Caution: Explosive!

Explosion Protection – Made by WAGO

Contents

What Is Explosion Protection?

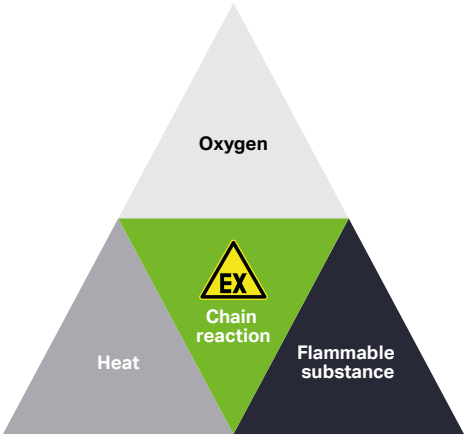
Mine damps – these are what miners once called the mixtures of methane and air that were generated while mining coal.

And mine damps are explosive when mixed in certain ratios. Through the second half of the 19th century, it was common to flare off mine damps – by simply bringing them to an explosion in a controlled manner. Although controlled, it was a life-threatening task for the miners. Fortunately, controlled explosions are no longer required due to several technical achievements and protection regulations. It is no coincidence that explosion protection originated in mining. However, it is now widespread in other industries because explosive mixtures are also present in their processes.

Common examples include the chemical industry, during crude oil or natural gas production and the food industry. Combined with oxygen, these substances create a "dangerous explosive atmosphere."
If ignition, caused by a hot surface or an electrical spark, is applied to these mixtures, it could trigger a self-sustaining chemical chain reaction, fire, or, if the propagation speed is high enough, an explosion. This must be avoided at all costs because such an event can directly harm many people, not to mention the impacts on the environment or production systems.

Therefore, appropriate member states' directives and legislation based on it have now become well-established in Europe: the ATEX directives (ATmosphères EXplosibles).

These include the 1999/92/EC for plant operators and the 2014/34/EC for equipment manufacturers. The most important counterparts to Europe's ATEX on the American market are the corresponding articles on "Hazardous classified locations" (HazLoc) by the NEC and CEC. The EAC Ex or the EAC conformity procedure (Eurasian Conformity) applies to Russia, Kazakhstan and Belarus. Other important conformity assessment procedures include UKCA "Ex Scheme" for the United Kingdom, INMETRO for Brazil, CCC Ex for China and KCs for Korea.



Prerequisites for an explosive atmosphere:

- Flammable substance, flammable gases, dusts or liquids
- Oxidizing agent (e.g., air)
- Ignition source
- Reignition (chemical chain reaction)

Basic Principles of Explosion Protection

As a matter of principle, a differentiation is made between primary, secondary and tertiary explosion protection levels.

The measures of primary explosion protection are aimed at preventing or restricting the generation of explosive atmospheres. Secondary explosion protection measures prevent the ignition of explosive atmospheres, i.e., prevent potential ignition sources.
Tertiary explosion protection measures mitigate the impacts of an explosion, bringing them to near-harmless levels. In a hazard assessment, which each plant operator must perform, the operator must ask if – as part of the primary explosion protection – it is possible to replace potentially explosive material to prevent an explosion in the first place. If this is not possible, then the plant operator must classify the plant depending on the hazard and mark the access.
The zone model, specified in 1999/92/EC, is the most widely used method worldwide.

Measures and Requirements of the EU Directive RL

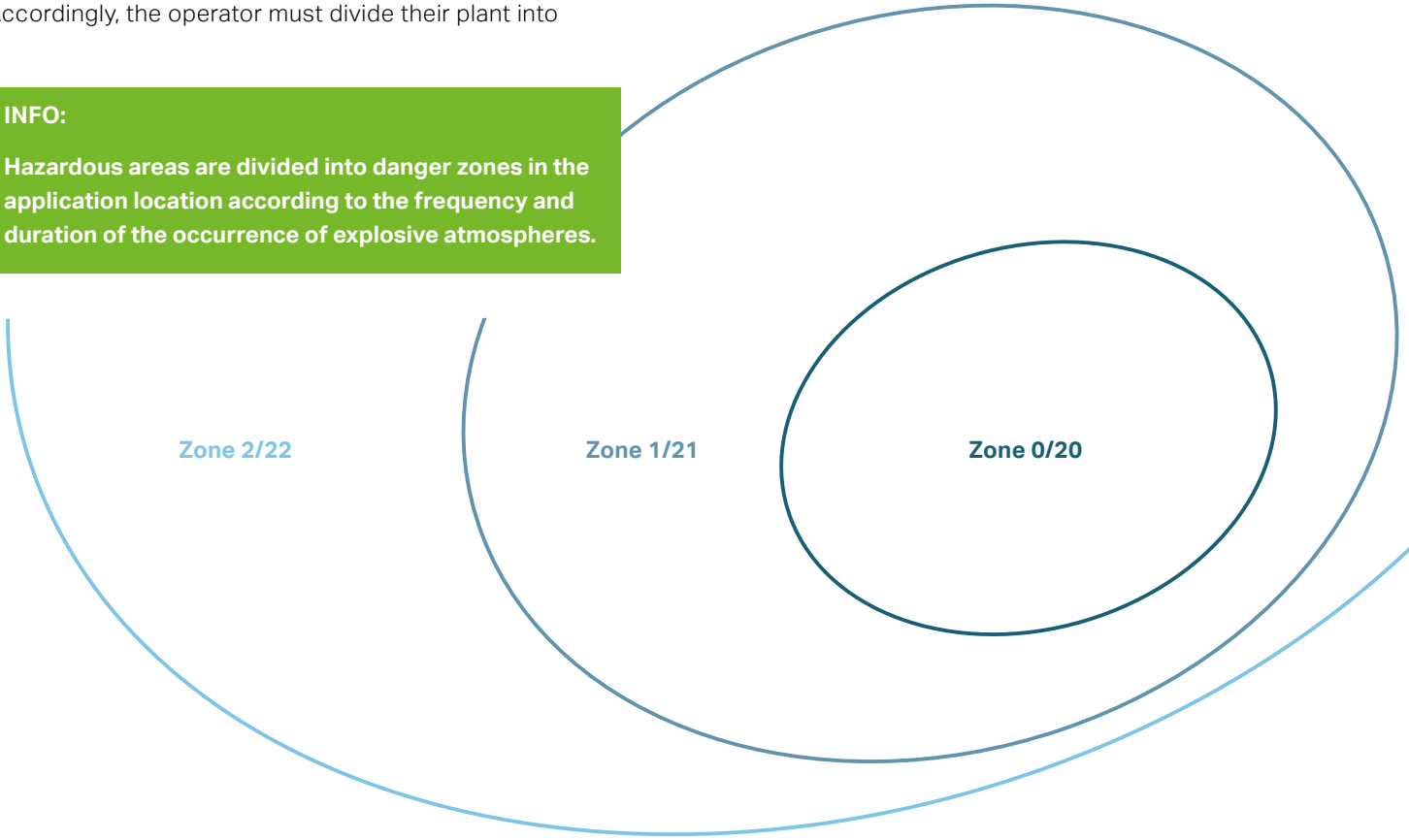
ATEX Product Directive 2014/34 EU	Operating Directive ATEX RL 1999/92/EC
Specifications for proper use: purpose, temperature class, ambient conditions, explosion group and category	Execution of a hazard assessment for tools and systems requiring monitoring (according to ArbSchG, BImSchG, GefStoffV, BetrSichV, StörfallV & technical rules and regulations) **The ATEX Directives 2014/34/EU[2] and 1999/92 are addressed to the EU Member States. These are thus obliged to transpose at least the standards defined in the directive into nationwide law in their national legislation.**
Equipment must comply with the essential safety and health requirements.	Installation setup, commissioning and maintenance instructions according to BetrSichV §§4.7/§12
Execution of risk and ignition source analysis	Specification of zones and selection of appropriate equipment (see, for example, BetrSichV- Appendix 3, DIN EN 60079-10 or example collection BGR 104)
Use the conformity assessment procedure; if necessary, have testing performed by a specified test office.	Adherence to the installation, start-up, and maintenance instructions
CE mark of the product declaration of conformity	Completion of explosion protection document
Regular updating	Regular updating

Ex Zones

The zone model classifies plant areas into Zones 0, 1 and 2 for gas atmospheres, 20, 21 and 22 for dusty atmospheres, and M1 and M2 for mines at risk of firedamp (mining), depending on their hazard. As part of risk analysis, the plant operator must assess how often and for how long explosive atmospheres can occur in different areas of a plant.
Accordingly, the operator must divide their plant into these zones. In this case, Zone 0 or Zone 20 are the most dangerous (see "Zone Classification" table).
Example: The zone classification for a tank filled with liquid crude oil and a pressure switch could appear as shown in our figure on the right.

INFO:

Hazardous areas are divided into danger zones in the application location according to the frequency and duration of the occurrence of explosive atmospheres.



Zone Classification (60079-10, a. o.)

Zone 0
Area in which an explosive atmosphere is **permanently or frequently** present for an extended period of time as a mixture of air and flammable substances in the form of gas, vapor or mist

Zone 1
Area in which an explosive atmosphere as a mixture of flammable substances in the form of gas, vapor or mist with air can be expected to **occur occasionally during normal operation**

Zone 2
Area in which **it is not anticipated during normal operation** that an explosive atmosphere will occur as a mixture of flammable substances in the form of gas, vapor or mist with air **and, if one occurs, then only temporarily**

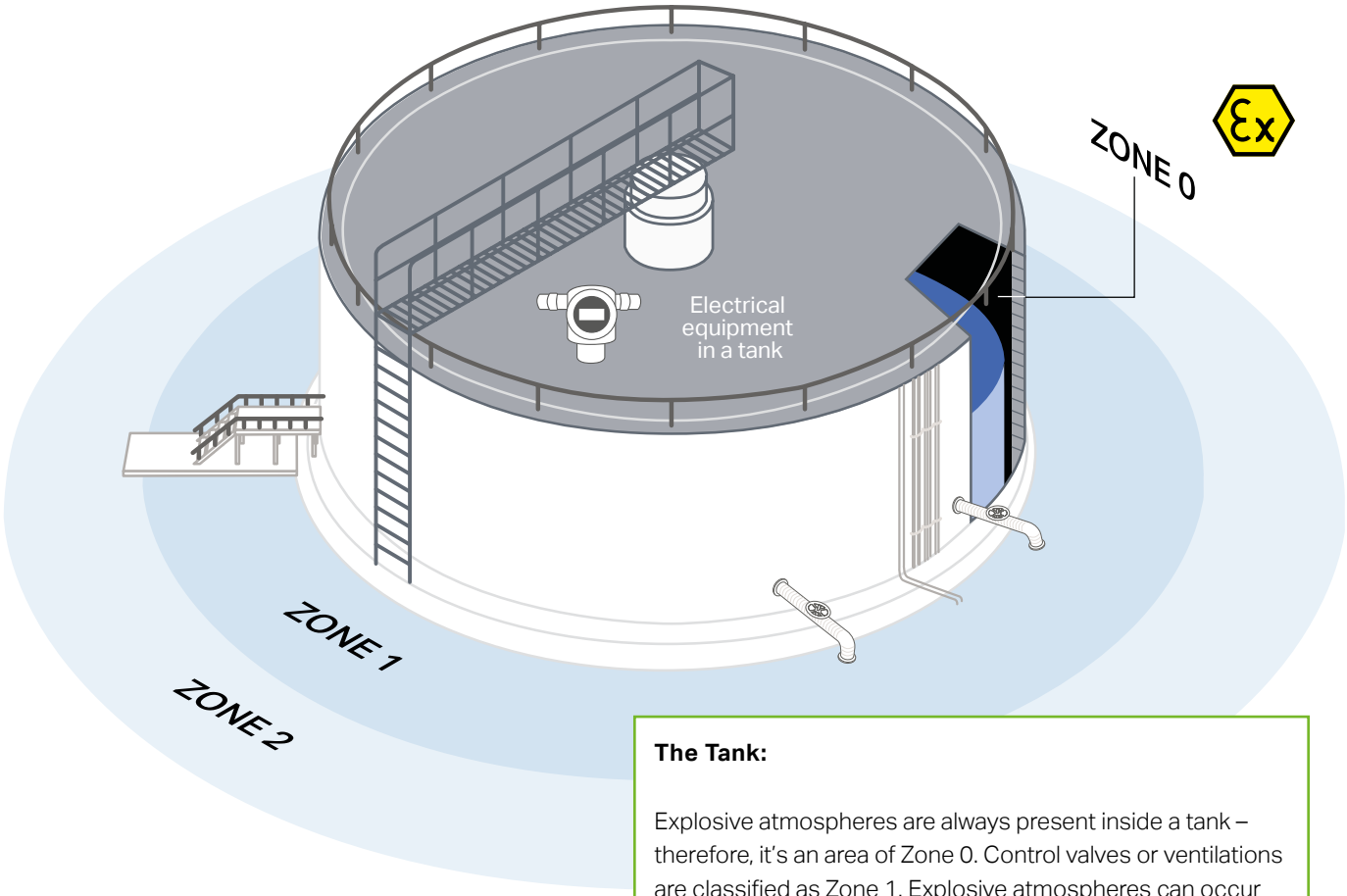
Zone 20
Area in which an explosive atmosphere in the form of a cloud of flammable dust is present **continuously, for long periods or frequently**

Zone 21
Area in which an explosive atmosphere in the form of a cloud of flammable dust can be expected to **occur occasionally during normal operation**

Zone 22
Area in which **it is not anticipated during normal operation** that an explosive atmosphere will occur in the form of a cloud of flammable dust in air and, **if one occurs, then only temporarily**

Use in Hazardous Locations

Equipment Categories and Types of Ignition Protection



The Tank:

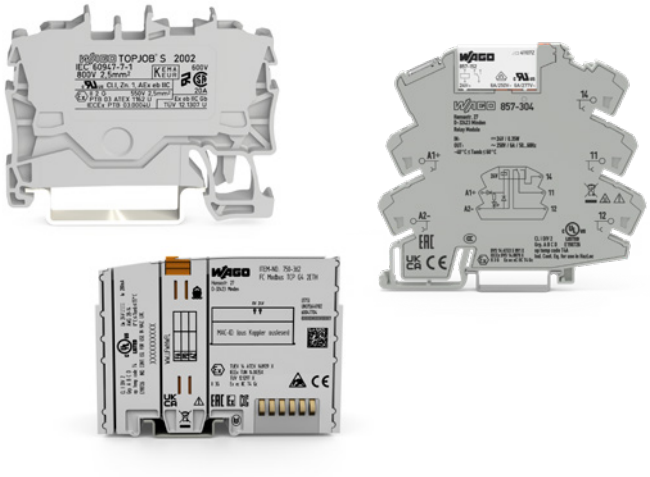
Explosive atmospheres are always present inside a tank – therefore, it's an area of Zone 0. Control valves or ventilations are classified as Zone 1. Explosive atmospheres can occur here during normal operation. This does not normally occur in Zone 2; if it does, then it's only momentarily.

Device Selection

All devices for potentially explosive atmospheres must have undergone a conformity assessment process. Depending on the safety level, a notified body must be involved in the assessment. The device identification must be implemented and applied.

This identification mark includes the required information for usage in explosive areas.
It provides information about equipment group, category, type of protection, group of explosive substances, temperature class and the equipment protection level indicator EPL.

Marking Examples:



Marking Examples:

Several options exist to prevent an explosion. These were carefully developed during the last decades and are considered in the respective standards.
Different types of protection were defined for electrical equipment. However, certain types of protection are not appropriate for all zones. The Ex nC type of protection (sealed, hermetically sealed devices, non-ignitable components), for example, may only be used in Zone 2. The Ex i type of protection (intrinsic safety), in contrast, is approved for equipment up to Zone 0/20. We are selecting intrinsic safety for our example. It is one of the most favored and widely used protection types.

Protection Type for Electrical Equipment Used in Gas Hazardous Areas

Protection Type					
Protection Type for Electrical Equipment		**Zone**	**Protection Principle**	**Standards**	**Application Examples**
Pressure-tight encapsulation	da db dc	0,1,2 1,2 2	Protection by pressure-resistant housing	EN/IEC/UL 60079-1	Switch and command systems, heating equipment, lights and motors
Pressure encapsulation	pxb pyb pzc	1,2/21,22 1,2/21,22 2/22	Protection through shielding gas within a housing (under preload pressure)	EN/IEC/UL 60079-2	Switching, control and analysis devices
Sand encapsulation	q	1,2	Protection through surrounding filler	EN/IEC/UL 60079-5	Transformers, relays, safety fuses, switches
Oil encapsulation	ob, oc	1,2	Protection through surrounding fluid	EN/IEC/UL 60079-6	Transformers, starting resistors, switching devices
Increased safety	eb ec	1,2 2	Protection through prevention of high temperatures, sparks and electric arcs	EN/IEC/UL 60079-7	Junction and connection boxes, housings, terminal blocks, electrical devices, measuring and control technology, sensors, actuators
Intrinsic safety	ia ib ic	0,1,2/20,21,22 1,2/21,22 2/22	Protection through energy limitation, preventing the effect of an ignition source	EN/IEC/UL 60079-11	Measuring and control technology, sensors, actuators
Intrinsically safe systems				EN/IEC/UL 60079-25	
Intrinsically safe fieldbus systems (FISCO) and non-sparking fieldbus systems (FISCO)		0,1,2		EN/IEC 60079-27	
Sparking equipment	nC	2	Protection by enclosed, sealed, hermetically sealed housings, equipment	EN/IEC/UL 60079-15	Electrical devices for Zone 2
Vapor-proof equipment	nR	2	Protection through vapor-proof housing		
Cast encapsulation	ma mb mc	0,1,2/20,21,22 1,2/21,22 2/22	Protection through surrounding cast mass	EN/IEC/UL 60079-18	Relays, sensors, solenoid valves
Optical radiation	op is op pr op sh	0,1,2 / 20,21,22 1,2 / 21,22 2 / 22	Protection through limitation/ prevention of optical radiation energy transfer	EN/IEC/UL 60079-28	Optoelectronic devices
Protection by enclosure	ta tb tc	20,21,22 21,22 22	Protection through exclusion of explosive atmosphere	EN/IEC/UL 60079-31	Terminal and junction boxes, motors, switching devices and switchgear units, lights

Explosion Protection – Made by WAGO

Product Portfolio

WAGO I/O System 750

Whether offshore or onshore, above or below ground, in the refinery or producing pharmaceuticals and food – WAGO offers a universal system for your individual explosion-proof applications.

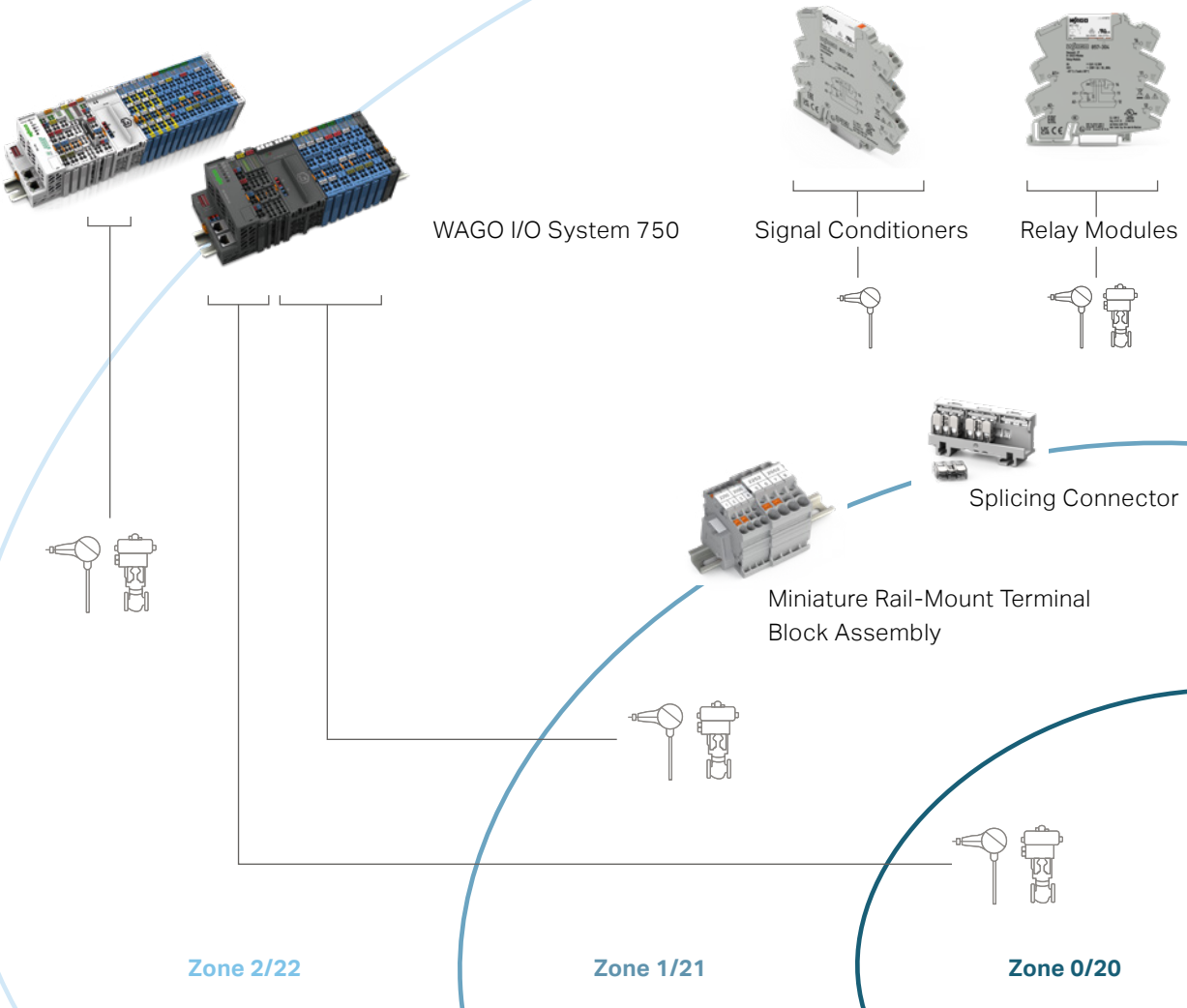
- Approved for use in Zone 2/22 hazardous areas for integration of intrinsically safe signals from the field up to Zone 0/20 and M1, M2
- Comprehensive certification, including ATEX, IECEx, ANSI/ISA, INMETRO etc., ensures worldwide use
- Intrinsically safe inputs with functional safety
- Rated up to SIL 3, Cat. 4/PL e PROFIsafe

Relays and Signal Conditioners, 857/859 Series

Our relay modules and signal conditioners can be used in locations subject to gas explosions. They are just 6 mm wide, making them ideal for galvanic isolation of digital and analog signals.

- Simple configuration via easy-to-use DIP switches and software
- Vibration-proof connection technology – jumpers with Push-in CAGE CLAMP® connection minimize wiring.

* The exact custom installation conditions can be found in the product documentation.



TOPJOB® S and POWER CAGE CLAMP

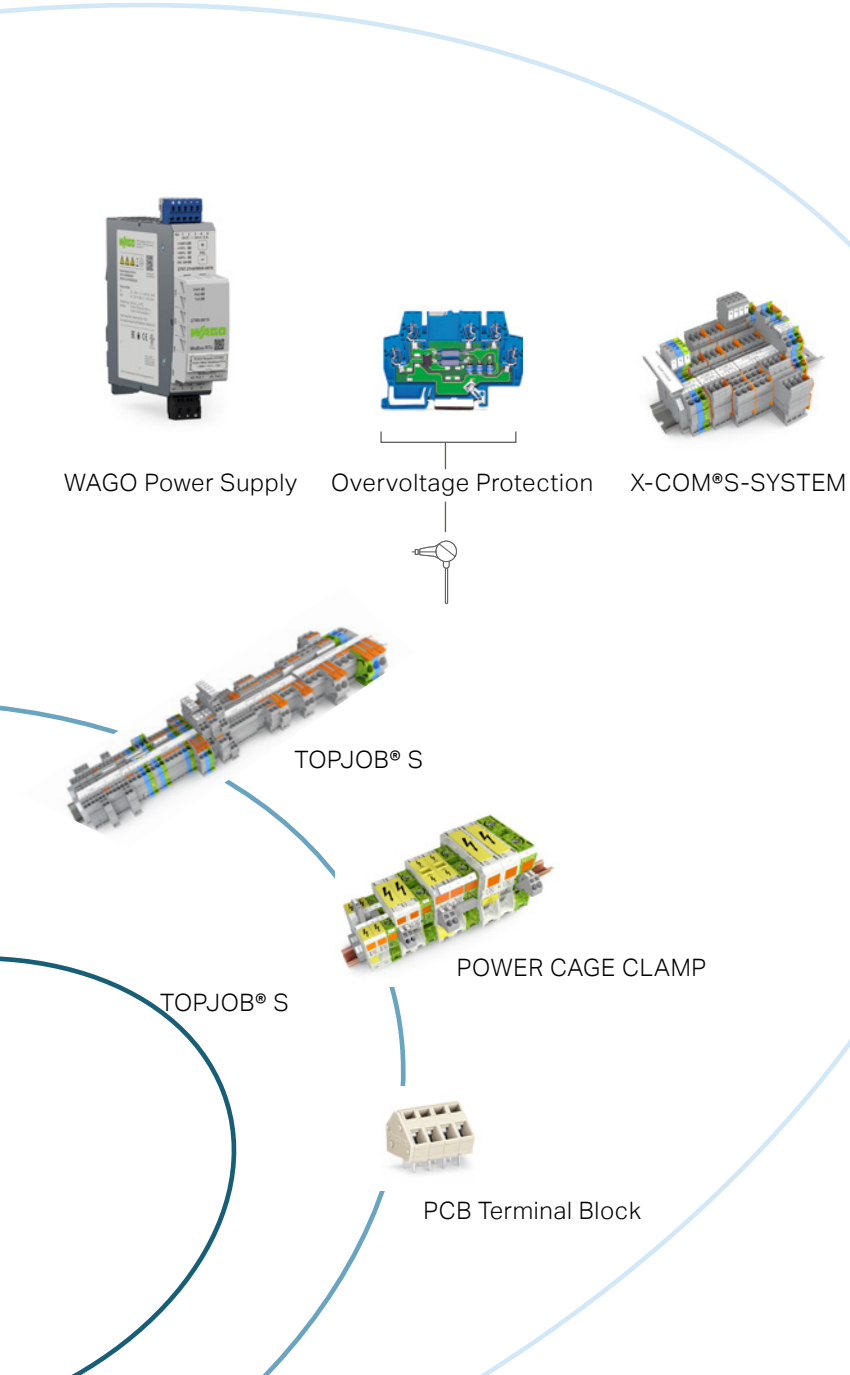
Process engineering systems, such as pumps, compressors or drives are prone to both high- and low-frequency vibrations. Electrical connections are also often subjected to strong ambient temperature fluctuations. High contact resistance due to copper cold flow? Rely on WAGO's vibration-proof and maintenance-free, rail-mount terminal blocks.

- Reliable connections from 0.14 to 185 mm² (24 AWG–350 kcmil)
- Maintenance-free due to spring-loaded connection technology
- Ex eb I/II approval

X-COM®S-SYSTEM

Modularize systems and improve system uptime via fast and flexible maintenance solutions. This is made possible using the world's first pluggable rail-mount terminal block system with Ex area approval.

- Pluggable with all the advantages of our rail-mount terminal blocks
- Locking lever provides additional protection to prevent accidental disconnection
- Ex ec approval for use in Zone 2/22



PCB Terminal Blocks

Reliably connect to your printed circuit board in explosion-prone areas: WAGO PCB terminal blocks are specially designed for use in such areas. You are on the safe side with the 236, 255, 256, 257 and 745 Series.

- Conductor range: 0.08 … 16 mm²
- Ex e II approval
- CAGE CLAMP® connection

WAGO I/O System 750

Fieldbus-Independent I/O for Hazardous Areas

The modules within the WAGO I/O System 750 are designed for use in both non-hazardous and hazardous areas.
The direct use of fieldbus technology in hazardous areas places unique demands on the systems. When used in Zone 2/22 hazardous areas, the WAGO I/O System 750 offers safe, easy and economical connection to the sensors/actuators of Zones 0/20 and 1/21.
The "blue" Ex i I/O modules were specially developed for this purpose. They form an intrinsically safe segment that can be integrated into a standard fieldbus node, offering all the advantages of state-of-the-art fieldbus technology.

The WAGO I/O System 750 is approved for use in:

- Mining
- Explosive gas environments
- Explosive dust environments
- Onshore/offshore environments (gas tankers, oil/gas fields, etc.)

Worldwide Approvals

- International approvals for process engineering and the marine industry (e.g., ATEX, IECEx, UL OrdLoc, UL HazLoc, Inmetro, CCC Ex, EAC Ex, KCs, UKEx, DNV) guarantee worldwide use – even under harsh operating conditions.

Maximum Fieldbus Independence

- Modular design supported by numerous fieldbus systems and ETHERNET standards
- Fieldbus couplers, controllers and communication modules for greatly varying protocols, depending on application
- Fine modularity
- Large variety of components

Maximum Flexibility

- Bus supply modules permit different voltages within the same node
- Standard I/O modules can be combined with intrinsically safe Ex modules in one node

Numerous Specialty Functions

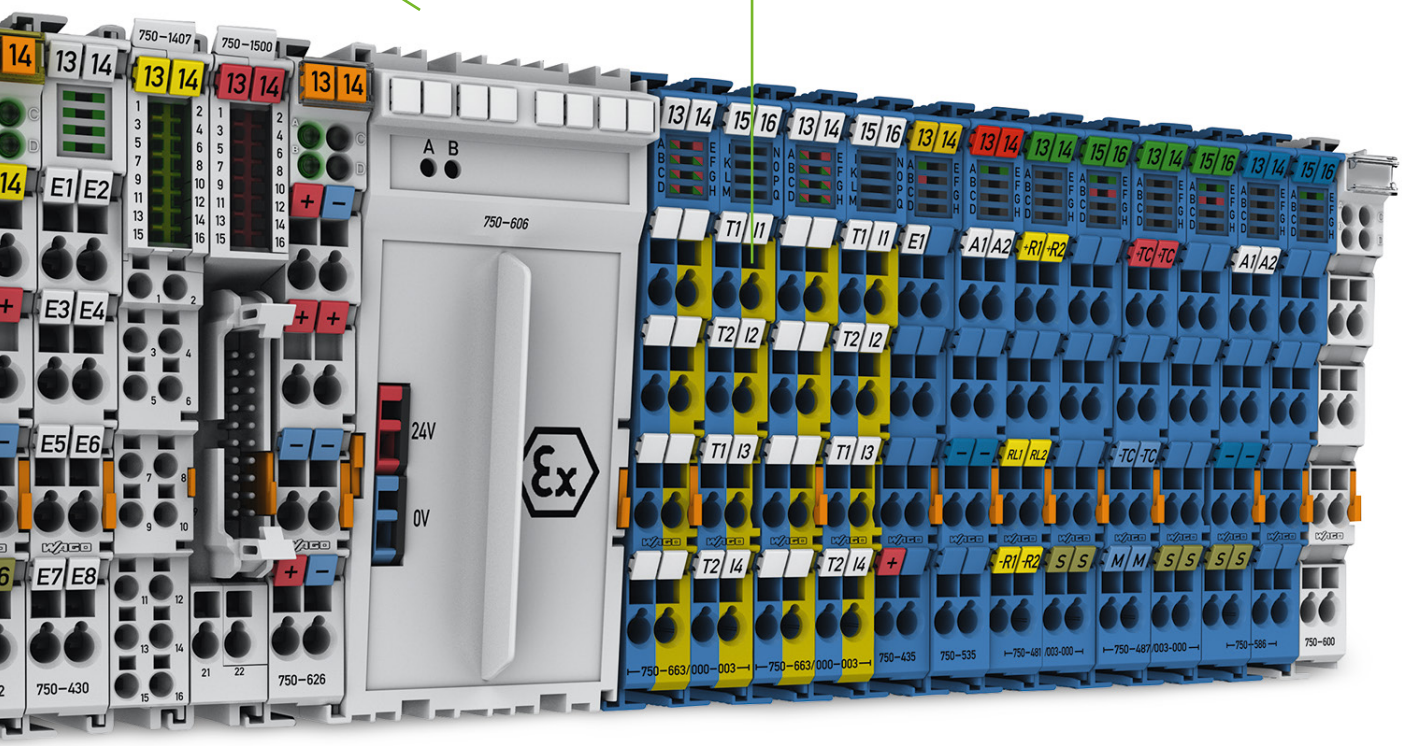
- Analog functions (RTD, TC, AC/DC), NAMUR
- HART protocol support
- Extensive diagnostic features (e.g., short circuits, discontinuity and out-of-measurement range)

Compact Solution

- The extremely compact I/O nodes make the system a perfect fit in the most compact spaces
- Space-saving design with functional safety and explosion protection combined in one module

Maximum Ruggedness and Reliability

- The WAGO I/O System 750 is also engineered and tested for use in the most demanding environments in accordance with the highest standards, e.g., those required in marine applications
- Continuous operation guaranteed thanks to Push-in CAGE-CLAMP® spring-loaded contacts



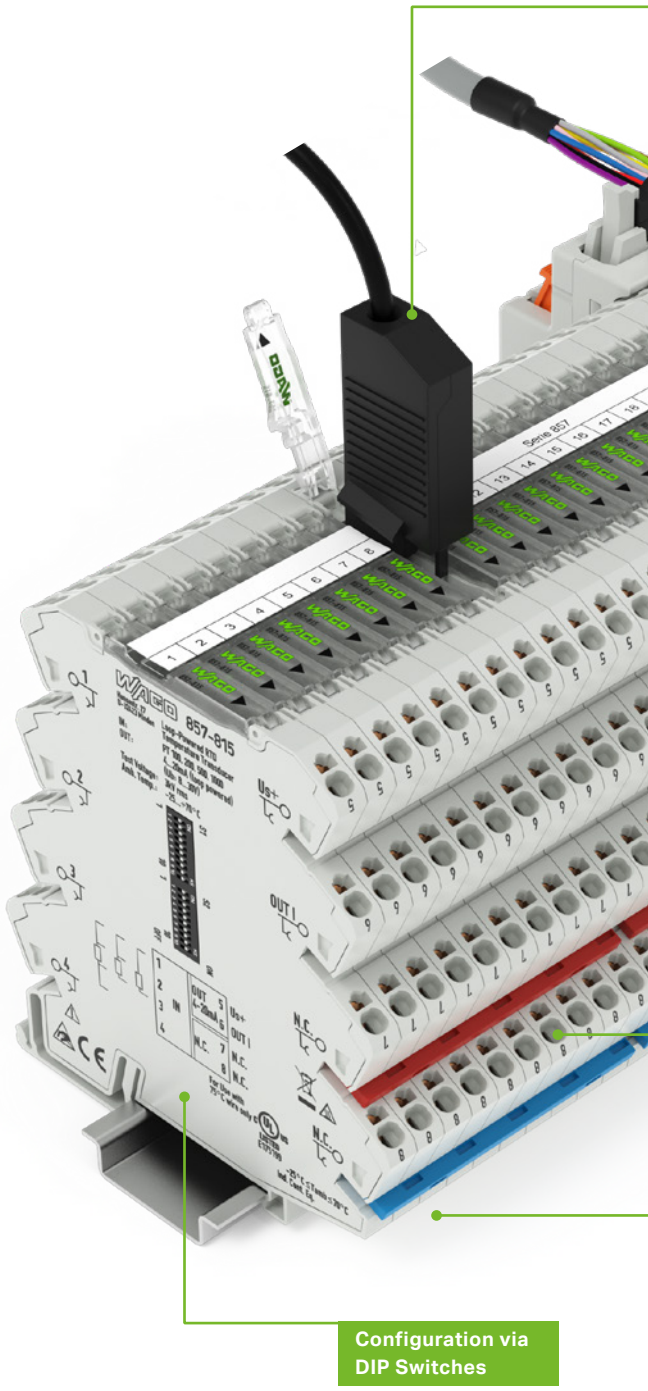
Signal Conditioners

The Right Signal is Crucial!

The signal conditioners have a logical housing concept with cross-product commoning options on each clamping point, eight Push-in CAGE CLAMP® connections and a width of just 6.0 mm. These features create the basis for a successful solution. Additional benefits include “safe isolation,” extended operating temperature range and calibrated, configurable signals. Combined with excellent technical specifications, these features lead to a line of advanced signal conditioning solutions that maximize panel space while reducing signal wiring and downtime.

Push-in termination saves time!

Terminate both solid conductors and fine-stranded conductors with ferrules by simply pushing them in – no operating tool needed.



Push-in CAGE CLAMP®

Vibration-Proof – Fast – Maintenance-Free
Push-in CAGE CLAMP® termination for all conductor types

Configuration via PC Software

- Simulation of input and output parameters (2857 Series)
- Automatic module detection
- Configuration and visualization of process values
- Parameterization of the digital switch output

The Industry's Most Compact

- "True" 6 mm width maximizes panel space

Commoning, Not Discrete Wiring

- Same profile allows use of a single in-line, push-in jumper

Configuration via Push/ Slide Switch

For Extreme Temperatures

- Extended temperature range of −25 °C to +70 °C to support more applications

Requirements for Safe and Economical Signal Matching:

Solution		Requirement
Disconnecting		Potential differences Ground loops
Amplifying/ Processing		High loads Long cable runs
Filtering		Interferences
Converting		Various signals PT, TC, KTY, Ni → Analog

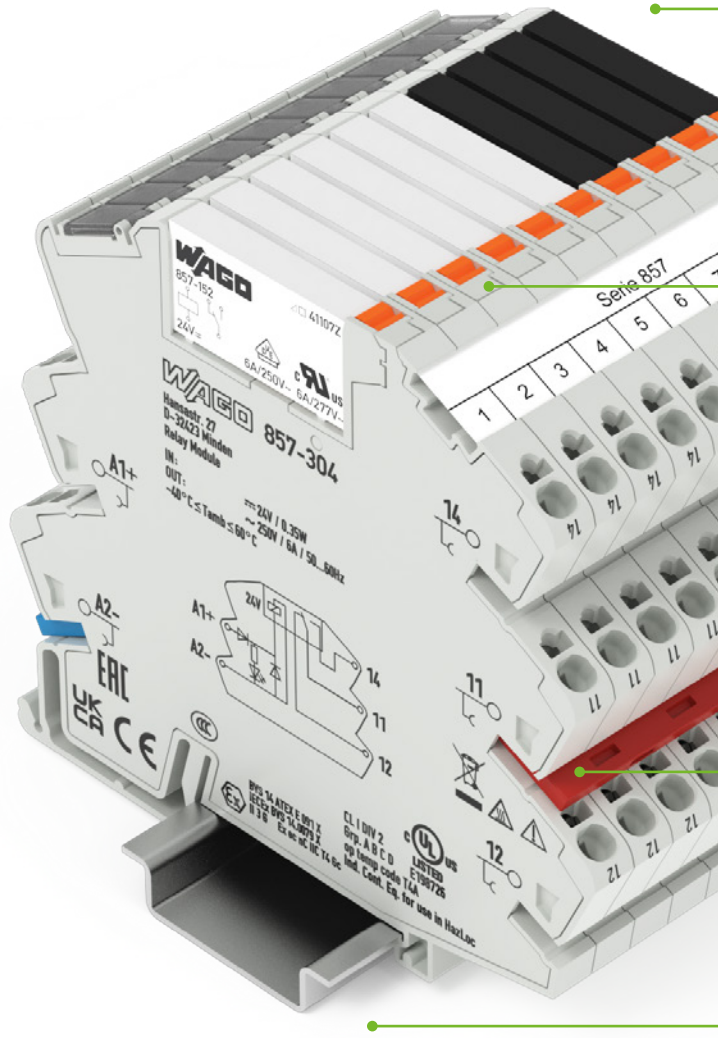
Relay/SSR Modules

Conveniently Interface Electronics and Field Devices

In modern automation systems, electromechanical relays safely connect process peripherals with electronic control, alarm and monitoring systems.

For example, relay modules perform a variety of tasks:

- Electrical isolation with high isolation levels between input and output circuits
- Adjust different signal levels
- Signal amplification and/or signal multiplication in presence of simultaneously varying potentials



PUSH-IN CAGE CLAMP®

Vibration-Proof – Fast – Maintenance-Free

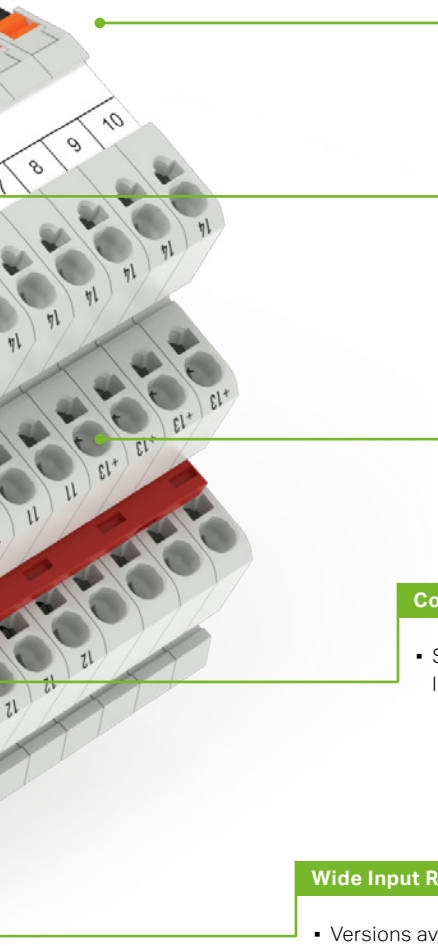
Push-in CAGE CLAMP® termination for all conductor types

For Extreme Temperatures

- Extended temperature range from −20°C to +60°C to support more applications

Flexible Loads

- Switchable loads from 1 mA to 6 A



The Industry's Most Compact

- "True" 6.0 mm (0.23 inch) width maximizes panel space

Quick Commissioning

- Simple connection of conductors ranging from 0.34 to 2.5 mm²
- Push-in termination of fine-stranded conductors with ferrules

Commoning, Not Discrete Wiring

- Same profile allows use of a single in-line, push-in jumper

Wide Input Range

- Versions available with input voltage of 12 to 230 V AC/DC

Your Benefits:

- Easy to operate and maintain
- Switchable loads from 1 mA to 16 A
- Industry proven
- Push-in CAGE CLAMP® connection for simple conductor termination
- Suitable for use in Zone 2

WAGO Power Supplies

For Ex Areas

Where electrical power is required in the hazardous area of machinery or equipment, special requirements apply to the power supply. With strong expertise in the field of power supply, WAGO offers solutions for a wide range of requirements. What they all have in common is reliability and durability, as well as compliance with the latest standards.

For North America, WAGO offers Eco and Pro 2 Series Power Supplies, including communication modules, redundancy modules and DC/DC converters, which are suitable for use in hazardous locations. Tested to UL 121201 Class I Div 2 standard, these devices allow use in areas where explosive gaseous materials such as acetylene, hydrogen, ethylene, propane or methane are present (Groups A,B C,D).

DC/DC Converter

- 859-801

Eco Power Supply

- 787-712

Redundancy Module

- 787-783/000-040

WAGO also offers Eco Series Power Supplies, redundancy modules and DC/DC converters for the European ATEX Directive and the worldwide IEC Ex regulations, with approval according to ATEX or IEC Ex, Zone 2 IIC.

Thanks to efficiency of up to 96%, the Pro 2 Power Supplies with approval for hazardous locations offer the lowest power dissipation, the longest service life and, thanks to plug-in communication modules, monitoring and parameterization of devices that are otherwise difficult to access, e.g., via IO-Link, Modbus RTU, Modbus TCP, EtherNet/IP™ web server. This ensures reliable operation for years to come.

Pro 2 Power Supply

- with protective coating

Communication Module

- suitable for the Pro 2 Power Supply

An extract of the available power supplies, redundancy modules and DC/DC converters is shown in the table below. Other devices upon request !

Item	Description	UL HazLoc	ATEX	IEC Ex	InMetro	CCC Ex	EAC Ex
787-712	Power Supplies Eco, 1-ph., DC 24 V, 2.5 A	Cl.I, Div. 2, Gr. A,B,C and D, Temp.Code T4A	II3G Ex ec IIC T4 Gc	II3G Ex ec IIC T4 Gc	II3G Ex ec IIC T4 Gc	Ex na IIC T4 Gc	-
787-722	Power Supplies Eco, 1-ph., DC 24 V, 5 A	Cl.I, Div. 2, Gr. A,B,C and D, Temp.Code T4	II3G Ex ec IIC T4 Gc	II3G Ex ec IIC T4 Gc	II3G Ex ec IIC T4 Gc	Ex nA nC IIC T4 Gc	-
787-732	Power Supplies Eco, 1-ph., DC 24 V, 10 A	Cl.I, Div. 2, Gr. A,B,C and D, Temp.Code T3C	II3G Ex ec IIC T3 Gc	II3G Ex ec IIC T3 Gc	II3G Ex ec IIC T3Gc	Ex nA nC IIC T3 Gc	-
787-783/ 000-040	Redundanzmodul 2 x DC 24 V, 12.5 A	Cl.I, Div. 2, Gr. A,B,C and D, Temp.Code T4	II 3 G Ex ec IIC T4 Gc	II 3 G Ex ec IIC T4 Gc	-	Ex nA IIC T4 Gc	**2Ex e IIC T4 Gc X**
787-785/ 000-040	Redundancy Module 2 x DC 24 V, 40 A	Cl.I, Div. 2, Gr. A,B,C and D, Temp.Code T4	II 3 G Ex ec IIC T4 Gc	II 3 G Ex ec IIC T4 Gc	-	Ex nA IIC T4 Gc	**2Ex e IIC T4 Gc X**
2787-2xxx/ xxxx-xxxx	Power Supplies Pro 2, 1- or 3-ph., DC 12 V /24 V / 48 V, 5 A to 40 A	Cl.I, Div. 2, Gr. A,B,C and D, Temp.Code T4	-	-	-	-	-
859-801	DC/DC Converter DC 24 V / 5 V, 0.4 A	Cl.I, Div. 2, Gr. A,B,C and D, Temp.Code T4	II 3 G Ex nA IIC T4 Gc	-	-	Ex nA IIC T4 Gc	

TOPJOB® S – Rail-Mount Terminal Blocks

With Push-in CAGE CLAMP® Reliability

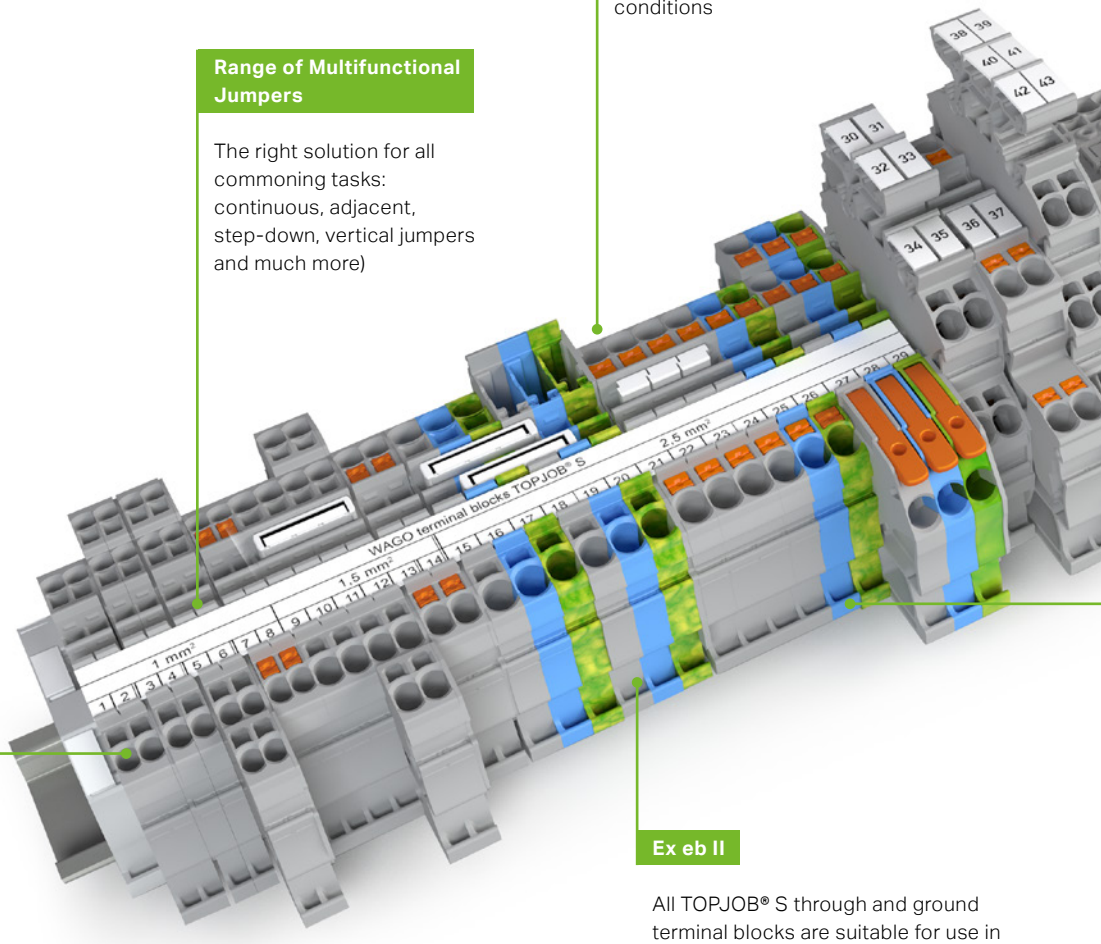
In various industrial applications and modern building installations, rail-mount terminal blocks must, above all, provide safe electrical connections.
WAGO's TOPJOB® S Rail-Mount Terminal Block System with three different actuation variants (lever, push-button and operating slot) is suitable for all through and ground terminal blocks for Ex eb I/II applications.
Therefore, it provides the most reliable connection for extreme environments, such as those with gas or dust, such as mining.
The TOPJOB® S through terminal blocks with blue insulated housings are also suitable in Ex i areas. And of course, all the time-saving features and industry-leading performance of TOPJOB® S are backed by the renowned reliability of Push-in CAGE CLAMP®, a universal connection for all conductor types, whether or not they require preparation. For example, solid and fine-stranded conductors with ferrules are terminated by simply pushing them into the unit.
WAGO's TOPJOB® S rail-mount terminal blocks provide a multi-functional line of jumpers for all types of jumper connections. Additionally, the line is compatible with the fastest marking system to not only help lower costs, but also provide additional safety and reliability through inherently clear control cabinet labeling that helps prevent wiring errors.

Industry-Leading Safety Reserves

Functional safety for electrical connections – even under harsh operating conditions

Range of Multifunctional Jumpers

The right solution for all commoning tasks: continuous, adjacent, step-down, vertical jumpers and much more)

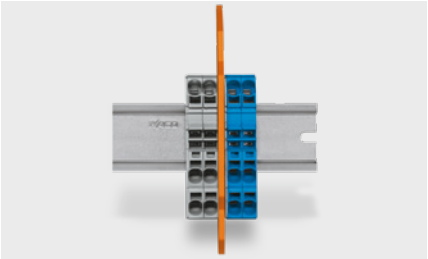


For All Conductor Types

The universal connection system for all conductor types offers the additional advantage of directly inserting solid and ferruled fine-stranded conductors.

Ex eb II

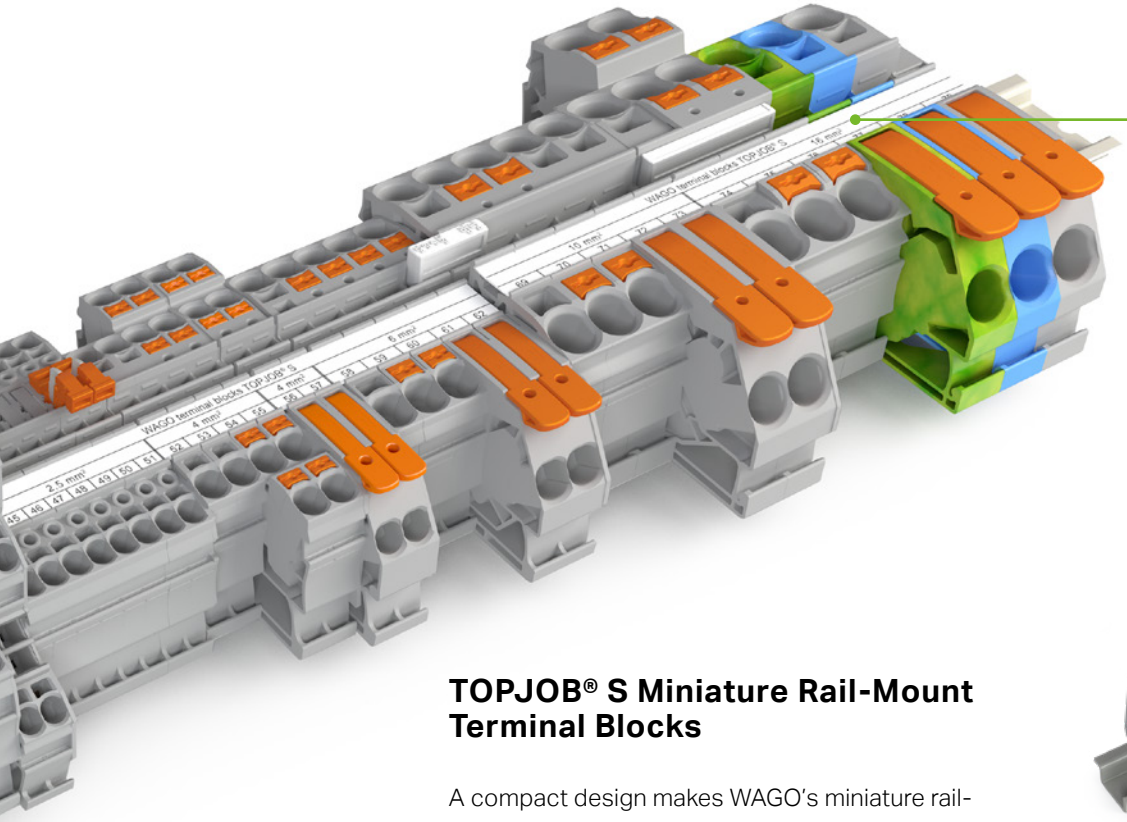
All TOPJOB® S through and ground terminal blocks are suitable for use in Ex eb II areas.

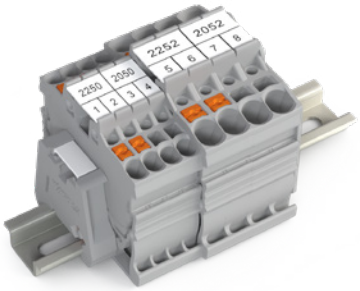


TOPJOB® S through and ground terminal blocks are all certified for use in hazardous areas. When Ex e and Ex i circuits are combined, a space-efficient separator plate can maintain the “safety” gap of 50 mm.

Fastest Marking System

The continuous marking strip saves time and money when marking.





TOPJOB® S Miniature Rail-Mount Terminal Blocks

A compact design makes WAGO’s miniature rail-mount terminal blocks ideal for work in tight spaces. Three mounting and two actuation variants are also available for maximum flexibility so that you can choose your miniature rail-mount terminal blocks based on use and convenience. The well-known TOPJOB® S rail-mount terminal block accessories, such as the multiline printable marking strip and the jumper system, can be used for the miniature rail-mount terminal blocks. Thanks to spring pressure connection technology, they are also suitable for vibration-proof connections and can be used in junction boxes of three-phase motors, for example.
The entire portfolio of TOPJOB® S mini rail-mount terminal blocks is also suitable for Ex e II applications and thus offers increased safety, even in potentially explosive environments. In addition, the terminal blocks with blue housings are suitable for Ex i applications.

Ex i

TOPJOB® S through terminal blocks with blue insulated housings are suitable for use in Ex i areas.

Your Benefits:

- 3 mounting options: for DIN-15 rail, mounting plate with a snap-in mounting foot or a flange
- Same accessories as the range of TOPJOB® S rail-mount terminal blocks
- Entire portfolio is suitable for Ex e II applications
- Terminal blocks with a blue housing are suitable for Ex i applications

X-COM®S-System – Pluggable Rail-Mount Terminal Blocks

2022 Series

The pluggable rail-mount terminal system enables faster commissioning thanks to tested pre-assembled connections in Ex ec areas. It is the first system providing the "ec" protection type that can be used in hazardous areas. Complete modules can be easily and quickly exchanged, meaning expensive on-site installations are no longer necessary – a cost-saving and maintenance-friendly alternative.

The certified X-COM®S-SYSTEM products can be recognized by the extended item number "…/0999-0953." With a maximum nominal cross-section of 2.5 mm²/14 AWG (maximum 4 mm²/AWG 12), they are designed for a nominal current of 20 A.
Shorter locking levers (factory-mounted) make accidental disconnection more difficult, while providing additional safety.

Prevent Mismating

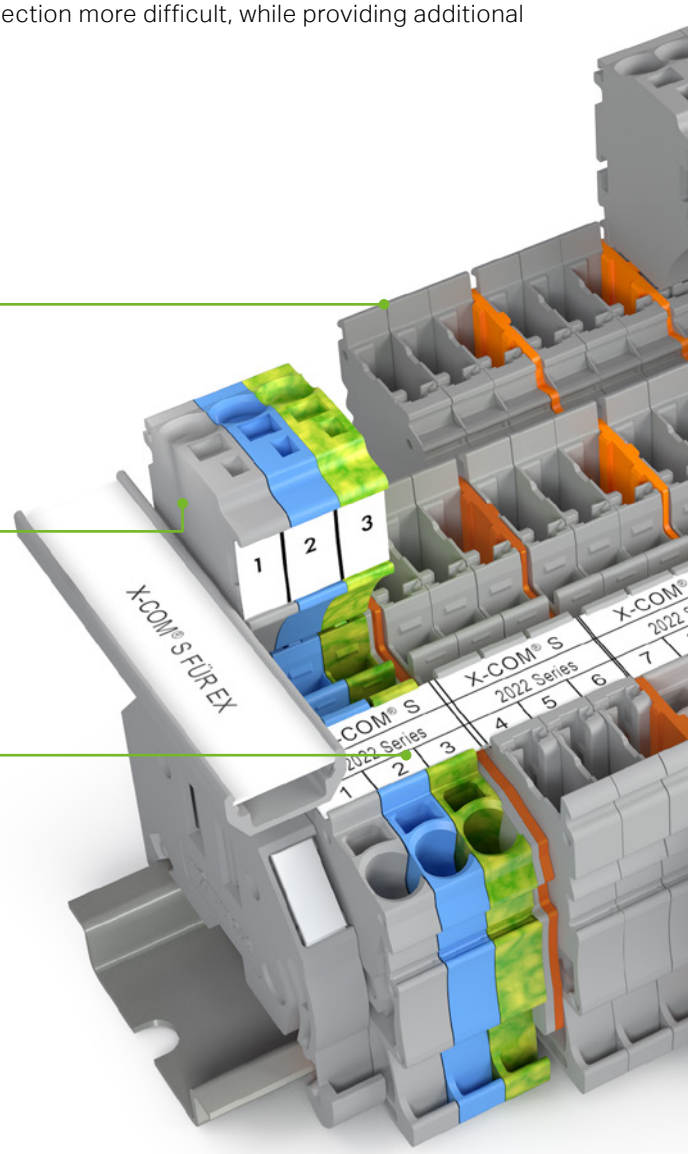
By coding groups with the same pole numbers

Compatible with TOPJOB® S Rail-Mount Terminal Blocks

Thanks to identical profiles

Clear Identification

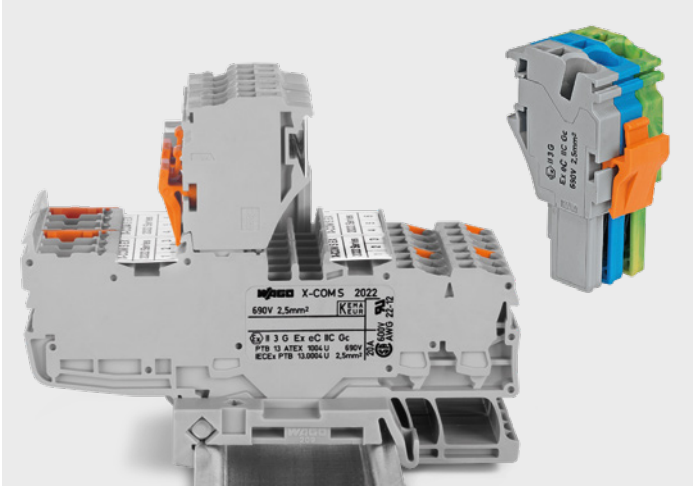
Via multi-line printing of marking strips and WMB markers and group formation using orange end plates

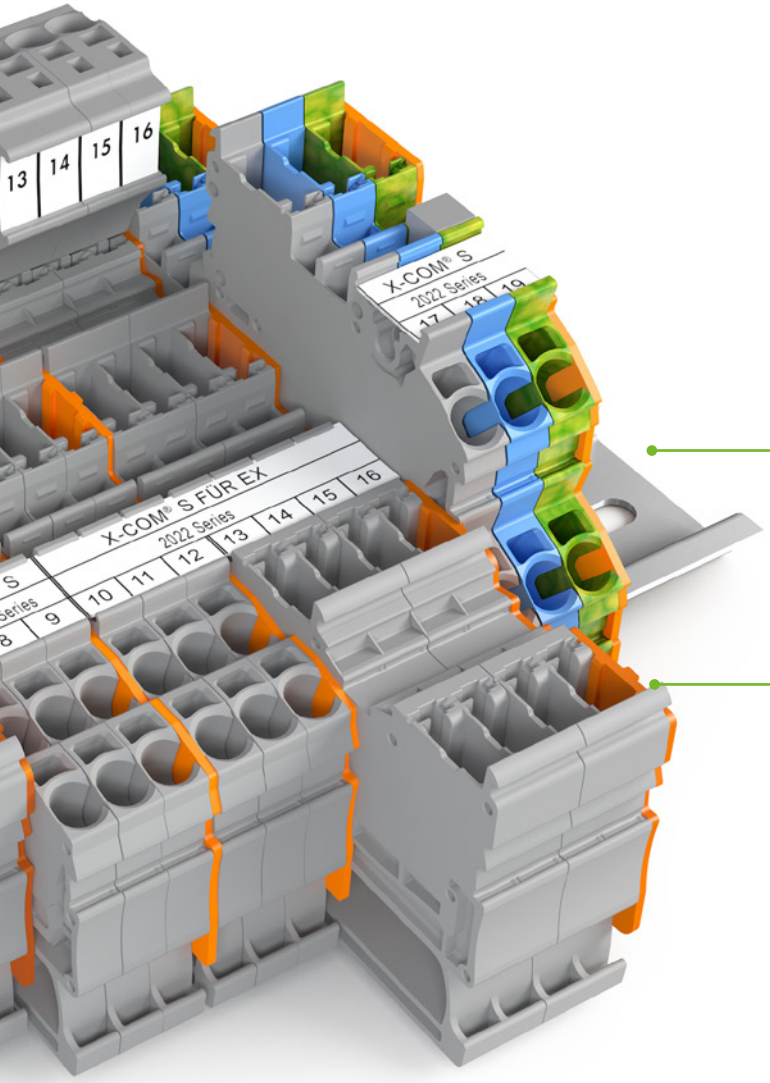


Push-in CAGE CLAMP®

Push-in CAGE CLAMP® enables solid conductors to be connected by simply pushing them into the unit.

“Ex” sign and extended item number “.../0999-0953” are printed on the side of both carrier terminal blocks and female connectors with Ex approval.





X-COM®S-SYSTEM for Ex Applications

The components of the X-COM®S-SYSTEM are non-sparking (“ec” ignition protection class) and approved for use in Zone 2 hazardous areas.

Securing Connectors

Shorter locking levers make accidental disconnection more difficult, while providing additional safety.

Your Benefits:

- **During production:** Pre-wired subassemblies can be tested before installation.
- **During installation:** Pre-assembled components and mismating protection save time and money – even those with limited experience can perform the installation.
- **During operation and maintenance:** Subassemblies can be replaced quickly and error-free.

POWER CAGE CLAMP – High-Current Rail-Mount Terminal Blocks

285 Series

Engineered to provide the proper contact pressure, WAGO's high-current terminal blocks with POWER CAGE CLAMP connection technology have earned approvals for severe duty in energy-intensive applications up to 185 mm² (350 kcmil). .These cover such as machinery and equipment manufacturing, as well as energy production. Rail-mount terminal blocks for 35 mm² (2 AWG), 50 mm² (2/0 AWG), as well as 95 mm² (4/0 AWG) and 185 mm² (350 kcmil) conductors are also approved for hazardous areas, making them ideal for "Ex e" increased safety applications. The following models are approved per DIN EN 60079-0 and DIN EN 60079-7: 2-conductor through terminal blocks (light gray) and ground terminal blocks (green-yellow) with ".../999-950" suffix number. Select accessories are also certified to provide switchgear manufacturers with full flexibility when high-current, rail-mount terminal blocks are used in hazardous locations.

WAGO's Rail-Mount Terminal Block Variety for Ex Areas

In addition to the range of high-current terminal blocks, WAGO also offers TOPJOB® S Rail-Mount Terminal Blocks – including through terminal blocks – suited to hazardous locations. Altogether, WAGO offers a complete range of rail-mount terminal blocks with spring pressure connection technology for "Ex e" applications and conductors ranging from 0.14 to 185 mm² (24 AWG to 350 kcmil).

Perfect for Every Application

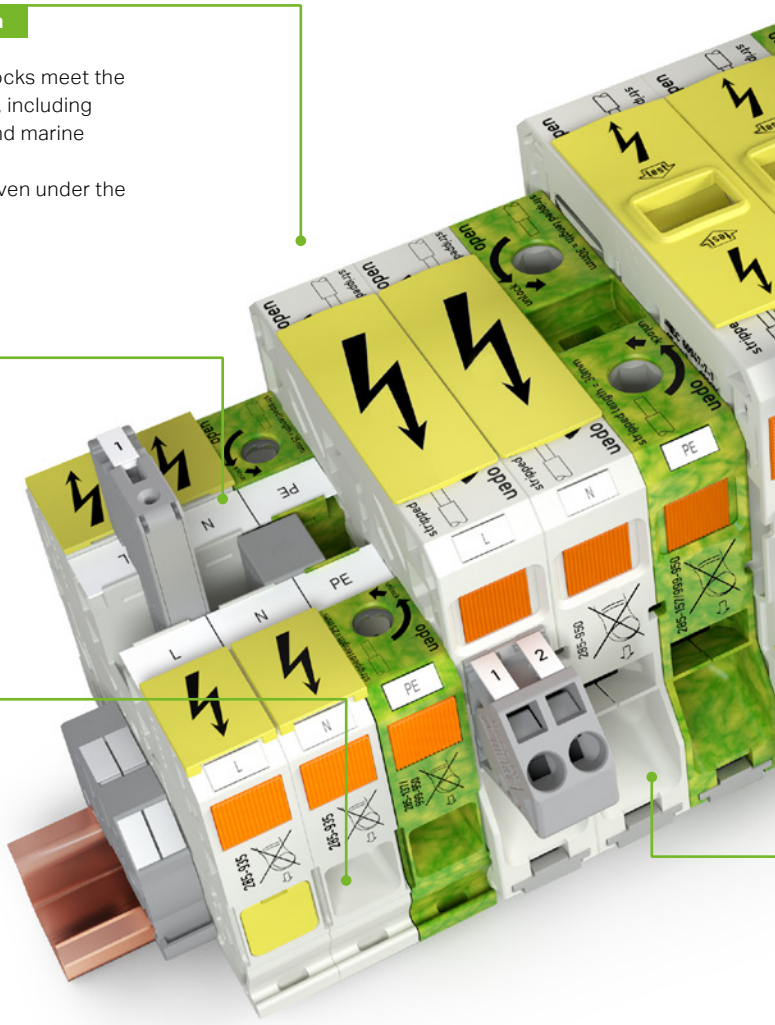
- The high-current terminal blocks meet the most stringent requirements, including those specified for railway and marine applications.
- Resistant to hot and cold – even under the heaviest loads

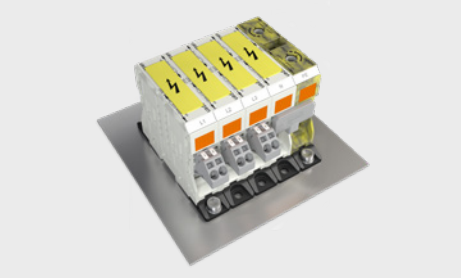
Clear Labeling

With WMB markers or printable marking strips print up to three lines (use a 285-442 adapter for 50 mm² / 2/0 AWG and 95 mm² / 4/0 AWG terminal blocks)

Faster Conductor Termination

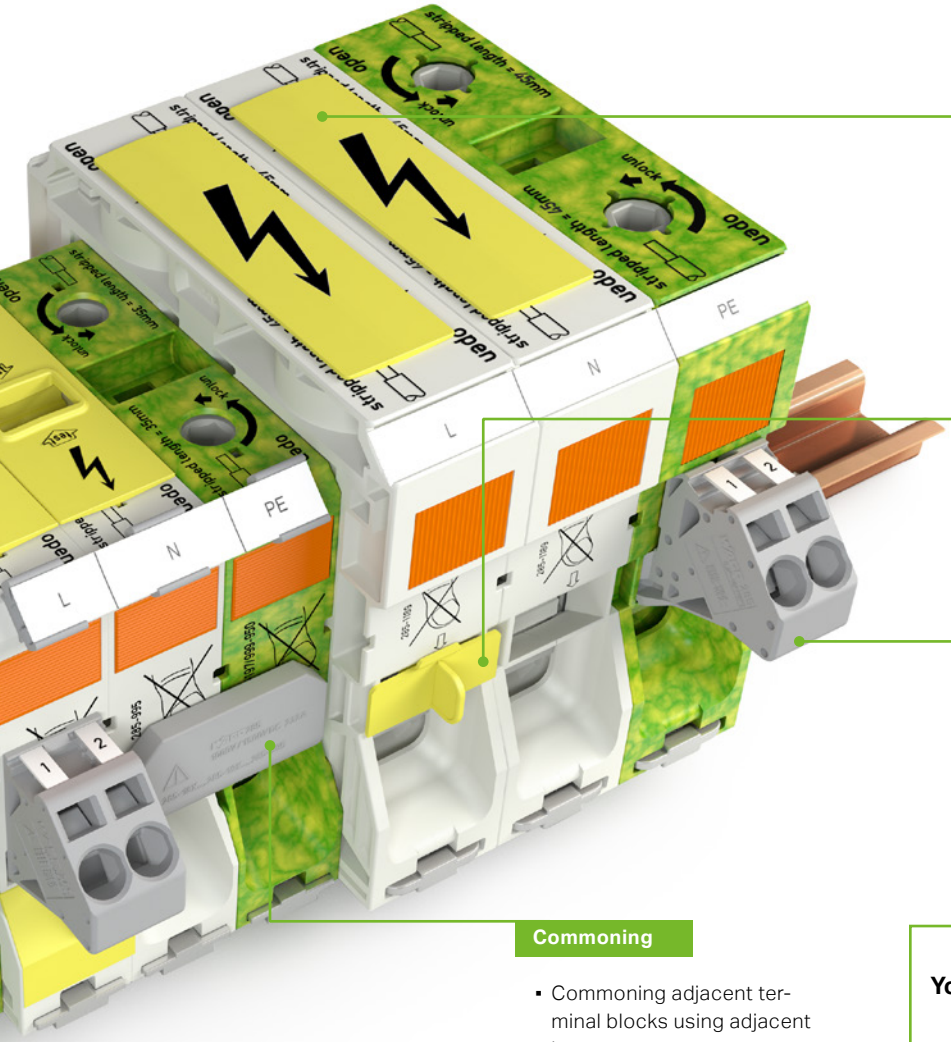
- Eliminate time-consuming preparation – no ring terminals or ferrules required
- Side-entry conductor termination
- Orange locking tab keeps the clamp open for hands-free wiring





High-Current Rail-Mount Terminal Blocks with Mounting Flanges

WAGO's 185 mm² (350 kcmil) high-current rail-mount terminal blocks are also approved as variants with a mounting flange for use in hazardous areas. The mounting flange allows direct installation on mounting surfaces. These versions share the same accessories with the high-current, rail-mount terminal blocks.



Safety

Warning covers visually indicate high-voltage applications, e.g., "CAUTION: Power is still on even after switching off the main switch!"

Finger Guards

Yellow finger guards shield the jumper slots and/or unused clamping units (dividable).

Tapping Voltages Easily and Safely

Potential taps: Connect directly to the power supply (e.g., for control cabinet lighting or air conditioning).

Optimum Clamping Force

The contact quality is largely independent of operator skill.

Commoning

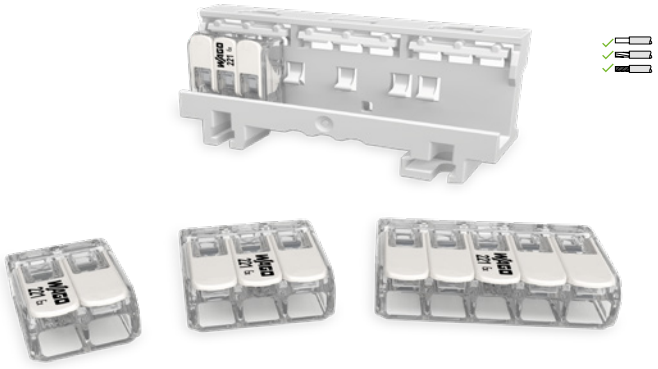
- Commoning adjacent terminal blocks using adjacent jumpers
- Commoning 35 mm² (2 AWG) high-current terminal blocks with 10/16 mm² (8/6 AWG) TOPJOP® S Rail-Mount Terminal Blocks.

Your Benefits:

- These high-current, rail-mount terminal blocks meet the most stringent requirements, including those specified for railway and marine applications.
- Resistant to hot and cold – even under the heaviest loads

COMPACT Splicing Connector for Ex e Applications

New Possibilities for Manufacturers of Junction Boxes, Luminaires and Electronic Devices for Ex Areas



The 221 Series COMPACT Splicing Connector for hazardous areas offers entirely new design possibilities, particularly for the manufacturers of distribution boxes, terminal boxes, lights or electronic devices.
The light gray “Ex protection” version also retains all the advantages of the 221 Series. As an all-purpose terminal block of ignition protection type Ex e (“Increased Safety”) it can be used for all applications in zones 1 and 2.

- Easy, fast and reliable connection technology for your products in Ex areas
- Only permitted in conjunction with a mounting carrier per IEC/EN/UL 60079
- Custom carriers are possible (see certificates)
- Certificates for:

  II 2 G

  Ex eb IIC Gb

  Cl. I, Zn. 1, AEx eb IIC
- Operating temperature range: -55 … +105 °C

Adapter

	Description	Item No.	PU
	Mounting carrier, for 2-, 3-and 5-wire connectors, 4 mm² version	221-501	10
	Mounting carrier, for 2-, 3-and 5-wire connectors, 6 mm² version	221-511	10

Ex Version, 4 mm²

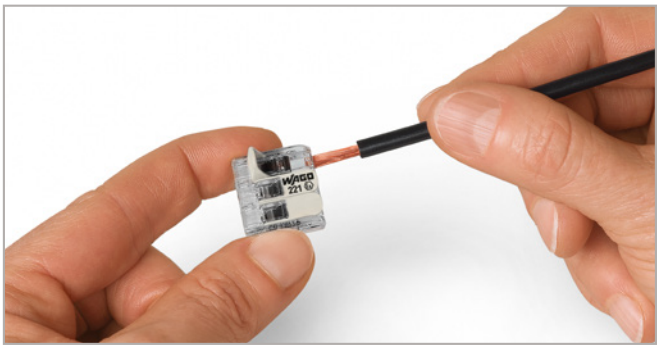
0.14 … 4 mm² 440 V (275 V*)
0.2 … 4 mm²

	Description	Item No.	Current	PU
	2-wire connectors	221-482	24.5 A	100
	3-wire connectors	221-483	32 A	50
	5-wire connectors	221-485	32 A	25

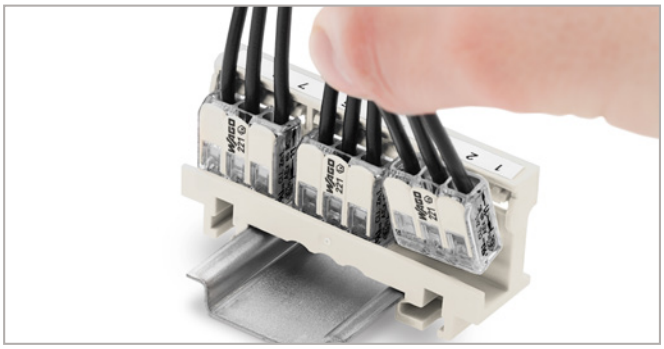
Ex Version, 6 mm²

0.5 … 6 mm² 440 V (275 V*)

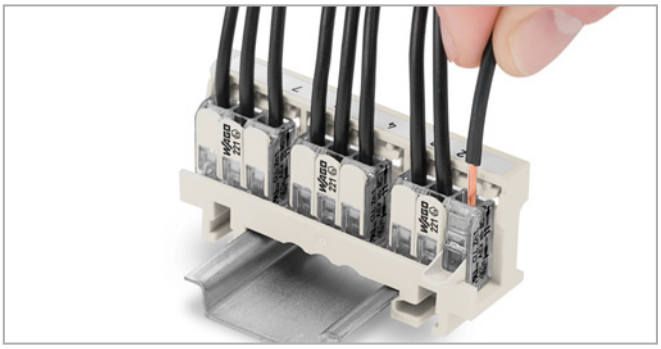
	Description	Item No.	Current	PU
	2-wire connectors	221-682	37 A	50
	3-wire connectors	221-683	37 A	30
	5-wire connectors	221-685	37 A	15



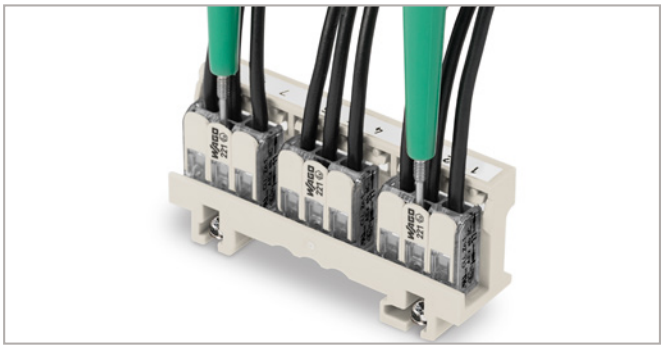
Strip the conductor, open the lever conveniently by hand, insert the conductor, and lower the lever back down to the resting position.



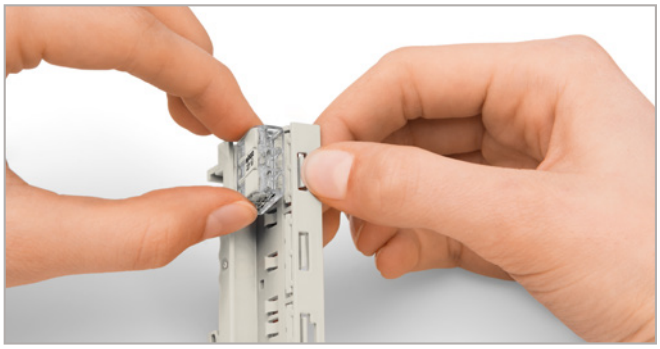
Conveniently snap the connector into a mounting carrier.



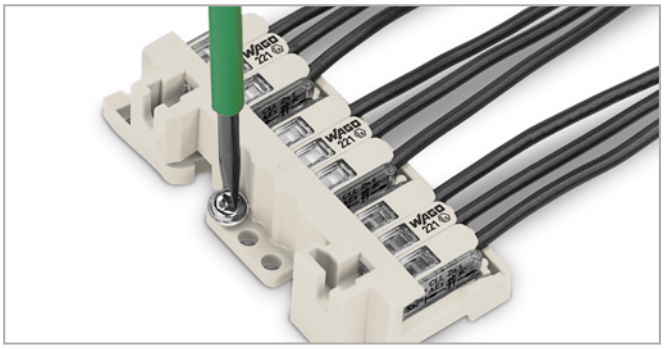
Simply connect and re-wire inserted connectors in the carrier.



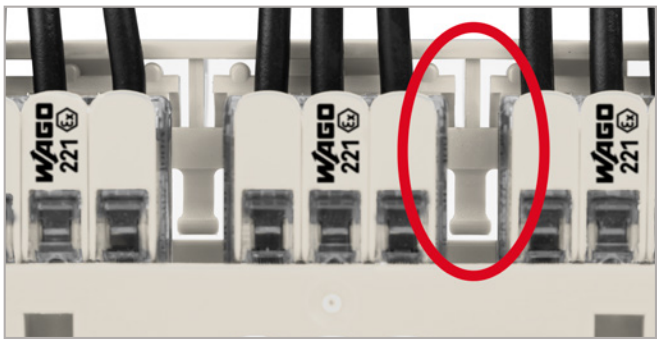
Easily test inserted connectors in the carrier.



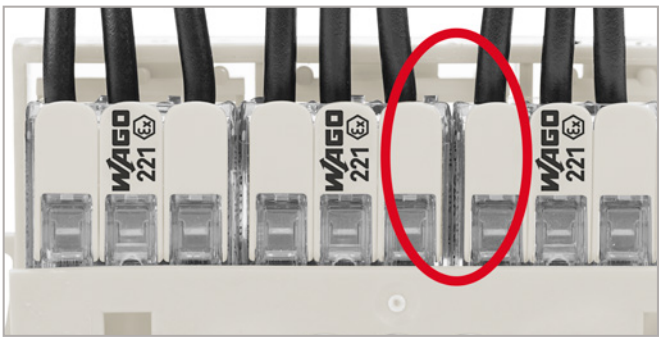
Easily remove the connectors – without tools.



Secure the carrier using screws on smooth surfaces.



With a spacer between the connectors:
For operating voltage up to 440 V



* Without spacer for operating voltages up to 275 V

Legal Bases

Standards, Directives and Regulations

ATEX – European Directive

Equipment brought into the European Union must fulfill the requirements of the ATEX directive. The ATEX directive applies to all products used in areas subject to explosion and is mandatory for all EC member states.

It includes the ATEX product directive 1999/92/EG and the ATEX operating directive 2014/34/EU.

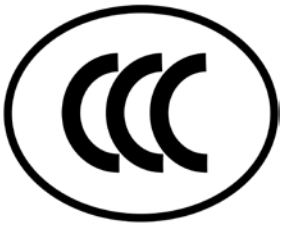
The aim of the ATEX directives is to ensure that equipment on the market complies with requirements that guarantee a high level of protection for the health and safety of people, domestic animals and goods, while ensuring the functioning of the internal market.

IECEx – The Global Certification System

The IECEx system is an international certification system for Ex equipment based on the international standards of the International Electrotechnical Commission. The goal is for evaluation and audit reports (ExTRs) to be mutually recognized around the globe. Like ATEX, IECEx has regulations that classify environments into specific hazard classes. A number of standards issued by the IEC are authoritative in this respect, for example, IEC 60079-0, IEC 60079-7 and IEC 60079-11.

The goal of the IECEx scheme is the harmonization of national and international Ex standards. This simplifies global trade in equipment for hazardous applications. The resources certified according to IECEx are recognized by the international uniform standards, inspections, and test symbols. Due to increasing globalization, certifications according to IECEx are becoming necessary. It is global and independent, so it can be used to confirm national Ex requirements and guidelines.

Certificates issued under the IECEx Equipment Certification Program are issued as “electronic certificates” and are available on the IECEx website. This allows unrestricted public access for viewing and printing.



EAC Ex – Regulatory Framework in Eurasian Economic Union Territory

The technical rules of the Eurasian Economic Union regulate the quality of products in the markets of Russia, Belarus, Kazakhstan, Armenia and Kyrgyzstan.
The EAC-Ex certificate is comparable to the ATEX certificate of the European Union.

The equipment and components to be certified according to the technical regulation TR CU 012/2011 “On the safety of equipment for operation in explosive environments” must be marked accordingly.

This includes the explosion protection label and the identification number on the nameplate or packaging unit, which determine the explosion protection of the device and components.

The evaluation is performed in accordance with GOST standards. The electrical equipment is marked in accordance with GOST 31610.0-2014 “Explosive atmospheres, part 0, equipment – general requirements” and GOST 60079. These GOST standards are harmonized with the international IEC standard.

CCCEx - for the Use of Explosion Protection Products in China

Since October 01, 2019, applying for a CCC certificate for explosion protection products in China has been possible. From October 01, 2020, a China CCC certification will be mandatory for the affected products. Until now, products that were explicitly used in explosion protection areas and already had Ex certification were exempt from CCC. The new implementation regulation CNCA-C23-01:2019 regulates which product groups, such as switches, control and protection products, motors, electric pumps, etc., are subject to a CCC obligation. The CCC certificate is administered by the Chinese central authority CNCA (Certification and Accreditation Administration) in cooperation with AQSIQ (General Administration of Quality Supervision, Inspection and Quarantine).

Electronic products must be tested according to their Ex type. The Guobiao (GB) standards regulate the necessary test(s). Explosion-proof products can be tested according to one or more Ex types.

Test reports from IECEx, ATEX, etc., can be used as a basis for the CCC Ex certificates, if applicable. Whether test reports and certificates are accepted depends on the issuing authority in China, the tests and test laboratories performing them. Whether test reports and certificates are accepted depends on the issuing authority in China, the tests and test laboratories performing them. Existing IECEx Quality Assessment Report (QAR) or ATEX Quality Assurance Notification (QAN) will not be accepted. WAGO has a corresponding CCC audit.

INMETRO – Certification for Brazil

In Brazil, equipment intended for use in potentially explosive atmospheres requires mandatory certification by an independent certification body to ensure compliance with the relevant regulation "Portaria INMETRO / MDIC Number 179," dated May 18, 2010.
INMETRO is the Brazilian National Institute of Metrology, Quality and Technology.

The technical requirements for equipment for use in potentially explosive atmospheres are closely based on the international IEC requirements in combination with applying the relevant Brazilian national requirements. As a rule, a presumption of conformity can be based on IECEx certification per the current version of the relevant IEC standards for the protection methods used.

The INMETRO system contains some specific requirements related to performing tests. Test reports on relevant international standards prepared by laboratories outside Brazil are generally accepted if they originate from a testing body recognized by ILAC. The conformity assessment structure is also similar to IECEx and ATEX certification in that type testing is required in addition to inspecting the manufacturer's production. Additionally, the certification process requires a local distributor to act as the official importer of equipment for Brazil.

Our colleagues at WAGO Eletroeletrônicos Ltda would be happy to help you on-site in Brazil.

Explosion Protection in North America – NEC, CEC, UL, ANSI/ISA, CSA

All electrical equipment installed in a hazardous location and intended for North America and Canada must be certified as such by a Nationally Recognized Testing Laboratory (NRTL). Unlike the ATEX directive, there is no possibility of self-certification of equipment, regardless of the hazardous area in which the equipment is to be used. For electrical equipment and systems used in hazardous locations, the National Electric Code (NEC) applies in the USA and in Canada, the Canadian Electrical Code (CEC). These codes have the character of installation regulations for electrical systems in all areas and refer to a series of standards from other institutions, which include provisions for the installation and construction of suitable operating equipment.

In the USA, these are primarily the standards of Underwriters Laboratories Inc. (UL) and the International Society of Automation (ISA). In Canada, those of the Canadian Standards Association (CSA).

The way the IEC standards assign hazardous locations based on the type of potentially explosive atmosphere and its presence applies similarly to the North American system. However, there are some fundamental differences. North America categorizes the type and presence of the explosive atmosphere by class (I, II, or III) using either a division system (NEC 500) or a zone system (NEC 505).

UKCA Mark

Post-Brexit, the UKCA mark is the English equivalent of the CE mark. UKEX is the equivalent of ATEX. From January 1, 2023, the acceptance of ATEX certificates in the UK will have no appeal. It is possible to rewrite the ATEX certificates to the “UK Type Examination” certificate for products to be used in potentially explosive atmospheres.

For products in category 3 (non-regulated area), the issuance of a “UK Type Examination” is possible as a self-declaration by the manufacturer with associated production monitoring, while in the regulated area (e.g., Ex i), an independent third-party inspection body must be involved in the conformity assessment process.

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WAGO GmbH & Co. KG
Postfach 2880 · D-32385 Minden
Hansastraße 27 · D-32423 Minden
info@wago.com
www.wago.com

Headquarters	+49 (0)571/ 887 - 0
Sales	+49 (0)571/ 887 - 44 222
Orders	+49 (0)571/ 887 - 44 333
Fax	+49 (0)571/ 887 - 844 169