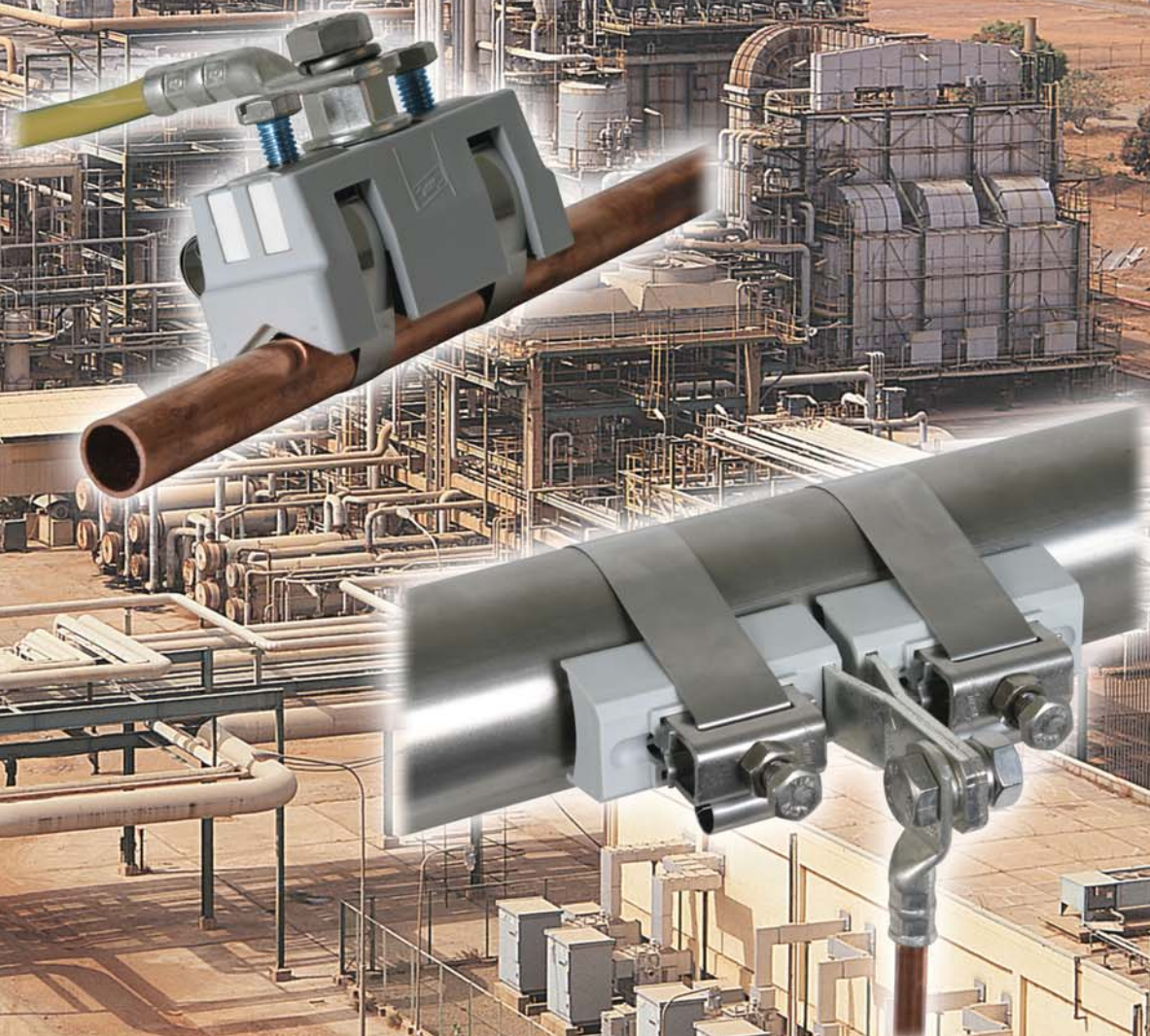




Pipe Clamp for Explosion Hazard Areas



Usually both equipotential bonding and lightning equipotential bonding connections in areas with potentially explosive atmospheres are welded or carried out with threaded bushings, such as

- welded-on lugs,
- bolts or
- tapped bores in the flanges for inserting the screws.

These conventional techniques have great disadvantages. Whole systems or at least system sections have to be put out of operation, for example; during welding or drilling work – unacceptable in most circumstances.

Clamp connections, however, are only permitted if testing has proved an absence of any ignition sparks in case of lightning currents and if suitable measures are taken to ensure the reliability of the connection.

Figure 1 shows the impulse current loading of a conventional pipe clamp and the resulting sparking at the transitions. The figure reveals that usual pipe clamps do not meet the claims for non-sparking.

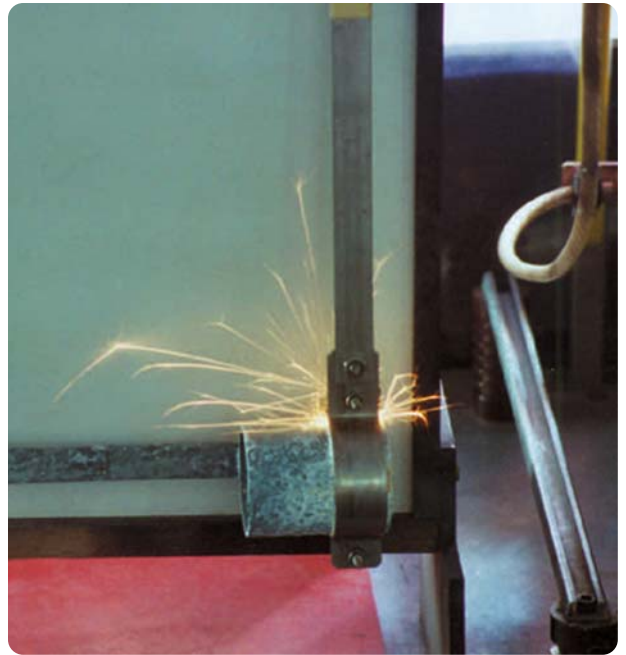


Figure 1

Clear evidence of ignition sparks!

DEHN + SÖHNE has met this challenge and provides evidence of no ignition sparks at lightning current loading of pipe clamps.

By trying and testing in accordance with EN 50164-1 (VDE 0185-201): "Lightning Protection Components (LPC) - Part 1: Requirements for connection components", in an explosion-hazard atmosphere non-sparking of the test sample at lightning current loads was proved.

Figure 3 shows the used test arrangement.

Prior to the actual impulse current loading, the test samples are subjected to an artificial ageing according to EN 50164-1 (VDE 0185-201). During three days the specimen are exposed to a salty fog and then for seven days to a sulphurous atmosphere. The resulting corrosion is shown in Figure 2. The artificially aged test samples are enclosed with a hermetically sealed plastic bag. A hydrogen test mixture generated in a gas processing plant is fed into the plastic bag, providing the explosive atmosphere. The test gas used meets the requirements for explosion group II B according to EN 60079-11 (e.g. ethylene). After this intensive preparation every specimen is tested three times with the impulse current load for requirement class N (50 kA 10/350 μ), for example, in accordance with EN 50164-1 (VDE 0185-201).

The special design of the spring supported contacts allows for a non-sparking electrical contacting in case of different pipe diameters.

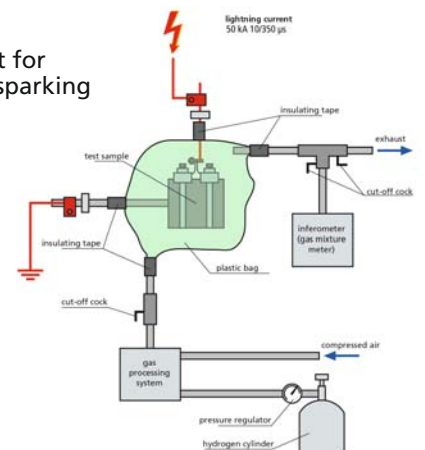
Figure 2

Test sample after artificial ageing according to EN 50164-1 (VDE 0185-201)



Figure 3

Test arrangement for evidence of non-sparking





Pipe clamp for safe electrical contacting of pipes in Ex areas for implementation of lightning equipotential bonding according to IEC 62305-3 EN 62305 (VDE 0185-305-3)



Pipe clamp for explosion-hazard areas attached to a stainless steel pipe (StSt)



Ex-BRS 27 Part No. 540 821 Clamping range \varnothing 6 - 26.9 mm (3/4")



Ex-BRS 90 Part No. 540 801 Clamping range \varnothing 26.9 (3/4") - 88.9 mm (3")
Ex-BRS 300 Part No. 540 803 Clamping range \varnothing 88.9 (3") - 300 mm
Ex-BRS 500 Part No. 540 805 Clamping range \varnothing 300 - 500 mm



Separate clamp body Part No. 540 810 Clamping range \varnothing 26.9 (3/4") - 500 mm in combination with endless tensioning strap

The design of (this novel) Ex pipe clamps (Ex-BandRohrSchellen – Ex-BRS) allows for

1. A safe electrical contact by one contact piece in case of Ex-BRS 27 or two contact clips in case of e.g. Ex-BRS 90
and
2. a mechanical fixing by means of an electrically isolated clamp body.

The pipe clamp is fixed mechanically by two tensioning straps which are electrically isolated from the contact clip by the clamp body manufactures from polyamide (plastic). The tensioning straps are only necessary for the mechanical fixing of the pipe clamp and do not carry current.

Variations of the material due to changing temperatures will be compensated by the plate spring in the clamp body of the Ex pipe clamp and the applied pressure ensures a permanent, non-sparking contact. As required for explosion-risk areas all mechanical and electrical connections are self-locking.

The Ex pipe clamp is available for clamping ranges of \varnothing 6 to 26.9 mm (3/4"), \varnothing 26.9 (3/4") to 88.9 mm (3"), \varnothing 88.9 (3") bis 300 mm, von \varnothing 300 bis 500 mm and in connection with a separate clamp body with an endless tensioning strap. Different pipe diameters from 3/4" to 500 mm can be connected with this model.

Possibilities of connection to the equipotential bonding system or directly to the earth-termination system:

The **Ex-BRS 27** pipe clamp is connected with a cable lug according to DIN 46235 (made of tin-plated E-Cu) in combination with

- a stranded copper conductor with a cross section of 16 to 35 mm² (e.g. for cross section 16 mm² cable lug **Klaue Part No. 103R8**)
or
- a round conductor out of aluminium, copper, galvanised steel (St/tZn) or StSt (V2A / V4A) diameter 8 mm (cross section 50 mm²) cable lug **Klaue Part No. 106R8**.

The **Ex-BRS 90**, **Ex-BRS 300**, **Ex-BRS 500** type of pipe clamp and the **separate clamp body**, with a cable lug according to DIN 46235 (made of tin-plated E-Cu), allows for connection with

- stranded copper conductors min. cross section 16 mm² (e.g. for cross section 16 mm² cable lug **Klaue Part No. 103R10**)
or
- round conductors made of either aluminium, copper, galvanised steel (St/tZn) and StSt (V2A / V4A) diameter 8 mm (cross section 50 mm²) cable lug **Klaue Part No. 106R10**

or

- round conductors made of either aluminium, copper galvanised steel (St/tZn) and StSt (V4A) diameter 10 mm (cross section 78 mm²) cable lug
Klauke Part No. 107R10

The cable lugs have to be crimped professionally using the tool specified by the manufacturer and the appropriate hexagon crimping dies.

Also a flat copper conductor with minimum dimensions of 20 x 2.5 mm and a bore diameter of 10.5 mm can be used.

Type	Part No.	Pipe diameter Clamping range	Pipe material			
			Niro	Cu	St/tZn	St/blank
Ex-BRS 27	540 821	6 mm - 12 mm	10 kA	10 kA	-	-
		12 - 26.9 mm (3/4")	12 kA	20 kA	-	-
		26.9 mm (3/4")	25 kA	25 kA	25 kA	-
Ex-BRS 90	540 801	26.9 - 88.9 mm (3/4" - 3")	25 kA	50 kA		-
	540 810					
Ex-BRS 300	540 803	88.9 (3") - 300 mm	50 kA			-
	540 810					
Ex-BRS 500	540 805	300 - 500 mm	50 kA	-	-	50 kA

The Ex pipe clamps are designed for use in Ex zones 1 and 2 (gases, vapours, fogs) as well as in Ex zones 21 and 22 (dusts). This is also confirmed by the manufacturer declaration.

The representatives of the European market surveillance authorities (ATEX-ADCO Group) have confirmed on their meeting in Brussels, that the pipe clamp is not subject to Directive 94/9/EG. Thus an ATEX certification is not necessary as confirmed by ATEX-ADCO. DEHN + SÖHNE provided evidence of no ignition sparking if the pipe clamp is loaded by lightning current. Therefore welding or using threaded sockets for lightning equipotential bonding at pipelines in explosion-hazard areas will soon be a thing of the past.

For further information about use and installation to be taken into account please see installation instructions No. 1599.

The pros of this novel Ex pipe clamp are quite obvious for the user. Systems or certain areas no longer have to be put out of operation because of welding or drilling work which saves a lot of mounting time. Also the material structure of steel (e.g. of pipelines) being changed due to welding work can be avoided.

The installation instructions can also be downloaded from our internet page www.dehn.de in the scope of product data.



Explosion groups IIA, IIB or IIC are

- characteristic of hazardous gaseous substances. They are also referred to as "substance group" and thus assume the character of a minimum desired value when selecting electrical equipment of equipment category II.
- characteristic of the safety level for the explosion protection of electrical equipment with the character of an actual value. The actual value must at least correspond to the desired value. The explosion groups are also referred to as equipment groups.

IIA represents the minimum, IIC the maximum requirements.

Classification of gases into explosion groups in accordance with IEC, CENELEC and NEC 505

Explosion group	Typical gas
IIA	Propane
IIB	Ethylene
IIC	Hydrogen, acetylene, carbon disulphide

The percentage of all substances classified in the book "Sicherheitstechnische Kennzahlen brennbarer Gase und Dämpfe" (Safety characteristics of flammable gases and vapours) by Redeker/Nabert/Schön was determined. The result is shown in the table below. IIB covers 99% of all applications. However, it must be observed that gas mixtures behave differently.

Explosion protection groups			
IIA	IIB	IIC	Sum ¹⁾
85,2 %	13,8 %	1 %	501

¹⁾The number of substances is indicated under sum

Since also gas mixtures, other ambient temperatures and pressures may occur in different chemical processes, the user of the EX-BRS must coordinate the explosion protection group in the installation area with the operator prior to installation and must document it.