

# Cable Accessories for XLPE-insulated medium voltage cables 12 – 52 kV



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## Accessories – Technology with system

Südkabel can look back on more than 50 years of experience in the field of silicone rubber cable accessories for up to 550 kV. This experience is also a decisive factor in order to be able to guarantee high-quality terminations and joints for XLPE-insulated medium voltage cables. With the early introduction of preassembled insulating bodies, Südkabel made sure that critical assembly steps such as the manufacturing of stress control or insulation elements were taken from the building site to the manufacturing plant.

Südkabel has set many milestones with its cable accessories for energy transmission. The company has done pioneering work, particularly in the field of silicone rubber technology. The first one-piece medium voltage accessories were already being used back in the seventies. The company is therefore the trailblazer of a technology that did not take long to become a standard for medium voltage accessories and that is used today in accessories for up to 550 kV.

The properties of silicone rubber make it the ideal material for cable accessories:

- Good dielectric properties
- High degree of elasticity (for perfect adaption to prepared cable insulations)
- Ozone and UV resistance
- Long-term hydrophobicity
- High leakage current and arc resistance
- Usable in a wide range of temperatures
- Carbon-free and flame retardant material
- Halogen free and low smoke density

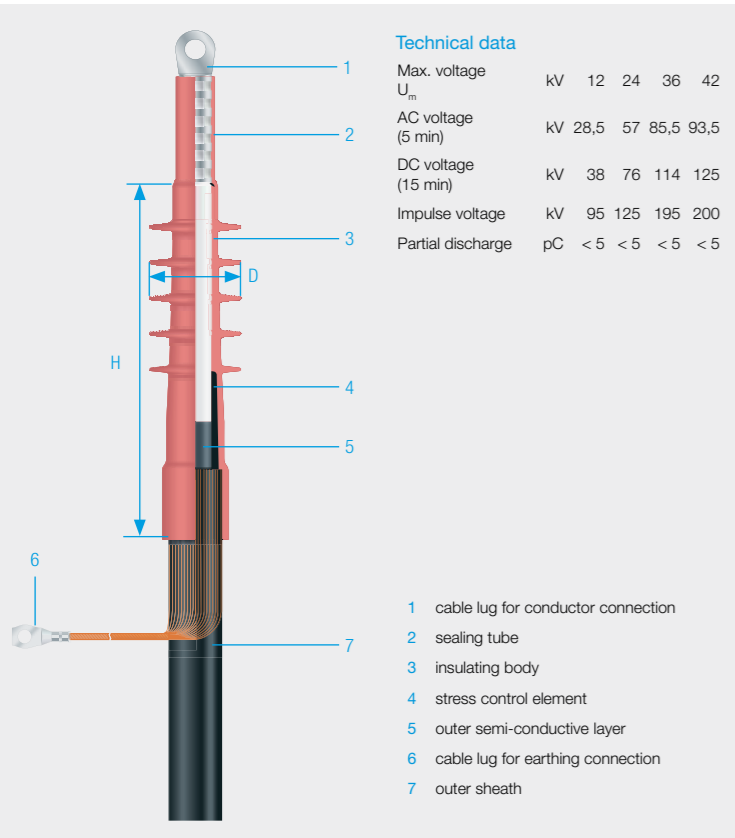
At Südkabel, different types of silicone rubber are used. On the one hand, this enables the cost-efficient production of standard accessories on a large scale. On the other hand, small batches can also be manufactured at a reasonable expense.

The Südkabel standard range of medium voltage accessories includes:

- Multi-ranged terminations for indoor and outdoor applications
- Multi-range straight-through and transition joints
- Plug-in terminations (cable plugs) for metal-enclosed switchgears with inner or outer cone system (bushing type according to EN 50180 and EN 50181)
- All accessories are type tested to the DIN VDE 0278-629-1 and CENELEC HD 629.1 revision valid at the time of market launch. In some cases, higher test requirements were set to cover applications up to 42 kV.

# Indoor terminations

12 – 36 kV



**Indoor terminations with silicone rubber push-on technology are set on cable with an insulation made of cross-linked polyethylene (XLPE).**

Various optimisations have led to today's common multi-ranged terminations for 12 and 24 kV. This type of termination covers up to five conductor cross-sections with one insulating body and is compatible with cable lugs in compression-type and screwed-type.

The applied material of the insulating body features relatively low shore hardness (A). This helps to achieve good adaptation to irregularities in the XLPE cable cores that potentially occur when stripping the fix-bonded outer semi-conductive layer. Reworking the stripped core is then no longer necessary.

The indoor terminations significantly exceed the requirements of the DIN VDE 0278-629-1 and meets the requirements of CENELEC HD 629.1. A cable breakout is required for applications with three-core cables. Special cable clamps are available.

# Outdoor terminations

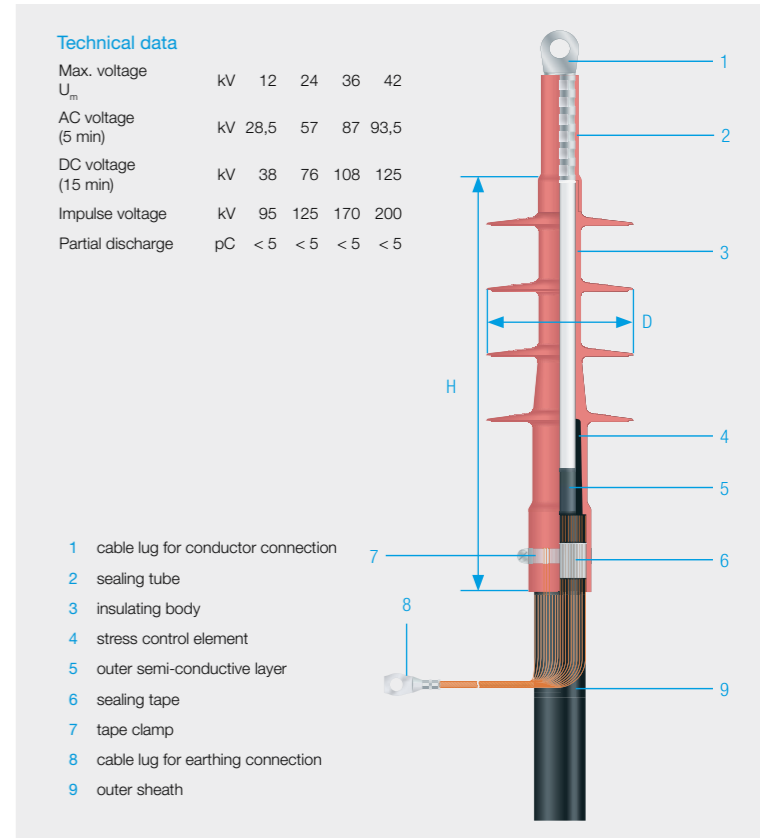
12 – 36 kV

**Outdoor terminations with silicone rubber push-on technology are set on cable with an insulation made of cross-linked polyethylene (XLPE).**

Various optimisations have led to today's common multi-ranged terminations for 12 and 24 kV. This type of termination covers up to five conductor cross-sections with one insulating body and is compatible with cable lugs in compression-type and screwed-type.

The applied material of the insulating body features relatively low shore hardness (A). This helps to achieve good adaptation to irregularities in the XLPE cable cores that potentially occur when stripping the fix-bonded outer semi-conductive layer. Reworking the stripped core is then no longer necessary.

The outdoor terminations significantly exceed the requirements of the DIN VDE 0278-629-1 and meets the requirements of CENELEC HD 629.1. A cable breakout is required for applications with three-core cables. Special cable clamps are available for fastening the cables at pole traverses or scaffolding. (see page 24)



Type	Voltage $U_m$ kV	Admissible diameter over core insulation mm	Allocation of insulating body acc. to cross-section <sup>1)</sup> mm <sup>2</sup>	Possible cross-sections with screwed-type lug mm <sup>2</sup>	Measure H mm	Measure D mm
SEHDI 10.2	12	13.3 – 20.8	35 – 95	35 – 95	205	35
SEI 12	12	16.8 – 24.3	70 – 150	70 – 150	205	50
SEI 12	12	21.5 – 32.6	150 – 300	150 – 240	205	54
SEI 12	12	22.2 – 34.6	185 – 300	185 – 300	205	56
SEHDI 10.2	12	26.5 – 40.9	400 – 630	400	205	46
SEI 24	24	16.8 – 24.3	25 – 70	25 – 70	205	50
SEI 24	24	21.5 – 32.6	95 – 240	95 – 240	205	54
SEI 24	24	22.2 – 34.6	150 – 300	150 – 300	205	56
SEHDI 20.2	24	30.0 – 45.0	300 – 630	300 300 – 400	215	69
SEHDI 20.2	24	34.1 – 45.0	400 – 630	400 – 630	215	69
SEHDI 30.1	36	23.1 – 26.7	35 – 50	35 – 50	270	77
SEHDI 30.1	36	25.9 – 30.0	70 – 95	70 – 95	270	77
SEHDI 30.1	36	29.0 – 33.5	120 – 150	120 – 150	270	77
SEHDI 30.1	36	32.1 – 37.6	185 – 240	185 – 240	270	83
SEHDI 30.1	36	36.6 – 42.8	300 – 400	300 300 – 400	270	83
SEHDI 30.1	36	42.6 – 50.0	500 – 630	500 – 630	270	88

1) for cables acc. to DIN VDE 0276-620

Type	Voltage $U_m$ kV	Admissible diameter over core insulation mm	Allocation of insulating body acc. to cross-section <sup>1)</sup> mm <sup>2</sup>	Possible cross-sections with screwed-type lug mm <sup>2</sup>	Measure H mm	Measure D mm
SEHDF 10.2	12	13.3 – 20.8	35 – 70	35 – 70	225	105
SEHDF 10.2	12	16.8 – 24.3	95 – 150	95 – 150	225	105
SEF 12	12	21.6 – 32.6	150 – 300	150 – 240	260	92
SEF 12	12	22.2 – 34.6	185 – 300	185 – 300	260	94
SEHDF 10.2	12	30.0 – 45.0	400 – 630	400	225	120
SEHDF 20.2	24	16.8 – 24.3	25 – 70	25 – 70	225	105
SEF 24	24	21.6 – 32.6	95 – 240	95 – 240	260	92
SEF 24	24	22.2 – 34.6	150 – 300	150 – 300	260	94
SEHDF 20.2	24	30.0 – 45.0	300 – 630	300 300 – 400	225	120
SEHDF 20.2	24	34.1 – 45.0	400 – 630	400 – 630	225	120
SEHDF 30.1	36	23.1 – 26.7	35 – 50	35 – 50	375	133
SEHDF 30.1	36	25.9 – 30.0	70 – 95	70 – 95	375	133
SEHDF 30.1	36	29.0 – 33.5	120 – 150	120 – 150	375	138
SEHDF 30.1	36	32.1 – 37.6	185 – 240	185 – 240	375	138
SEHDF 30.1	36	36.6 – 42.8	300 – 400	300 300 – 400	375	144
SEHDF 30.1	36	42.6 – 50.0	500 – 630	500 – 630	375	151

1) for cables acc. to DIN VDE 0276-620

# Straight through joints ECOLD GLS

12 – 36 kV

The All-In-one straight through joint ECOLD GLS\* in cold-shrink technology serves as the connection between two plastic-insulated cables with 12, 24 or 36 kV.

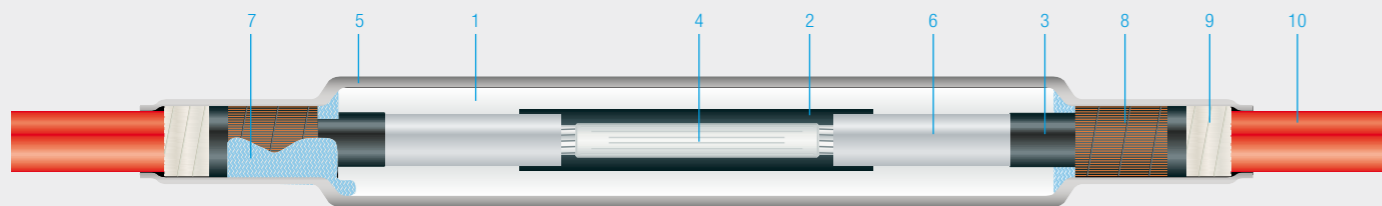
The multi-range capability enables usage of up to six cross-sections with one insulating body size. The basic design is the All-In-One design. That means all components of the joint body are pre-assembled at factory on only one support spiral and the assembly on the cable is done in one step. The joint consisting of insulating body made of silicone rubber with intergrated stress control, fine screen wire braid and outer covering made of silicone rubber.

The coldshrink joint ECOLD GLS meets the requirements of DIN VDE 0278-629-1 and CENELEC HD 629.1.

**Options:**

- reinforced mechanical protection via heat-shrinkable tube
- solutions for three-core cables or transition to three-core cable
- solutions for alternative cable constructions (tape screen, lead sheath, laminated sheath, and/or metallic armour)

\* The straight through joint ECOLD GLS is produced in cooperation with our partner elcon megarad



**Technical data**

Max. voltage $U_m$	12 kV	24 kV	36 kV
AC voltage (5 min)	27 kV	54 kV	81 kV
DC voltage (15 min)	36 kV	72 kV	108 kV
Impulse voltage	95 kV	125 kV	170 kV
Partial discharge	< 5pC	< 5pC	< 5pC

- |   |                    |
|---|--------------------|
| 1 insulating body                               | 6 cable insulation |
| 2 faraday cage                                  | 7 braided tape     |
| 3 outer semi-conducting layer                   | 8 screen wires     |
| 4 connector                                     | 9 sealing tape     |
| 5 outer protective tube made of silicone rubber | 10 XLPE cable      |

Type	Voltage $U_m$		Admissible diameter over core insulation	Allocation of insulating body acc. to cross-section <sup>1)</sup>	Possibel cross-sections with screwed-type connector
	kV	mm			
ECOLD GLS-1290RCR/W 1x50/95	12	16.3 – 20.3	50 – 95	50 – 95	
ECOLD GLS-1290RCR/W 1x95/240	12	20.3 – 24.8	95 – 240	95 – 240	
ECOLD GLS-1290RCR/W 1x240/400	12	24.8 – 32.2	240 – 400	240 – 400	
ECOLD GLS-1290RCR/W 1x400/630	12	32.2 – 38.9	400 – 630	400 – 630	
ECOLD GLS-2490RCR/W 1x25/95	24	16.0 – 25.0	25 – 95	25 – 95	
ECOLD GLS-2490RCR/W 1x95/240	24	20.5 – 32.0	95 – 240	95 – 240	
ECOLD GLS-2490RCR/W 1x95/300	24	23.0 – 35.0	95 – 300	95 – 300	
ECOLD GLS-2490RCR/W 1x240/400	24	29.0 – 42.0	240 – 400	240 – 400	
ECOLD GLS-2490RCR/W 1x500/630	24	38.0 – 50.0	500 – 630	500 – 630	
ECOLD GLS-3690RCR/W 1x25/95	36	20.5 – 32.0	25 – 95	25 – 95	
ECOLD GLS-3690RCR/W 1x120/240	36	29.0 – 37.2	120 – 240	120 – 240	
ECOLD GLS-3690RCR/W 1x240/400	36	32.5 – 42.0	240 – 400	240 – 400	
ECOLD GLS-3690RCR/W 1x400/630	36	38.0 – 50.0	400 – 630	400 – 630	

1) for cables acc. to DIN VDE 0276-620

# Transition joints ECOLD GLM

12 – 36 kV

The transition joint ECOLD GLM\* in hybrid technology serves as the connection between paper-insulated cables and plastic-insulated cables with 12, 24 or 36 kV.

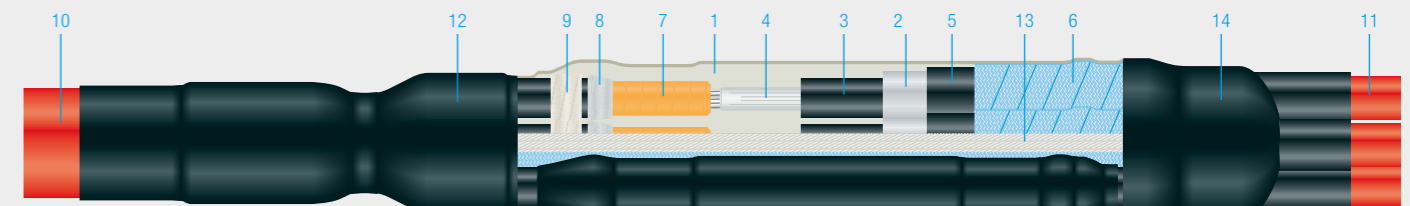
The ECOLD GLM is similar to ECOLD GLS and its advantages (multi-ranged cold-shrink body, usage of compression and screwed-type connectors). There are only additional installation steps necessary for paper-insulated cable side. The paper-insulated side is prepared with tapes and cold-shrink elements in such way that no impregnating compound from the paper can reach the insulating body. This technology is referred to a „dry“ transition joint.

In connection with XLPE cables with paper-insulated single-core cables, the external mechanical protection is provided by a heat-shrinkable tube.

When used on paper-insulated three-core cables, the external protection is provided by sub-division and one heat-shrinkable tube over all three cores.

The transition joints ECOLD GLM meets the requirement of DIN VDE 0278-629-2 and CENELEC HD 629.2.

\* The transition joint ECOLD GLM is produced in cooperation with our partner elcon megarad



**Technical data**

Max. voltage $U_m$	12 kV	24 kV	36 kV
AC voltage (5 min)	27 kV	54 kV	81 kV
DC voltage (15 min)	36 kV	72 kV	108 kV
Impulse voltage	95 kV	125 kV	170 kV
Partial discharge	< 5pC	< 5pC	< 5pC

- |                                 |                           |                         |
|---------------------------------|---------------------------|-------------------------|
| 1 insulating body               | 6 copper-braided tape     | 11 XLPE cable           |
| 2 insulating part of joint body | 7 paper insulation        | 12 heat-shrinkable tube |
| 3 faraday cage                  | 8 stress-controlling tape | 13 earthing strand      |
| 4 connector                     | 9 sealing tape            | 14 sub-division         |
| 5 outer protective tube         | 10 PILC cable             |                         |

Type for transition from PILC single-core cable to XLPE single-core cable	Type for transition from PILC three-core cable to three XLPE single-core cables	Allocation of insulating body acc. to cross-section <sup>1)</sup>	Voltage $U_m$	Admissible diameter over core insulation
		mm <sup>2</sup>	kV	mm
ECOLD GLM 1288RCR/W 1x50/95	ECOLD GLM 1267RCR 50/95	50 – 95	12	16.3 – 20.3
ECOLD GLM 1288RCR/W 1x95/240	ECOLD GLM 1267RCR 95/240	95 – 240	12	20.3 – 24.8
ECOLD GLM 1288RCR/W 1x240/400	ECOLD GLM 1267RCR 240/400	240 – 400	12	24.8 – 32.2
ECOLD GLM 2488RCR/W 1x25/95	ECOLD GLM 2467RCR 25/95	25 – 95	24	16.0 – 25.0
ECOLD GLM 2488RCR/W 1x95/240	ECOLD GLM 2467RCR 95/240	95 – 240	24	20.5 – 32.0
ECOLD GLM 2488RCR/W 1x95/300	ECOLD GLM 2467RCR 95/300	95 – 300	24	23.0 – 35.0
ECOLD GLM 2488RCR/W 1x240/400	ECOLD GLM 2467RCR 240/400	240 – 400	24	29.0 – 42.0
ECOLD GLM 3688RCR/W 1x25/95	ECOLD GLM 3667RCR 25/95	25 – 95	36	20.5 – 32.0
ECOLD GLM 3688RCR/W 1x120/240	ECOLD GLM 3667RCR 120/240	120 – 240	36	29.0 – 37.2
ECOLD GLM 3688RCR/W 1x240/400	ECOLD GLM 3667RCR 240/400	240 – 400	36	32.5 – 42.0

1) for cables acc. to DIN VDE 0276-620

# Inner cone system

Bushings up to 52 kV

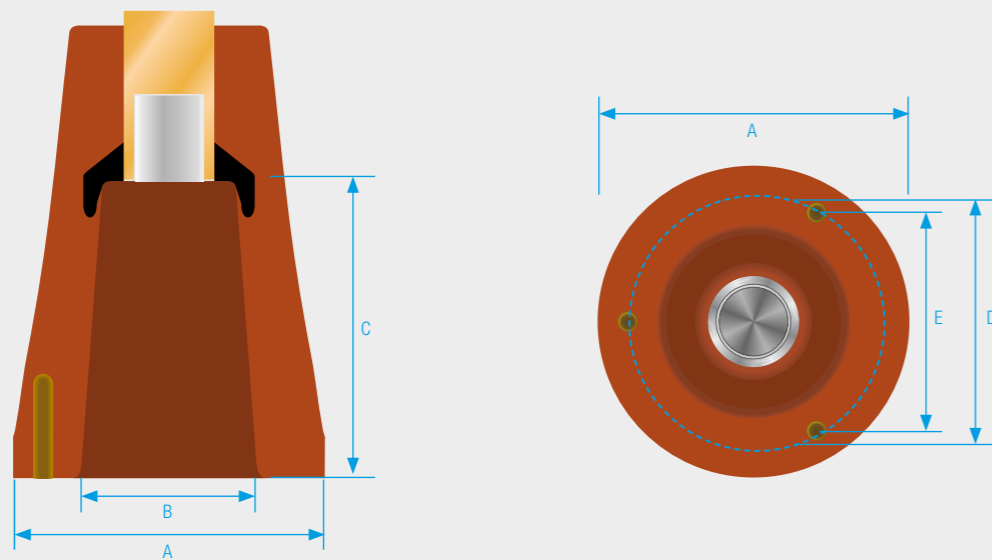
For the inner cone system too, particularly used in power switchgears and power transformers, Südkabel has developed a designated compatible product range for flexible application.

The standards EN 50180 and EN 50181 define four types of interfaces for the inner cone system up to 52 kV of which only three are relevant in practice.

The basic design of all inner cone plug-in terminations can be compared. The size of the insulator and the design of the individual plug-in contacts, however, vary according to the size of the respective bushing.

The plug-in contact consists of a laminated contact that is connected to the conductor with a cone clamp. A pressure spring between insulating body and mounting flange ensures compensation of the expansion of the silicone components during operation. It also provides sufficient contact pressure at the interface between the silicone component and cast resin bushing.

The bushing type 1, type 2 and type 3 mainly vary in dimensions.



Designation	Rated current	Max. operating voltage kV	Contact element	Measure A mm	Measure B mm	Measure C mm	Measure D mm	Measure E mm
Interface type 1	400 – 630	36	lamellated contact	137	63.5	83	95	82.3
Interface type 2	800	42	lamellated contact	137	69.5	83	102	88.3
Interface type 3	1250	52	lamellated contact	185	92.5	110	130	112.6

# Accessories for inner cone systems

Interface type 1 – 3

**The inner cone plug-in termination type SEIK is suitable for bushings according to DIN EN 50180 and DIN EN 50181, interface types 1, 2 and 3.**

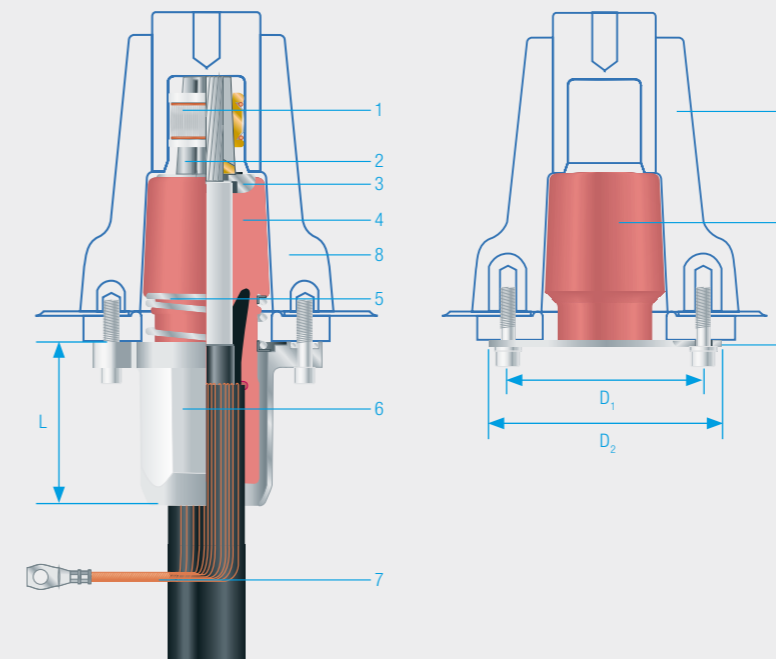
**The inner cone insulating seal type ISIK is suitable for bushings according to DIN EN 50180 and DIN EN 50181, interface types 1, 2 and 3.**

**Inner cone plug-in termination SEIK, U<sub>m</sub> up to 52 kV**

**Inner cone Insulating seal ISIK, U<sub>m</sub> up to 52 kV**

- straight plug-in termination for connection of XLPE cable 12 - 52 kV to metal enclosed switchgears and transformers
- capacitive voltage tap on request
- sheath test possible with optional insulating wrap
- additional sealing options on request

- for surge-proof and shock-proof terminations of bushings for inner cone system



**Technical data**

Max. voltage U <sub>m</sub>	36 kV	42 kV	52 kV
AC voltage (5 min)	87 kV	93,5 kV	117 kV
DC voltage (15 min)	108 kV	125 kV	156 kV
Impulse voltage	170 kV	200 kV	250 kV
Partial discharge	< 5pC	< 5pC	< 5pC

- 1 contact ring with lamellated contact
- 2 cone clamp
- 3 stop disc
- 4 insulating body made of silicone rubber
- 5 pressure spring
- 6 silumin entry gland with mounting flange
- 7 earthing connection
- 8 inner cone bushing
- 9 pressure disc with mounting screws

Type	Interface type (max. rated current of bushing)	Admissible diameter over core insulation mm	Voltage U <sub>m</sub> kV	Allocation of insulating body <sup>2)</sup> acc. to cross-section <sup>1)</sup> mm <sup>2</sup>	Measure L mm	Measure D <sub>1</sub> mm	Measure D <sub>2</sub> mm
SEIK	13	1 (630A)	12	35 – 240	80	95	112
	23		24	25 – 240			
	33		36	25 – 150			
SEIK	14	2 (800A)	12	35 – 300	80	102	119
	24		24	25 – 300			
	34		36 (42)	35 – 300			
SEIK	15	3 (1250A)	12	120 – 800	80	130	147
	25		24	50 – 800			
	35		36 (42)	35 – 800			
	55		52	95 – 500			
ISIK	13/23/33	1 (630A)	36	–	–	95	112
	14/24/34	2 (800A)	42	–	–	102	119
	15/25/35	3 (1250A)	52	–	–	130	147

1) for cables acc. to DIN VDE 0276-620

2) each cross-section is assigned a separate insulating body

# Outer cone system

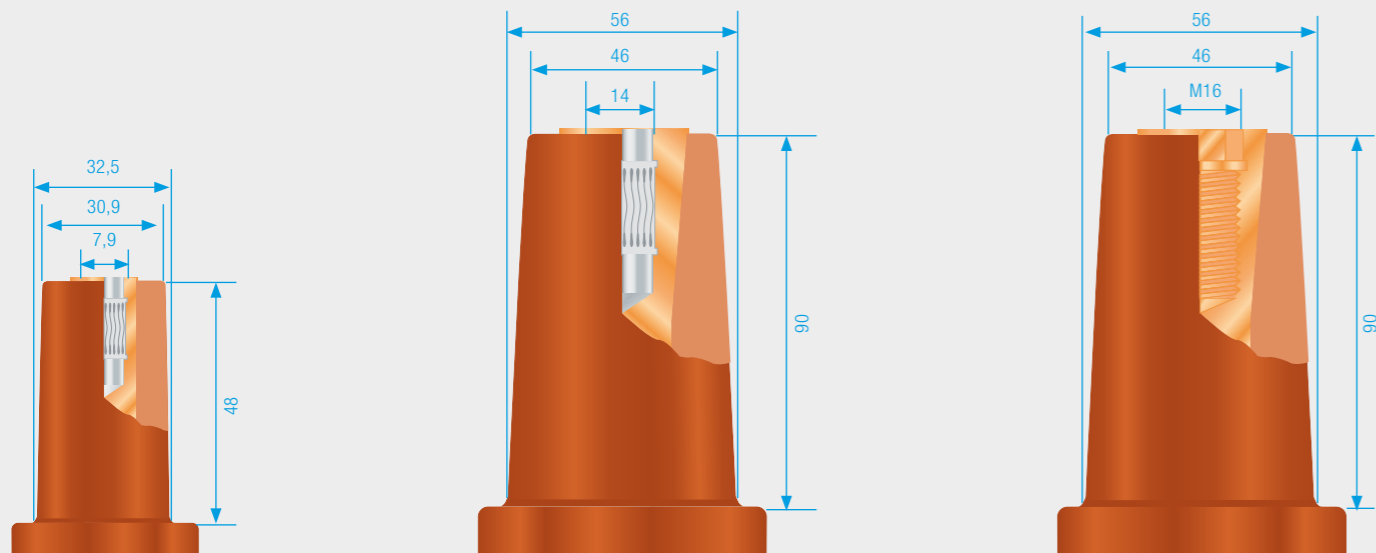
Bushings up to 36 kV

As a result of different models of bushings and the varying field requirement, different versions of plug-in terminations are available.

Südkabel offers plug-in terminations that are elbow-shaped, straight or T-shaped. In many cases, the insulating bodies made of silicone rubber are multi-ranged and can be combined with hexagonal compression cable lugs or with mechanical cable lugs with shear-off bolts.

A conductive coating makes these plug-in terminations independent of ambient conditions, maintenance-free and submersible.

The standards EN 50180 and EN 50181 define six type of bushing for outer cone system up to 36 kV, of which only three are relevant in practice.



## Bushing type A (rated current 250 A)

- for rated current of 250 A and for max. operating voltage of 24 kV
- contact element is dimensioned for contact pin of 7.9 mm
- mainly used on distribution transformers, motor junction boxes and at transformer feeders of switch disconnector substations up to 24 kV in distributor stations for local networks

## Bushing type B (rated current 250/400 A)

- for rated current of 250/400 A and for max. operating voltage of 36 kV
- contact element is dimensioned for contact pin of 14 mm
- mainly used on distribution transformers, motor junction boxes and at transformer feeders of switch disconnector substations up to 36 kV in distributor stations for local networks

## Bushing type C (rated current 630/1250 A)

- for rated current of 630/1250 A and for max. operating voltage of 36 kV
- contact element is dimensioned M16x2 threaded pins
- mainly used on ring-main systems of substations in local networks but also in switch disconnector substations of transformer stations

Interface type	Rated current A	Max. operating voltage kV	Contact element
A	250	24	contact pin Ø 7,9 mm
B	250 – 400	36	contact pin Ø 14 mm
C	630 – 1250	36	M16 threaded pin

# Cable accessories for outer cone systems

Interface type A

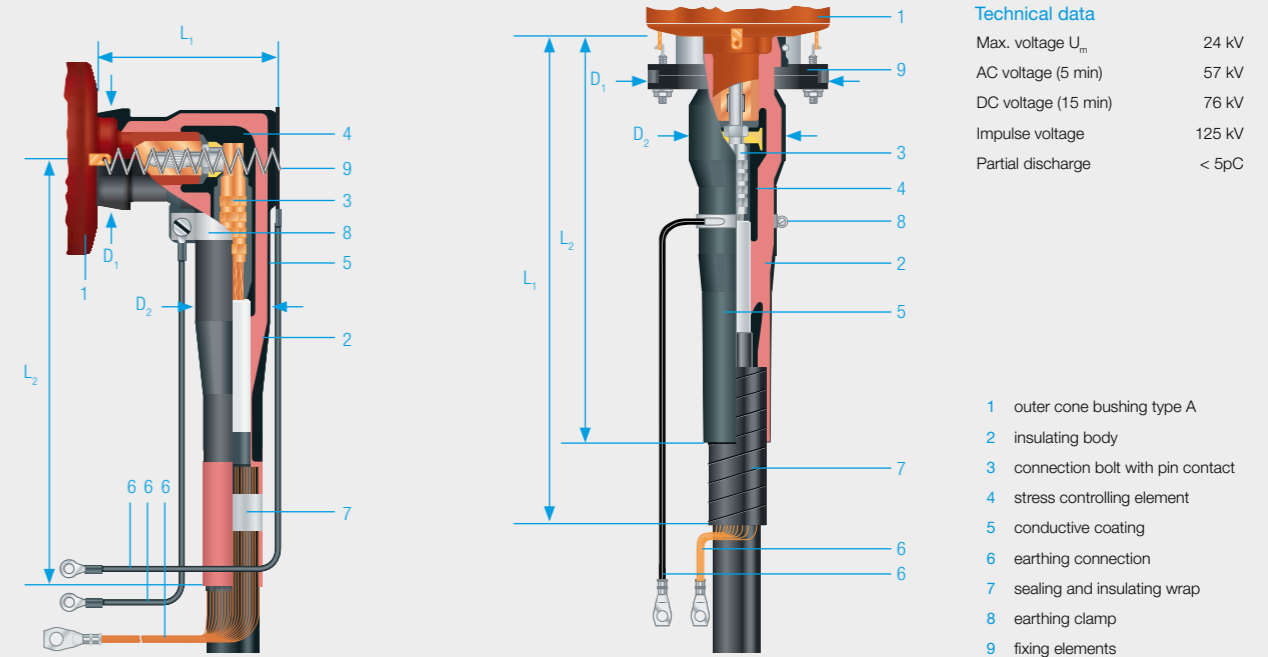
The elbow and straight plug-in terminations of type A are suitable for bushings according to DIN EN 50180 and EN 50181, interface type A, rated current 250 A.

## Elbow plug-in terminations SEW and SEHDW, U<sub>m</sub> up to 24 kV

- connection of conductor and screen in compression-type or screwed-type (with shear-off bolts) available
- available with conductive coating only
- optionally with additional metal housing
- cover up to eight cable cross-sections with one insulating body size and a stress controlling adapter (SEW)
- fixation with one fixing ring and two extension springs (SEW) or alternatively with fixing ring and hooks

## Straight plug-in termination SEHDG, U<sub>m</sub> up to 24 kV

- connection of conductor and screen in compression-type or screwed-type (with shear-off bolts) available
- available with conductive coating only
- optionally with additional metal housing
- each cross-section is assigned a separate insulating body
- fixation with one fixing ring and hooks



Technical data	
Max. voltage U <sub>m</sub>	24 kV
AC voltage (5 min)	57 kV
DC voltage (15 min)	76 kV
Impulse voltage	125 kV
Partial discharge	< 5pC

- outer cone bushing type A
- insulating body
- connection bolt with pin contact
- stress controlling element
- conductive coating
- earthing connection
- sealing and insulating wrap
- earthing clamp
- fixing elements

Type	Shape	Voltage U <sub>m</sub> kV	Admissible diameter over core insulation mm	Allocation of insulating body acc. to cross-section <sup>1)</sup> mm <sup>2</sup>	Possible cross-sections with screwed-type connection mm <sup>2</sup>	Measure D <sub>1</sub> <sup>3)</sup> mm	Measure D <sub>2</sub> <sup>3)</sup> mm	Measure L <sub>1</sub> <sup>3)</sup> mm	Measure L <sub>2</sub> <sup>3)</sup> mm
SEW 12		12	12.2 – 18.6 <sup>2)</sup>	25 – 70 (95)	25 – 95				
SEW 12	elbow	12	17.3 – 25.0	(70) 95 – 150	–	58/74	45/61	105/113	245/245
SEW 24		24	17.3 – 25.0	(25) 35 – 95	25 – 95				
SEHDW 21	elbow	24	17.0 – 28.5 <sup>4)</sup>	25 – 150 <sup>4)</sup>	–	82/82	58/70	118/134	285/315
SEHDG 11.1	straight	12	12.7 – 24.3 <sup>4)</sup>	25 – 150 <sup>4)</sup>	25 – 35, 50, 70, 95, 120, 150	82/82	58/68	325/325	275/285
SEHDG 21.1	straight	24	17.0 – 23.4 <sup>4)</sup>	25 – 70 <sup>4)</sup>	25 – 35, 50, 70	82/82	58/68	325/325	275/285
SEHDG 21	straight	24	22.5 – 28.5 <sup>4)</sup>	95 – 150 <sup>4)</sup>	95, 120, 150	82/82	61/75	330/330	280/310

1) for cables acc. to DIN VDE 0276-620 (cross-sections in brackets are only partly covered)

2) with stress controlling adapter

3) data without/with metal housing

4) each cross-section is assigned a separate insulating body

# Cable accessories for outer cone systems

## Interface type B

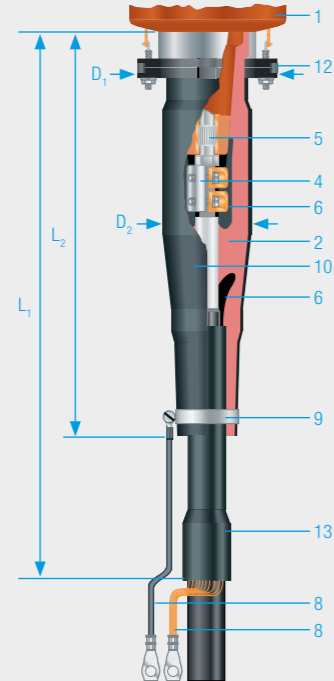
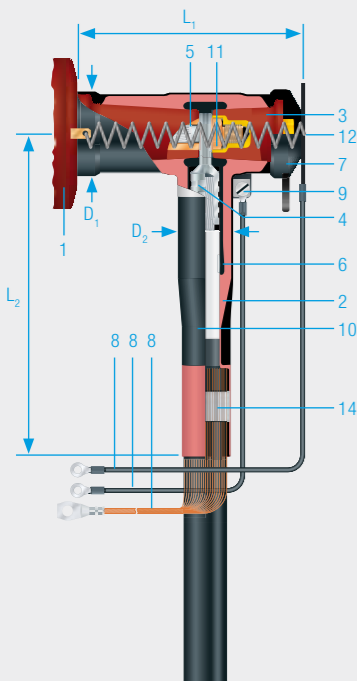
The T-shaped and straight plug-in terminations of type B are suitable for bushings according to DIN EN 50180 and EN 50181, interface type B, rated current 250/400 A.

### T-shaped plug-in terminations SET-B, U<sub>m</sub> up to 36 kV

- connection of conductor and screen in compression-type or screwed-type (with shear-off bolts) available
- available with conductive coating only
- optionally with additional metal housing
- cover up to nine cable cross-sections with one insulating body size and a stress controlling adapter
- fixation with one fixing ring and two extension springs
- capacitive voltage tap available

### Straight plug-in termination SEHDG, U<sub>m</sub> up to 24 kV

- conductor connection for special clamping bolt suitable for Al and Cu conductors
- available with conductive coating only
- optionally with additional metal housing
- each cross-section is assigned a separate insulating body
- fixation with one fixing ring and hooks



**Technical data**

Max. voltage U <sub>m</sub>	24 kV	36 kV	42 kV
AC voltage (5 min)	57 kV	87 kV	93,5 kV
DC voltage (15 min)	76 kV	108 kV	125 kV
Impulse voltage	125 kV	170 kV	200 kV
Partial discharge	< 5pC	< 5pC	< 5pC

- 1 outer cone bushing type B
- 2 insulating body
- 3 sealing piece
- 4 connection bolt
- 5 contact pin
- 6 stress-controlling element
- 7 earthing cap
- 8 earthing connection
- 9 earthing clamp
- 10 conductive coating
- 11 counter nut
- 12 fixing elements
- 13 heat-shrinkable tube
- 14 sealing tape

Type	Shape	Voltage U <sub>m</sub> kV	Admissible diameter over core insulation mm	Allocation of insulating body acc. to cross-section <sup>1)</sup> mm <sup>2</sup>	Possible cross-sections with screwed-type connection mm <sup>2</sup>	Measure D <sub>1</sub> <sup>3)</sup> mm	Measure D <sub>2</sub> <sup>3)</sup> mm	Measure L <sub>1</sub> <sup>3)</sup> mm	Measure L <sub>2</sub> <sup>3)</sup> mm
SET-B 12	T-shaped	12	15.0 – 23.5 <sup>2)</sup>	50 – 150	50 – 95	80/88	53/71	190/192	275/275
SET-B 12		12	21.8 – 32.6	185 – 300	95 – 240	80/88	53/71	190/192	275/275
SET-B 24	T-shaped	24	15.0 – 23.5 <sup>2)</sup>	25 – 70	25 – 70	80/88	53/71	190/192	275/275
SET-B 24		24	21.8 – 32.6	95 – 240	95 – 240	80/88	53/71	190/192	275/275
SET-B 36	T-shaped	36	26.2 – 32.0	70 – 120	70 – 95, 120	90/– <sup>4)</sup>	70/– <sup>4)</sup>	193/– <sup>4)</sup>	290/– <sup>4)</sup>
SET-B 36		36	30.8 – 39.6	150 – 300	150 – 240, 300	90/– <sup>4)</sup>	70/– <sup>4)</sup>	193/– <sup>4)</sup>	290/– <sup>4)</sup>
SEHDG 12	straight	12	15.0 – 28.4 <sup>5)</sup>	50 – 240 <sup>5)</sup>	–	97/97	80/90	515/515	317/347
SEHDG 22		24	15.0 – 32.6 <sup>5)</sup>	35 – 240 <sup>5)</sup>	–	97/97	80/90	515/515	317/347

1) for cables acc. to DIN VDE 0276-620  
 2) with stress controlling adapter  
 3) data without/with metal housing  
 4) metal housing on request  
 5) each cross-section is assigned a separate insulating body

# Cable accessories for outer cone systems

## Interface type C

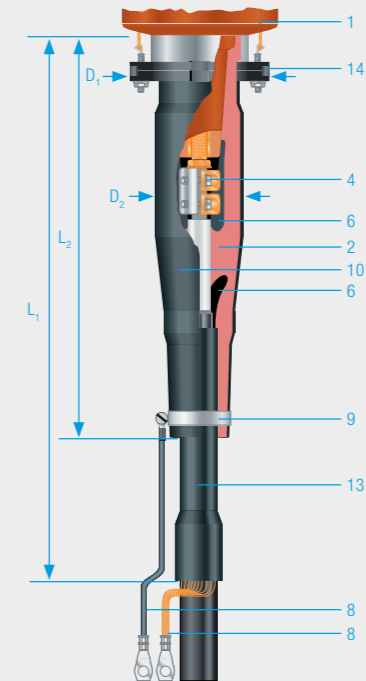
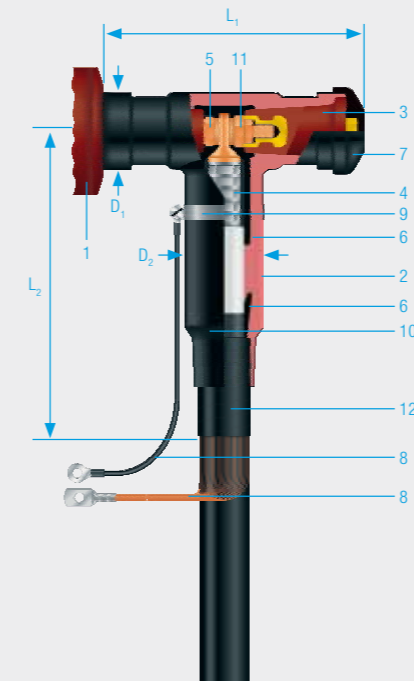
The T-shaped and straight plug-in terminations of type C are suitable for bushings according to DIN EN 50180 and EN 50181, interface type C, rated current 630/1250 A.

### Symmetric T-shaped plug-in terminations SEHDT, U<sub>m</sub> up to 36 kV

- conductor connection in compression-type available
- available with conductive coating only
- optionally with additional metal housing
- each cross-section is assigned a separate insulating body
- suitable for double connection for total current of 1250A, whereas each individual plug may have a maximum current of 630 A
- capacitive voltage tap available

### Straight plug-in termination SEHDG, U<sub>m</sub> up to 24 kV

- conductor connection for special clamping bolt suitable for Al and Cu conductors
- available with conductive coating only
- optionally with additional metal housing
- each cross-section is assigned a separate insulating body



**Technical data**

Max. voltage U <sub>m</sub>	24 kV	36 kV
AC voltage (5 min)	57 kV	87 kV
DC voltage (15 min)	76 kV	108 kV
Impulse voltage	125 kV	170 kV
Partial discharge	< 5pC	< 5pC

- 1 outer cone bushing type C
- 2 insulating body
- 3 sealing piece
- 4 connection bolt
- 5 threaded pin
- 6 stress-controlling element
- 7 earthing cap
- 8 earthing connection
- 9 earthing clamp
- 10 conductive coating
- 11 threaded piece
- 12 sealing tape
- 13 heat-shrinkable tube
- 14 fixing elements

Type	Shape	Voltage U <sub>m</sub> kV	Admissible diameter over core insulation mm	Allocation of insulating body acc. to cross-section <sup>1)</sup> mm <sup>2</sup>	Possible cross-sections with screwed-type connection mm <sup>2</sup>	Measure D <sub>1</sub> <sup>3)</sup> mm	Measure D <sub>2</sub> <sup>3)</sup> mm	Measure L <sub>1</sub> <sup>3)</sup> mm	Measure L <sub>2</sub> <sup>3)</sup> mm
SEHDT 13	symmetric	12	24.6 – 36.4 <sup>4)</sup>	240 – 500 <sup>4)</sup>	–	90/95	70/85	265/278	310/310
SEHDT 23	T-shape	24	26.3 – 40.6 <sup>4)</sup>	185 – 500 <sup>4)</sup>	–	90/95	70/85	265/278	310/310
SEHDT 23	symmetric	24	41.2 – 45.6	630	–	90/95	80/95	265/278	310/310
SEHDT 33	T-shape	36	22.8 – 45.6 <sup>4)</sup>	35 – 500	–	90/95	80/95	265/278	310/310
SEHDG 13	straight	12	15.0 – 28.4 <sup>4)</sup>	50 – 240 <sup>4)</sup>	–	97/97	80/90	485/485	317/347
SEHDG 23		24	15.0 – 32.6 <sup>4)</sup>	35 – 240 <sup>4)</sup>	–	97/97	80/90	485/485	317/347

1) for cables acc. to DIN VDE 0276-620  
 2) with stress controlling adapter  
 3) data without/with metal housing  
 4) each cross-section is assigned a separate insulating body

# Cable accessories for outer cone systems

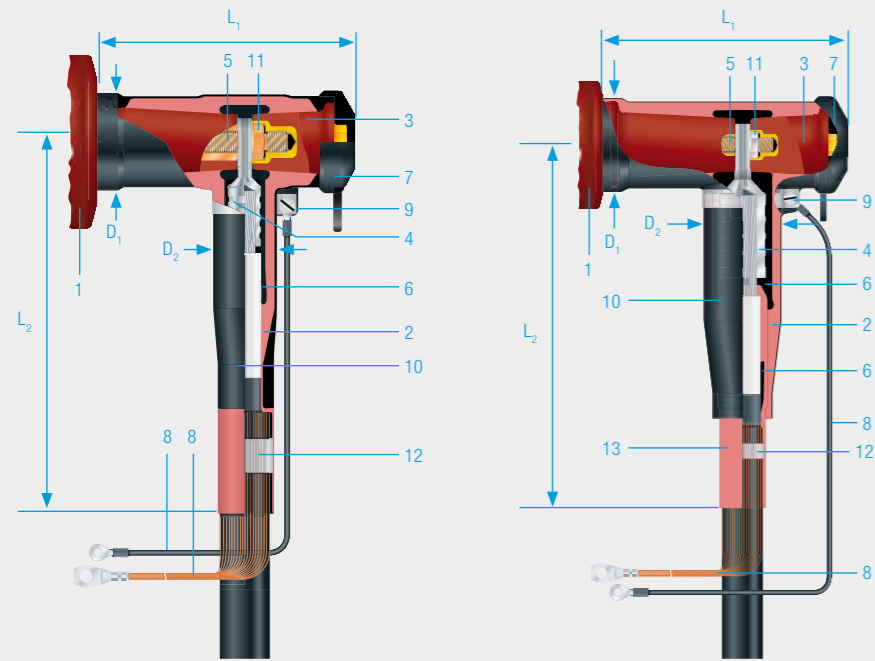
## Interface type C

The compact T-shaped plug-in terminations of type C are suitable for bushings according to DIN EN 50180 and EN 50181, interface type C, rated current 630/1250 A.

### Compact T-shaped plug-in terminations SET and SAT, U<sub>m</sub> up to 36 (42) kV

- connection of conductor and screen in compression-type or screwed-type (with shear-off bolts) available

- available with conductive coating only
- optionally with additional metal housing
- cover up to nine cable cross-sections with one insulating body size and a stress controlling adapter
- capacitive voltage tap available



Technical data			
Max. voltage U <sub>m</sub>	24 kV	36 kV	42 kV
AC voltage (5 min)	57 kV	87 kV	93,5 kV
DC voltage (15 min)	76 kV	108 kV	125 kV
Impulse voltage	125 kV	170 kV	200 kV
Partial discharge	< 5pC	< 5pC	< 5pC

- 1 outer cone bushing type C
- 2 insulating body
- 3 sealing piece
- 4 connection bolt
- 5 threaded pin
- 6 stress-controlling element
- 7 earthing cap
- 8 earthing connection
- 9 earthing clamp
- 10 conductive coating
- 11 counter nut
- 12 sealing tape
- 13 adapter SAT

# Cable accessories for outer cone systems

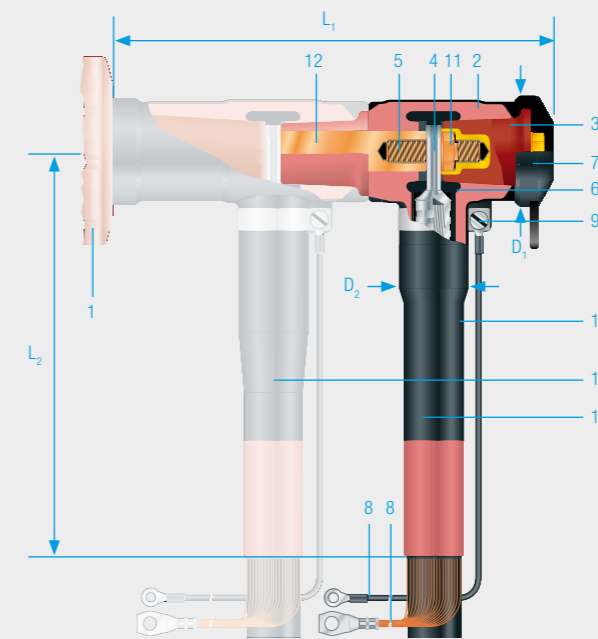
## Interface type C

The coupling plug-in terminations can be used to expand a compact T-shaped plug-in termination connected to the system to a space-saving and convenient parallel connection without a coupling element.

### Coupling T-shaped plug-in terminations SEHDK and SAK, U<sub>m</sub> up to 36 (42) kV

- connection of conductor and screen in compression-type or screwed-type (with shear-off bolts) available

- available with conductive coating only
- cover up to nine cable cross-sections with one insulating body size and a stress controlling adapter
- capacitive voltage tap available



Technical data			
Max. voltage U <sub>m</sub>	24 kV	36 kV	42 kV
AC voltage (5 min)	57 kV	87 kV	93,5 kV
DC voltage (15 min)	76 kV	108 kV	125 kV
Impulse voltage	125 kV	170 kV	200 kV
Partial discharge	< 5pC	< 5pC	< 5pC

- 1 outer cone bushing type C
- 2 insulating body
- 3 sealing piece
- 4 connection bolt
- 5 threaded pin
- 6 stress-controlling element
- 7 earthing cap
- 8 earthing connection
- 9 earthing clamp
- 10 conductive coating
- 11 counter nut
- 12 copper bold
- 13 first compact plug-in (here: type SET)
- 14 second coupling plug-in (here: type SEHDK)

Type	Voltage U <sub>m</sub> kV	Admissible diameter over core insulation mm	Allocation of insulating body acc. to cross-section <sup>1)</sup> mm <sup>2</sup>	Possible cross-sections with screwed-type connection mm <sup>2</sup>	Measure D <sub>1</sub> <sup>3)</sup> mm	Measure D <sub>2</sub> <sup>3)</sup> mm	Measure L <sub>1</sub> <sup>3)</sup> mm	Measure L <sub>2</sub> <sup>3)</sup> mm
SET 12	12	15.0 – 23.5 <sup>2)</sup>	50 – 150	50 – 95	80/88	53/71	187/188	275/275
SET 12		21.8 – 32.6	185 – 300	95 – 240	80/88	53/71	187/188	275/275
SAT 12	12	22.1 – 34.6	185 – 300	185 – 300	80/-	65/- <sup>4)</sup>	189/- <sup>4)</sup>	285/- <sup>4)</sup>
SAT 12		33.0 – 45.0	500 – 630	500 – 630	80/-	85/- <sup>4)</sup>	189/- <sup>4)</sup>	370/- <sup>4)</sup>
SAT 12	12	42.9 – 52.8	1000	1000	80/-	95/- <sup>4)</sup>	189/- <sup>4)</sup>	390/- <sup>4)</sup>
SET 24	24	15.0 – 23.5 <sup>2)</sup>	25 – 70	25 – 70	80/88	53/71	187/188	275/275
SET 24		21.8 – 32.6	95 – 240	95 – 240	80/88	53/71	187/188	275/275
SEHDT 23.1	24	31.6 – 34.6	300	-	80/88	59/71	189/190	295/295
SAT 24	24	22.1 – 34.6	95 – 300	95 – 300	80/- <sup>4)</sup>	65/- <sup>4)</sup>	189/- <sup>4)</sup>	285/- <sup>4)</sup>
SAT 24		33.0 – 45.0	400 – 630	400 – 630	80/- <sup>4)</sup>	85/- <sup>4)</sup>	189/- <sup>4)</sup>	370/- <sup>4)</sup>
SAT 24	24	42.9 – 52.8	800 – 1000	800 – 1000	80/- <sup>4)</sup>	95/- <sup>4)</sup>	189/- <sup>4)</sup>	390/- <sup>4)</sup>
SET 36	36 (42)	26.2 – 32.0	70 – 120	70 – 95 120	90/- <sup>4)</sup>	70/- <sup>4)</sup>	192/- <sup>4)</sup>	290/- <sup>4)</sup>
SET 36		30.8 – 39.6	150 – 300	150 – 240 300	90/- <sup>4)</sup>	70/- <sup>4)</sup>	192/- <sup>4)</sup>	290/- <sup>4)</sup>
SAT 36	36 (42)	39.1 – 52.8	400 – 630	400 – 630	90/- <sup>4)</sup>	95/- <sup>4)</sup>	189/- <sup>4)</sup>	370/- <sup>4)</sup>
SAT 36	36 (42)	49.8 – 55.9	800	800	90/- <sup>4)</sup>	110/- <sup>4)</sup>	201/- <sup>4)</sup>	445/- <sup>4)</sup>
SAT 36	36 (42)	53.4 – 59.4	1000	1000	90/- <sup>4)</sup>	110/- <sup>4)</sup>	201/- <sup>4)</sup>	445/- <sup>4)</sup>

1) for cables acc. to DIN VDE 0276-620 2) with stress controlling adapter 3) data without/with metal housing 4) metal housing on request

Type	Voltage U <sub>m</sub> kV	Admissible diameter over core insulation mm	Allocation of insulating body acc. to cross-section <sup>1)</sup> mm <sup>2</sup>	Possible cross-sections with screwed-type connection mm <sup>2</sup>	Measure D <sub>1</sub> <sup>3)</sup> mm	Measure D <sub>2</sub> <sup>3)</sup> mm	Measure L <sub>1</sub> <sup>3)</sup> mm	Measure L <sub>2</sub> <sup>3)</sup> mm
SEHDK 13.1	12	15.0 – 23.5 <sup>2)</sup>	50 – 150	50 – 95	80/- <sup>4)</sup>	53/- <sup>4)</sup>	286/- <sup>4)</sup>	275/- <sup>4)</sup>
SEHDK 13.1		21.8 – 32.6	185 – 300	95 – 240	80/- <sup>4)</sup>	53/- <sup>4)</sup>	286/- <sup>4)</sup>	275/- <sup>4)</sup>
SAK 12	12	22.1 – 34.6	185 – 300	185 – 300	80/- <sup>4)</sup>	60/- <sup>4)</sup>	289/- <sup>4)</sup>	285/- <sup>4)</sup>
SAK 12	12	33.0 – 45.0	500 – 630	500 – 630	80/- <sup>4)</sup>	85/- <sup>4)</sup>	289/- <sup>4)</sup>	370/- <sup>4)</sup>
SEHDK 23.1	24	15.0 – 23.5 <sup>2)</sup>	25 – 70	25 – 70	80/- <sup>4)</sup>	53/- <sup>4)</sup>	286/- <sup>4)</sup>	275/- <sup>4)</sup>
SEHDK 23.1		21.8 – 32.6	95 – 240	95 – 240	80/- <sup>4)</sup>	53/- <sup>4)</sup>	286/- <sup>4)</sup>	275/- <sup>4)</sup>
SAK 24	24	22.1 – 34.6	95 – 300	95 – 300	80/- <sup>4)</sup>	60/- <sup>4)</sup>	288/- <sup>4)</sup>	285/- <sup>4)</sup>
SAK 24	24	33.0 – 45.0	400 – 630	400 – 630	80/- <sup>4)</sup>	85/- <sup>4)</sup>	288/- <sup>4)</sup>	370/- <sup>4)</sup>
SEHDK 36	36 (42)	26.2 – 32.0	70 – 120	70 – 95 120	90/- <sup>4)</sup>	70/- <sup>4)</sup>	296/- <sup>4)</sup>	290/- <sup>4)</sup>
SEHDK 36		30.8 – 39.6	150 – 300	150 – 240 300	90/- <sup>4)</sup>	70/- <sup>4)</sup>	296/- <sup>4)</sup>	290/- <sup>4)</sup>

1) for cables acc. to DIN VDE 0276-620

2) with stress controlling adapter

3) data without/with metal housing

4) metal housing on request



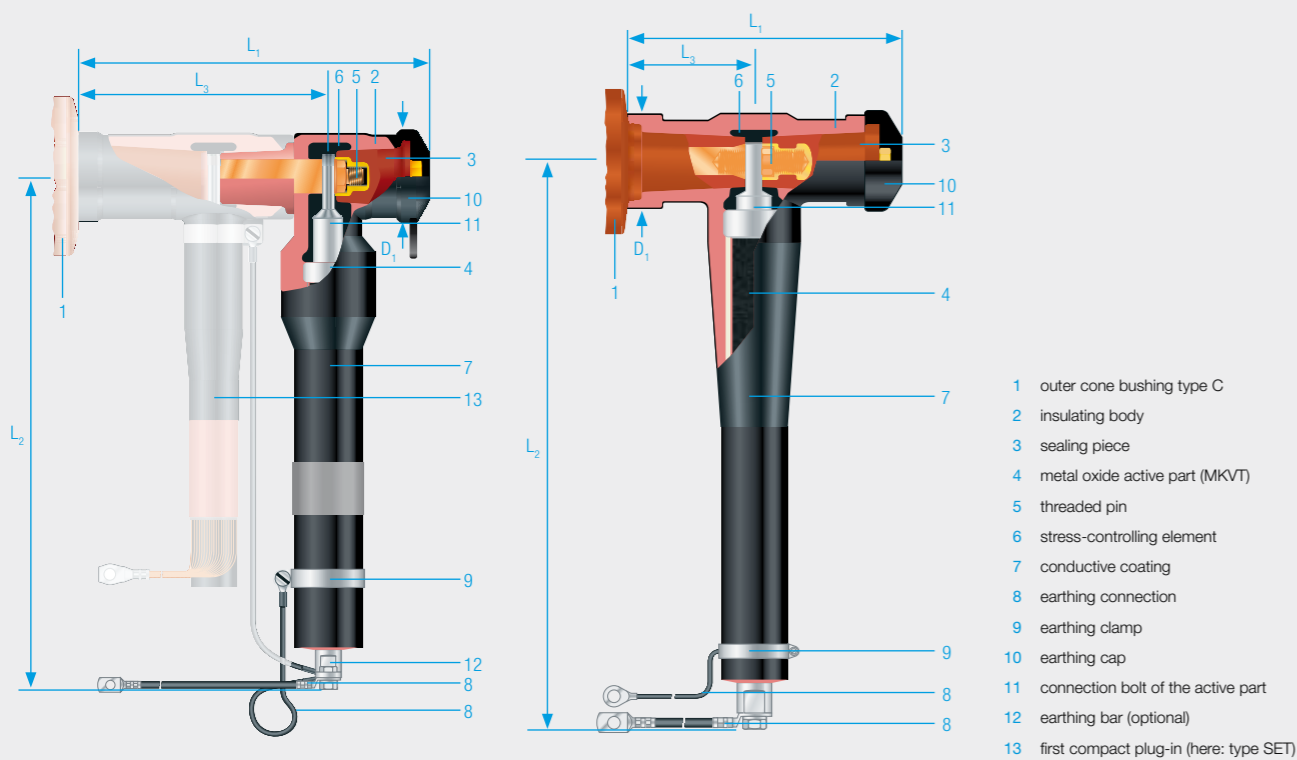
# Cable accessories for outer cone systems

## Interface type C

### T-shaped surge arrester MUT, $U_m$ up to 36 kV

Südkabel has developed a comprehensive range of accessories to make optimal use of all the advantages of plug-in terminations for metal-enclosed switchgears. The wide range of products offers solutions for any requirement regarding plug-in terminations. Metal-enclosed surge arresters protect switchgears against power-frequency and atmospheric overvoltage.

- available with conductive coating only or with additional metal housing
- active part: metal-oxide arrester
- meets the specification of IEC 60099-4, 11/91, protection level based on VDE recommendation DIN VDE 0675 part 5
- overload performance verification by tests in accordance with IEC and ANSI C6211-1987



### MUT 23 / MUT 23.1

- compact T-shaped surge arrester for application in combination with compact T-shaped plug-in terminations
- compact solution for overvoltage protection directly at the connection of the pole-mounted feeder cable to the substation

### MUT 33

- T-shaped surge arrester for direct connection to outer cone bushing according to DIN EN 50180 and DIN EN 50181, interface type C, as well as for parallel connection to T-shaped plug-in terminations via appropriate coupling piece

Type	Voltage $U_m$	Measure $L_1$ <sup>1)</sup>	Measure $L_2$	Measure $L_3$	Measure $D_1$
	kV	mm	mm	mm	mm
MUT 23	24	302/302 <sup>3)</sup>	415	219 <sup>3)</sup>	80/88
MUT 23.1	24	290/- <sup>2) 3)</sup>	445	208 <sup>3)</sup>	80/88
MUT 33	36	240/253	481	112	90/95

1) data without/with metal housing  
 2) metal housing on request  
 3) measure with compact plug-in

### Technical data of the active parts MKVT in surge arresters MUT 23 / MUT 23.1 / MUT 33

Type metal oxide surge arrester Active part MKVT	MUT 23 / MUT 23.1 <sup>2)</sup> / MUT 33 <sup>3)</sup>							
	6	12	18	20	22	24	30	36
Max. continuous operating voltage $U_c$ (kV <sub>eff</sub> <sup>1)</sup> )	6	12	18	20	22	24	30	36
Rated voltage (kV <sub>eff</sub> )	7.5	15	22.5	25	27.5	30	37.5	45
Rated discharge current (kA <sub>pv</sub> )	10	10	10	10	10	10	10	10
Maximum discharge current (kA <sub>pv</sub> )	65	65	65	65	65	65	65	65
Rect. wave strength, 2000 $\mu$ s (A <sub>pv</sub> )	250	250	250	250	250	250	250	250
Energy absorption capacity E at rect. wave strength kJ/kV $U_c$	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5
Energy absorption capacity E at high impulse current kJ/kV $U_c$	2.6	2.6	2.6	2.6	2.6	2.6	2.6	2.6
Short-circuit current up to (kA)	16	16	16	16	16	16	16	16
<b>Discharge voltage <math>U_p</math> (peak value)</b>								
with 1/10 $\mu$ sec wave at 5 kA (kV <sub>pv</sub> )	21.8	43.6	65.3	72.6	79.8	87.1	108.9	130.6
with 1/10 $\mu$ sec wave at 10 kA (kV <sub>pv</sub> )	24.0	48.0	72.0	80.0	88.0	96.0	120.0	144.0
with 8/20 $\mu$ sec wave at 1 kA (kV <sub>pv</sub> )	17.4	34.8	52.1	57.9	63.7	69.5	86.8	104.2
with 8/20 $\mu$ sec wave at 2,5 kA (kV <sub>pv</sub> )	18.6	37.1	55.6	61.8	68.0	74.1	92.7	111.2
with 8/20 $\mu$ sec wave at 5 kA (kV <sub>pv</sub> )	19.5	39.0	58.5	65.0	71.5	78.0	97.5	117.0
with 8/20 $\mu$ sec wave at 10 kA (kV <sub>pv</sub> )	21.5	42.9	64.4	71.5	78.7	85.8	107.3	128.7
with 8/20 $\mu$ sec wave at 20 kA (kV <sub>pv</sub> )	23.8	47.6	71.4	79.3	87.3	95.2	119.0	142.8
with 30/60 $\mu$ sec wave at 100 A (kV <sub>pv</sub> )	14.9	29.7	44.5	49.4	54.4	59.3	74.1	89.0
with 30/60 $\mu$ sec wave at 250 A (kV <sub>pv</sub> )	15.5	30.9	46.3	51.4	56.5	61.7	77.1	92.5
with 30/60 $\mu$ sec wave at 500 A (kV <sub>pv</sub> )	16.0	32.0	48.0	53.3	58.7	64.0	80.0	96.0
with 30/60 $\mu$ sec wave at 1000 A (kV <sub>pv</sub> )	16.8	33.6	50.4	55.9	61.5	67.1	83.9	100.7

1) further operating voltages on request  
 2) MUT 23 and MUT 23.1 for voltages up to 24 kV  
 3) MUT 33 for voltages up to 36 kV

### Definitions

The maximum permissible continuous operating voltage  $U_c$  (MCOV) is the highest power-frequency voltage the arrester can withstand on a continual basis. This value is specified in kV as an r.m.s. value.

The energy absorption capacity E is the maximum permissible electrical energy expressed in kJ per kV  $U_c$  that the surge arrester can absorb in total without its thermal stability being endangered.

The energy absorption capacity is temperature-dependent and is specified for an ambient temperature of 45 °C

### Explanation of the protection characteristics

Gap-free arresters have no sparkover voltage but only a discharge voltage  $U_p$ . This represents the voltage between the arrester terminals while a power pulse current passes through.

The 1/10  $\mu$ sec current wave at a rated discharge current of 10 kA represents very steep overvoltage waves. The associated discharge voltage is comparable to the front sparkover voltage of conventional arresters with spark gaps.

The 8/20  $\mu$ sec current wave at a peak value of 10 kA results in a discharge voltage approximately corresponding to the protection level in case of lightning impulses.

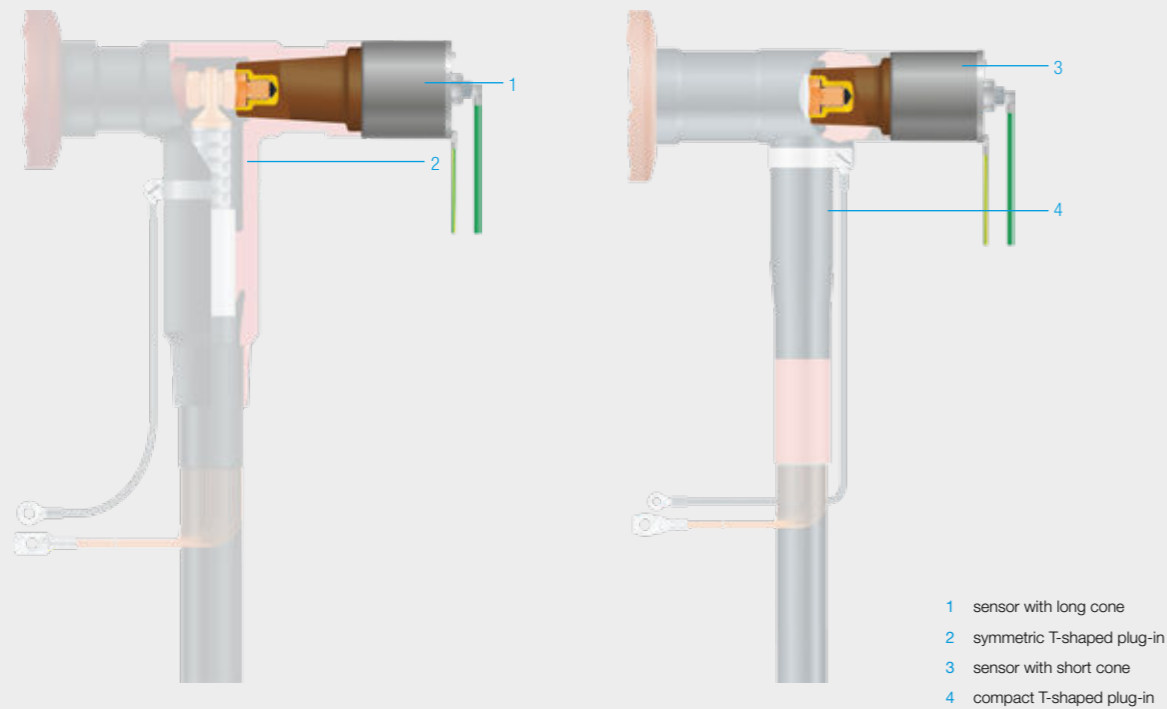
The 30/60  $\mu$ sec current wave corresponds to a steep switching impulse voltage. With this waveform, the discharge voltage at 1 kA results in approximately the protection level for switching impulse voltage stress.

The protection characteristics are sufficiently described with these three current waves.

# Accessories for outer cone systems

## Voltage detecting sensors

The destabilisation of the grid due to the increasing occurrence of decentralised feed-in makes the expansion of an „intelligent“ electricity grid („smart grid“) necessary. In the course of this digitalisation, current and voltage sensors from various manufacturers for measuring, monitoring, protecting and detecting short circuits or earth faults and determining their direction are playing an increasingly important role for grid operators. Voltage sensors can be used to equip medium-voltage switchgear in local network stations in urban, rural and industrial areas with accurate measurement technology.



- 1 sensor with long cone
- 2 symmetric T-shaped plug-in
- 3 sensor with short cone
- 4 compact T-shaped plug-in

The following sensor types are suitable to Südkabel's T-shaped medium voltage plug-in terminations:

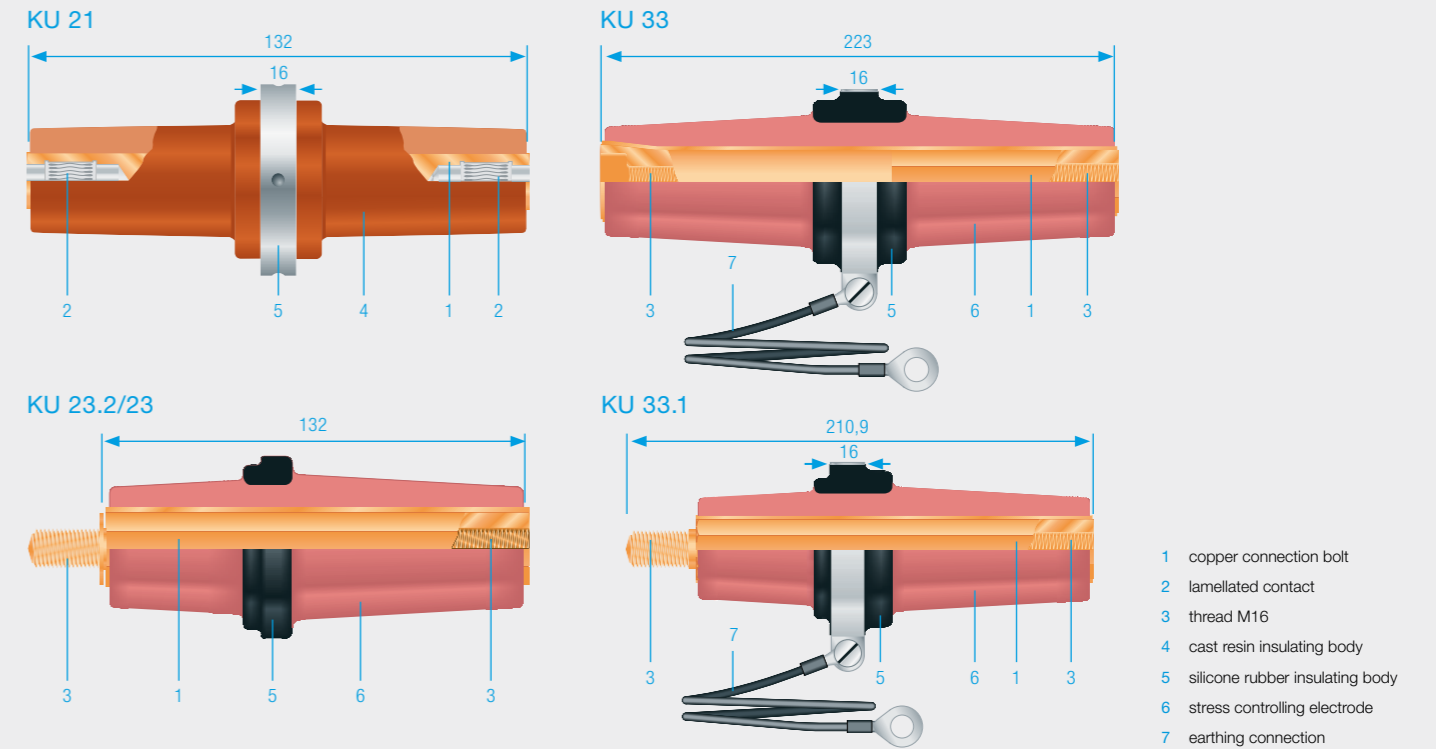
Accessory type (symmetric T-Shape)	$U_0$ ( $U_m$ )	Possible sensor type	Manufacturer of sensor	Accessory type (compact T-Shape)	$U_0$ ( $U_m$ )	Possible sensor type	Manufacturer of sensor
SEHDT 13/23	6 kV (12 kV) 12 kV (24 kV)	KEVA 24 C10, KEVA 24 C10c	ABB	SET 12/24 SAT 12/24 SEHDT 13.1/23.1 SEHDK 13.1/23.1 SAK 12/24 MUT 23/23.1 AD 23.1 SP	6 kV (12 kV) 12 kV (24 kV)	KEVA 24 26, KEVA 24 26c	ABB
		T120C, T240C	Greenwood Power, FMT			T120K, T240K	Greenwood Power, FMT
		VSP12-S, VSP24-S	MBS AG Sulzbach Messwandler			VAP12-S, VAP24-S	MBS AG Sulzbach Messwandler
		RDP1-24	HORSTMANN			RDP3-24	HORSTMANN
		OAS12, OAS12 R2, OAS24, OAS24 R2	Jordan, Kries			OAS12, OAS12 R2, OAS24, OAS24 R2	Jordan, Kries
MGTK 12, MGTK 24	Ritz Instrument Transformers GmbH	MGTK-V 12, MGTK-V 24	Ritz Instrument Transformers GmbH				
		SMVS-UW1001	ZELISKO			SMVS-UW1002-1	ZELISKO
SEHDT 33 MUT 33	18 kV (36 kV)	SMVS-UW1001	ZELISKO	SET 36; SAT 36 SEHDK 36	18 kV (36 kV)	SMVS-UW1002-1	ZELISKO

compatibility of further sensors on request

# Accessories for outer cone plug-ins

## Coupling pieces KU ( $U_m$ up to 36 kV)

Coupling pieces are used in combination with shaped plug-in terminations for surge-proof and shock-proof connection of components such as parallel cables or surge arresters. It is also possible to provide cable connections or highly-flexible cable connections in the form of detachable sections using coupling pieces and appropriate plug-in terminations. Special coupling pieces are available for connecting plug-in terminations for different connection types.



- 1 copper connection bolt
- 2 lamellated contact
- 3 thread M16
- 4 cast resin insulating body
- 5 silicone rubber insulating body
- 6 stress controlling electrode
- 7 earthing connection

### Coupling piece KU 21

- insulating material: cast resin
- for interconnecting plug-in terminations of interface type A up to 24 kV

### Coupling piece KU 23.2 / 23

- insulating material: silicone rubber
- for interconnecting plug-in terminations for interface type C up to 24 kV to plug-in type SET 12/24

### Coupling piece KU 33

- insulating material: silicone rubber
- for interconnecting plug-in terminations of interface type C up to 36 kV
- option: version for front-to-front connection

### Coupling piece KU 33.1

- insulating material: silicone rubber
- for interconnecting plug-in terminations for interface type C up to 36 kV to compact T-shaped plug-in terminations

# Accessories for outer cone plug-ins

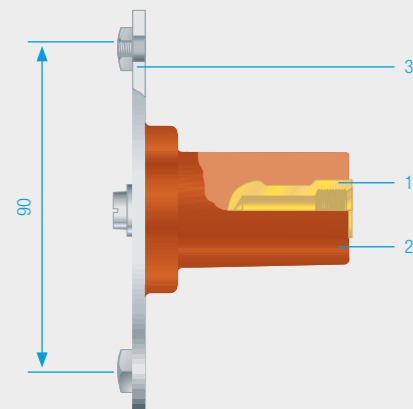
Surge-proof insulating terminations IS  
( $U_m$  up to 36 kV)

Surge-proof insulating terminations are used for surge-proof and shock-proof insulation of plug-in terminations which are disconnected from the switchgear or the transformer.

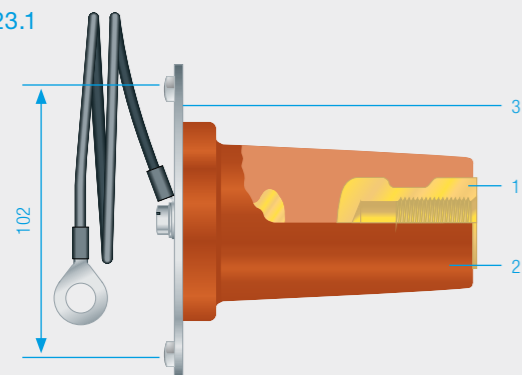
Earthing accessories ER

Earthing accessories are used for short circuit-proof earthing of plug-in terminations

IS 21

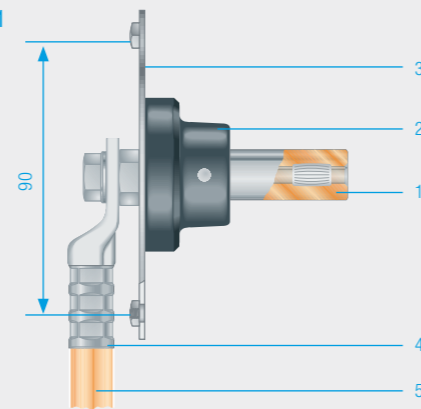


IS 23.1

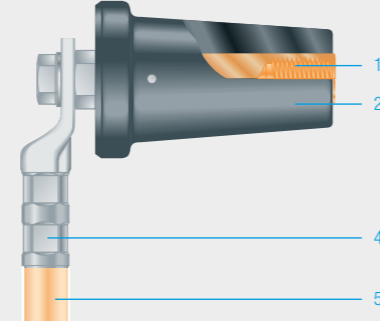


- 1 contact tube
- 2 cast resin terminating element
- 3 mounting plate with borings for fastening the insulation to plug-in terminations

ER 21



ER 23



- 1 earthing pin with contact for plug-in or screwed contact
- 2 polyamide body
- 3 mounting plate with borings for fastening the earthing accessories to plug-in terminations with plug-in contacts copper compression
- 4 cable lug, tin-plated
- 5 ESUY earthing cable (50 mm<sup>2</sup> for interface type A, 95 mm<sup>2</sup> for interface type B and C), cable length 500 mm, counterpart with copper compression cable lug with palm hole (10,5 mm for interface type A, 13 mm for interface type B and C), alternatively available with ball pin Ø 20 mm or 25 mm.

## Insulating termination IS 21

- for plug-in terminations of interface type A
- suitable for up to 24 kV

## Insulating termination IS 23.1

- for plug-in terminations of interface type B and C
- suitable for up to 36 kV

## Earthing accessory ER 21

- for plug-in terminations of interface type A

## Earthing accessory ER 22 and ER 23

- for plug-in terminations of interface type B and C

# Accessories for outer cone plug-ins

Test bushing PR  
( $U_m$  up to 36 kV)

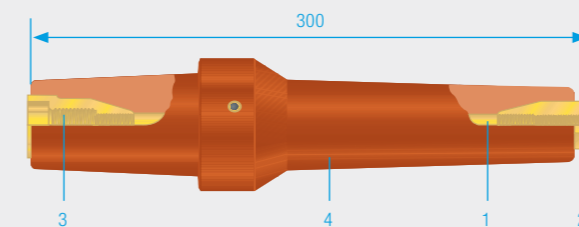
Test bushings are used to perform voltage test (cable tests, fault locating) on cables that are connected with plug-in terminations.

Post insulator STF 21  
( $U_m$  up to 24 kV)

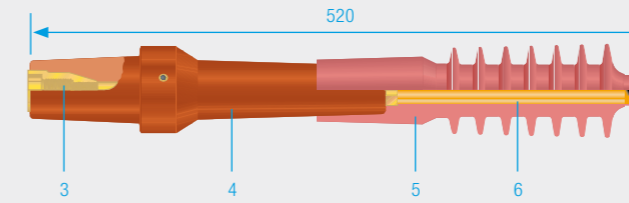
The post insulator STF 21 is used to connect cables to outer cone bushing type A via conventional terminations.

- suitable for bushings of interface type A
- termination connection with thread M12

PR 23.1

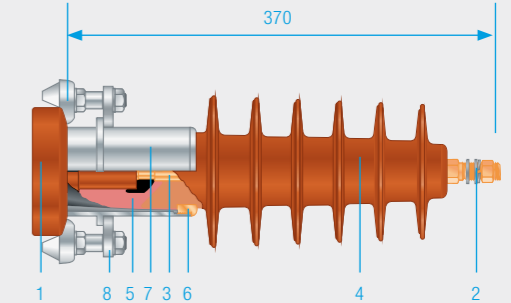


PR 23.1 with extension



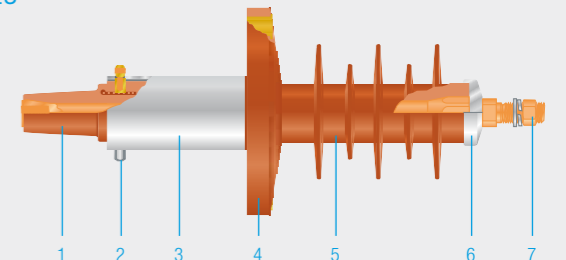
- 1 connecting bolt
- 2 thread for testing lead connection
- 3 thread for the threaded pin of the plug-in termination
- 4 insulating body made of cast resin
- 5 insulating body made of silicone rubber
- 6 extension

STF 21



- 1 outer cone bushing type A
- 2 threaded bolt for termination connection
- 3 contact pin
- 4 cast resin insulator
- 5 insulating body made of silicone rubber with stress-controlling
- 6 support ring with stress-controlling element
- 7 support tube with mounting flange
- 8 mounting plate

WA 23



- 1 outer cone bushing type C
- 2 fixing elements for earthing of metal housing and stress-controlling electrode
- 3 metal housing
- 4 flange boring for fastening the wall bushing at the wall surface of the masonry-enclosed substation
- 5 epoxy cast resin outdoor insulator
- 6 radiation hood of the outdoor insulator
- 7 threaded connection bolt for overhead-line connection

## Test bushing PR 23.1

- for T-shaped plug-in terminations of interface type C up to 24 kV
- T-shaped plug-in terminations can remain connected to the system.
- assembly of the test bushing on the rear cast resin terminating element of the T-shaped plug-in termination

## Test bushing PR 23.1 with extension

- for T-shaped plug-in terminations of interface type C up to 36 kV
- T-shaped plug-in terminations can remain connected to the system
- assembly of the test bushing on the rear cast resin terminating element of the T-shaped plug-in termination

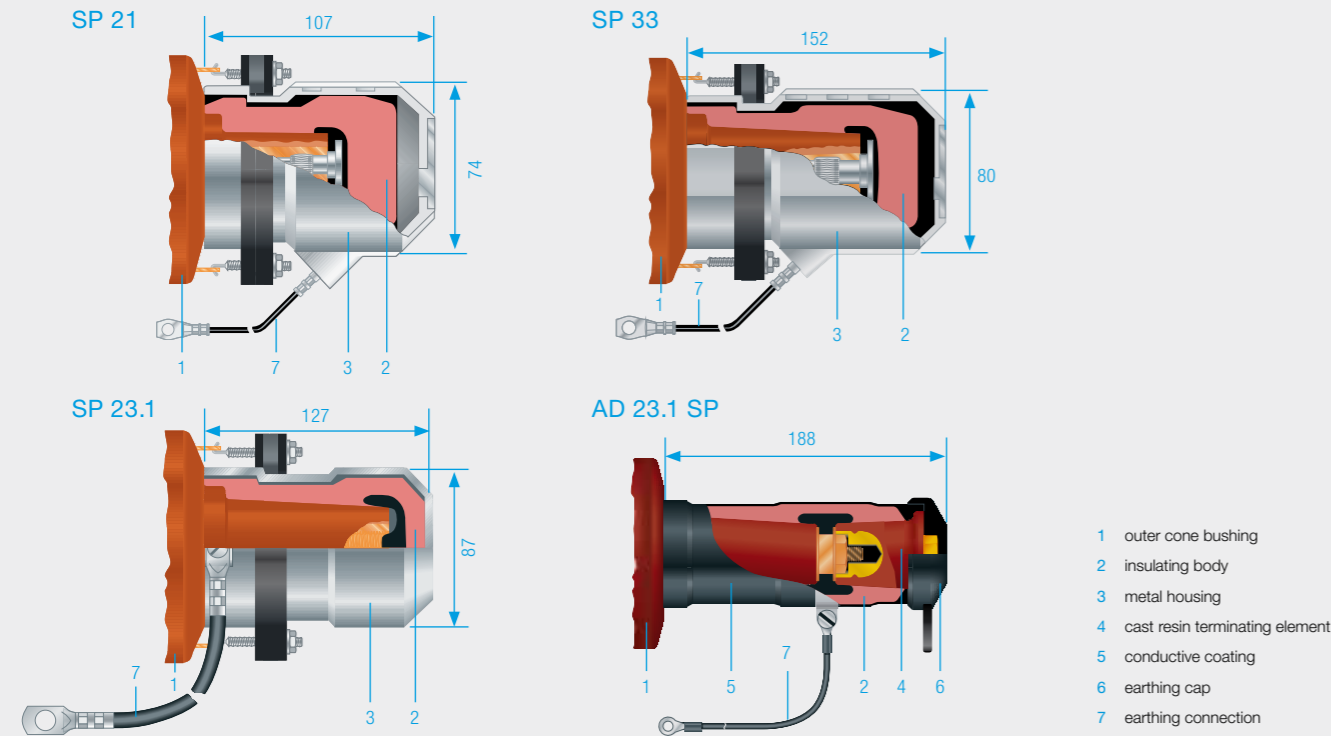
## Wall bushing WA 23, $U_m$ up to 24 kV

- The wall bushing WA 23 enables the transition from medium voltage overhead lines to metal enclosed termination systems up to 24 kV inside masonry-enclosed substation.
- on the outside: outdoor insulator made of epoxy cast resin
  - overhead line connection with thread M16
  - inside the station: outer cone bushing according to EN 50180 and DIN EN 50181, suitable for plug-in terminations of interface type C
  - metal-enclosed through insulator for wall thicknesses up to 25 cm

# Accessories for outer cone plug-ins

Surge-proof terminating caps SP  
( $U_m$  up to 36 kV)

Terminating caps are used for surge-proof and shock-proof insulation of bushings on distribution transformers and metal-enclosed switchgears.



## Terminating cap SP 21

- for bushings type A up to 24 kV
- connector bail holder according to DIN EN 50180 and DIN EN 50181 required

## Terminating cap SP 23.1

- for bushings type B and C up to 24 kV
- connector bail holder according to DIN EN 50180 and DIN EN 50181 required

## Terminating cap SP 33

- for bushings type C up to 36 kV
- connector bail holder according to DIN EN 50180 and DIN EN 50181 required

## Terminating cap AD 23.1 SP

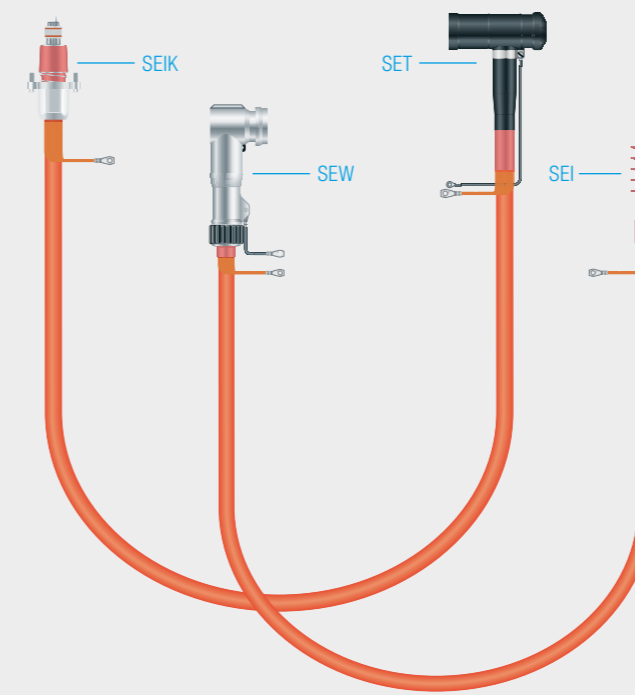
- for bushings type C up to 24 kV
- no connector bail holder required
- includes adapter AD 23.1 \*), threaded pin, cast resin terminating element and earthing cap

\*) for direct switchgear connection of accessory parts than can only be assembled on compact plug-in terminations

# Applications

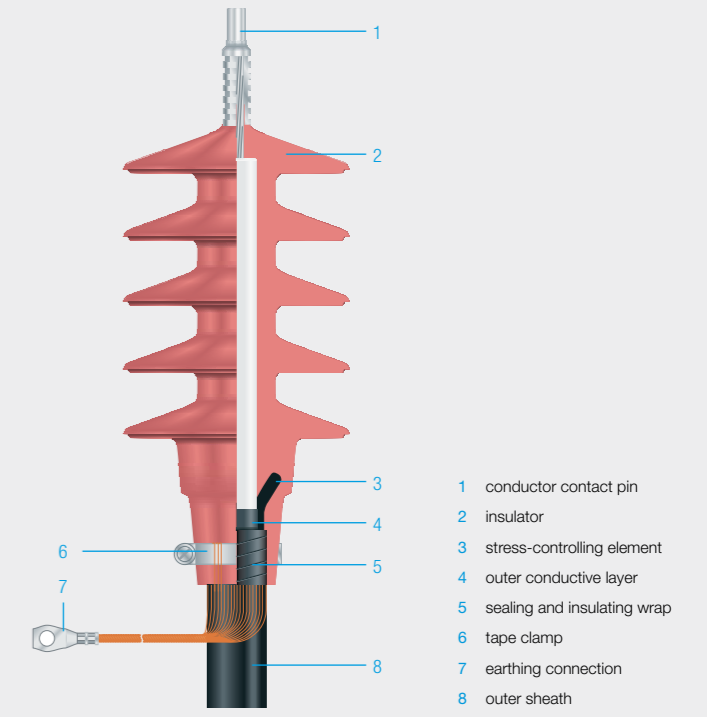
Preassembled cable and high flexible cable links 12 – 36 kV

Preassembled links are XLPE-insulated cables or flexible EPR-insulated trailing cables that are factory-equipped with terminations. They are primarily used for connections between transformers and switchgears or for special applications like electrically-powered trains.



Terminations for electrostatic precipitators 111 kV<sub>s</sub>

These terminations are especially designed for cable type A2XSY 1x50RM/16 111 kVS electrostatic precipitators and meet the special requirements of electrostatic filters.



- minimum radius of flexible cables is ideal for installation in narrow areas
- rationalization of substation assembly as no installation on site is necessary
- accessory equipment of the cable links can be freely chosen as any type of termination that are suitable for the used cable
- outgoing test on request

Type	Admissible current carrying capacity <sup>1)</sup>	Short-circuit current 1s	Outer diameter	Minimum bending radius
	A	kA	mm	mm
Trailing cable 24 kV <sup>2)</sup>				
NTMCWOEU 35 mm <sup>2</sup>	240	5	29,5	145
NTMCWOEU 50 mm <sup>2</sup>	300	7.2	31,5	155
Cable 24 kV <sup>2)</sup>				
N2XSY 35 mm <sup>2</sup>	235	5	30	450
N2XSY 50 mm <sup>2</sup>	282	7.2	34	550

1) installation in air at ambient temperature of 30 °C

2) further cable cross-sections and voltage levels on request

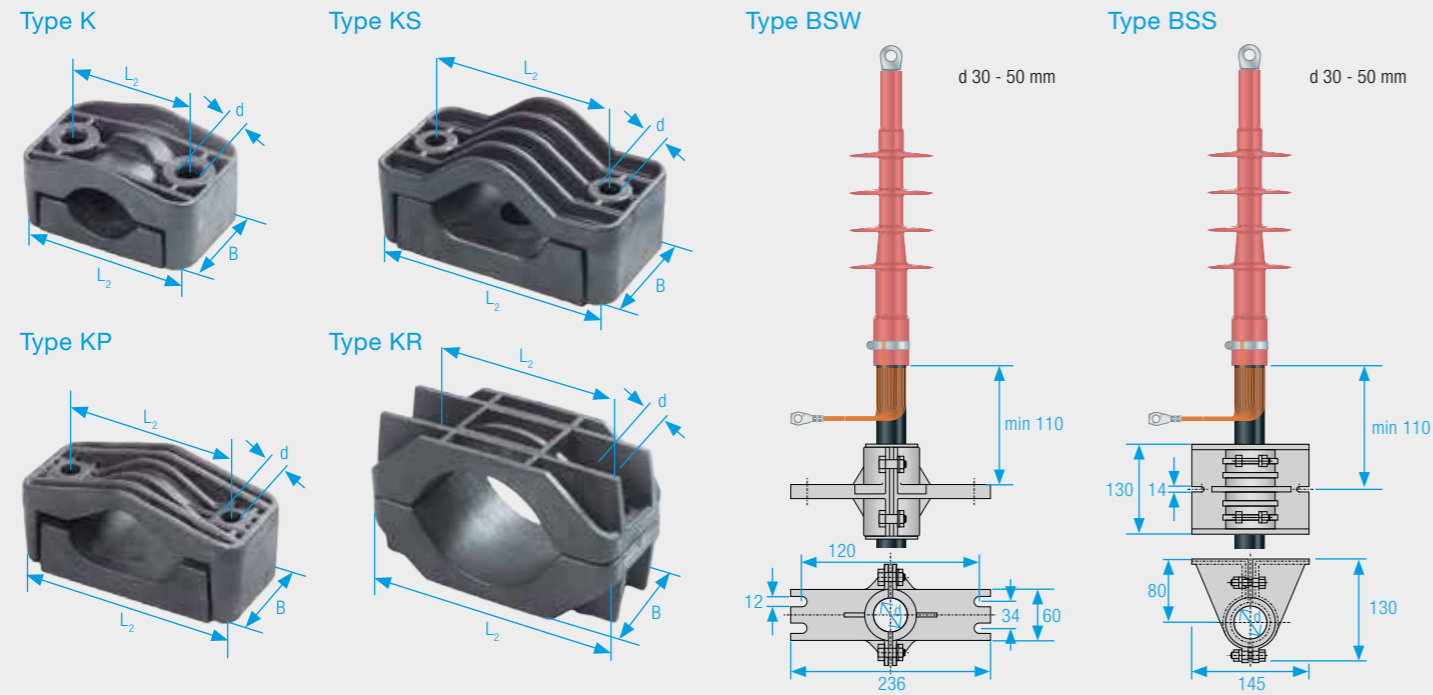
The components of electrostatic filters are subject to electrical impulse-shaped stresses. The voltage increases according to the charging properties of a capacitor and abruptly drops after voltage flashover in the filter. Afterwards, the charging process is restarted.

Type	Voltage $U_m$	Admissible diameter over core insulation	Cross-section area	Measure H	Measure D
	KV <sub>s</sub>	mm	mm <sup>2</sup>	mm	mm
SEHDL	111	25.5 – 30.8	50	425	170
SEHDL	111	33.5 – 38.5	50	425	170

# Accessories

## Cable clamps

Cable clamps made of glass fibre reinforced UV-resistant polyamide are used to fasten cables on poles, in stations and cable ducts. Potentially occurring mechanical loads after short-circuits and cable oscillations or due to the inherent rigidity of the cable can be controlled by means of suitable fixing clamps.



### Type K

- for fastening of single-core and multi-core cables
- mechanical short-circuit resistance: 12.500 N

### Type KS

- for fastening of single-core cables in trefoil formation
- mechanical short-circuit resistance: 13.000 N

### Type KP

- for fastening of single-core cables in trefoil formation
- mechanical short-circuit resistance: 25.000 N

### Type KR

- for fastening of single-core and multi-core cables
- mechanical short-circuit resistance: 30.000 N

### Fixing clamps for outdoor terminations

Outdoor terminations can withstand transverse forces only to a limited extend. Herefore there are special designed clamps:

- for horizontal mounting with clamps BSW
- for vertical mounting with clamp BSS

The fixing clamps BSW and BSS are characterised by a large clamping length of 100 mm for ideal mounting while observing the admissible surface pressure of the cable.

Adjustment to individual external cable diameters from 30 – 50 mm is enabled by different reducers in 5 mm increments.

Type	K26/38	K36/52	K50/75	K66/90	KP29/41	KP39/53	KS25/36	KS33/46	KR75/100	KR100/130	KR130/160
Suitable for outer diameter of cable in mm	26 – 38	36 – 52	50 – 75	66 – 90	29 – 41	39 – 53	25 – 36	33 – 46	75 – 100	100 – 130	130 – 160
Measure L <sub>1</sub>	90	105	126	158	172	190	150	170	180	210	250
Measure L <sub>2</sub>	60	75	95	120	125	145	110	130	150	175	210
Measure B	60	60	60	70	80	80	80	80	77	97	97
Measure d	12	12	12	14	14	14	12	12	14	14	18

# Accessories

## Earthing kits and tools for cable preparation

Each cable must be prepared before a cable accessory can be assembled on the cable. The method of the cable preparation can vary in complexity depending on the cable construction and can be solved by means of tools and earthing kits.



### Earthing kits

Beyond the VDE standard, there are a variety of cable constructions that requires appropriate type of earthing kit. For this purpose a special earthing kits are available, which are especially made to the cable construction.

For the correct selection, it is necessary to record the construction data and dimensions of the cable. You can provide us with the necessary information using the cable data form (on page 27).

- A separate earthing kit is necessary for:
- single core-cable construction with copper wire screen and further metallic sheaths
  - single core-cable construction with aluminum wire screen (and optional further metallic sheaths)
  - single core-cable construction with tape screen or lead sheath as screen and optional further metallic sheaths
  - three-core cable constructions

### Sheath cutter WM 20.1

Sheath cutter are used to remove exterior PE sheaths and XLPE insulations sheaths of medium voltage cable.

### Stripping tool WL 20.1

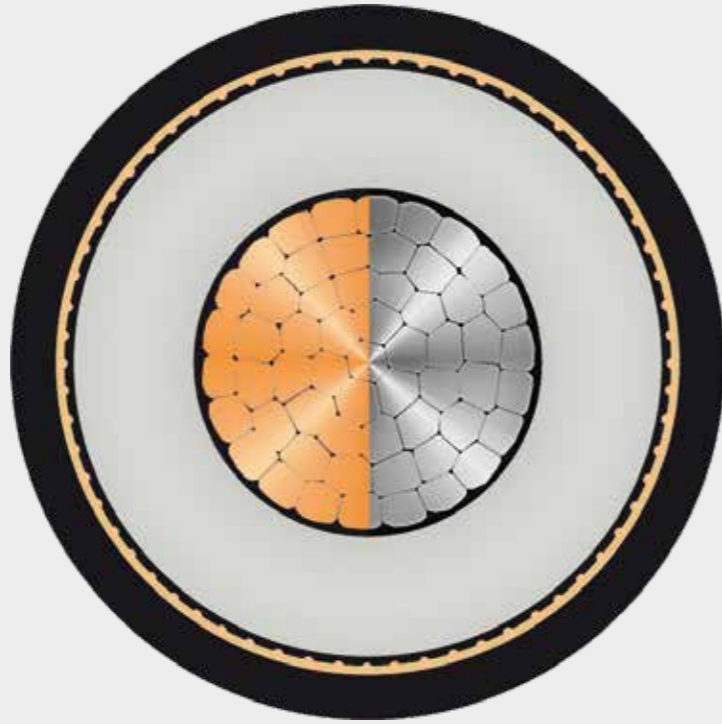
Stripping tools are used to remove the firmly bonded outer conductive layer of XLPE-insulated medium voltage cable.

### Additional accessories

- cable bundling tape for short-circuit-proof bundling of single-core cables
- impregnated cleaning wipes RUK 500 for cleaning of cable sheaths and insulations

# References to diameter over insulation

according to DIN VDE 0278-620



6/10 (12) kV		12/20 (24) kV		18/30 (36) kV	
Diameter over insulation	Cross-section area of conductor	Diameter over insulation	Cross-section area of conductor	Diameter over insulation	Cross-section area of conductor
mm	mm <sup>2</sup>	mm	mm <sup>2</sup>	mm	mm <sup>2</sup>
13.7 – 15.2	25	18.0 – 19.5	25	–	25
14.8 – 16.3	35	19.0 – 20.5	35	–	35
16.0 – 17.5	50	20.2 – 21.7	50	24.5 – 26.7	50
17.7 – 19.2	70	21.9 – 23.4	70	26.2 – 28.4	70
18.6 – 20.8	95	23.5 – 25.0	95	27.8 – 30.0	95
20.1 – 22.8	120	24.3 – 27.0	120	29.3 – 32.0	120
21.6 – 24.3	150	25.8 – 28.5	150	30.8 – 33.5	150
23.2 – 25.9	185	27.4 – 30.1	185	32.4 – 35.5	185
25.7 – 28.4	240	29.9 – 32.6	240	34.9 – 37.6	240
28.4 – 30.4	300	31.9 – 34.6	300	36.9 – 39.6	300
31.6 – 33.6	400	35.1 – 37.8	400	40.1 – 42.8	400
34.4 – 36.4	500	37.9 – 40.6	500	42.9 – 45.6	500

# Cable data form for allocation

to fill-in

Cable designation: \_\_\_\_\_

1 Conductor:  single-core cable  three-core cable  
 Conductor material and cross-section:  Al  Cu \_\_\_\_\_ mm<sup>2</sup>  
 Diameter over conductor: \_\_\_\_\_ Ø (mm)  
 Conductor form:  round, solid (RE)  round, stranded (RM)  round, fine-wired/flexible (RF)

2 Insulation:  XLPE  PE  PVC  (H)EPR  
 Diameter over insulation (DOI): \_\_\_\_\_ Ø (mm)  
 Voltage level U<sub>0</sub>/U (U<sub>m</sub>):  6/10 (12)  12/20 (24)  
 18/30 (36)  other \_\_\_\_\_

3 Insulation screen:  fix-bonded  strippable  
 Diameter over insulation screen: \_\_\_\_\_ Ø (mm)  
 Thickness over insulation screen: \_\_\_\_\_ (mm)

4 Screen:  copper wire screen cross-section or number/diameter of wires \_\_\_\_\_  
 aluminium wire screen cross-section or number/diameter of wires \_\_\_\_\_  
 copper tape screen  lead sheath screen (without screen)

5 Further metallic sheaths:  no  yes  
 laminated Al sheath  
 lead sheath only for three-core cables  for each cable core  
 common over all 3 cores

6 Armouring:  no  yes material \_\_\_\_\_  
 flat stripes  tape  
 round wires cross-section or number/diameter of wires \_\_\_\_\_

7 Outer sheath: overall diameter \_\_\_\_\_ Ø (mm)

The cable accessories offered in any quotation have been selected in accordance with information supplied. Where insufficient or incorrect information is supplied the products have been selected based on our experience. Before purchasing or using these products please satisfy yourselves that they are suitable for the intended purpose.

# Our offer

## Cables

- XLPE-insulated cables from 10 kV to 500 kV
- Temporary site cables up to 220 kV

## Accessories

### for medium, high, and extra-high voltage

- Outdoor terminations
- Conventional and compact terminations for SF<sub>6</sub> gas-insulated switchgears and transformers
- Cable joints
- Compact terminations for outer and inner cone systems
- Cable links for medium voltage
- Accessories for electrostatic precipitator cables

## Services

- Consulting for application-related questions
- Training for installation personnel
- Cable laying and supervision of laying
- Installation of accessories
- Commissioning
- After-sales services

## Cable systems

- Turnkey XLPE cable systems up to 500 kV
- AC and DC

## Südkabel – everything at one site

- Founded 1898 in Mannheim, Germany
- Manufacturing of cables and accessories
- Own department for research and development
- International project
- Sales partners worldwide

## Certified

- Environmental management ISO 14001
- Quality management ISO 9001
- Energy management ISO 50001
- Health and safety management ISO 45001
- Project management ISO 21500
- Safety Culture Ladder Level 3

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[www.suedkabel.com](http://www.suedkabel.com)



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