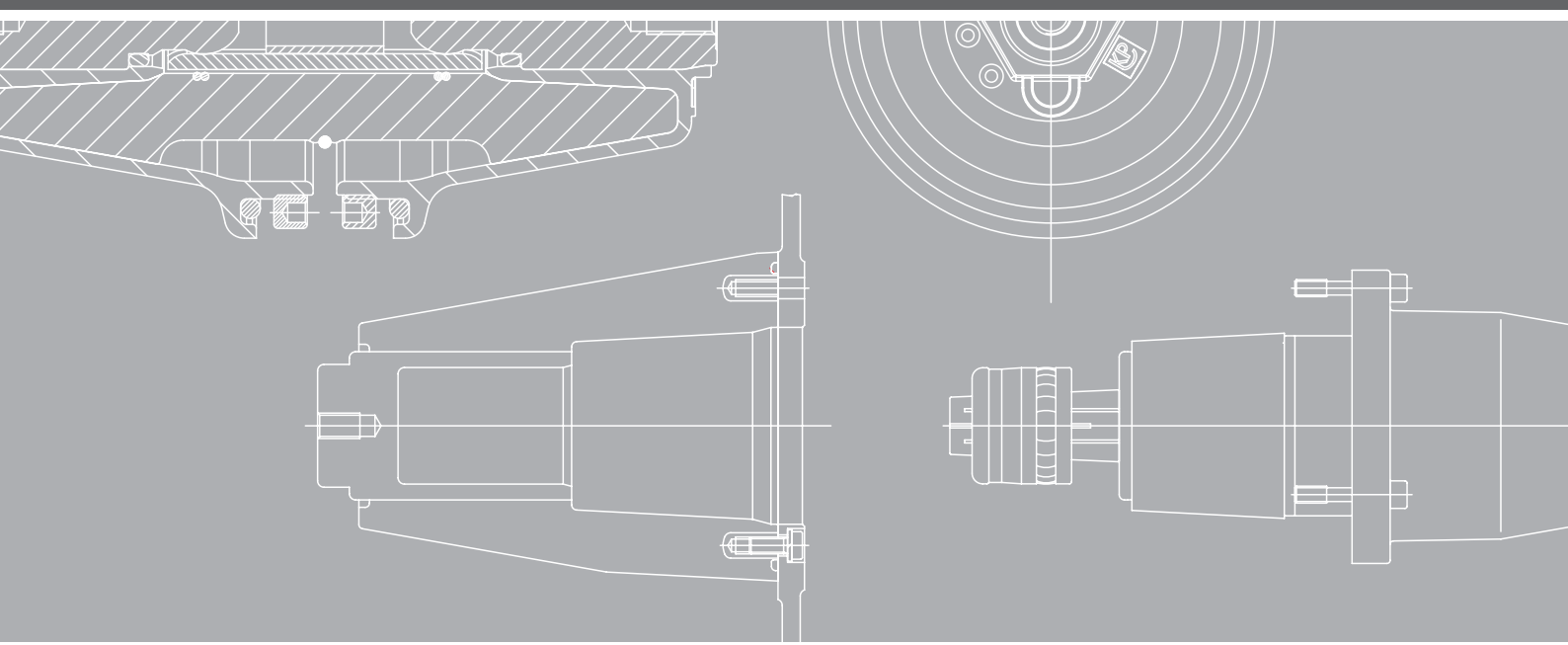


PFISTERER



EDITION 2014

CABLE SYSTEMS

Cable fittings for medium voltage networks

THE POWER CONNECTION



Cable Fittings for Medium Voltage Networks.

Our range of cable accessories offers solutions for virtually all applications in the area of medium voltage engineering. All accessories use silicone rubber as insulating medium because of its outstanding properties. We offer components and complete systems.

MV-CONNEX. A Dry, Separable Connector System for Medium Voltage Networks.

CONNEX meets all your requirements to an universal system of separable connectors: fully insulated with metal housing and providing touch-proof properties. It is maintenance-free, suitable for outdoor use and waterproof. This means MV-CONNEX can be used even in the most extreme conditions.

MV-CONNEX components are factory tested and are surprisingly simple to install. Complex oil and gas work during installation and commissioning of transformers and switchgears are finally a thing of the past.

MV-CONNEX for medium voltage systems comes in a wide range of variations. It includes traditional plug and socket combinations, multiple sockets, bus-bar connectors, surge arresters and voltage detecting systems.



Silicone – a Key Material in Medium Voltage Engineering.

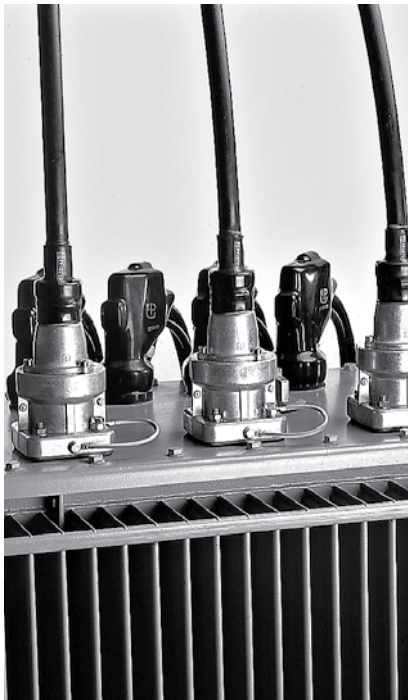
Water, dirt, grease and oil-resistant, completely maintenance-free, shock-resistant and unbreakable: silicone rubber is the perfect material for cable terminations and far superior to traditional materials such as porcelain. When used as a stress-relief device in sealed applications, silicone evens out temperature variations and unevenness in the cable surface

much better than harder materials such as EPDM do. 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 Vulcanizing Silicone).

Continuous voltage indicator for enclosed equipment.

With the increasing use of enclosed switchgear, voltage testing systems, that indicate the presence of voltage without directly contacting live parts, are becoming increasingly important. The principle of the DSA continuous voltage indicator that was

developed by us has become a standard. In line with the trend towards integrated systems we have incorporated these plug-in display devices in the compact DSA-i3 system.



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
- metal enclosed
- fully insulated
- touch proof
- free from arcing
- high short-circuit protection
- maintenance free
- soil- and offshore-proof (optional)

A Contact system

- 1 contact ring
- 2 tension cone
- 3 thrust piece

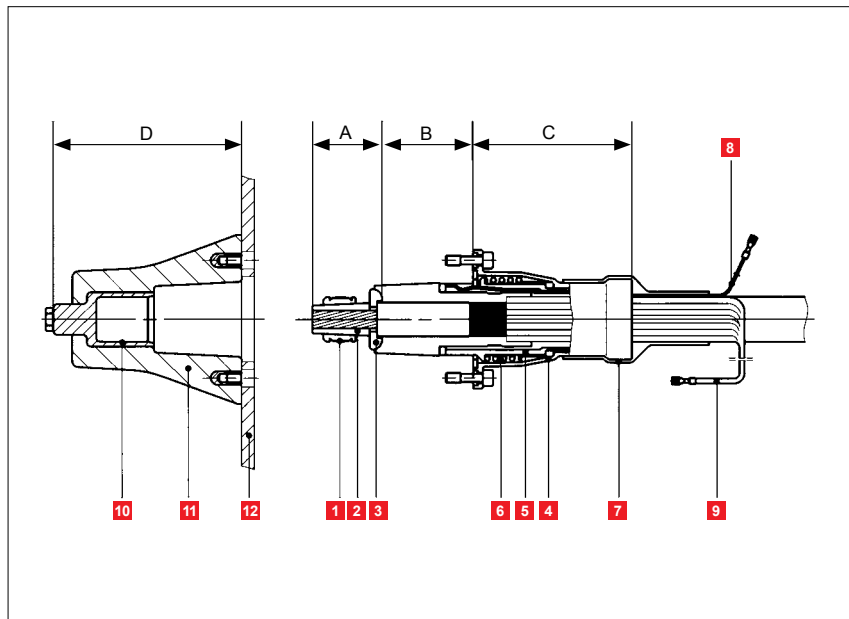
B Insulating and field-control part

C Housing

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

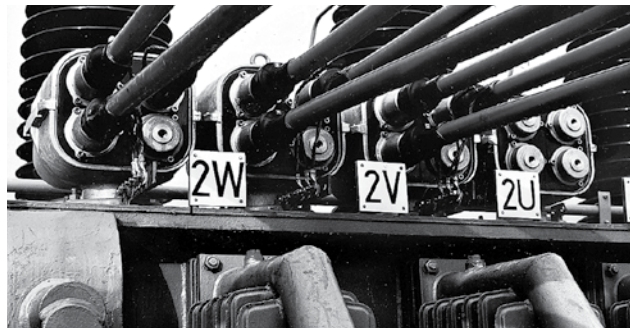
D Socket

- 10 female contact part
- 11 insulating socket
- 12 housing



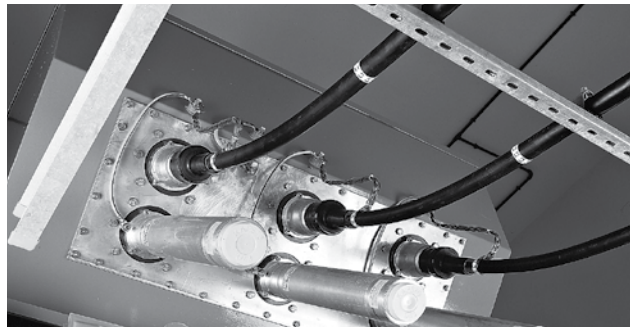
MV-CONNEX Multi-Contact Elbow Bushing up to 52 kV

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.



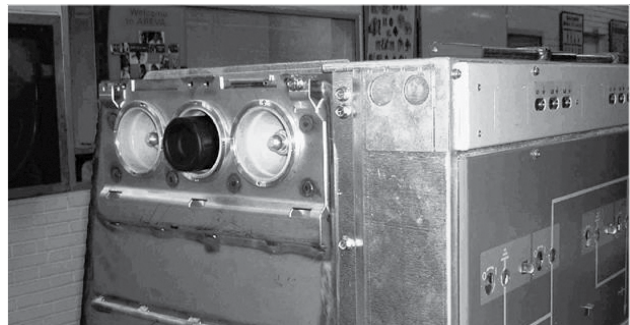
MV-CONNEX Surge Arrester up to 52 kV

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.



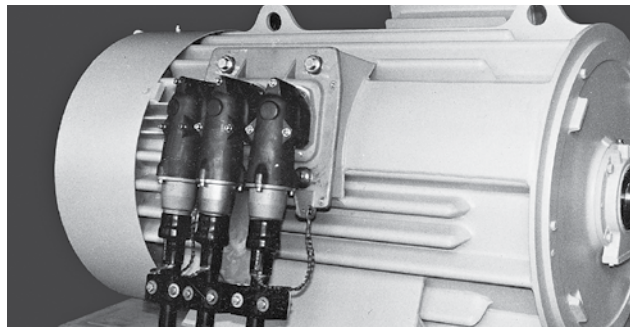
MV-CONNEX Busbar Connectors up to 42 kV

Busbar connectors facilitate the modular construction and on-site expansion of SF6 insulated switchgear, because the gas compartment does not have to be opened during installation. The range includes 24 kV to 42 kV versions.



CMA-MV-CONNEX Motor Connector up to 13,8 kV

The CMA-MV-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.





MV-CONNEX Separable Connectors, Size 0 - 3-S Technical Data and Size Classification List

■ type tested in accordance to IEC 60 502-4:2005 / DIN VDE 0278-629-1:2006

- ¹⁾ If not required, the voltage tap must be earthed separately.
- ²⁾ The min. and max. cross sections can only be achieved by maintaining the min. or max. diameter across the conductors and the min. or max. diameter across the insulation.
- ³⁾ The entire diameter range is covered by various components.

Size	0			1			2			3			3-S						
Max. operating voltage	U_m	(kV)		24	36		42			42			52						
Rated voltage	U	(kV)		20	30		36			36			45						
Line-to-earth-voltage	U_0	(kV)		12	18		20,8			20,8			26						
Nominal current	I_n	(A)		250	630		800			1250			1250						
Conductor		RM	RE	RF	RM	RE	RF	RM	RE	RF	RM	RE	RF	RM	RE	RF			
Cross section (Guide value) ²⁾	Min.	(mm ²)		25	35	16	25	70	16	25	70	16	35	95	25	35	95	25	
	Max.	(mm ²)		70	70	50	240	240	185	400	325	240	800	1000	400	800	1000	400	
Diameter (Set value) ³⁾	Min.	(mm)		5,6	5,6	5,6	4,9	8,3	6,5	4,9	8,3	6,5	6,1	10,5	6,5	17,5	10,5	6,5	
	Max.	(mm)		11,9	11,9	11,9	20,1	20,1	18,3	24,1	22,0	20,6	36,0	36,0	26,8	36,0	36,0	26,8	
Voltage tap		without		with ¹⁾		with- out	with ^{1)/} without		without (XL)		with ^{1)/} without		without (XL)		with ^{1)/} without		without (XL)		
Diameter of insulation ³⁾ after removing the outer semi-conducting layer	Min.	(mm)		12,7		13,5	13,5		13,5	36,0		15,5		46,0		15,5		46,0	
	Max.	(mm)		23,5		31,5	36,0		36,0		44,0		46,0		55,0		46,0		55,0
Rated AC voltage	5 min.	(kV)		54	81		95			95			117						
Partial discharge level at $2 \times U_0$		(pC)		≤ 10		≤ 10		≤ 10			≤ 10			≤ 10					
Rated lightning impulse withstand voltage (BIL)		(kV)		125		170		200			200			250					
DC voltage test	15 min.	(kV)		72	108		125			125			156						
Rated short time current	1 s	(kA)		16	31,5		40			60			60						
	3 s	(kA)		-	16		25			40			40						
Rated impulse current		(kA)		40	125		125			150			150						



MV-CONNEX Separable Connectors, Size 0, $U_m = 24 \text{ kV}$, $I_N = 250 \text{ A}$

Standard article no.

- for DIN VDE cables
- for RM-conductor (stranded circular) of aluminium or copper
- for single core cable with copper wire shield without armouring
- with sealing system (bell flange seal and shrink tubing)
- for indoor and outdoor applications
- not soil-resistant and not offshore-proof
- Packaging unit: set with three separable connectors
- 3-core version on request (see page 17: product configurator)

No.	Max. operating voltage U_m (kV)	for cable cross section (mm ²)	for diameter over conductor (mm)	Insulation thickness (nominal value) (mm)	for diameter over XLPE insulation Ø (mm)
870 010 025	12	25	5.6 - 6.5	3.5	12.7 - 16.3
870 010 035	12	35	6.6 - 7.5	3.4	12.7 - 16.3
870 010 050	12	50	7.7 - 8.6	3.4	15.0 - 19.2
870 010 070	12	70	9.3 - 10.2	3.4	15.0 - 19.2
870 020 025	24	25	5.6 - 6.5	5.5	15.0 - 19.2
870 020 035	24	35	6.6 - 7.5	5.5	18.0 - 21.7
870 020 050	24	50	7.7 - 8.6	5.5	18.0 - 21.7
870 020 070	24	70	9.3 - 10.2	5.5	20.0 - 23.5

MV-CONNEX Separable Connectors, Size 1, $U_m = 36 \text{ kV}$, $I_N = 630 \text{ A}$

Standard article no.

- for DIN VDE cables
- for RM-conductor (stranded circular) of aluminium or copper
- for single core cable with copper wire shield without armouring
- with sealing system (bell flange seal and shrink tubing)
- for indoor and outdoor applications
- not soil-resistant and not offshore-proof
- offshore version on request (see page 17: product configurator)
- Packaging unit: set with three separable connectors
- 3-core version on request (see page 17: product configurator)

The picture shows MV-CONNEX separable connector without voltage tap



No.	No.	Max. operating voltage	for cable cross section	for diameter over conductor	Insulation thickness (nominal value)	for diameter over XLPE insulation
with voltage tap	without voltage tap	U_m (kV)	(mm ²)	(mm)	(mm)	Ø (mm)
850 110 035	870 110 035	12	35	6.0 - 7.3	3.4	13.5 - 17.5
850 110 050	870 110 050	12	50	7.5 - 8.8	3.4	13.5 - 17.5
850 110 070	870 110 070	12	70	9.3 - 10.6	3.4	16.0 - 19.5
850 110 095	870 110 095	12	95	10.8 - 12.1	3.4	18.0 - 21.5
850 110 120	870 110 120	12	120	12.3 - 13.6	3.4	18.0 - 21.5
850 110 150	870 110 150	12	150	13.8 - 15.1	3.4	20.0 - 23.5
850 110 185	870 110 185	12	185	15.3 - 16.6	3.4	22.0 - 25.5
850 110 240	870 110 240	12	240	17.8 - 19.1	3.4	25.0 - 28.5
850 120 035	870 120 035	24	35	6.0 - 7.3	5.5	18.0 - 21.5
850 120 050	870 120 050	24	50	7.5 - 8.8	5.5	18.0 - 21.5
850 120 070	870 120 070	24	70	9.3 - 10.6	5.5	20.0 - 23.5
850 120 095	870 120 095	24	95	10.8 - 12.1	5.5	22.0 - 25.5
850 120 120	870 120 120	24	120	12.3 - 13.6	5.5	23.5 - 27.0
850 120 150	870 120 150	24	150	13.8 - 15.1	5.5	25.0 - 28.5
850 120 185	870 120 185	24	185	15.3 - 16.6	5.5	26.5 - 30.0
850 120 240	870 120 240	24	240	17.8 - 19.1	5.5	28.0 - 31.5
850 130 050	870 130 050	36	50	7.5 - 8.8	8.0	23.5 - 27.0
850 130 070	870 130 070	36	70	9.3 - 10.6	8.0	25.0 - 28.5
850 130 095	870 130 095	36	95	10.8 - 12.1	8.0	26.5 - 30.0
850 130 120	870 130 120	36	120	12.3 - 13.6	8.0	28.0 - 31.5
-	870 130 150	36	150	13.8 - 15.1	8.0	30.0 - 33.5
-	870 130 185	36	185	15.3 - 16.6	8.0	31.0 - 34.5



MV-CONNEX Separable Connectors, Size 2, $U_m = 42 \text{ kV}, I_N = 800 \text{ A}$

Standard article no.

- for DIN VDE cables
- for RM-conductor (stranded circular) of aluminium or copper
- for single core cable with copper wire shield without armouring
- with sealing system (bell flange seal and shrink tubing)
- for indoor and outdoor applications
- not soil-resistant and not offshore-proof
- offshore version on request (see page 17: product configurator)
- Packaging unit: set with three separable connectors
- 3-core version on request (see page 17: product configurator)
- rotatable flange

The picture shows MV-CONNEX separable connector with voltage tap.

No.	No.	Max. operating voltage	for cable cross section	for diameter over conductor	Insulation thickness (nominal value)	for diameter over XLPE insulation	Rem.
with voltage tap	without voltage tap	U_m (kV)	(mm ²)	(mm)	(mm)	Ø (mm)	
850 210 050	870 210 050	12	50	7.5 - 8.8	3.4	13.5 - 17.5	
850 210 070	870 210 070	12	70	9.3 - 10.6	3.4	16.0 - 19.5	
850 210 095	870 210 095	12	95	10.8 - 12.1	3.4	18.0 - 21.5	
850 210 120	870 210 120	12	120	12.3 - 13.6	3.4	18.0 - 21.5	
850 210 150	870 210 150	12	150	13.8 - 15.1	3.4	20.0 - 23.5	
850 210 185	870 210 185	12	185	15.3 - 16.6	3.4	22.0 - 25.5	
850 210 240	870 210 240	12	240	17.8 - 19.1	3.4	25.0 - 28.5	
850 210 300	870 210 300	12	300	19.2 - 20.9	3.4	26.5 - 30.0	
850 220 050	870 220 050	24	50	7.5 - 8.8	5.5	18.0 - 21.5	
850 220 070	870 220 070	24	70	9.3 - 10.6	5.5	20.0 - 23.5	
850 220 095	870 220 095	24	95	10.8 - 12.1	5.5	22.0 - 25.5	
850 220 120	870 220 120	24	120	12.3 - 13.6	5.5	23.5 - 27.0	
850 220 150	870 220 150	24	150	13.8 - 15.1	5.5	25.0 - 28.5	
850 220 185	870 220 185	24	185	15.3 - 16.6	5.5	26.5 - 30.0	
850 220 240	870 220 240	24	240	17.8 - 19.1	5.5	28.0 - 31.5	
850 220 300	870 220 300	24	300	19.2 - 20.9	5.5	31.0 - 34.5	
850 230 035	870 230 035	36	35	6.0 - 7.3	8.0	16.0 - 19.5	
850 230 050	870 230 050	36	50	7.5 - 8.8	8.0	23.5 - 27.0	
850 230 070	870 230 070	36	70	9.3 - 10.6	8.0	25.0 - 28.5	
850 230 095	870 230 095	36	95	10.8 - 12.1	8.0	26.5 - 30.0	
850 230 120	870 230 120	36	120	12.3 - 13.6	8.0	28.0 - 31.5	
850 230 150	870 230 150	36	150	13.8 - 15.1	8.0	29.5 - 33.0	
850 230 185	870 230 185	36	185	15.3 - 16.6	8.0	31.0 - 34.5	
850 230 240	870 230 240	36	240	17.8 - 19.1	8.0	32.5 - 36.0	
-	870 235 300	36	300	19,7 - 21,4	8.0	36.0 - 38.5	(XL)

MV-CONNEX Separable Connectors, Size 3, $U_m = 42 \text{ kV}, I_N = 1250 \text{ A}$

Standard article no.

- for DIN VDE cables
- for RM-conductor (stranded circular) of aluminium or copper
- for single core cable with copper wire shield without armouring
- with sealing system (bell flange seal and shrink tubing)
- for indoor and outdoor applications
- not soil-resistant and not offshore-proof
- offshore version on request (see page 17: product configurator)
- Packaging unit: set with three separable connectors
- 3-core version on request (see page 17: product configurator)
- rotatable flange

The picture shows MV-CONNEX separable connector without voltage tap



No.	No.	Max. operating voltage	for cable cross section	for diameter over conductor	Insulation thickness (nominal value)	for diameter over XLPE insulation	Rem.
with voltage tap	without voltage tap	U_m (kV)	(mm ²)	(mm)	(mm)	Ø (mm)	
850 310 800	870 310 120	12	120	12.5 - 14.7	3.4	19.0 - 23.0	
850 310 150	870 310 150	12	150	13.5 - 15.7	3.4	19.0 - 23.0	
850 310 185	870 310 185	12	185	15.0 - 17.2	3.4	22.5 - 26.5	
850 310 240	870 310 240	12	240	17.5 - 19.7	3.4	24.5 - 28.5	
850 310 300	870 310 300	12	300	19.5 - 21.7	3.4	26.0 - 30.0	
850 310 400	870 310 400	12	400	22.6 - 24.8	3.4	30.0 - 34.0	
850 310 500	870 310 500	12	500	25.4 - 27.6	3.4	32.0 - 36.0	
850 310 630	870 310 630	12	630	28.9 - 31.1	3.4	36.0 - 39.5	
850 320 050	870 320 050	24	50	7.2 - 9.4	5.5	19.0 - 23.0	
850 320 070	870 320 070	24	70	9.0 - 11.2	5.5	19.0 - 23.0	
850 320 095	870 320 095	24	95	10.5 - 12.7	5.5	22.5 - 26.5	
850 320 120	870 320 120	24	120	12.5 - 14.7	5.5	22.5 - 26.5	
850 320 150	870 320 150	24	150	13.5 - 15.7	5.5	24.5 - 28.5	
850 320 185	870 320 185	24	185	15.0 - 17.2	5.5	26.0 - 30.0	
850 320 240	870 320 240	24	240	17.5 - 19.7	5.5	28.0 - 32.0	
850 320 300	870 320 300	24	300	19.5 - 21.7	5.5	30.0 - 34.0	
850 320 400	870 320 400	24	400	22.6 - 24.8	5.5	34.0 - 38.0	
850 320 500	870 320 500	24	500	25.4 - 27.6	5.5	36.0 - 39.5	
850 320 630	870 320 630	24	630	28.9 - 31.1	5.5	40.0 - 43.0	
850 330 050	870 330 050	36	50	7.2 - 9.4	8.0	22.5 - 26.5	
850 330 070	870 330 070	36	70	9.0 - 11.2	8.0	24.5 - 28.5	
850 330 095	870 330 095	36	95	10.5 - 12.7	8.0	26.0 - 30.0	
850 330 120	870 330 120	36	120	11.5 - 13.7	8.0	28.0 - 32.0	
850 330 150	870 330 150	36	150	13.5 - 15.7	8.0	30.0 - 34.0	
850 330 185	870 330 185	36	185	15.0 - 17.2	8.0	30.0 - 34.0	
850 330 240	870 330 240	36	240	17.5 - 19.7	8.0	34.0 - 38.0	
850 330 300	870 330 300	36	300	19.5 - 21.7	8.0	36.0 - 39.5	
850 330 400	870 330 400	36	400	22.6 - 24.8	8.0	38.0 - 41.0	
850 330 500	870 330 500	36	500	25.4 - 27.6	8.0	42.0 - 44.5	
-	870 335 630	36	630	28.9 - 31.1	8.0	44.5 - 47.0	(XL)
-	870 335 631	36	630	28,9 - 31,1	8,0	46.5 - 49.0	(XL)



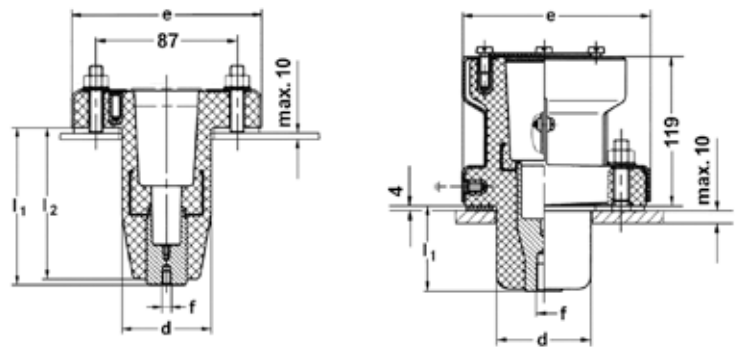
1 MV-CONNEX Transformer Sockets, straight

For local grid transformers, the transformer connecting pieces are fitted instead of the DIN porcelain bushings on the medium voltage side.

The insulation piece that extends into the transformer (dimensions l_1 and l_2) is available in different lengths in order to accommodate the type of transformer. The cables are connected using metal-encapsulated CONNEX separable connectors. On the 0.4 kV side there are corresponding insulating caps which provide total protection against contact.

Note:

For an example of application, see picture overview of local grid transformers. Not offshore qualified



No.	Size	Max. operating voltage	Nominal current	Threaded connection	Weight (kg)	l_1 (mm)	d (mm)	e (mm)	
		U_m (kV)	I_N (A)	f					
827 115 004	0	24	250	M8 x 12	2.1	137	77	127	1
827 158 001	0	24	250	M12 x 22	3.4	68	75	130	2
827 159 001	1	24	630	M12 x 22	3.3	68	75	130	2

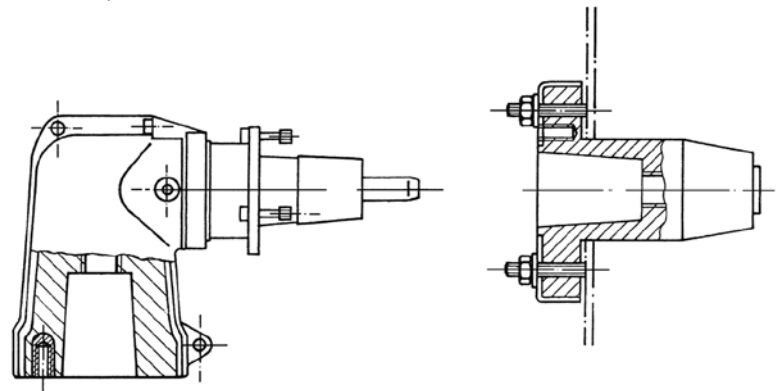


1 MV-CONNEX Elbow Adapters

The metal-encapsulated CONNEX elbow adapter is a component which can be used to convert straight CONNEX sockets into CONNEX elbow bushings. The system offers a connection that is angled by 90°. One side is designed as a CONNEX separable connector size 0 or 1, the other side as a CONNEX sockets of the same size. The grounded metal housing provides total protection against contact.

Note:

For an example of application, see picture overview of local grid transformers. Not offshore qualified



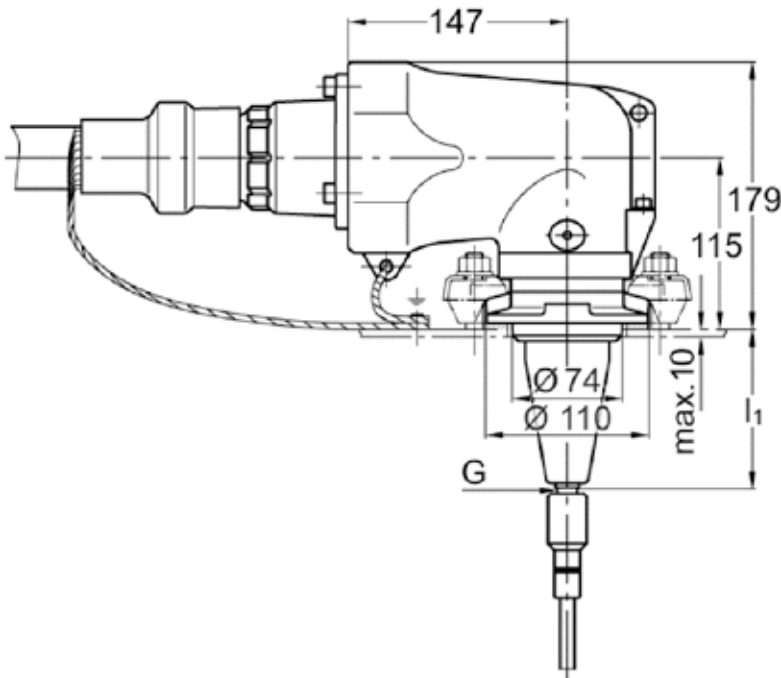
No.	Size	Max. operating voltage	Nominal current	Weight	
		U_m (kV)	I_N (A)	(kg)	
827 176 001	0	24	250	4.3	1
827 180 001	1	24	630	5.4	2

MV-CONNEX Transformer Elbow Bushings

When installed, elbow bushings can be swiveled by 260°. The grounded metal housing provides absolute protection against electric-shock hazard. Fastening in accordance with DIN 42538 flange A, flange thickness of the transformer cover max. 10 mm.

Compression Sleeves: See page 34

Note: Not offshore qualified



No.	Size	Max. operating voltage		Nominal current	Thread	Weight	I ₁
		U _m (kV)	I _N (A)				
827 107 064	0	24	250	M10	4.4	64	
827 107 107	0	24	250	M10	4.5	107	
827 107 168	0	24	250	M10	4.8	168	
827 117 064	1	36	630	M16	4.8	64	
827 117 107	1	36	630	M16	5	107	
827 117 168	1	36	630	M16	5.2	168	

Fixing set

for MV-CONNEX Elbow Bushing size 0 and 1. Comprises a flange ring, flat gasket, spring washers and hexagon nuts.

No.

827 190 017

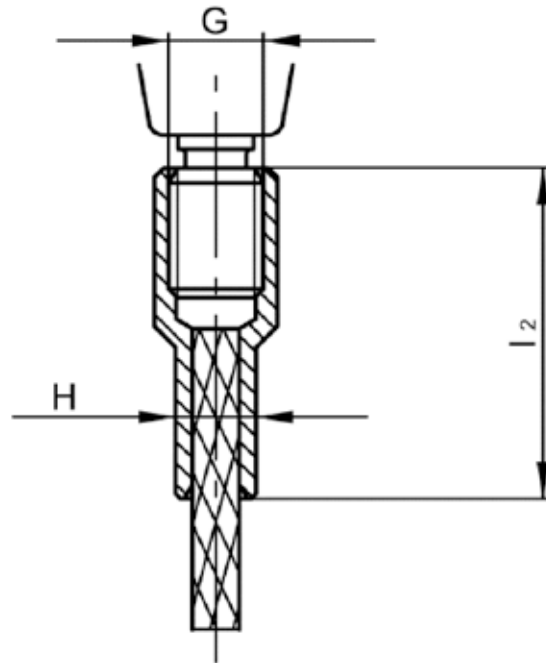




1 Compression Sleeves

Only these compression sleeves are approved for connection of MV-CONNEX transformers elbow bushings size 0 and 1. For use with hexagonal compression dies.

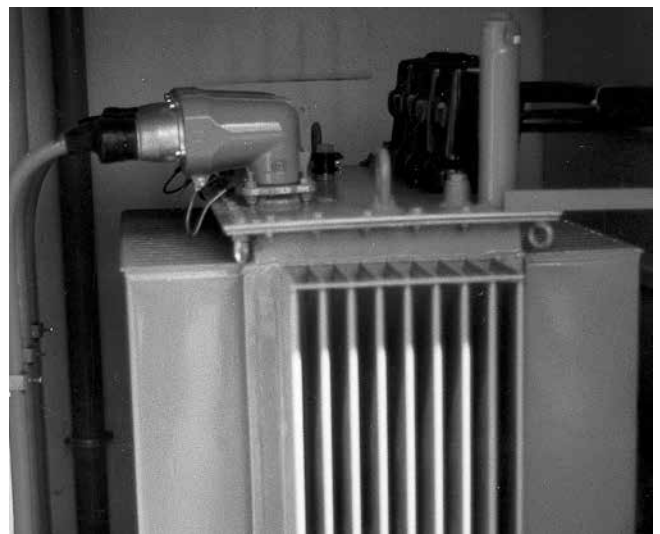
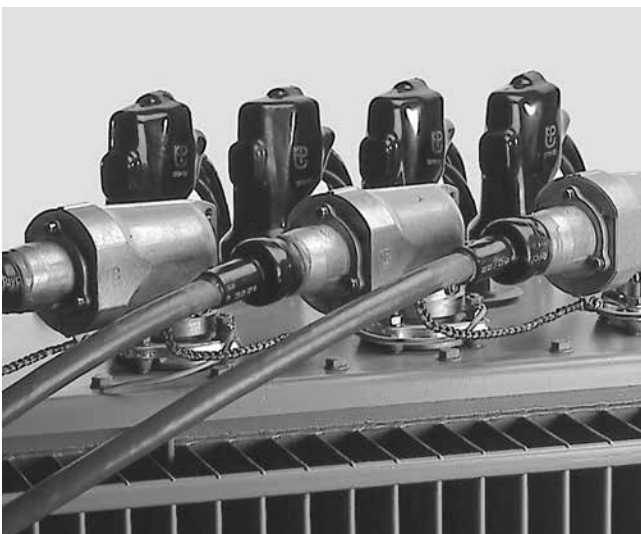
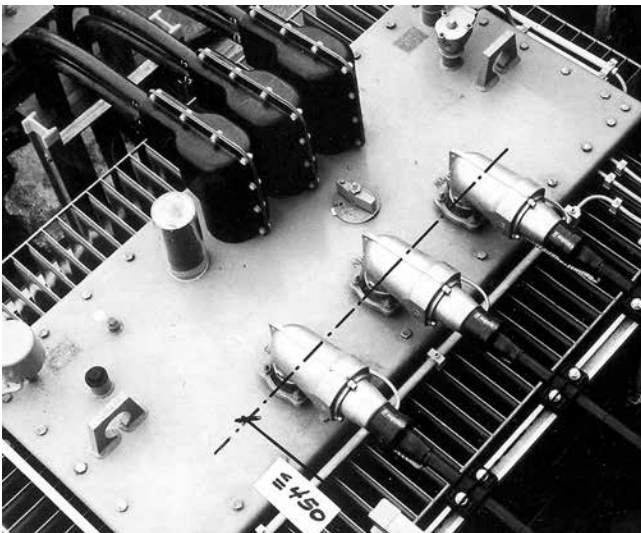
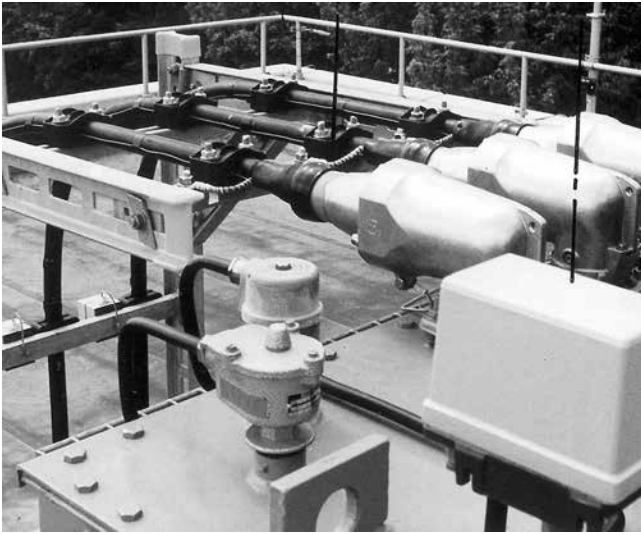
2



No.	for size	Cross section Cu strand wire (mm ²)	Diameter Cu strand wire according to DIN 46438 Ø (mm)	Diameter Cu strand wire according to DIN 60228 Ø (mm)	Pressing tool for		l ₂ (mm)	
					thread G	Cu strand H		
560 320 001	0	10	5.0	4,5 - 5,0	KZ 14	KZ 8	35	1
560 320 007	0	35	10.0	8,6 - 9,2	KZ 16	KZ 14	42	1
560 320 005	0	70	14.2	12,6 - 13,1	KZ 16	KZ 18	70	1
560 320 002	1	10	5.0	4,5 - 5,0	KZ 20	KZ 8	38	2
560 320 003	1	35	10.0	8,6 - 9,2	KZ 20	KZ 14	42	2
560 320 004	1	50	12.0	10,0 - 11,0	KZ 20	KZ 16	42	2
560 320 006	1	120	19.5	(16,2 - 17,0) ^{*)}	KZ 22	KZ 25	70	2
560 320 006	1	150	-	18,0 - 19,0	KZ 22	KZ 25	70	2

*) The diameters of the CU-stranded wires are to be re-crimped with the next smaller tool code (KZ 25 + KZ 22)

Picture overview of local grid transformers





MV-CONNEX Multi-Contact Elbow Bushings

The multiple elbow bushings are fitted instead of the DIN porcelain bushings on the medium voltage side of the power transformer.

The multiple elbow bushings consist of an insulation body that is integrated in a metal housing is connected with a maximum of 2 or 4 cables using CONNEX cable connectors sizes 2 or 3.

The earthed metal housing provide total protection against contact and is suitable for offshore applications.

Unassigned sockets must be closed using dummy plugs such that they are voltage-proof.

External environmental influences, such as small animals and birds, cannot cause short circuits. Plug-in enclosed surge arresters can be fitted instead of a CONNEX cable connectors. The electrical connections in the transformer can be in the form of either clamps or plugs.

For power transformers suitable for fastening in accordance with DIN 42538, resistant to outside air.

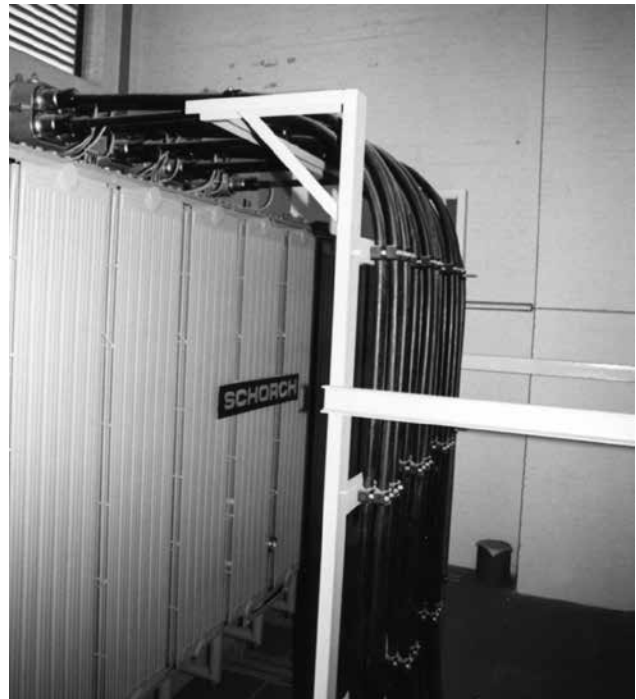
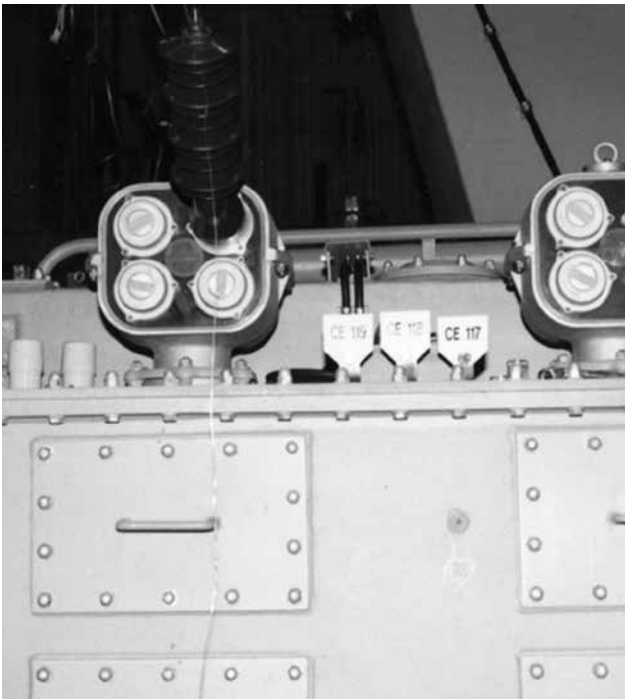
Order connectors separately.

Cold shock tests in accordance with VDE 0441.

Caution:

The CONNEX dummy plugs are not provided and must be ordered separately.

MV-CONNEX Multi-Contact Elbow Bushings



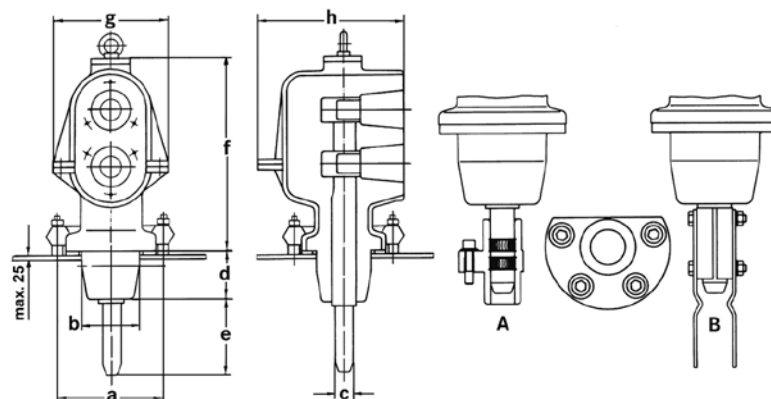


MV-CONNEX Double-Contact Elbow Bushings, up to 52 kV

For plug-in and clamping type construction respectively.
With aluminium housing.

A Plug-in type connecting part

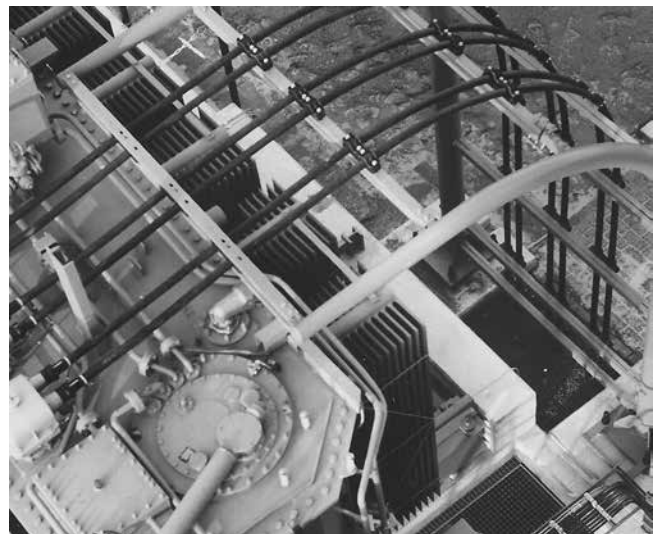
B Clamping type connecting part (supplied by the transformer manufacturer)



No.	Size	Max. operating voltage	max. rated current with plugged connection in transformer - type A	max. rated current with clamped connection in transformer - type B	dimensions						cone	
					a	b	c	d	e	f		g
		U_m (kV)	max. I_N (A)	max. I_N (A)	(mm)	(mm)	(mm)	(mm)	(mm)	(mm)	(mm)	
827 661 005	2	36	1250	1250	180	110	30	125	90	388	215	slim
827 661 006	2	36	1600	1600	200	135	35	125	125	388	215	standard
827 661 007	2	36	1600	1600	200	135	35	300	125	388	215	long ¹⁾
827 661 002	2	42	1250	1250	180	110	30	125	90	388	215	slim
827 661 001	2	42	1600	1600	200	135	35	125	125	388	215	standard
827 661 004	2	42	1600	1600	200	135	35	300	125	388	215	long ¹⁾
827 660 002	3	36	2200	2500	200	135	35	125	125	451	246	standard
827 660 007	3	36	2200	2500	200	135	35	300	125	451	246	long ¹⁾
827 660 001	3	42	2200	2500	200	135	35	125	125	451	246	standard
827 660 003	3	42	2200	2500	200	135	35	300	125	451	246	long ¹⁾
827 660 004	3	52	2200	2500	200	135	35	125	125	451	246	standard
827 660 006	3	52	2200	2500	200	135	35	300	125	451	246	long ¹⁾

¹⁾ For current transformers for measuring purposes

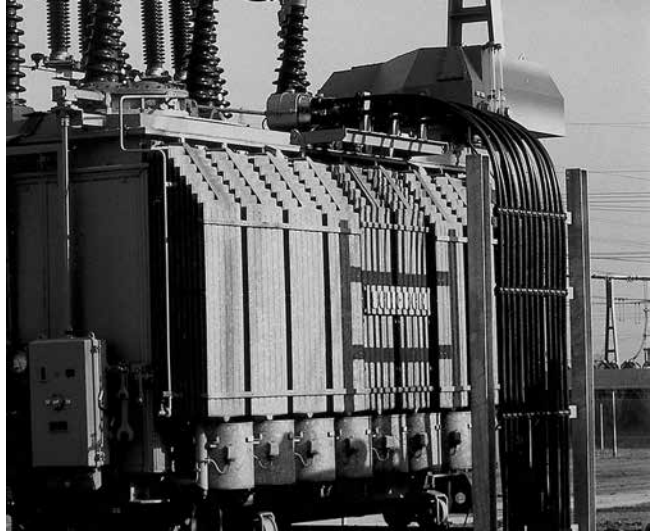
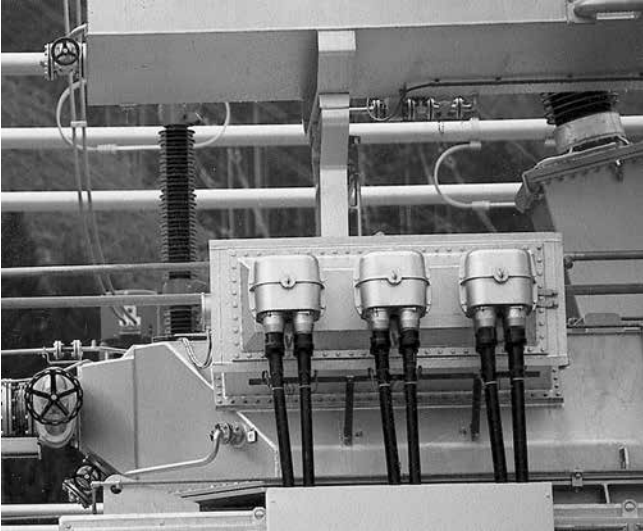
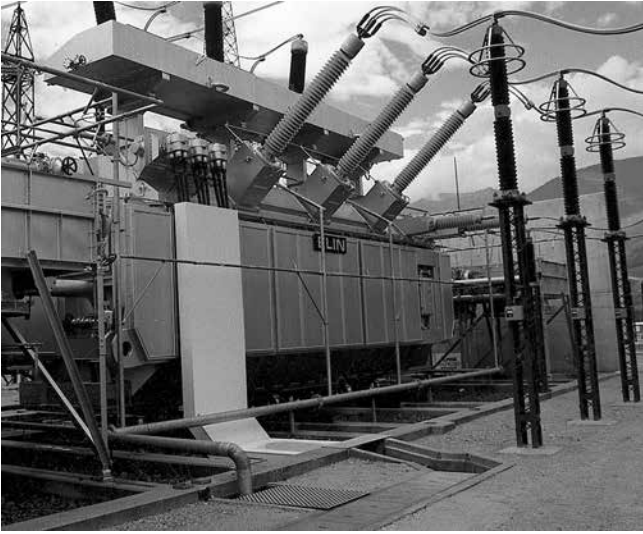
Power Transformers, on the low-voltage side with multi-contact elbow bushings up to 52 kV



MV-CONNEX Transformer Bushings

MV-CONNEX Transformer Bushings

Power Transformers, on the low-voltage side with multi-contact elbow bushings up to 52 kV

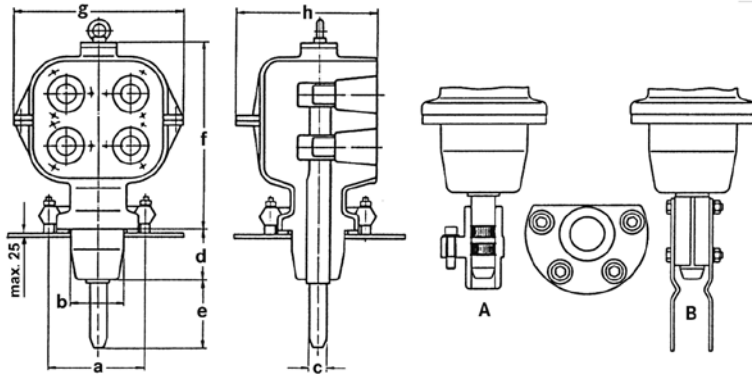


MV-CONNEX Quadruple-Contact Elbow Bushings, up to 52 kV

For plug-in and clamping type construction respectively.
With aluminium housing.

A Plug-in type connecting part.

B Clamping type connecting part (supplied by the transformer manufacturer)

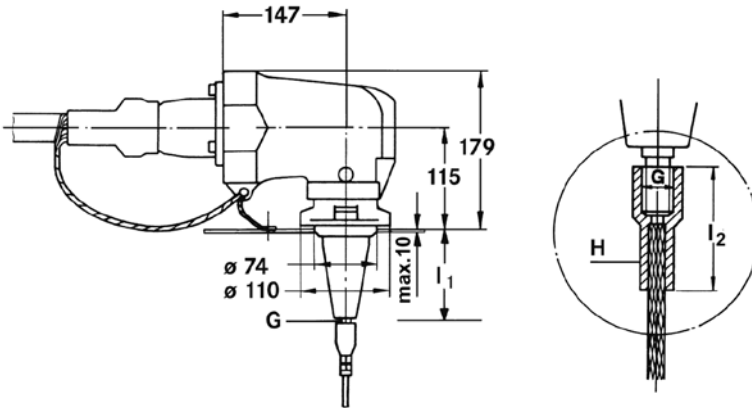


No.	Size	Max. operating voltage	max. rated current with plug-in type connection in transformer - type A	max. rated current with clamped connection in transformer - type B	a	b	c	d	e	f	g	Cone
	U_m (kV)		max. I_N (A)	max. I_N (A)	(mm)	(mm)	(mm)	(mm)	(mm)	(mm)	(mm)	
827 124 715	2	36	1250	1250	180	110	30	125	90	387	345	slim
827 124 723	2	36	2200	3150	200	135	35	125	125	387	345	standard
827 124 823	2	36	2200	3150	200	135	35	300	125	387	345	long ¹⁾
827 124 716	2	42	1250	1250	180	110	30	125	90	387	345	slim
827 124 727	2	42	2200	3150	200	135	35	125	125	387	345	standard
827 124 827	2	42	2200	3150	200	135	35	300	125	387	345	long ¹⁾
827 146 335	3	36	2200	2500	200	135	35	125	125	449	390	standard
827 146 835	3	36	2200	2500	200	135	35	300	125	449	390	long ¹⁾
827 146 336	3	42	2200	3150	200	135	35	125	125	449	390	standard
827 146 836	3	42	2200	3150	200	135	35	300	125	449	390	long ¹⁾
827 146 337	3	52	2200	3150	200	135	35	125	125	449	390	standard
827 146 837	3	52	2200	3150	200	135	35	300	125	449	390	long ¹⁾

¹⁾ For current transformers for measuring purposes

MV-CONNEX Elbow Bushings

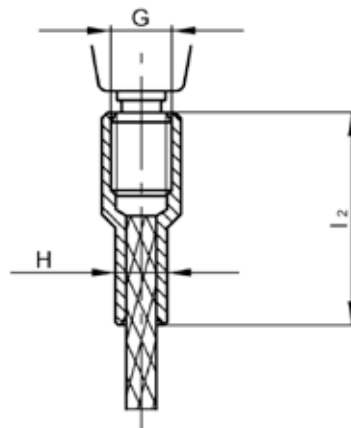
For switch gears and motors.
Fasten with 4 fillister head screws (included in the scope of delivery)



No.	Size	Nominal current	Max. operating voltage air	Max. operating voltage SF ₆ -gas	Max. operating voltage oil	Thread	Weight	I ₁
		I _N (A)	U _m (kV)	U _m (kV)	U _m (kV)			
827 109 107	0	250	6	24	24	M10	6.5	107
827 119 107	1	630	6	36	36	M16	4.9	107

Compression Sleeves

Only these compression sleeves are approved for connection of MV-CONNEX elbow bushings.
For use with hexagonal compression dies.



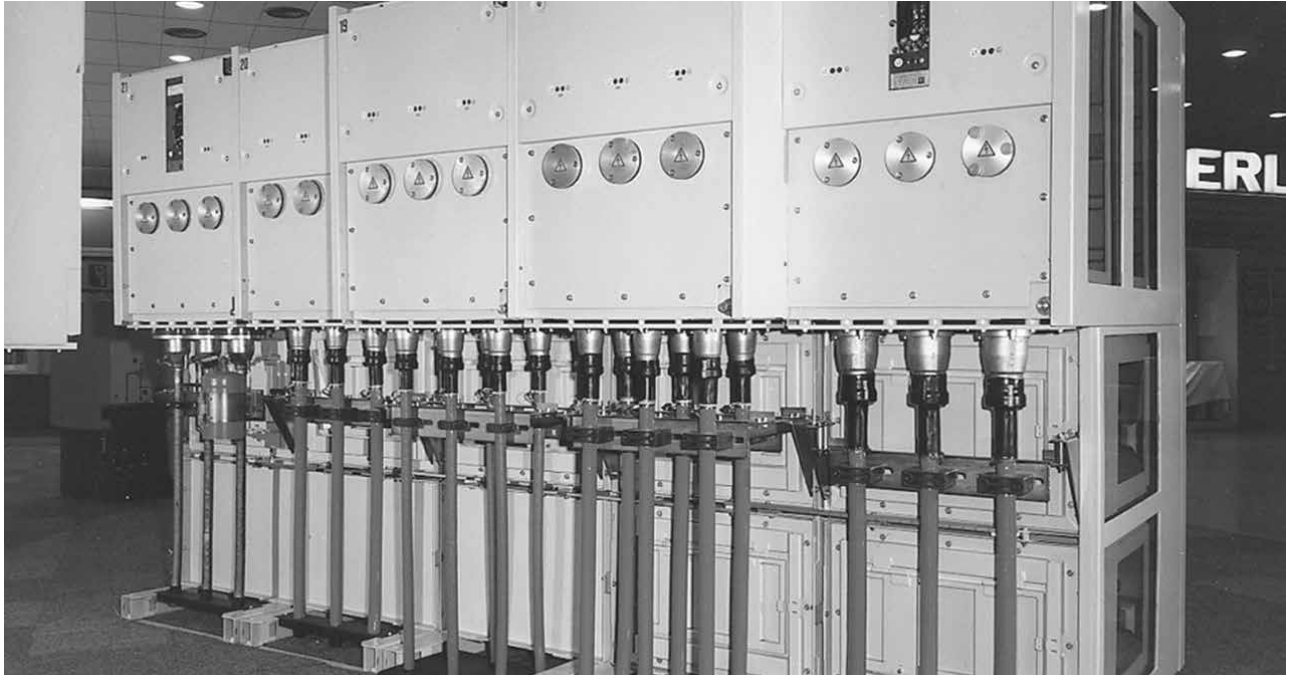
No.	for size	Cross section Cu strand wire	Diameter Cu strand wire according to DIN 46438	Diameter Cu strand wire according to DIN 60228	Pressing tool for thread	Pressing tool for Cu strand	I ₂
		(mm ²)	Ø (mm)	Ø (mm)	G	H	
560 320 001	0	10	5.0	4,5 - 5,0	KZ 14	KZ 8	35
560 320 007	0	35	10.0	8,6 - 9,2	KZ 16	KZ 14	42
560 320 005	0	70	14.2	12,6 - 13,1	KZ 16	KZ 18	70
560 320 002	1	10	5.0	4,5 - 5,0	KZ 20	KZ 8	38
560 320 003	1	35	10.0	8,6 - 9,2	KZ 20	KZ 14	42
560 320 004	1	50	12.0	10,0 - 11,0	KZ 20	KZ 16	42
560 320 006	1	120	19.5	(16,2 - 17,0) ^{*)}	KZ 22	KZ 25	70
560 320 006	1	150	-	18,0 - 19,0	KZ 22	KZ 25	70

*) The diameters of the CU-stranded wires are to be re-crimped with the next smaller tool code (KZ 25 + KZ 22)



MV-CONNEX Sockets up to 52 kV

MV-CONNEX Bushings



MV-CONNEX Sockets, up to 42 kV, hexagonal

For use in:
Switching stations, circuit breaker units, high-voltage motors, condensers, and other appliances.
Insulating medium: SF₆ gas
max. operating temperature of insulating medium: 90°C



No.	No. with sealing and fixing set	Sealing Form	Size	Max. operating voltage U _m (kV)	Nominal current I _N (A)	Capacitive voltage tap (pF)	Weight (kg)
827 106 401	827 106 601	hexagonal	1	36	630	—	2
827 106 411	827 106 611	hexagonal	1	36	630	8,5 ± 1,5	2
827 106 402	827 106 602	hexagonal	2	42	800	—	2.1
827 106 412	827 106 612	hexagonal	2	42	800	8,5 ± 1,5	2.1

MV-CONNEX Sockets, up to 42 kV, round version

For use in:
Switching stations, circuit breaker units, high-voltage motors, transformers, condensers, connecting sleeves and other appliances.
suitable for use in transformers
Insulating medium: SF₆ gas or oil
max. operating temperature of insulating medium: 110°C



Attention: With XLPE-insulated cable the max. temperature of the conductor must not be higher than 90°C.

No.	No. with sealing and fixing set	Sealing Form	Size	Max. operating voltage U _m (kV)	Nominal current I _N (A)	Capacitive voltage tap (pF)	Weight (kg)
827 104 005	827 104 205	round	2	42	800	—	2.8

MV-CONNEX Sockets, up to 52 kV, hexagonal

For use in:
Switching stations, circuit breaker units, high-voltage motors, condensers, connecting sleeves and other appliances.

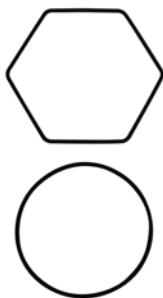
Insulating medium: SF₆ gas or oil
max. operating temperature of insulating medium: 90°C



Attention: With XLPE-insulated cable the max. temperature of the conductor must not be higher than 90°C.

No.	No. with sealing and fixing set	Sealing Form	Size	Max. operating voltage U _m (kV)	Nominal current I _N (A)	Capacitive voltage tap (pF)	Weight (kg)	Application
827 110 010	827 110 210	hexagonal	3	52	1250	—	4.6	GIS
827 110 011	827 110 211	hexagonal	3	52	1250	14,5 ± 1,5	5.2	GIS
827 110 012	827 110 212	hexagonal	3	52	1250	—	4.6	*) Transformer
-	827 110 214	hexagonal	3	52	1250	—	4.6	*) min. -40°C

*) Suitable for use in transformers.



O-Ring Sealings

No.	suitable for	Dimensions (mm)	Form	Material
021 937 087	827 106 401	112 x 4	hexagonal	EPDM
	827 106 411			
	827 106 402			
	827 106 412			
021 937 069	827 110 010	137 x 4	hexagonal	FKM (Viton)
	827 110 011			
	827 110 012			
021 937 070	827 104 005	118 x 4	round	FKM (Viton)



MV-CONNEX Insulator, up to 24 kV

For indoor installation.

By using MV-CONNEX Insulators air-insulated switching stations can be equipped with shock-proof cable connections. Switching and cable connection areas can thus be easily sheltered.

The size 1 and 2 MV-CONNEX Insulators are suitable to be fitted to sheets that are 2 - 2.5 mm thick.

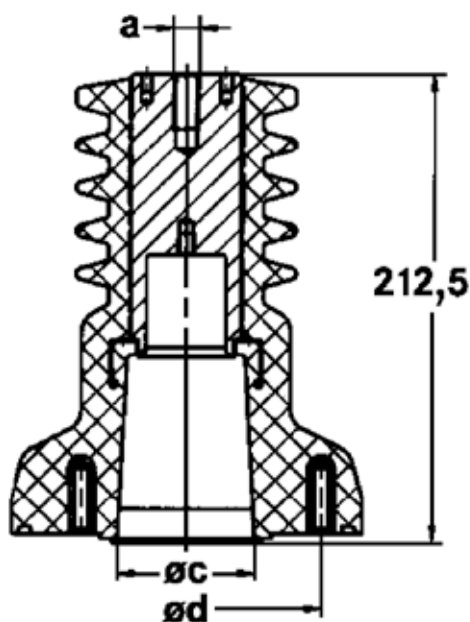
Breaking force $P_n = 5\text{ kN}$

Creepage distance 340 mm

Suitable for outdoor use up to $U_m = 6\text{ kV}$

BIL 125 kV

AC-test 54 kV/1 min



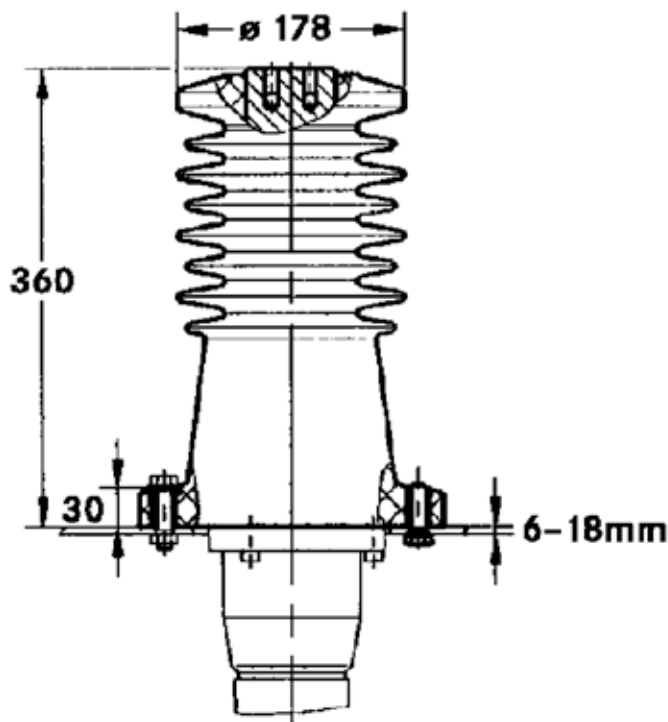
No.	Size	Max. operating voltage U_m (kV)	Nominal current I_n (A)	Diame-ter c \varnothing (mm)	Diame-ter d \varnothing (mm)	Terminal pin a	Weight (kg)	
827 113 011	1	24	630	62	95	M12	3.9	Silicone-free production process
827 113 001	1	24	630	62	95	M12	3.9	-
827 113 003	2	24	800	68	102	M12	4.4	-

MV-CONNEX Insulator, up to 36 kV

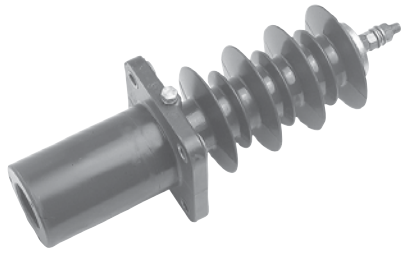
The size 3 MV-CONNEX Insulators are suitable to be fitted to sheets that are 6 - 18 mm thick.

For indoor equipment.

Breaking force $P_n = 10$ kN
 Creepage distance 740 mm
 Suitable for outdoor use up to $U_m = 24$ kV
 BIL 170 kV
 AC-test 81 kV/1 min



No.	Size	Max. operating voltage	Nominal current	Weight
		U_m (kV)	I_N (A)	(kg)
827 177 001	3	36	1250	17.6



MV-CONNEX Outdoor Insulators

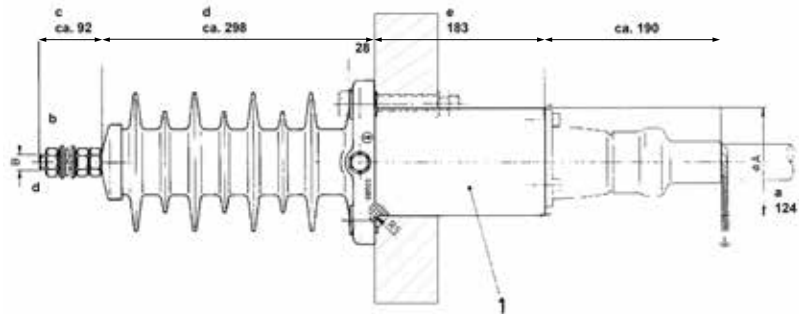
For tower substations.

The Outdoor Insulator permits the transition from the overhead line to the metal-enclosed touchproof cable termination inside tower substations. This insulator is designed as a bushing insulator with integrated female contact part for CONNEX separable connectors. Linked to other metal-enclosed equipment such as

- CONNEX elbow adapters
- CONNEX separable connectors
- CONNEX transformer bushings
- transformer terminal clamps with covers
- metal-enclosed ring main units

the outdoor insulator offers the possibility of an absolutely intrinsically safe construction of tower substations.

Cantilever strength $P_n = 5 \text{ kN}$.



No.	Size	Max. operating voltage U_m (kV)	Nominal current I_N (A)	Terminal Bolt	Weight (kg)	a (mm)	c (mm)	d (mm)	e (mm)
827 173 002	2	24	800	M24	13	124	92	298	183

MV-CONNEX Cable Joints

For outdoor, offshore and underground application.

Caution:

For use underground or offshore the bell flanges of the separable connectors must be made of bronze.

Single-pole, resistant to outdoor, soil-resistant, offshore-proof, plug-in type.

The single-pole connection sleeve is supplied as factory-built; the contact bushings are integrated into the soil-resistant insulating body. The connection is established by inserting the CONNEX separable connector.

Size 3

Cast shieldings guarantee short-circuit-resistant cable screen up to max. 95 mm².



No.	Size	Max. operating voltage	Nominal current	Type	Length l (mm)	Diameter Ø (mm)	Breite b (mm)	Höhe (mm)	Weight (kg)		
		U _m (kV)	I _N (A)								
827 212 001	1	36	630	not insulated against the soil	263	143	-	-	5.8	1	A
827 212 002	1	36	630	Not soil sensitive *	263	143	-	-	6.4	1	B
827 222 001	2	42	800	not insulated against the soil	263	143	-	-	5.8	1	A
827 222 002	2	42	800	Not soil sensitive *	263	143	-	-	6.4	1	B
827 228 001	3	52	1250	not insulated against the soil	565	-	204	209	28	2	

*) The use of a heat-shrink tubing at the CONNEX separable connectors eliminates the soil sensitivity. The shrink tubing is provided. (B) Soil sensitivity can not be eliminated at size 3. (Shrinking on a heat-shrink tubing is not possible with cable joint size 3.)



1 MV-CONNEX-T-Joint

Single-pole, metal clad, for outdoor use, soil resistant.

In the event of network modifications, the underground T-joints can be replaced by CONNEX joints.

Using this T-joint and the CONNEX coupling connector *), switching stations that are equipped with CONNEX sockets can later be expanded to become double connections. In addition, a plug-in cable branch wire can also be realised.

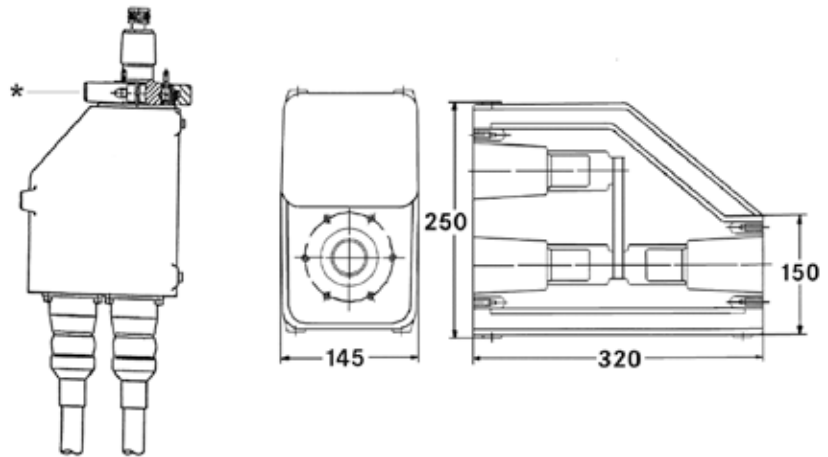
The single-pole T-joint is provided wired ready for connection. The CONNEX contact bushings are integrated in the soil-resistant insulating bodies.

The connection is established by inserting the CONNEX separable connector. Cast shieldings additionally guarantee a short-circuit-resistant cable screen connection.

2

*) MV-CONNEX Coupling Connector is available only in size 2

3

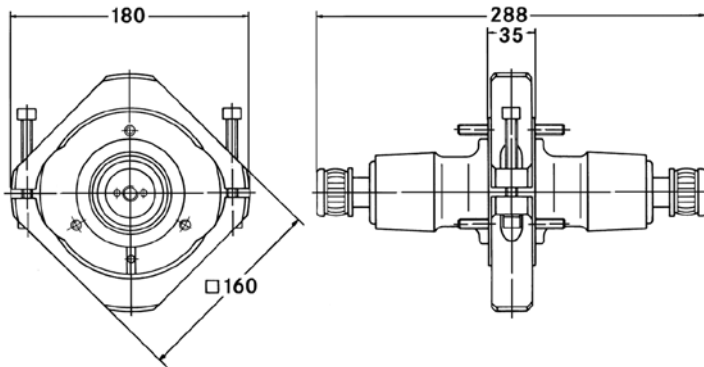


No.	Size	Max. operating voltage		Nominal current I_N (A)	Ausführung	Weight (kg)	
		U_m (kV)					
827 147 001	1	36		630	with metal housing, not soilproof	21	1
827 147 002	2	42		800	with metal housing, not soilproof	21	1
827 221 001	1	36		630	soilproof	17.6	2
827 221 002	2	42		800	soilproof	17.6	2
827 227 001	3	52		1250	soilproof	46	3

MV-CONNEX Coupling Connector, up to 42 kV

For the coupling of equipment and switchgear. This coupling connector permits easy electric coupling of different components fitted with CONNEX sockets.

The metal flange assures that the mechanical connection of the two components is coupled at minimum distance.



No.	Size	Max. operating voltage	Nominal current	Weight
		U_m (kV)	I_N (A)	(kg)
827 138 002	2	42	800	4.2



MV-CONNEX Surge Arrester

Features of MV-CONNEX Surge Arrester, pluggable

- Metal-enclosed
- Fully-insulated
- touchproof
- free from arcing
- High short-circuit protection
- Maintenance-free
- For outdoor and offshore use
- Protection class IP 66

Scope of Application

CONNEX surge arresters are used for the protection to metal-enclosed switchgears and transformers equipped with plug-in type bushings acc. to EN 50180 / 50181. The separable surge arrester is installed on the switchgear/transformer to prevent the intake of unduely high overvoltages. The surge arrester limits particularly those overvoltages that are produced by the reflection of traveling waves. **When using these surge arresters for switchgears/transformers connected to the transmission line via a cable route, it is necessary to protect the transition between the cable and the transmission line with suitable arresters. The capacity of protection is specially coordinated with the switchgear's resistance to surge voltages, considering at the same time the space arrangement and the level of electrical protection.**

Specifications

The Standard for surge arresters IEC 60099-4 is applicable to these devices. The dimensions of the plug-in termination system comply with EN 50180/EN 50181.

Design

The live part consists of metal oxide resistors without spark gap. The resistors possess a high thermal stability ensured by suitable dimensioning. These live parts are enclosed by a silicone rubber jacket that provides insulation against the metal housing. The corrosion-resistant aluminium housing renders the surge arrester intrinsically safe and thus assures optimal safety for operating personnel. The metal housing provides a hermetic sealing of the live parts against environmental influences, such as moisture or pollution. The plug-in connector is designed to fit the inside cone plug-in termination system acc. to EN 50180/ EN 50181. It is available in sizes 1, 2 and 3. The arrester is equipped to a corrosion-resistant fracture membrane that opens the arrester in case of an internal fault and allows a defined axial pressure relief on the rear end of the arrester without damaging the plug-in system.

Selection parameters

The following principle must be applied when selecting a suitable surge arrester:

1. The **continuous operating voltage** U_c must be higher than the maximum voltage permanently allowed on arrester terminals.
2. The **residual voltage** U_{res} of the surge arrester must be lower than the protection level of the operating equipment.
3. The **temporary over voltages** must be below than the TOV characteristic.

If a continuous voltage is too low, it may cause the arrester to fail, while a residual voltage that is too high can damage the operating system.

Selection of continuous operating voltage U_c

The continuous operating voltage U_c is the maximum voltage permanently allowed (> 30 min) on arrester terminals.

The selection of continuous voltage is dependent upon the grounding principle of the network:

Solidly earthed:

In a solidly earthed network, the phase earth voltage affects the continuous operating voltage. Due to harmonic waves in the sinusoidal voltage, a safety factor of 5 % is taken into account.

$$U_{c, \text{earthed grid}} = 1,05 * U_S / \sqrt{3}$$

Insulated/compensated grid:

In compensated or insulated grids, the continuous operating voltage U_c of the arrester must equal to the maximum system voltage U_S . This is to ensure continuing operation of the grid in the case of a single-phase earth fault.

$$U_{c, \text{insulated grid}} = U_S$$

Selection of the rated voltage U_r

The ratio of rated voltage and continuous operating voltage is $U_r/U_c = 1.25$.

Selection of residual voltage U_{res}

The residual voltage U_{res} is the maximum voltage at the arrester terminals when a current pulse is being discharged (e.g. 10 kA, wave form 8/20 μ s). The residual voltage must be correspondingly lower than the insulation coordination.

According to the insulation coordination, the residual voltage must be lower than the insulating capacity of the operating equipment. As a safety factor, 15 % has proven to be suitable.

$$U_{res, 10 \text{ kA}, 8/20\mu s} = 0,85 * U_{BIL, 8/20\mu s}$$

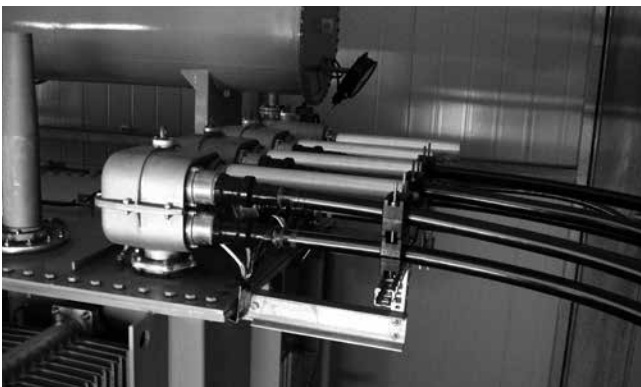
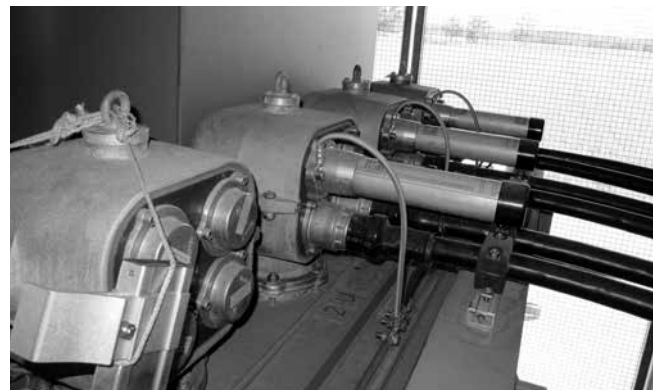
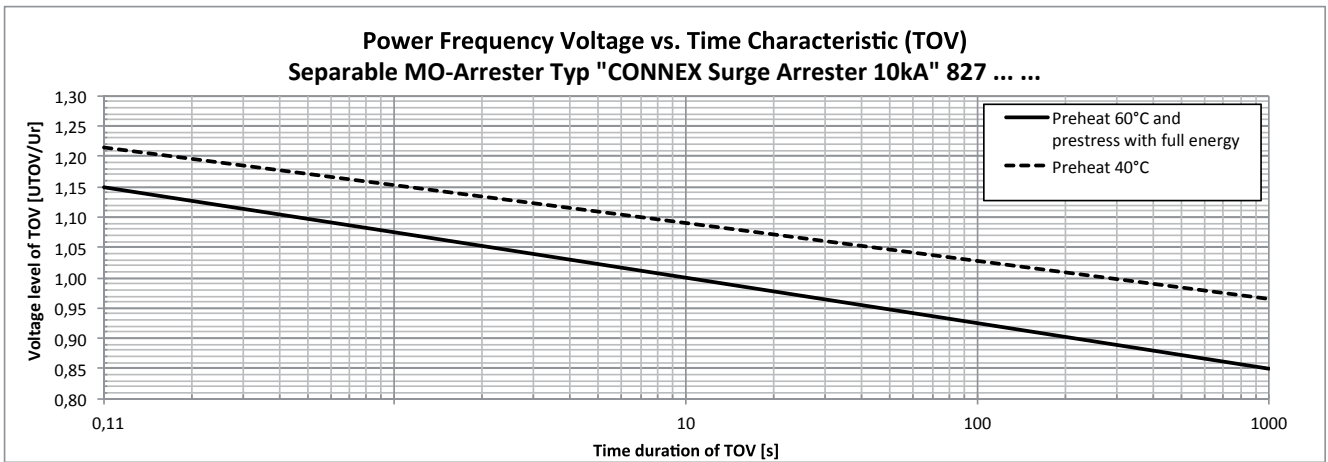
Temporary overvoltages

Due to alternating load and fluctuations in production, the voltage is kept within a regular range by means of step switches on transformers. Tracking the voltage back into the target range requires a control time. During the control time (few seconds), the voltage can be on the arrester terminals above the continuous operating voltage. Short-term exceedance of the continuous voltage is described in the TOV characteristic. The exceptional scenario of temporary overvoltage for 10 s is described by the rated voltage $U_{TOV, 10s} = U_r$.

see diagramm on page 60



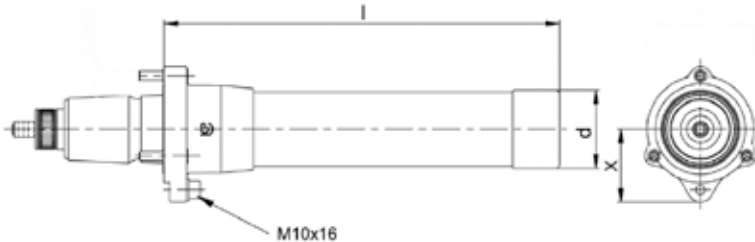
TOV characteristics



CONNEX Surge Arrester, 10 kA

Technical data

Line discharge class	1	High peak current	65 kA, 4/10 μ s
Energy absorption capacity	2 kJ/kV _{Ur}	Long-wave peak current	250 A, 2 ms
Rated discharge surge current	10 kA, 8/20 μ s	Short-circuit withstand current	16 kA, 0,2 s
		Earth return	min. 16 mm ²



No.	Size	Rated voltage	Max. continuous rating	Max. residual voltage U _{res} at			Length l (mm)	Thickness d (mm)	Dimension x (mm)	Weight (kg)
		U _r (kV)		U _c (kV)	8/20 μ s/5 kA (kV)	8/20 μ s/10 kA (kV)				
827 513 075	1	7,5	6	20	22	23	350	66	66	3.5
827 513 090	1	9,0	7	24	26	29	350	66	66	3.5
827 513 125	1	12,5	10	34	37	40	350	66	66	3.5
827 513 150	1	15,0	12	40	44	47	350	66	66	3.5
827 513 175	1	17,5	14	47	51	55	350	66	66	3.5
827 513 190	1	19,0	15	51	56	60	350	66	66	3.5
827 513 215	1	21,5	17	58	63	67	350	66	66	3.5
827 513 240	1	24,0	19	64	70	75	350	66	66	3.5
827 513 300	1	30,0	24	80	87	94	350	66	66	3.5
827 513 360	1	36,0	29	96	105	112	350	66	66	3.5
827 523 075	2	7,5	6	20	22	23	350	66	66	3.7
827 523 090	2	9,0	7	24	26	29	350	66	66	3.7
827 523 125	2	12,5	10	34	37	40	350	66	66	3.7
827 523 150	2	15,0	12	40	44	47	350	66	66	3.7
827 523 175	2	17,5	14	47	51	55	350	66	66	3.7
827 523 190	2	19,0	15	51	56	60	350	66	66	3.7
827 523 215	2	21,5	17	58	63	67	350	66	66	3.7
827 523 240	2	24,0	19	64	70	75	350	66	66	3.7
827 523 300	2	30,0	24	80	87	94	350	66	66	3.7
827 523 360	2	36,0	29	96	105	112	350	66	66	3.7
827 527 450	2	45,0	36	120	131	140	500	98	66	4.4
827 527 510	2	51,0	40.8	134	147	158	500	98	66	4.4
827 527 525	2	52,5	42	139	152	163	500	98	66	4.4
827 537 075	3	7,5	6	20	22	23	490	98	80	5.2
827 537 091	3	9,0	7	24	26	29	490	98	80	5.2
827 537 125	3	12,5	10	34	37	40	490	98	80	5.2
827 537 150	3	15,0	12	40	44	47	490	98	80	5.2
827 537 175	3	17,5	14	47	51	55	490	98	80	5.2
827 537 190	3	19,0	15	51	56	60	490	98	80	5.2
827 537 215	3	21,5	17	58	63	67	490	98	80	5.2
827 537 240	3	24,0	19	64	70	75	490	98	80	5.2
827 537 300	3	30,0	24	80	87	94	490	98	80	5.2
827 537 360	3	36,0	29	96	105	112	490	98	80	5.2
827 539 450	3	45,0	36	120	131	140	490	98	80	5.2
827 539 510	3	51,0	40.8	134	147	158	490	98	80	5.2
827 539 525	3	52,5	42	139	152	163	490	98	80	5.2