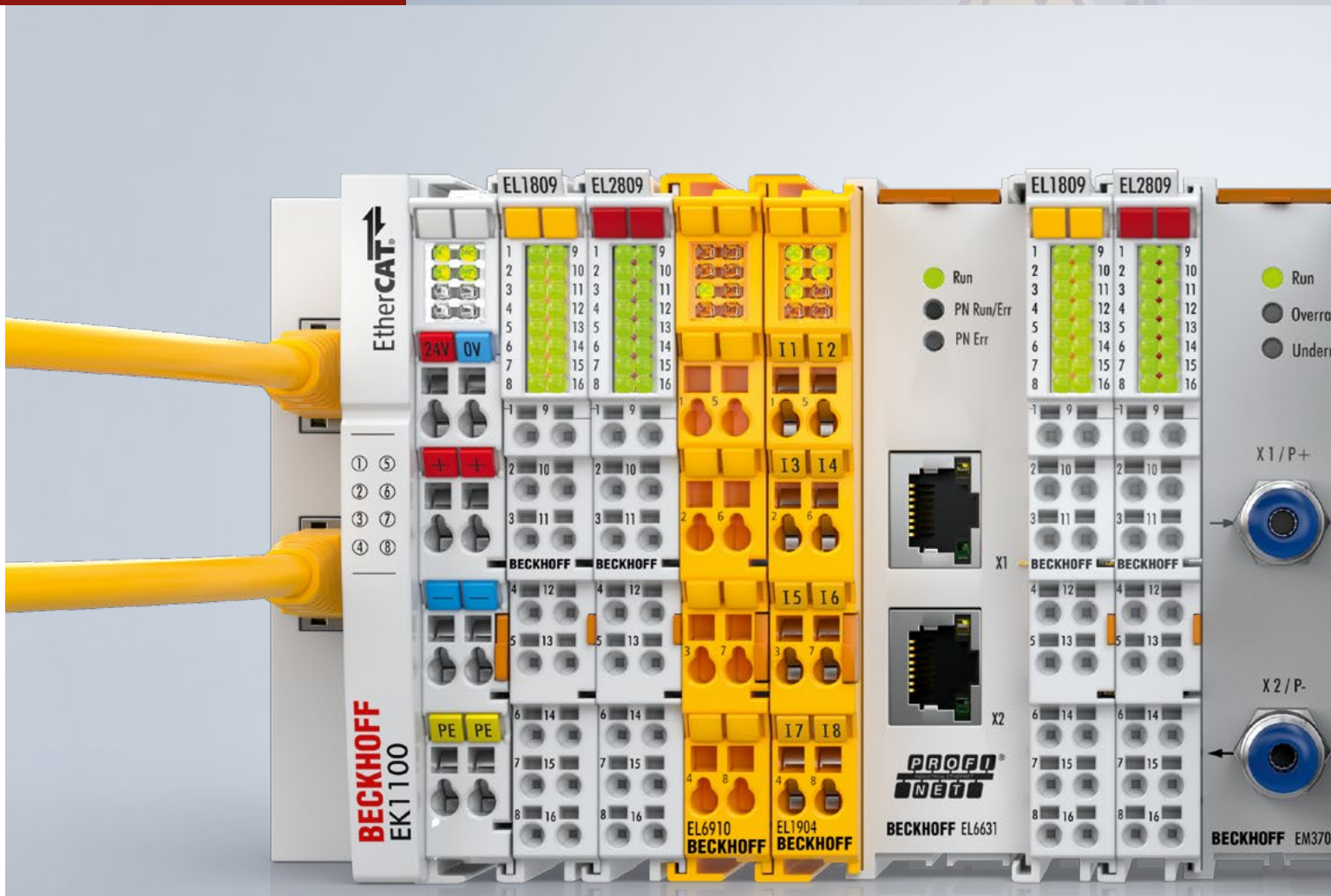
The Beckhoff portfolio comprises many products that are certified for use in Zone 2/22, including various embedded controllers, Control Panels and Panel PCs in the CPX series, as well as most IP20 terminal blocks and IP67 box modules. Beckhoff is continuously expanding its certifications along with its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



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.

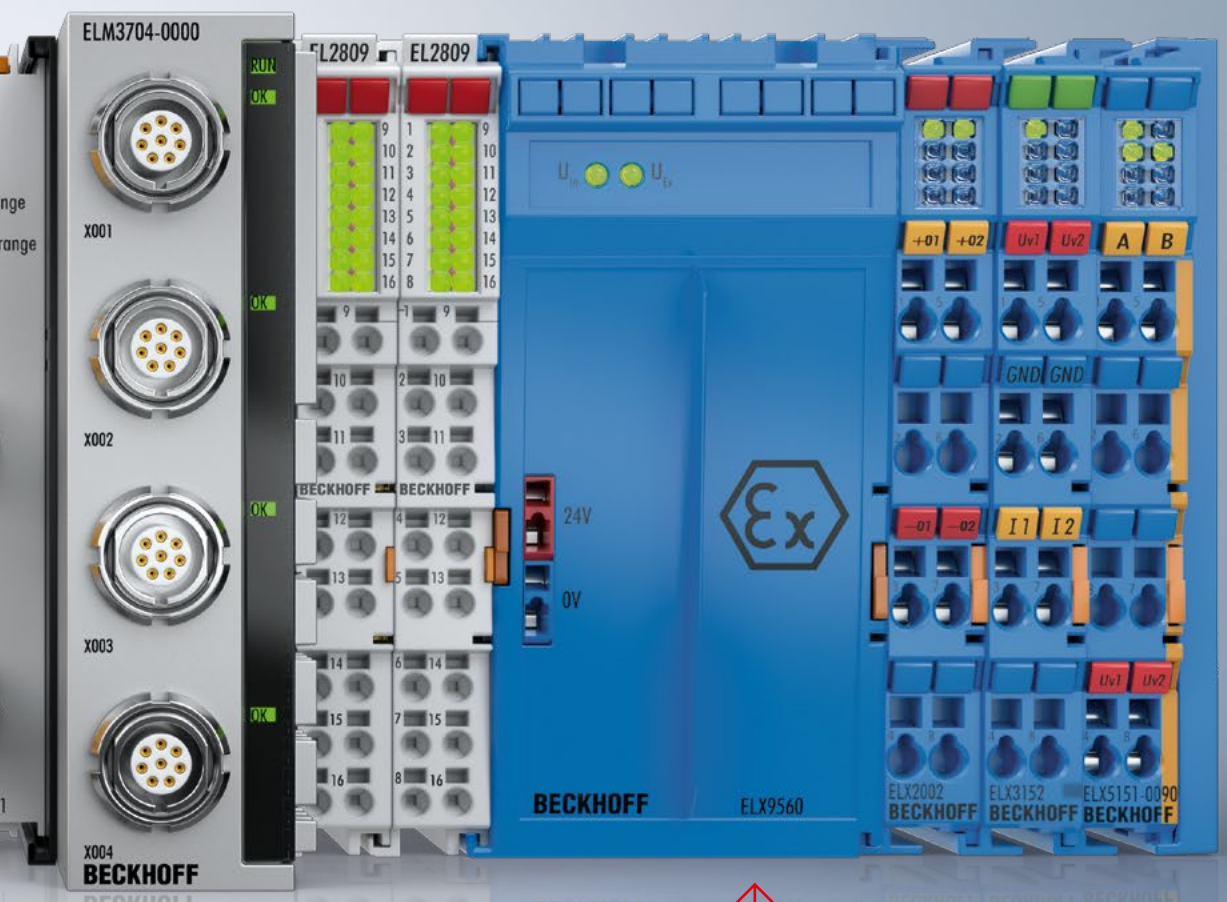


Fieldbus couplers

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

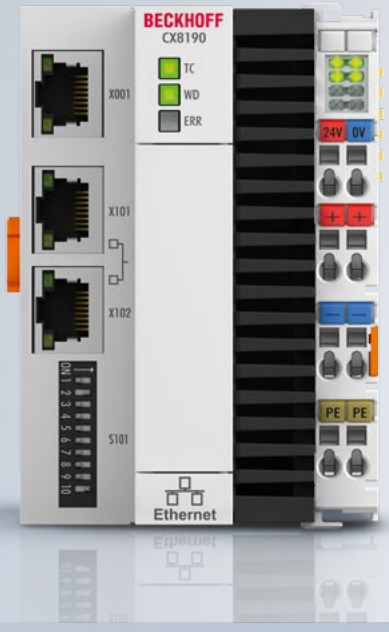
Ideal for explosion protection retrofits
Openness is the underlying principle of each Beckhoff control architecture, which is why Beckhoff components support various communication protocols such as EtherCAT, PROFINET, PROFIBUS, Modbus, EtherNet/IP, and more. Via these standardized interfaces, Beckhoff 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.

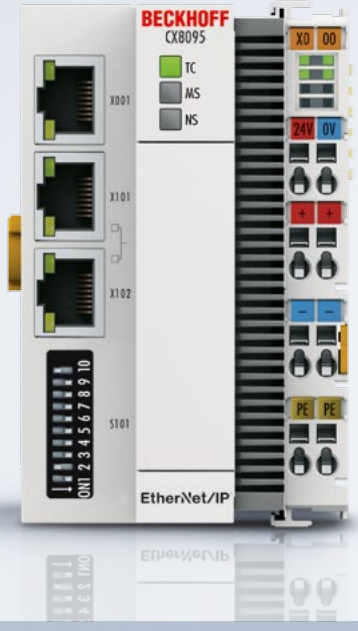
The modular Beckhoff control system supports both versions. Powerful Industrial PCs provide the basis for a central control station from which the

Embedded PCs

Modbus

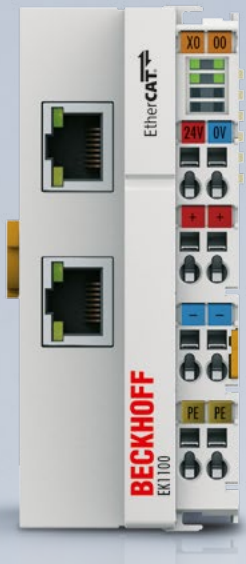


EtherNet/IP™

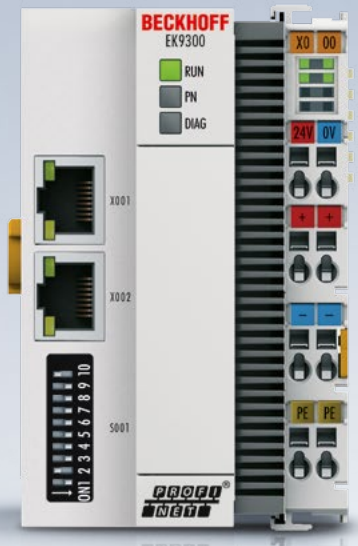


Bus Couplers

EtherCAT®

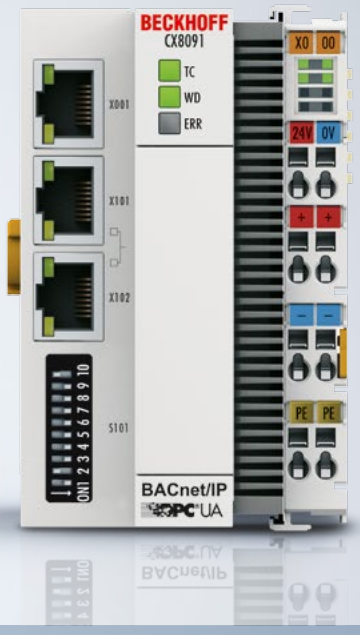


PROFINET®



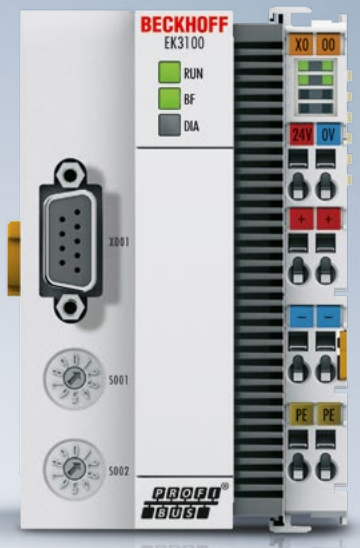
entire system can be managed and monitored. Sensors and actuators are connected via remote I/O that use a fieldbus coupler to transmit data from the field to the control center. With embedded controllers on the other hand, a segment of the system can be controlled locally via an Embedded PC installed 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

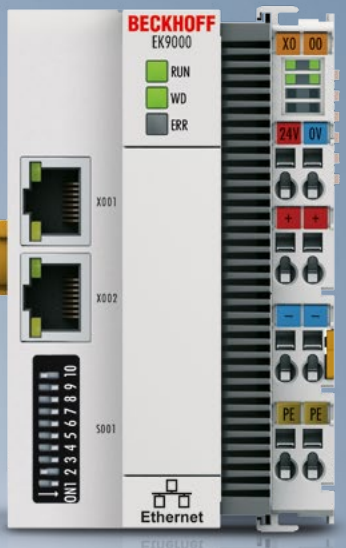


RS232
RS485

PROFIBUS



Modbus



I/O modules for direct connection of field devices from Zone 0/20

The ELX series: Highly compact EtherCAT Terminals featuring intrinsically safe interfaces

Beckhoff's ELX terminals combine highly compact remote I/O modules with safety barriers for the direct connection of intrinsically safe field devices from Zone 0/20 and 1/21. This results in extremely narrow EtherCAT Terminals for the direct connection of intrinsically safe sensors and actuators. With their high resolution and accuracy, ELX terminals guarantee the standard of measurement quality that customers have come to expect from Beckhoff over the years. Another advantage stems from the compact design of the terminals, with up to eight intrinsically safe inputs available in the 12 mm housing. The absence of intermediate external barriers not only makes for a significant reduction in the space needed in the control cabinet, but also offers real cost advantages. With certification according to ATEX, IECEx, and NEC/CEC, as well as other country-specific standards and directives, ELX terminals can be used in virtually all markets worldwide.

The EPX series: Decentralized acquisition of intrinsically safe signals

The EtherCAT Box modules in the EPX series combine intrinsic safety with an IP67 protection rating and are suitable for the implementation of modular and control cabinet-free system concepts in hazardous areas. The robust EPX modules can be mounted directly on the machine or plant and enable the acquisition of intrinsically safe signals up to Zone 0/20. In this way, they offer reliable data acquisition in hazardous areas where control cabinets cannot – and should not – be installed. What's more, their extremely compact modular design offers significant space savings, which in turn serves to cut down on costs. Additional advantages include simple commissioning, the avoidance of installation errors due to incorrect contact assignments, and the reduced cable lengths facilitated by on-site signal acquisition.

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.

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	ATEX	IECEx
NEC certified	Ex	IEC IECEx
North America	Europe	International

DK3932-0822

How can we meet your explosion protection requirements?
Talk to us.

▸ **www.beckhoff.com/ex**

Beckhoff Automation GmbH & Co. KG
Huelshorstweg 20
33415 Verl
Germany
Phone: +49 5246 963-0
info@beckhoff.com
www.beckhoff.com