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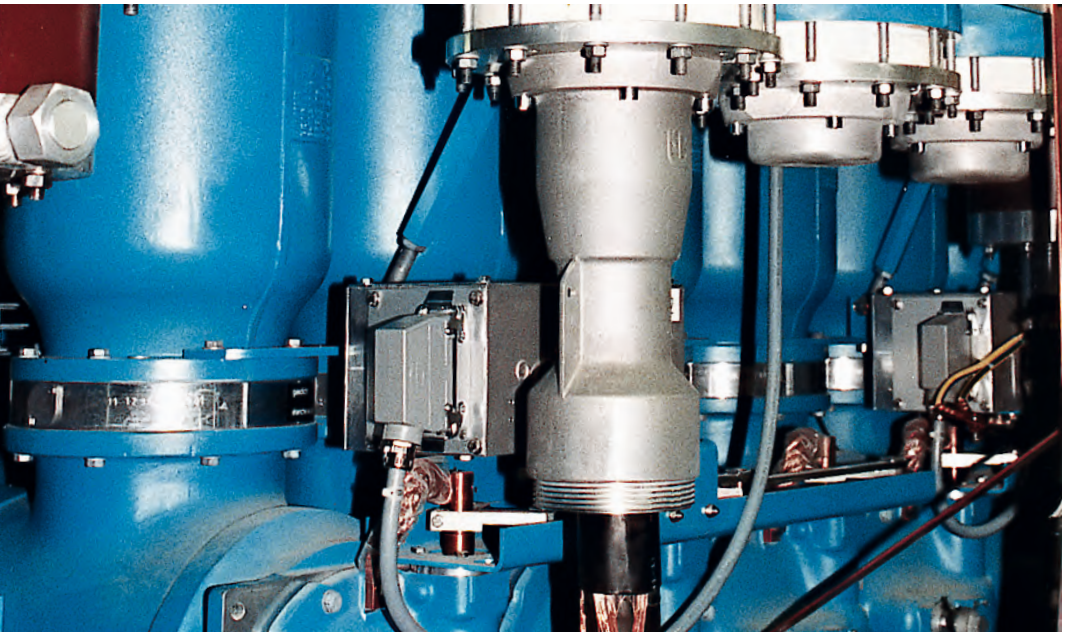
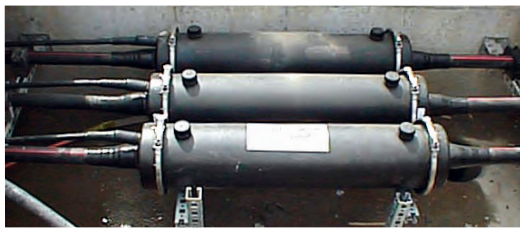
PFISTERER





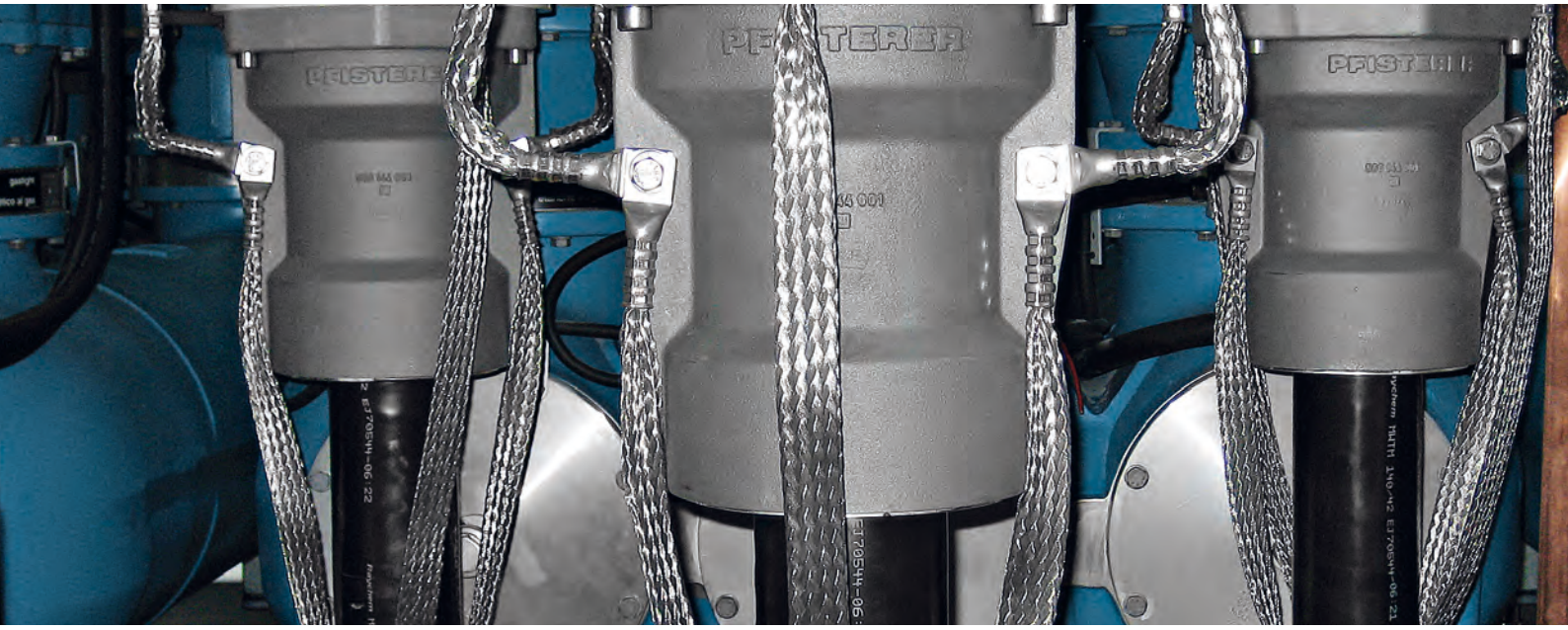
MV-CONNEX, HV-CONNEX, IXOSIL Terminations, IXOSIL MSA Slip-on Joint Boxes

CABLE SYSTEMS

Accessories and Systems for Medium and High-Voltage Cables up to 300 kV.

THE POWER CONNECTION

CABLE SYSTEMS | COMPONENTS | OVERHEAD LINES | RAILWAY CATENARY SYSTEMS



Welcome to the CABLE SYSTEMS Centre of Competence.

Our range of cable terminations and general connectors offers solutions for virtually all applications in the area of medium and high-voltage engineering up to 300 kV. All connectors use silicone as an insulating medium because of its outstanding properties. We offer components and complete systems, as well as worldwide installation and advisory services.

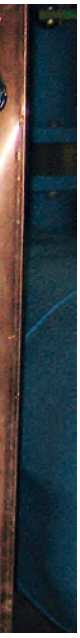
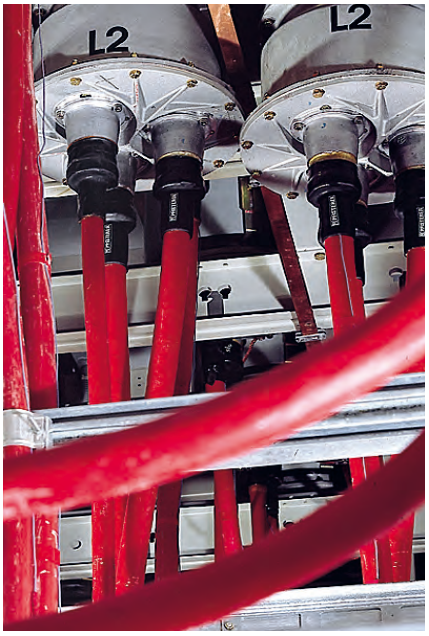
CONNEX. A Dry, Plug-in Connector System for Medium and High-Voltage Networks.

CONNEX meets all your requirements of a universal connector system: full insulation, metal housings and protection against electric shocks. It is maintenance-free, suitable for outdoor use and deckwater-proof. This means CONNEX can be used even in the most extreme conditions.

MV-CONNEX for mediumvoltage systems comes in a wide range of variations. It includes traditional plug and socket combinations, multiple sockets, busbar connectors, surge arresters and voltage detectors. HV-CONNEX components for high-voltage systems up to 245 kV are tested at the factory and are surprisingly simple to install. Complex oil and gas work during installation and commissioning of transformers is finally a thing of the past.

IXOSIL Cable Terminations.

The comprehensive range of terminations suits all applications: the use of silicone as the insulating medium means they are ideally suited to outdoor use, and special designs for indoor use are available as well. In addition, oil-filled and dry models are also available. Standard components with porcelain insulators complete the range.




IXOSIL MSA Slip-on Joint Boxes.

IXOSIL MSA silicone-rubber joint boxes can be used to join copper or aluminium cables within the 72.5 kV to 300 kV voltage range. There are two designs: the compact, one-part version and a version for connecting cables of different types and cross sections.

IXOLINE. Ready-Made Cables.

IXOLINE cables are supplied with IXOSIL or CONNEX connectors. No special tools are required for installation. Result: increased efficiency in less time and at lower cost.

Silicone – a Key Material in High-Voltage Engineering

Water, dirt, grease and oil-resistant, completely maintenance-free, shock-resistant and unbreakable: silicone is the perfect material for cable terminations and far superior to traditional materials such as porcelain. When used as a stress-relief device in sealed applications, silicone evens out temperature variations and unevenness in the cable surface much better than do harder materials such as EPDM. Dangerous partial discharges caused by air gaps are safely avoided. PFISTERER makes silicone products primarily using advanced LSR (Liquid Silicone Rubber) designs; special variations are designed using RTV (room-temperature vulcanising silicone).

Worldwide Installation Services.

The installation of high-voltage components requires knowledge and care. We share our know-how in practical applications training courses. If requested we can of course carry out the installation ourselves for you, wherever in the world you may be.

MV-CONNEX up to 52 kV

The MV-CONNEX range is ideal for use in ring main units, circuit-breaker switchgear, high-voltage motors, transformers, capacitors, transducers and sealing boxes. The connectors on the equipment-side are designed to meet EN 50180, 50181, and DIN 47637. The plug is suitable for all kinds of insulated plastic cables. As well as a wide range of standard types there are also customer-specific versions for every cable type. The MV-CONNEX system features numerous variations: in addition to the standard plug and socket combination, there are many other versions for testing purposes and special applications.

Advantages

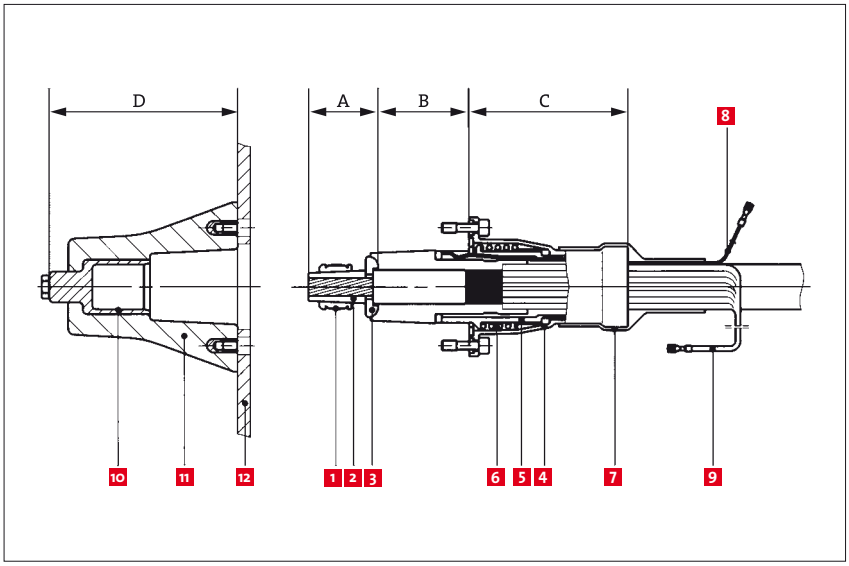
- no liquid insulating medium
- no need to open the cable termination at the installation site
- deckwater-proof
- suitable for outdoor use
- thorough transformer and GIS testing by manufacturer possible

A Contact system
1 contact ring
2 tension cone
3 thrust piece

B Insulating and field-control part

C Housing
4 bell flange
5 pressure sleeve
6 pressure spring
7 heat-shrink
8 test lead (depends on design)
9 cable screen

D Bushing
10 female contact part
11 insulating bushing
12 housing



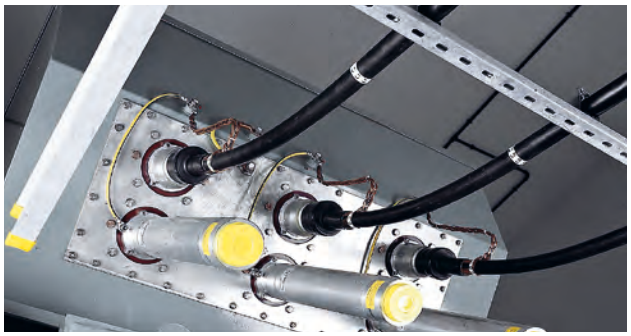
Test standard: DIN VDE 0278 Part 6 high-current design II		CONNEX cable connector system Size				
		0	1	2	3	3-S
Current rating	I_N(A)	250	630	800	1250	1250
Max. working voltage	U_m (kV)	24	36	42	42	52
AC voltage test	50 Hz/1 min (kV)	50	70	95	95	117
Nominal withstand lightning impulse voltage	1.2/50 µs (kV)	125	170	200	200	250
Partial discharg	2 x U_o (pC)	≤10	≤10	≤10	≤10	≤10
DC voltage test	15 min 6 x U_o (kV)	72	108	125	125	156
Rated short-time withstand current	0.5 sec (kA)	-	50	50	63	63
Rated short-time withstand current	1 sec (kA)	16	31.5	40	50	50
Nominal impulse current	(kA)	40	125	125	150	150

MV-CONNEX Multi-Contact Elbow Bushing up to 52 kV

Multi-contact elbow bushings are used instead of DIN-standard porcelain versions on the medium-voltage side of power transformers. They distribute the current over two or four cables, thus accommodating higher power loads using more manageable cable cross sections.

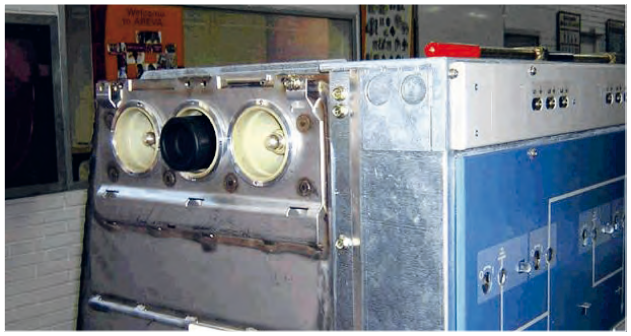
MV-CONNEX Surge Arrester up to 52 kV

CONNEX surge arresters are used to protect metal-enclosed switchgear fitted with cable terminations in accordance with EN 50180/EN 50181. The surge arresters are connected to the switchgear transformer and prevent the entry of excessively high surges. The surge arresters are particularly effective in limiting surges caused by reflected travelling waves and switching overvoltages.



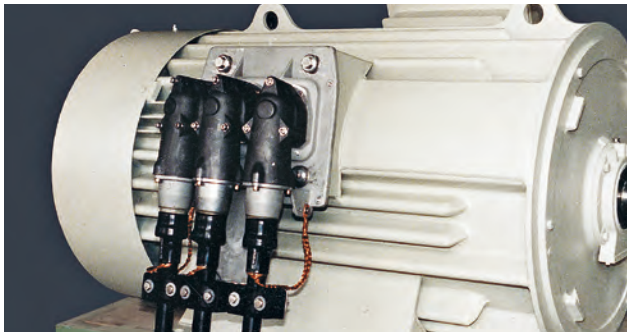
MV-CONNEX Busbar Connectors up to 42 kV

Busbar connectors facilitate the modular construction and on-site expansion of SF 6 insulated switchgear, because the gas compartment does not have to be opened during installation. The range includes 24 kV to 42 kV versions.



MV-CONNEX Motor Connector (CMA) up to 13.8 kV

The CMA CONNEX motor connector allows the quick and easy connection of high-voltage motors, with the connection area being fully metal-enclosed and intrinsically safe. The system is easily installed in place of the motor connection box.



Voltage Detecting Systems

The integrated capacitive potential point makes it easy to check the connection for the absence of voltage. The PFISTERER range includes mobile and stationary continuous voltage indicators, as well as phase comparators and performance testing equipment.

HV-CONNEX 72.5 kV – 245 kV

The advantages of the CONNEX system come to the fore in particular in the area of high-voltage systems: simple on-site installation and factory-tested components save money and provide additional safety. Plug-in HV-CONNEX systems make costly oil and gas work during the installation and commissioning of transformers and gas-insulated switchgear a thing of the past. Thanks to their plug-in connectors, cable joints from the HV-CONNEX range are much more flexible than traditional solutions when it comes to building and converting electrical systems. Needless to say, the range includes all the connection components needed to test the system and the attached equipment.

Advantages

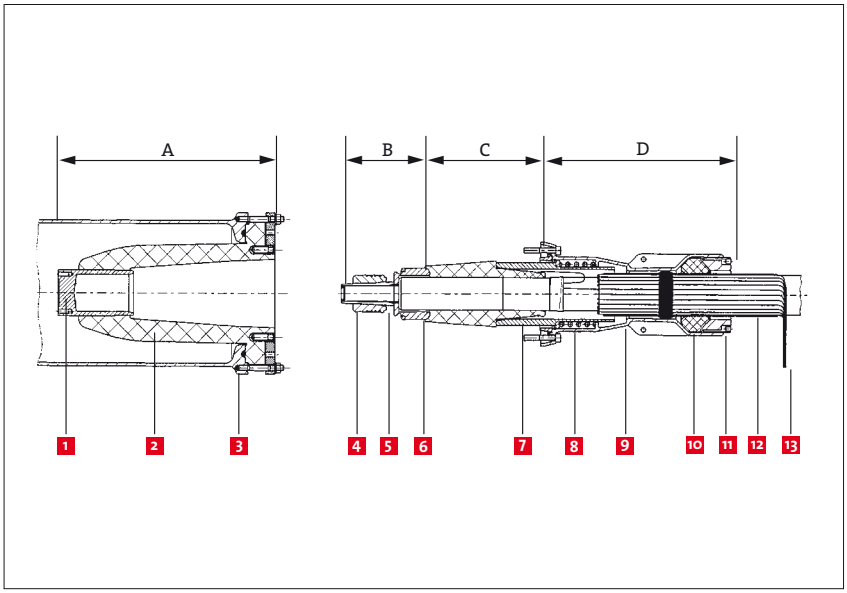
- approx. 50 % shorter mounting length compared with conventional systems in accordance with IEC 60 859
- no opening of the cable termination and associated costly gas or oil work
- horizontal, vertical and angled versions for connection to GIS and transformers
- considerably reduced installation times
- the use of pre-assembled and tested components means maximum safety and efficiency
- installation errors are minimised
- if a fault does arise, rapid separation of cable and equipment

A Bushing
1 female contact part
2 insulating bushing
3 housing

B Contact system
4 contact ring
5 tension cone
6 thrust piece

C Insulating and field-control part

D Housing
7 pressure sleeve
8 pressure spring
9 bell flange
10 gasket
11 threaded counter ring
12 heat-shrink
13 cable screen



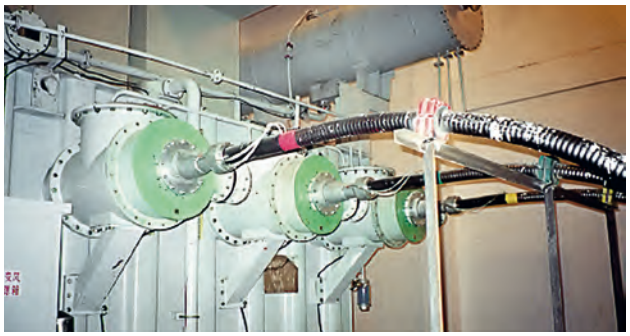
Test standard: TNT 10.97		CONNEX cable connection system Size			
		4	5-S	6	6-S
Current rating	I_N (A)	2500	2500	2500	2500
Max. working voltage	U_m (kV)	72,5	145	170	245
AC voltage test	50 Hz/1 min (kV)	140	275	325	460
Nominal withstand lightning impulse voltage	1.2/50 µs (kV)	325	650	750	1050
Partial discharge	2 x U_o (pC)	≤2	≤2	≤2	≤2
DC voltage test	15 min 6 x U_o (kV)	144	304	348	508
Nominal short-time current	0.5 sec (kA)	63	63	63	63
Nominal short-time current	1 sec (kA)	50	50	50	50
Nominal surge current	(kA)	160	160	160	160

GIS Equipment

HV-CONNEX bushings require less space than IEC connectors. All well-known manufacturers have since begun to offer equipment which exploits this advantage. An extension adapter for conventional cable connector modules is required when HV-CONNEX is used with traditional GIS equipment.

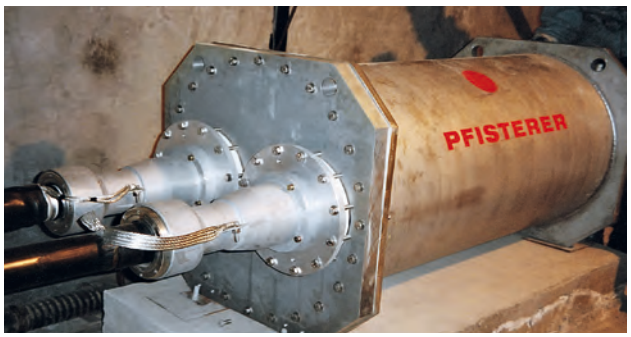
Transformers

The installation of two connectors on the equipment makes it possible to have one cable connector on the side, facing down. If it is necessary to connect this kind of transformer using an overhead line, an HV-CONNEX plug-in insulator for overhead lines can be installed and the downward facing cable connector then terminated with a dummy connector. This plug-in insulator also makes it very easy to carry out simple voltage tests on transformers fitted with HV-CONNEX equipment connectors, either in the factory or on site.



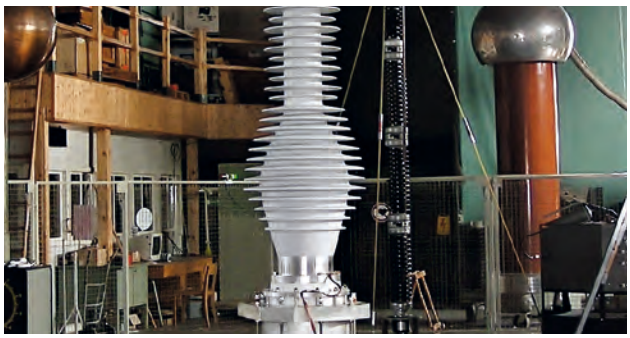
Plug-in Joint Boxes

The HV-CONNEX cable connection system means plug-in joint boxes for various geometric configurations can be assembled using fewer components. The advantage of these joint boxes is that the joint body is a single unit which is completely manufactured and tested at the factory. Solutions of this kind bring enormous benefits if, for example, cables need to be bent back multiple times during the installation and conversion phase.



CONNEX 170 kV Plug-in Bushing

The HV plug-in bushing can be used wherever high-voltage equipment needs to be connected to overhead lines. A CONNEX plug-in bushing provides the connection to the equipment. If the plug-in bushing is used, the high-voltage equipment can be operated immediately without having to open and test it again at the installation site. In addition, plug-in HV versions can be installed at any angle. And the bushing can, of course, be swapped for a cable connector at any time.



In addition to the CONNEX system, the IXOSIL ESG and IXOSIL ESU also provide conventional connections in accordance with IEC 60 859-1 for the direct introduction of XLPE-insulated cables in oil- or gas-filled equipment.

IXOSIL ESS Termination with Self-Supporting Properties

Type ESS terminations are available for voltages from 30 kV to 300 kV with various creepage distances. A resin-glass fibre tube equipped with silicone sheds gives the ESS termination the highest mechanical strength. The ESS termination can withstand the effects of high forces – in a shortcircuit for example. Insulation within the resin-glass fibre tube is ensured by a filling compound. An easy-to-fit head fitting completes the ESS to provide a maintenance-free system.

Electrical levels	ESS 72	ESS 123	ESS 145	ESS 170	ESS 245	ESS 300
Highest voltage U_m	72.5 kV	123 kV	145 kV	170 kV	245 kV	300 kV
Rated voltage	60 – 69 kV	110 – 115 kV	130 – 138 kV	150 – 161 kV	220 – 230 kV	275 kV
Lightning impulse withstand voltage (BIL)	325 kV	550 kV	650 kV	750 kV	1050 kV	1050 kV
AC withstand voltage 1 min/dry	175 kV	260 kV	310 kV	365 kV	460 kV	460 kV

IXOSIL ESP Termination with Porcelain Housing

The ESP termination can be supplied for voltages from 30 kV to 300 kV. The stress cone of the ESP and the ESS termination is identical. The porcelain housing is available with a DIN or alternating shed as required.

Electrical levels	ESP 72	ESP 123	ESP 145	ESP 170	ESP 245	ESP 300
Highest voltage U_m	72.5 kV	123 kV	145 kV	170 kV	245 kV	300 kV
Rated voltage	60 – 69 kV	110 – 115 kV	130 – 138 kV	150 – 161 kV	220 – 230 kV	275 kV
Lightning impulse withstand voltage (BIL)	325 kV	550 kV	650 kV	750 kV	1050 kV	1050 kV
AC withstand voltage 1 min/dry	175 kV	260 kV	310 kV	365 kV	460 kV	460 kV

IXOSIL ESF Termination for Multi-Purposes

Type ESF flexible terminations are dry, slip-on terminations for modular assembly. The use of silicone sheds makes them ideally suited for applications in outdoor installations. Type ESF terminations are available for voltages from 60 kV to 145 kV.

Electrical levels	ESF 60	ESF 123	ESF 145
Highest voltage U_m	72.5 kV	123 kV	145 kV
Rated voltage	60 kV	110 kV	132 kV
Lightning impulse withstand voltage (BIL)	325 kV	550 kV	550 kV
AC withstand voltage 1 min/dry	140 kV	230 kV	230 kV

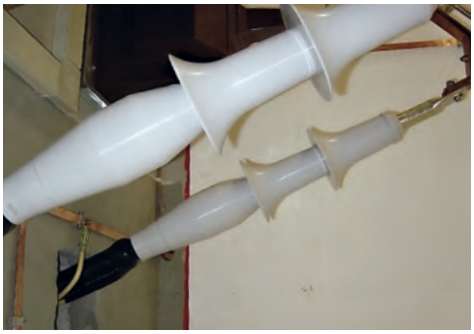
IXOSIL EST Termination Dry Insulated

Type EST is ideally suited for out- and indoor. It is available for voltages from 60 kV to 145 kV and consists of one flexible terminator of type ESF and three supporting insulators. It is free from liquid insulating materials, can be installed in each position and is self-supporting. The EST is built up modular which permits a fast and simple installation. The baseplate is dedsigned to fit on several existing support structures without any problems.

Electrical levels	EST 72	EST 123	EST 145
Highest voltage U_m	72.5 kV	123 kV	145 kV
Rated voltage	60 kV	110 kV	132 kV
Lightning impulse withstand voltage (BIL)	325 kV	550 kV	650 kV
AC withstand voltage 1 min/dry	140 kV	230 kV	275 kV

IXOSIL ESK Termination

Type ESK terminations are dry, slip-on terminations for modular assembly. The use of silicone sheds makes them ideally suited for applications in indoor installations. Type ESK terminations are available for voltages from 10 kV to 145 kV.



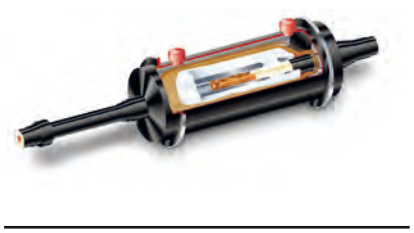
Electrical levels	ESK 60
Highest voltage U_m	72.5 kV
Rated voltage	60 kV
Lightning impulse withstand voltage (BIL)	350 kV
AC withstand voltage 1 min/dry	140 kV

The complete range of medium voltage terminations are also available apon request.

IXOSIL Slip-On Joints

IXOSIL joints essentially consist of premoulded slip-on silicone parts. This enables the secure and efficient connection of two polymeric-insulated cables (XLPE, EPR). The proven slip-on technique ensures minimum installation time and a maximum operation reliability. The tested and applied material complies with all electrical, mechanical and thermal requirements of the cable. The one-piece MSA slip-on joint is available in two different types. On the one hand with a solid PE housing, on the other hand with a shrink sleeve construction.

Both types of joints are available with integrated screen insulation. Therefore they can be used for any kind of screen treatment, for example cross bonding.



IXOSIL MSA One-Piece Slip-On Joint

The one-piece MSA slip-on joint is available for voltages from 60 kV to 300 kV. Due to the one-piece construction of this joint it is extremely compact in size. The required space in a joint pit therefore is reduced to a minimum. Every size of the silicone body covers a range of different insulation diameters. This enables the connection of a copper and an aluminium conductor cable.

IXOSIL MSA Three-Piece Slip-On Joint

The three-piece MSA slip-on joint is available for voltages from 60 kV to 170 kV. The well approved three-piece construction of this joint allows the connection of cables with different designs and dimensions. This enables the connection of a copper and an aluminium conductor cable. For example a 630 mm² EPR cable can be connected to a 500 mm² XLPE cable.

Joint Types	MSA 170 DO	MSA 170 S	MSA 170 MS
			
	Screen transition	Shrink sleeve	Metal water barrier with shrink sleeve

Joint Types	MSA 170 XL or XK	MSA 170 G	MSA 170 MG
			
	Screen interruption with screen take out	Plastic casing with filling compound	Metal water barrier with plastic casing

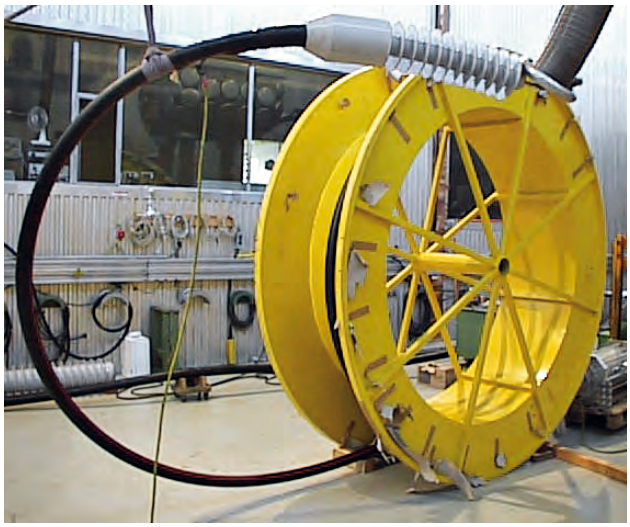
Electrical levels	MSA 72	MSA 123	MSA 145	MSA 170	MSA 245	MSA 300
Highest voltage U_m	72.5 kV	123 kV	145 kV	170 kV	245 kV	300 kV
Rated voltage	60 – 69 kV	110 – 115 kV	132 – 138 kV	150 – 161 kV	220 – 230 kV	275 kV
Lightning impulse withstand voltage (BIL)	325 kV	550 kV	650 kV	750 kV	1050 kV	1050 kV
AC withstand voltage 30 min	90 kV	160 kV	190 kV	218 kV	318 kV	400 kV
Heating cycle test voltage	72 kV	128 kV	152 kV	174 kV	254 kV	320 kV
Partial discharge test < 5 pC at	54 kV	96 kV	114 kV	131 kV	190 kV	240 kV

Installation and Accessories

IXOLINE – Ready-Made Cable Systems

A PFISTERER specialty: IXOLINE – ready-made cables with IXOSIL or CONNEX connectors. IXOLINE components make it very easy to assemble short cable connections. Neither special tools nor trained technicians are needed to install the factory-tested connectors. The applications are endless:

- for turnkey substations
- for emergency cable connections
- for cables under roads and rail lines
- for short connections between GIS and/or transformers
- for connecting overhead switchgear
- for high-voltage test cables

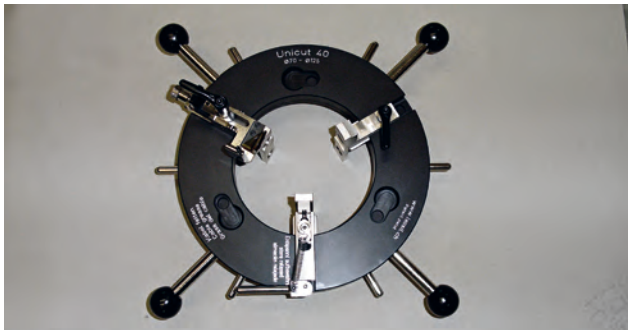


Installation Made Easy

The installation of high-voltage components requires know-how and care. Our own team of technicians carries out the installation of cable equipment, cable runs, cabling of substations and testing throughout the world in the area of medium and high-voltage. We also use practical oriented training courses and on-site supervision to share the necessary know-how.

Accessories

We can supply all the tools and components needed for the installation and testing of high-voltage connectors. We can also advise on your earthing concept and provide the required accessories.



High-Voltage Lab

Our high-voltage lab in Altdorf is equipped for internal and external testing. All tests are carried out in accordance with the relevant standards. Aside from type acceptance and routine tests, we also provide testing of fittings and cable systems. Much of our laboratory resources are dedicated to research and development in order to ensure that our products meet the latest market requirements. The infrastructure consists mainly of:

- AC test equipment up to 1 000 kV
- Impulse voltage test set up to 1 600 kV
- Current inducing system for heat cycle test
- Artificial rain test equipment
- Fully shielded PD measurement room