



## More safety in hazardous areas

Equipotential bonding in potentially explosive areas



## Content

<b>Dangers in hazardous areas</b>	3	<b>Solutions for Ex zones 2/22</b>	8
<b>Solutions for Ex zones 1/21 and 2/22</b>	4	Safe in hazardous areas with equipotential bonding on cable tray systems	9
Safe in hazardous areas with non-sparking equipotential bonding bars	5	Equipotential bonding bars with extensive application possibilities	10
Pipe clamps provide tested safety and flexibility	7	Electric contacting of pipes made easy	10
Universal and safe solution for equipotential bonding connections	7	Clamps make secure connections	11
		<b>DEHN Test Centre</b>	<b>11</b>



## Dangers in hazardous areas

### Permanently effective equipotential bonding provides safety

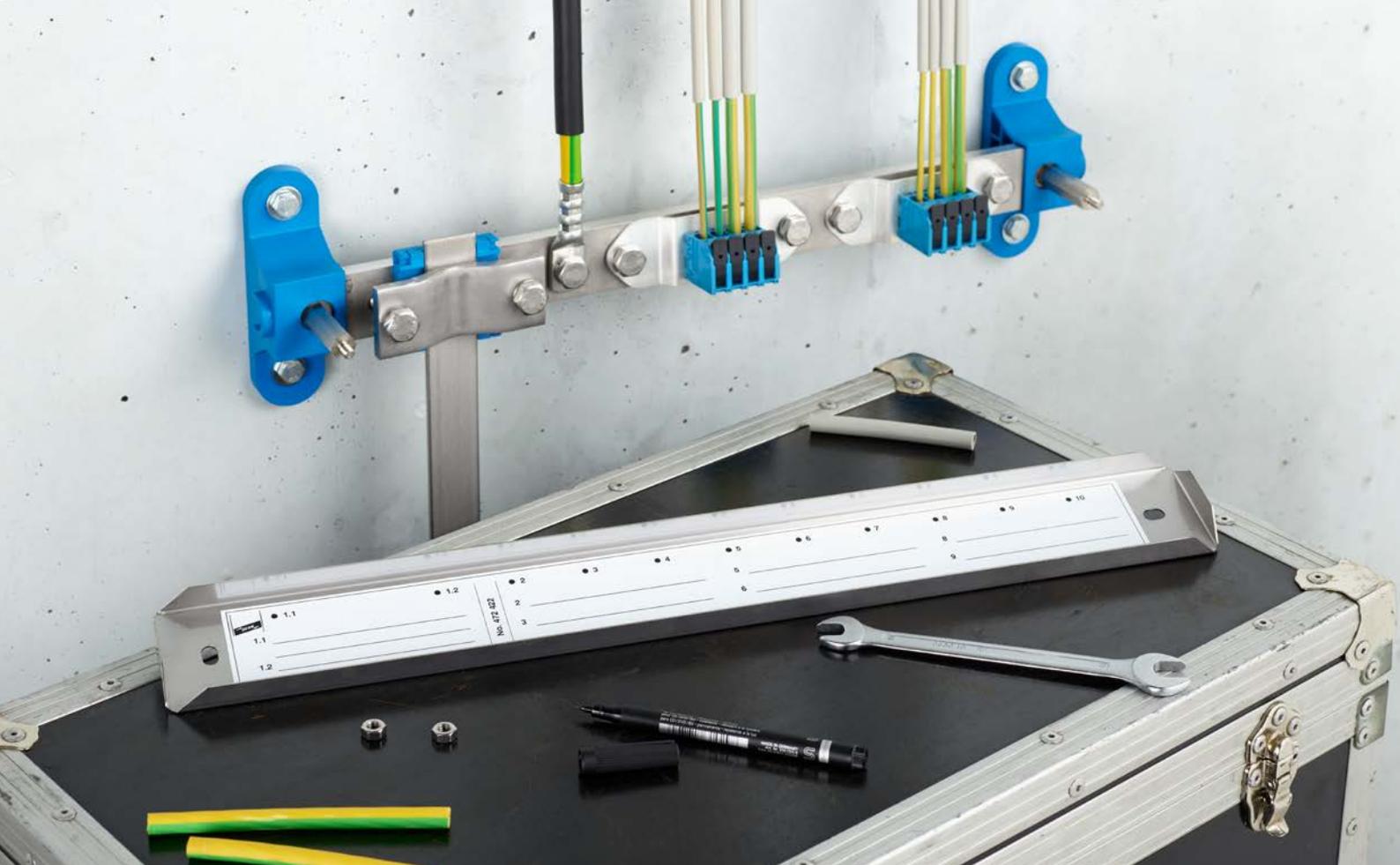
The manufacture, storage and processing of flammable materials poses a risk of explosion. All areas in which gases, vapours, mists and dusts can both accumulate and form an explosive mixture with oxygen or other oxidising substances are potentially at risk. Explosions threaten people and facilities in equal measure. System operators are therefore obliged to ensure protection. Appropriate measures should ensure the safety of employees and prevent damage to technical products, systems and equipment.

### Equipotential bonding systems – the basis for reliable system operation

Effective equipotential bonding is required for all electrical systems. It eliminates potential differences that arise, for example, between a protective conductor of a low-voltage consumer's installation and metal water, gas and heating pipes. An equipotential bonding system protects people from dangerous touch voltages and meets EMC requirements. In potentially explosive areas in particular, it is important that potential differences do not lead to sparking. To do this, all electrical equipment and extraneous conductive parts must be incorporated into the system.

### Standards – the basis for reliable protection

Equipotential bonding in installations with potentially explosive areas must satisfy the requirements in DIN VDE 0100-410 and 540. It must also meet the requirements outlined in DIN EN 60079-14 and DIN VDE 0800-2-310. In order for the equipotential bonding connection to be permanently effective, all connections to the equipotential bonding must be secured against loosening independently, for example. As a further requirement, the risk of corrosion must be reduced to a minimum. With installations at risk of explosion in particular, lightning strikes must also frequently be taken into account, which is why the standard DIN EN 62305-3 is also relevant. DIN EN 62305-3 Supplement 2 stipulate that all equipotential bonding connections in potentially explosive areas of Zone 1 and 21 must be configured so that no ignitable sparks or hot surfaces can arise in the event of a fault (e.g. a lightning strike or other electrical faults).



## Solutions for Ex zones 1/21 and 2/22

Potentially explosive areas are split into 3 zones according to the duration and frequency of occurrence of potentially explosive atmospheres. Potentially explosive areas are also distinguished between whether the hazardous explosive atmosphere consists of flammable gases or flammable dusts.

It is important to know that all connections of lightning protection systems in Ex zone 1/21 must be designed so that no ignitable sparks can arise in the event of lightning strike penetration or other electrical faults.

At DEHN, you can find a comprehensive product range for equipotential bonding in hazardous areas:

- Equipotential bonding bars
- Pipe clamps
- Parallel connectors

All products are suitable for use in Ex zone 1/21 and Ex zone 2/22, because they fulfil the requisite criteria:

- They work in a non-sparking manner
- They are secured against self-loosening

### Definition of Ex zones

#### Ex-Zone 0/20

Under normal operations, a hazardous explosive atmosphere develops **constantly, over long time periods or frequently.**

#### Ex-Zone 1/21

Under normal operations, a hazardous explosive atmosphere develops **occasionally.**

#### Ex-Zone 2/22

Under normal operations, a hazardous explosive atmosphere **usually either does not develop or does so only briefly.**

Note: Ex zone 0/1/2 = Gases; Ex zone 20/21/22 = Dusts

# Safe in hazardous areas with non-sparking equipotential bonding bars

The new PAS EX series of equipotential bonding bars may be used in Ex zones 1/21 and 2/22. For this purpose, they have been tested to the latest test standard CLC/TS 50703-2: 2020-12 in gas atmospheres and to IEC 62561-1 pursuant to class H. A wide variety of versions and configuration options mean absolute flexibility when connecting the bars. In hazardous areas, high surface temperatures on components can become sources of ignition. With PAS EX, this has been taken into account. Even under high loads, the surface temperature does not exceed a value of 135°C (temperature class T4).

## Advantages for you at a glance:

- Non-sparking up to 100 kA (10/350  $\mu$ s) of lightning current and 50 Hz short-circuit currents
- Tested to explosion group IIC (hydrogen)
- Flexibly configurable and with a multitude of connection options
- All connections secured against self-loosening by means of spring washers



You can find more installation examples on the Internet:  
[de.hn/aWpBA](https://de.hn/aWpBA)

## Flexible with the numerous connection possibilities of PAS EX

### ▪ Cable lug connection:

A thread is provided in the connection hole. The spring washer secures against self-loosening.

**Advantage:** quicker and easier connection; an additional nut is not necessary.

### ▪ Push-in connection

Connection of flexible and rigid conductors up to 16 mm<sup>2</sup>.

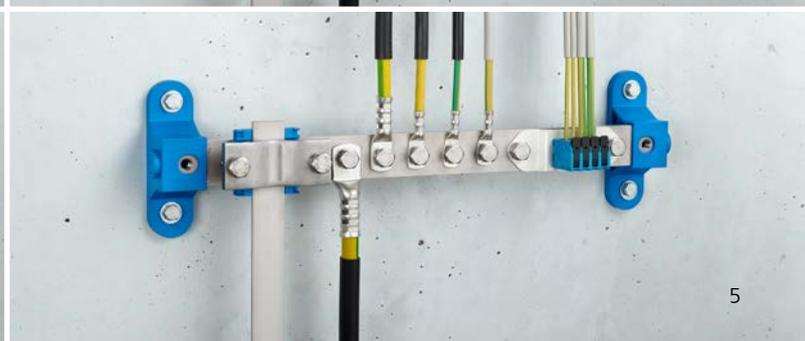
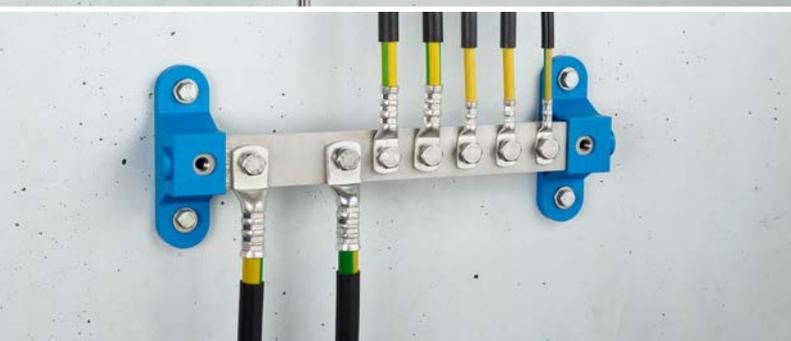
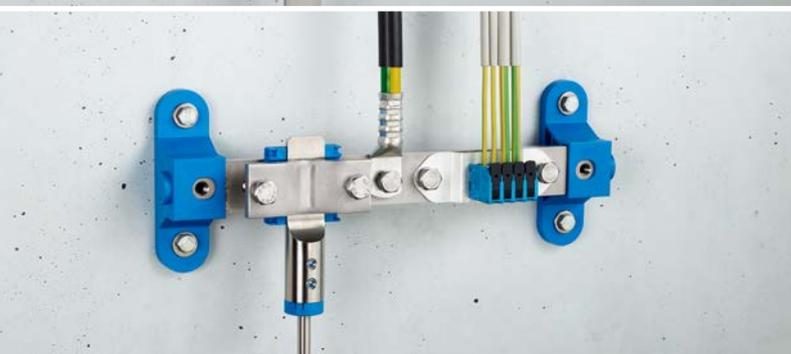
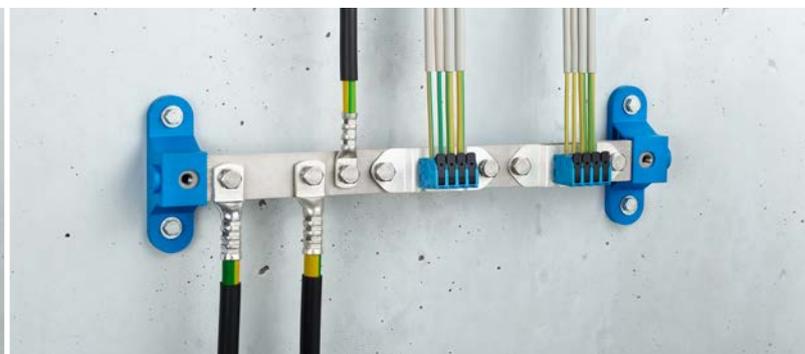
**Advantage:** installed quickly and without tools.

### ▪ Flat and round conductors:

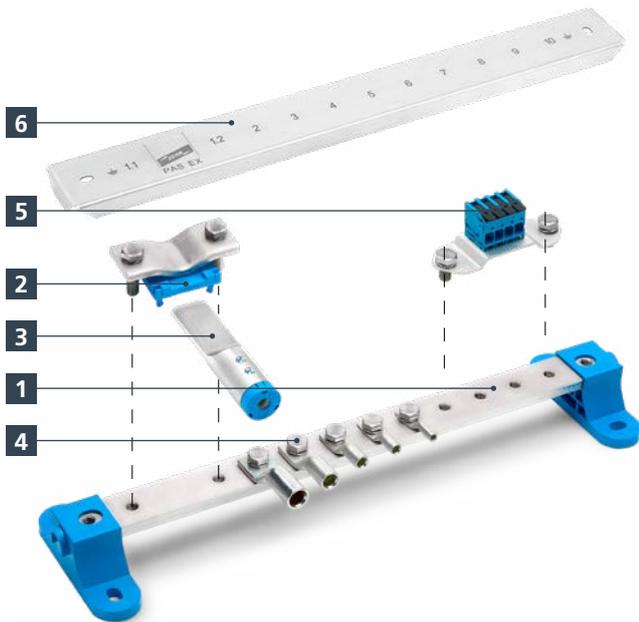
Connection of flat conductors with 30 or 40 mm and round conductors with a diameter of 10 mm possible. Special adapters available.

**Advantage:** with the two adapters, the flat and round conductors cannot come into contact with the terminal screws. They ensure a defined, non-sparking contact between conductor and equipotential bonding bar.

## Installation examples



## Absolute versatility in every detail



1. **Flexible connection possibilities:**  
Equipotential bonding bar in stainless steel (V2A) in two versions (long with 11 and short with 7 connections)
2. **Flat conductor connection**  
Defined cable routing for flat conductor connection with 30 or 40 mm (part no. 472 499)
3. **Round conductor connection**  
Connection of round conductors with 10 mm diameter using an adapter (part no. 472 498)
4. **Cable lug connection**  
M10 connection hole with thread for easy installation of conductors of up to 95 mm<sup>2</sup>
5. **Push-in connection**  
Connection of flexible and rigid conductors without tools (4–16 mm<sup>2</sup>) (part no. 472 497)
6. **Cover with connection marking**  
For easy identification of the connections



### Universal use

In Ex zones 1/21 and 2/22



### Tested solution

Non-sparking up to 100 kA (10/350 μs) of lightning current and 50 Hz short-circuit currents

Equipotential bonding bars for use in hazardous areas zones 1/21 and 2/22		Type	Part no.
	<b>Equipotential bonding bars</b> "Short" version with 7 terminals for cable lugs, including screws "Long" version with 11 terminals for cable lugs, including screws Ex-Zone 1/21 Ex-Zone 2/22	<b>PAS EX 7AP M10 V2A</b> <b>PAS EX 11AP M10 V2A</b>	<b>472 411</b> <b>472 421</b>
	<b>"Short" equipotential bonding bars for flat terminals</b> Adapter for flat conductors and 5 terminals for cable lugs, including screws Ex-Zone 1/21 Ex-Zone 2/22	<b>PAS EX 1+5AP M10 V2A</b>	<b>472 410</b>
	<b>"Short" equipotential bonding bar SET</b> Connection of flat/round conductors and 4 terminals with quick connection technology (push-in) and 1 terminal for cable lugs, including screws Ex-Zone 1/21 Ex-Zone 2/22	<b>PAS EX 7AP SET</b>	<b>472 415</b>
	<b>"Long" equipotential bonding bar for flat terminal</b> Adapter for flat conductors and 9 terminals for cable lugs, including screws Ex-Zone 1/21 Ex-Zone 2/22	<b>PAS EX 1+9AP M10 V2A</b>	<b>472 420</b>
	<b>"Long" equipotential bonding bar SET</b> Connection of flat/round conductors and 8 terminals with quick connection technology (push-in) and 1 terminal for cable lugs, including screws Ex-Zone 1/21 Ex-Zone 2/22	<b>PAS EX 11AP SET</b>	<b>472 425</b>



The entire product range of equipotential bonding bars for use in Ex zone 1/21 including accessories can be found here:  
[de.hn/bTRaY](https://de.hn/bTRaY)

## Pipe clamps provide tested safety and flexibility

Pipe clamps are used for connecting to the equipotential bonding in hazardous areas. They represent a secure alternative to welded connections or threaded bushings and enable non-sparking lightning equipotential bonding as per IEC 62305-3.

### Advantages for you at a glance:

- Use in Ex zones 1/21 and 2/22 as they are tested to be non-sparking
- Simple and flexible installation thanks to various connection options for round and flat conductors
- Time saved on installation as laborious welding work is done away with

Pipe clamps for use in hazardous areas zones 1/21 and 2/22		Type	Part no.
	For 6–27 mm (3/4") diameter clamping range <b>Ex-Zone 1/21</b> <b>Ex-Zone 2/22</b>	<b>EX BRS 27</b>	<b>540 821</b>
	For 27 mm (3/4") to 89 mm (3") diameter clamping range For 89 mm (3") to 300 mm diameter clamping range For 300–500 mm diameter clamping range <b>Ex-Zone 1/21</b> <b>Ex-Zone 2/22</b>	<b>EX BRS 90</b> <b>EX BRS 300</b> <b>EX BRS 500</b>	<b>540 801</b> <b>540 803</b> <b>540 805</b>
	The entire product range of pipe clamps for use in Ex zones 1/21 and 2/22 including accessories can be found here: <a href="https://de.hn/8hzot">de.hn/8hzot</a>		

## Universal and safe solution for equipotential bonding connections

Parallel connectors are specially designed for the connection of electrical equipment to equipotential bonding (e.g. ring equipotential bonding) and possess all the safety features required for hazardous areas. They are secured against self-loosening during installation under the nut with a spring washer.

### Advantages for you at a glance:

- Use in all Ex zones
- Tested as non-sparking for lightning currents and 50 Hz short-circuit currents
- Tested to explosion group IIC (hydrogen)

Parallel connectors for use in hazardous areas zones 1/21 and 2/22		Type	Part no.
	Parallel connector with spring washer for connecting round conductors / cables in potentially explosive areas. Clamps secured against self-loosening.		
	Clamping ranges: Rd / Rd: 5–12.5 mm Stranded / cable: 16–95 mm <sup>2</sup> <b>Ex-Zone 1/21</b> <b>Ex-Zone 2/22</b>	<b>PV 5.12.5</b> <b>SKM8X45 GSG</b> <b>CUGALSN</b>	<b>306 105</b>
	Clamping ranges: Rd / Rd: 5–16 mm Stranded / cable: 16–150 mm <sup>2</sup> <b>Ex-Zone 1/21</b> <b>Ex-Zone 2/22</b>	<b>PV 5.16</b> <b>SKM10X50 GSG</b> <b>CUGALSN</b>	<b>306 106</b>
	The entire product range of parallel connectors for use in Ex zones 1/21 and 2/22 including accessories can be found here: <a href="https://de.hn/bqvZX">de.hn/bqvZX</a>		



## Solutions for Ex zone 2/22

Secure equipotential bonding is also necessary in Ex zone 2/22. A requirement is that all equipotential bonding connections must be reliably secured against self-loosening. According to DIN EN 62305-3 Supplement 2, protection against self-loosening can be achieved by using spring washers.

At DEHN, you can find a comprehensive product range for equipotential bonding in hazardous areas:

- Equipotential bonding bars
- Pipe clamps
- Special solutions for equipotential bonding on cable tray systems.
- Matching clamps

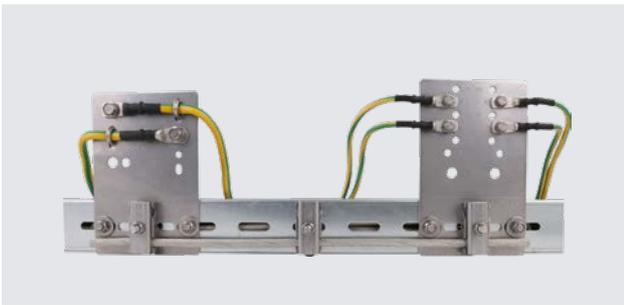
All products are suitable for use in zone 2/22, because they are secured against self-loosening.

## Safe in hazardous areas with equipotential bonding on cable tray systems

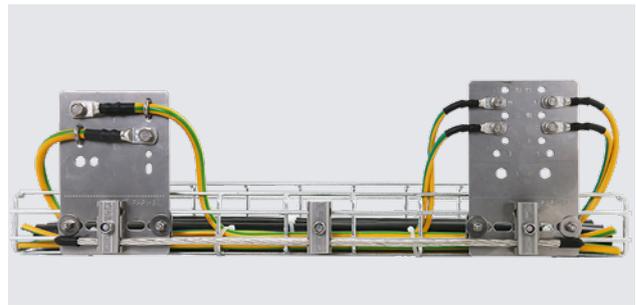
In practice, conductive parts of a structure or cable tray system are frequently defined as "equipotential bonding conductors". But watch out! A secure, consistent and permanently effective electrical connection cannot be guaranteed here as is required. The DEHN system solution is used for setting up ring equipotential bonding / radially connected equipotential bonding for attaching to the cable tray system. It therefore ensures consistent equipotential bonding. Conductive system parts and electrical equipment, such as power units, motors, field devices, sensors, etc., can be effortlessly incorporated into the equipotential bonding – people and installations are optimally protected.

### Advantages for you at a glance:

- Easy installation and simple retrofitting
- Clear documentation, labelling and tracking
- Compatible with all commonly used cable tray systems
- Time-saving maintenance, testing and servicing



Cable tray version



Wire tray version

Equipotential bonding on cable tray systems for use in hazardous areas zone 2/22		Type	Part no.
	EB plate for cable trays. Supports the EB clamp for the ring equipotential bonding conductor; fixed to the cable tray at the holes on the sides. <b>Ex-Zone 2/22</b>	<b>PAP 1 EX KB ER</b>	<b>306 210</b>
	EB plate for wire trays Supports the EB clamp for the ring equipotential bonding conductor; fixed to the wire tray. <b>Ex-Zone 2/22</b>	<b>PAP 1 EX GI ER</b>	<b>306 212</b>
	EB clamp for cable trays and EB plate, for attaching approx. every 0.5 m <b>Ex-Zone 2/22</b>	<b>PAK 35 M8 EX KB ER</b>	<b>306200</b>
	EB pipe clamp for fixing to the DN50 (60 mm) round pipe <b>Ex-Zone 2/22</b>	<b>SBD 60 PAK 35 EX ER</b>	<b>306220</b>



The entire product range for equipotential bonding on cable tray systems can be found here:  
[de.hn/8Mt8c](https://de.hn/8Mt8c)

## Equipotential bonding bars with extensive application possibilities

Equipotential bonding bars are used for protective and functional equipotential bonding as per DIN VDE 0100-410/540 and lightning equipotential bonding as per DIN EN 62305-3 (VDE 0185-305-3). They are also suitable for hazardous areas (zone 2/22).



### Advantages for you at a glance:

- Screws secured against self-loosening using spring washers
- Stainless steel version with UV-resistant insulator can be used outdoors

Equipotential bonding bars for use in hazardous areas zone 2/22		Type	Part no.
	Equipotential bonding bar for industrial use, secured against self-loosening using spring washers. 12 terminals, bar material: CU, screw/nut material: StSt <b>Ex-Zone 2/22</b>	<b>PAS I 12AP M10 CU</b>	<b>472 237</b>
	Equipotential bonding bar for industrial use, secured against self-loosening using spring washers. 12 terminals, bar material: StSt, screw/nut material: StSt <b>Ex-Zone 2/22</b>	<b>PAS I 12AP M10 V2A</b>	<b>472 239</b>



There are also equipotential bonding bars for use in hazardous areas zone 2/22 with 6, 8 or 10 terminals. The entire product range can be found here:  
**de.hn/2DoNw**

## Electric connection of pipes made easy

The GSG (secured against self-loosening) Ex pipe clamp is a special version for use in Ex zone 2/22. The adjustable tensioning strap made out of stainless steel provides reliable protection against self-loosening.

### Advantages for you at a glance:

- Secured against self-loosening
- Connection to any conductor diameters possible

Pipe clamp GSG for use in hazardous areas zone 2/22		Type	Part no.
	Pipe clamp GSG for the electrical contacting of pipes. In line with DIN EN 62305-3 Supplement 2 (VDE 0185-305-3 Supplement 2) secured against self-loosening. <b>Ex-Zone 2/22</b>	<b>BRS 27.89 AK1X10 2X6.8 GSG V2A</b>	<b>540 104</b>



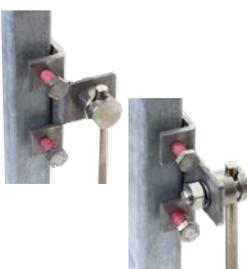
The entire product range of pipe clamps for use in Ex zones 2/22 including accessories can be found here:  
**de.hn/8kGxM**

## Clamps make secure connections

Clamps are required for connecting round and flat conductors. For use in Ex zone 2/22, they must be secured against self-loosening as per DIN EN 62305-3 Supplement 2 (VDE 0185-305-3 Supplement 2).

### Advantages for you at a glance:

- Secured against self-loosening
- Lightning current carrying capability tested (up to 200 kA depending on the design)

Clamps for use in hazardous areas zone 2/22		Type	Part no.
	UNI disconnecting clamp 200 kA (10/350 µs) with spring washer for earth entry rods. Material: StSt <b>Ex-Zone 2/22</b>	<b>UTK 200 8.10 16 ZP V2A</b>	<b>459 219</b>
	Clamping piece 200 kA (10/350 µs) with spring washer. Material: StSt <b>Ex-Zone 2/22</b>	<b>KS 200 B11.11 FL30X4 V2A</b>	<b>380 209</b>
	MV clamp 200 kA (10/350 µs) with spring washer for round conductors. <b>Ex-Zone 2/22</b>	<b>MVK 200 8.10 SKM10X30 V2A</b>	<b>390 209</b>
Connection clamps for steel girders in hazardous areas zone 2/22		Type	Part no.
	Connection clamps in heavy design suitable for connection to steel structures. All connections are secured against self-loosening. <b>Ex-Zone 2/22</b>	<b>Vertical design</b>	
		<b>AK 6.10 KSV FER S KBF3 18 V2A</b>	<b>372 169</b>
		<b>AK 6.10 KSV FER S KBF18 35 V2A</b>	<b>372 179</b>
		<b>Horizontal design</b>	
		<b>AK 6.10 KSV FER W KBF3 18 V2A</b>	<b>372 269</b>
<b>AK 6.10 KSV FER W KBF18 35 V2A</b>	<b>372 279</b>		



Clamps for use in hazardous areas zone 2/22 are available in a wide variety of versions.  
The entire product range can be found here:  
[de.hn/bCemq](https://de.hn/bCemq)

## DEHN Test Centre

### Products on the test bench

Want to have individual components or systems tested for their lightning current carrying capability? Then make use of the DEHN Test Centre.

It has one of the most powerful test facilities for lightning impulse currents in the world and is accredited to ISO/IEC 17025. Products, installations and systems are tested with test impulses of up to 400 kA (10/350 µs) in a facility spanning 800 m<sup>2</sup>. Equipotential bonding components for hazardous areas are tested in gas atmospheres in collaboration with external test institutes.

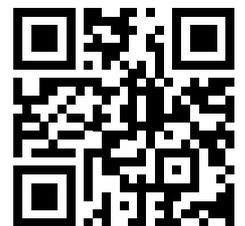


You can find information on the Web:  
[de.hn/3Fw9s](https://de.hn/3Fw9s)

Surge Protection  
Lightning Protection / Earthing  
Safety Equipment  
DEHN protects.

DEHN SE  
Hans-Dehn-Str. 1  
92318 Neumarkt  
Germany

Tel. +49 9181 906-0  
Fax +49 9181 906-1100  
info@dehn.de  
www.dehn.de



de.hn/c4ZVP

Subject to technical changes. Misprints and errors excepted.  
The illustrations are non-binding.

DS380/EN/0322 © Copyright 2022 DEHN SE