



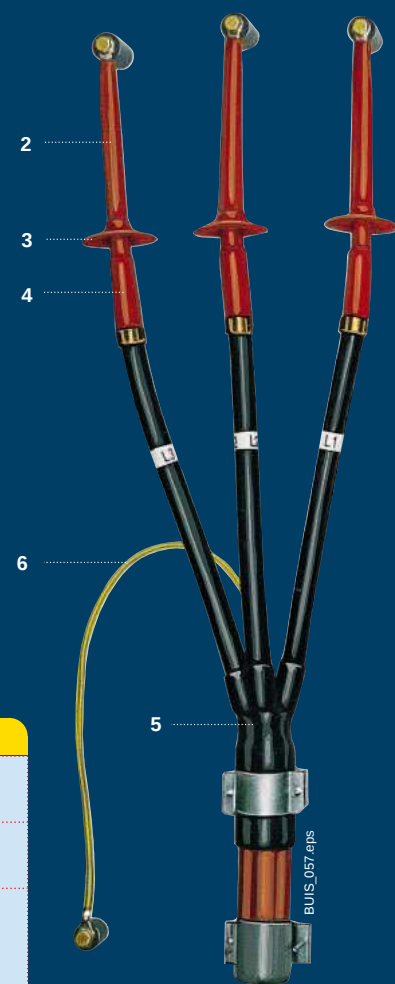
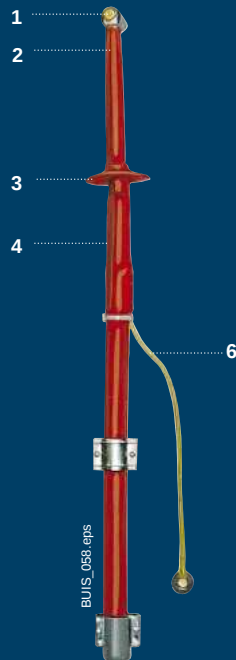
**THORNE &
DERRICK
INTERNATIONAL**

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Sealing Ends, Hybrid Design for PROTON (SF), PROTON (SB), PROTOMONT	3/2
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- 1 Cable lug
- 2 Heat shrinkable tubing (creepage-proof)
- 3 Silicon shield ¹⁾
- 4 Field control element
- 5 Splitting cap
- 6 Earth conductor



Selection and dimensioning criteria

Type	Sealing end, hybrid design (combined cold/hot shrink method)
Approvals/standards	According to DIN VDE 0278-629-1 and to all major international standards
Application	For PROTOLOK (ST), PROTOLOK (SB) and single-core MV flexible cables 6-30 kV and PROTOMONT tunnel driving machine MV power cables 6-20 kV for connection to MV sliprings, feeder stations, junction boxes, etc.
Rated voltage	$U_0/U = 3.6/6$ kV to 18/30 kV
Max. permissible operating voltage	
In AC systems	$U_0/U = 4.2/7.2$ kV to 20.8/36 kV
In DC systems	$U_0/U = 5.4/10.8$ kV to 27/54 kV
Test voltage	According to DIN VDE 0278-629-1
Current-carrying capacity	According to DIN VDE 0298, Part 4
Ambient temperature	- 40 °C to + 80 °C
Dynamic short-circuit strength	63 kA
Maximum permissible operating temperature of the conductor	90 °C
Installation instructions	MS 371-220
Connection dimensions	To customer specification. When ordering sealing ends prepared at our works, please enter the details in the dimension drawing on page 3/8.

1) The number and diameter are dependent on the application and on the voltage level.

Sealing Ends, Hybrid Design, Single and Three-Core for PROTOLON (ST), PROTOLON (SB) PROTOLON Medium-Voltage Flexible Single-Core Cables PROTOMONT Tunnel Driving Machine Cables

3

3

Selection and ordering data

Number of cores and nominal cross-section mm ²	Order No. Set of materials	Max. cable diameter mm	Max. core diameter mm	Max. diameter of sealing end mm
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Three-core sealing ends, hybrid design

3 x 25 + 3 x 25/3	5GU9 812-□□□	50.8	14.7	61.0
3 x 35 + 3 x 25/3	5GU9 813-□□□	54.6	15.9	65.5
3 x 50 + 3 x 25/3	5GU9 814-□□□	59.7	17.5	71.6
3 x 70 + 3 x 35/3	5GU9 815-□□□	65.8	19.4	79.0
3 x 95 + 3 x 50/3	5GU9 816-□□□	71.9	21.4	86.3
3 x 120 + 3 x 70/3	5GU9 817-□□□	77.0	23.0	92.4
3 x 150 + 3 x 70/3	5GU9 818-□□□	82.7	24.8	99.2
3 x 185 + 3 x 95/3	5GU9 819-□□□	88.4	26.6	106.1
3 x 240 + 3 x 120/3	5GU9 819-□□□	97.2	29.4	116.6

3.6/6 kV

3 x 25 + 3 x 25/3	5GU9 822-□□□	53.4	15.5	64.1
3 x 35 + 3 x 25/3	5GU9 823-□□□	57.2	16.7	68.6
3 x 50 + 3 x 25/3	5GU9 824-□□□	62.2	18.3	74.6
3 x 70 + 3 x 35/3	5GU9 825-□□□	68.1	20.2	81.7
3 x 95 + 3 x 50/3	5GU9 826-□□□	74.4	22.2	89.3
3 x 120 + 3 x 70/3	5GU9 827-□□□	79.5	23.8	95.4
3 x 150 + 3 x 70/3	5GU9 828-□□□	85.2	25.6	102.2
3 x 185 + 3 x 95/3	5GU9 829-□□□	90.9	27.4	109.1
3 x 240 + 3 x 120/3	5GU9 829-□□□	99.7	30.2	119.6

6/10 kV

3 x 25 + 3 x 25/3	5GU9 832-□□□	60.3	17.7	72.4
3 x 35 + 3 x 25/3	5GU9 833-□□□	64.1	18.9	76.9
3 x 50 + 3 x 25/3	5GU9 834-□□□	69.2	20.5	83.0
3 x 70 + 3 x 35/3	5GU9 835-□□□	75.1	22.4	90.1
3 x 95 + 3 x 50/3	5GU9 836-□□□	81.4	24.4	97.7
3 x 120 + 3 x 70/3	5GU9 837-□□□	86.5	26.0	103.8
3 x 150 + 3 x 70/3	5GU9 838-□□□	92.1	27.8	110.5
3 x 185 + 3 x 95/3	5GU9 839-□□□	97.8	29.6	117.4
3 x 240 + 3 x 120/3	5GU9 839-□□□	107.0	32.4	128.4

8.7/15 kV

3 x 25 + 3 x 25/3	5GU9 842-□□□	66.6	19.7	79.9
3 x 35 + 3 x 25/3	5GU9 843-□□□	70.4	20.9	84.5
3 x 50 + 3 x 25/3	5GU9 844-□□□	75.5	22.5	90.6
3 x 70 + 3 x 35/3	5GU9 845-□□□	81.4	24.4	97.7
3 x 95 + 3 x 50/3	5GU9 846-□□□	87.7	26.4	105.2
3 x 120 + 3 x 70/3	5GU9 847-□□□	92.8	28.0	111.4
3 x 150 + 3 x 70/3	5GU9 848-□□□	98.5	29.8	118.2
3 x 185 + 3 x 95/3	5GU9 849-□□□	104.0	31.6	124.8
3 x 240 + 3 x 120/3	5GU9 849-□□□	113.0	34.4	135.6

12/20 kV

3 x 25 + 3 x 25/3	5GU9 852-□□□	76.1	22.7	91.3
3 x 35 + 3 x 25/3	5GU9 853-□□□	78.7	23.5	94.4
3 x 50 + 3 x 25/3	5GU9 854-□□□	83.7	25.1	100.4
3 x 70 + 3 x 35/3	5GU9 855-□□□	89.6	27.0	107.5
3 x 95 + 3 x 50/3	5GU9 856-□□□	95.5	29.0	114.6
3 x 120 + 3 x 70/3	5GU9 857-□□□	101.0	30.6	121.2
3 x 150 + 3 x 70/3	5GU9 858-□□□	107.0	32.4	128.4
3 x 185 + 3 x 95/3	5GU9 859-□□□	112.0	34.2	134.4
3 x 240 + 3 x 120/3	5GU9 859-□□□	121.0	37.0	145.2

14.5/25 kV

3 x 25 + 3 x 25/3	5GU9 862-□□□	85.6	25.7	102.7
3 x 35 + 3 x 25/3	5GU9 863-□□□	87.5	26.3	105.0
3 x 50 + 3 x 25/3	5GU9 864-□□□	91.3	27.5	109.6
3 x 70 + 3 x 35/3	5GU9 865-□□□	97.2	29.4	116.6
3 x 95 + 3 x 50/3	5GU9 866-□□□	104.0	31.4	124.8
3 x 120 + 3 x 70/3	5GU9 867-□□□	109.0	33.0	130.8
3 x 150 + 3 x 70/3	5GU9 868-□□□	114.0	34.8	136.8
3 x 185 + 3 x 95/3	5GU9 869-□□□	120.0	36.6	144.0

18/30 kV



- 7 C I Indoor set of materials
- 7 C F Outdoor set of materials
- 8 C I Installation of indoor design at works
- 8 C F Installation of outdoor design at works

Selection and ordering data

Number of cores and nominal cross-section	Order No. Set of materials	Max. cable diameter	Max. core diameter	Max. diameter of sealing end
mm ²		mm	mm	mm

Single-core sealing ends, hybrid design

1 x 16/16	5GU9 611-□□□	20.4	14.1	24.5
1 x 25/16	5GU9 612-□□□	22.2	15.9	26.6
1 x 35/16	5GU9 613-□□□	23.4	17.1	28.1
1 x 50/16	5GU9 614-□□□	25.6	18.7	30.7
1 x 70/16	5GU9 615-□□□	27.1	20.2	32.5
1 x 95/16	5GU9 616-□□□	29.1	22.2	34.9
1 x 120/16	5GU9 617-□□□	31.8	23.9	38.2
1 x 150/25	5GU9 618-□□□	33.5	25.6	40.2
1 x 185/25	5GU9 619-□□□	34.9	27.0	41.9
1 x 240/25	5GU9 619-□□□	39.2	30.3	47.0

3.6/6 kV

1 x 16/16	5GU9 621-□□□	21.2	14.9	25.4
1 x 25/16	5GU9 622-□□□	23.0	16.7	27.6
1 x 35/16	5GU9 623-□□□	24.2	17.9	29.0
1 x 50/16	5GU9 624-□□□	26.4	19.5	31.7
1 x 70/16	5GU9 625-□□□	27.9	21.0	33.5
1 x 95/16	5GU9 626-□□□	29.9	23.0	35.9
1 x 120/16	5GU9 627-□□□	32.6	24.7	39.1
1 x 150/25	5GU9 628-□□□	34.3	26.4	41.2
1 x 185/25	5GU9 629-□□□	35.7	27.8	42.8
1 x 240/25	5GU9 629-□□□	40.0	31.1	48.0

6/10 kV

1 x 16/16	5GU9 631-□□□	23.4	17.1	28.1
1 x 25/16	5GU9 632-□□□	25.8	18.9	31.0
1 x 35/16	5GU9 633-□□□	27.0	20.1	32.4
1 x 50/16	5GU9 634-□□□	28.6	21.7	34.3
1 x 70/16	5GU9 635-□□□	31.1	23.2	37.3
1 x 95/16	5GU9 636-□□□	33.1	25.2	39.7
1 x 120/16	5GU9 637-□□□	34.8	26.9	41.8
1 x 150/25	5GU9 638-□□□	37.5	28.6	45.0
1 x 185/25	5GU9 639-□□□	38.9	30.0	46.7
1 x 240/25	5GU9 639-□□□	42.2	33.3	50.6

8.7/15 kV

1 x 16/16	5GU9 641-□□□	27.0	20.1	32.4
1 x 25/16	5GU9 642-□□□	27.8	20.9	33.4
1 x 35/16	5GU9 643-□□□	29.0	22.1	34.8
1 x 50/16	5GU9 644-□□□	31.6	23.7	37.9
1 x 70/16	5GU9 645-□□□	33.1	25.2	39.7
1 x 95/16	5GU9 646-□□□	35.1	27.2	42.1
1 x 120/16	5GU9 647-□□□	37.8	28.9	45.4
1 x 150/25	5GU9 648-□□□	39.5	30.6	47.4
1 x 185/25	5GU9 649-□□□	40.9	32.0	49.1
1 x 240/25	5GU9 649-□□□	44.2	35.3	53.0

12/20 kV



- 7 C I Indoor set of materials
- 7 C F Outdoor set of materials
- 8 C I Installation of indoor design at works
- 8 C F Installation of outdoor design at works

PROTOLON Medium-Voltage Flexible Single-Core Cables
PROTOMONT Tunnel Driving Machine Cables

Selection and ordering data

Number of cores and nominal cross-section	Order No. Set of materials	Max. cable diameter	Max. core diameter	Max. diameter of sealing end
mm ²		mm	mm	mm

Single-core sealing ends, hybrid design

1 x 16/16	5GU9 651-□□□	29.6	22.7	35.5
1 x 25/16	5GU9 652-□□□	31.8	23.9	38.2
1 x 35/16	5GU9 653-□□□	32.6	24.7	39.1
1 x 50/16	5GU9 654-□□□	34.2	26.3	41.0
1 x 70/16	5GU9 655-□□□	35.7	27.8	42.8
1 x 95/16	5GU9 656-□□□	38.7	29.8	46.4
1 x 120/16	5GU9 657-□□□	40.4	31.5	48.5
1 x 150/25	5GU9 658-□□□	42.1	33.2	50.5
1 x 185/25	5GU9 659-□□□	43.5	34.6	52.2

14.5/25 kV

1 x 16/16	5GU9 661-□□□	33.6	25.7	40.3
1 x 25/16	5GU9 662-□□□	34.8	26.9	41.8
1 x 35/16	5GU9 663-□□□	35.4	27.5	42.5
1 x 50/16	5GU9 664-□□□	37.6	28.7	45.1
1 x 70/16	5GU9 665-□□□	39.1	30.2	46.9
1 x 95/16	5GU9 666-□□□	41.1	32.2	49.3
1 x 120/16	5GU9 667-□□□	42.8	33.9	51.4
1 x 150/25	5GU9 668-□□□	44.5	35.6	53.4
1 x 185/25	5GU9 669-□□□	45.9	37.0	55.1

18/30 kV

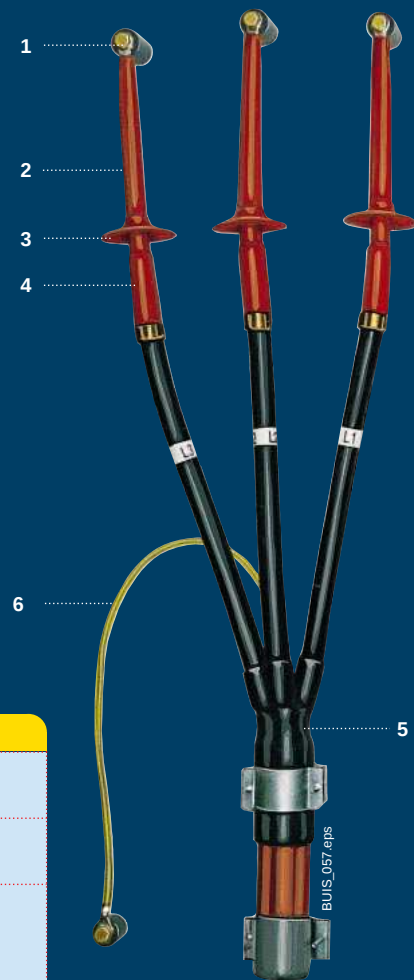


- 7 C I Indoor set of materials
- 7 C F Outdoor set of materials
- 8 C I Installation of indoor design at works
- 8 C F Installation of outdoor design at works

- 1 Cable lug
- 2 Heat shrinkable tubing (creepage-proof)
- 3 Silicon shield ¹⁾
- 4 Field control element
- 5 Splitting cap
- 6 Earth conductor

Selection and dimensioning criteria

Type	Sealing end, hybrid (S) design (combined cold/hot shrink method)
Approvals/standards	According to DIN VDE 0278-629-1 and to all major international standards
Application	For connection of PROTOLOX (M) flexible cables indoors and outdoors, to transformer substations, terminal boxes, motor connection boxes, reel boxes and to sliprings for guidance through hollow shafts.
Rated voltage	$U_0/U = 3.6/6 \text{ kV to } 18/30 \text{ kV}$
Max. permissible operating voltage	
In AC systems	$U_0/U = 4.2/7.2 \text{ kV to } 20.8/36 \text{ kV}$
In DC systems	$U_0/U = 5.4/10.8 \text{ kV to } 27/54 \text{ kV}$
Test voltage	According to DIN VDE 0278-629-1
Current-carrying capacity	According to DIN VDE 0298, Part 4
Ambient temperature	- 40 °C to + 80 °C
Dynamic short-circuit strength	63 kA
Maximum permissible operating temperature of the conductor	90 °C
Installation instructions	SK2V2/14-98
Connection dimensions	To customer specification. When ordering sealing ends prepared at our works, please enter the details in the dimension drawing on page 3/8.



Selection and ordering data

Number of cores and nominal cross-section	Order No.	Max. cable diameter	Max. diameter of sealing end	Min. length indoors	Min. length outdoors
mm ²		mm	mm	mm	mm

Three-core hybrid sealing ends

3 x 25 + 3 x 25/3	5GU9 812-□□□	37.8	45.4	180	250
3 x 35 + 3 x 25/3	5GU9 813-□□□	41.6	50.0	180	250
3 x 50 + 3 x 25/3	5GU9 814-□□□	45.3	54.4	180	250
3 x 70 + 3 x 35/3	5GU9 815-□□□	49.0	58.8	180	250
3 x 95 + 3 x 50/3	5GU9 816-□□□	54.7	65.6	180	250
3 x 120 + 3 x 70/3	5GU9 817-□□□	58.8	70.6	180	250
3 x 150 + 3 x 70/3	5GU9 818-□□□	63.9	76.7	180	250
3 x 185 + 3 x 95/3	5GU9 819-□□□	67.8	81.4	180	250

3.6/6 kV

3 x 25 + 3 x 25/3	5GU9 822-□□□	40.1	48.1	180	250
3 x 35 + 3 x 25/3	5GU9 823-□□□	42.9	51.5	180	250
3 x 50 + 3 x 25/3	5GU9 824-□□□	46.6	53.5	180	250
3 x 70 + 3 x 35/3	5GU9 825-□□□	51.7	62.0	180	250
3 x 95 + 3 x 50/3	5GU9 826-□□□	56.0	67.2	180	250
3 x 120 + 3 x 70/3	5GU9 827-□□□	60.1	72.1	180	250
3 x 150 + 3 x 70/3	5GU9 828-□□□	65.2	78.2	180	250
3 x 185 + 3 x 95/3	5GU9 829-□□□	69.1	82.9	180	250

6/10 kV

3 x 25 + 3 x 25/3	5GU9 832-□□□	43.6	52.3	230	300
3 x 35 + 3 x 25/3	5GU9 833-□□□	46.4	55.7	230	300
3 x 50 + 3 x 25/3	5GU9 834-□□□	51.5	61.8	230	300
3 x 70 + 3 x 35/3	5GU9 835-□□□	55.1	66.1	230	300
3 x 95 + 3 x 50/3	5GU9 836-□□□	59.3	71.2	230	300
3 x 120 + 3 x 70/3	5GU9 837-□□□	65.0	78.0	230	300
3 x 150 + 3 x 70/3	5GU9 838-□□□	68.6	82.3	230	300
3 x 185 + 3 x 95/3	5GU9 839-□□□	72.5	87.0	230	300

8.7/15 kV

3 x 25 + 3 x 25/3	5GU9 842-□□□	46.6	55.9	270	350
3 x 35 + 3 x 25/3	5GU9 843-□□□	49.4	59.3	270	350
3 x 50 + 3 x 25/3	5GU9 844-□□□	54.5	65.4	270	350
3 x 70 + 3 x 35/3	5GU9 845-□□□	58.2	69.8	270	350
3 x 95 + 3 x 50/3	5GU9 846-□□□	63.9	76.7	270	350
3 x 120 + 3 x 70/3	5GU9 847-□□□	68.0	81.6	270	350
3 x 150 + 3 x 70/3	5GU9 848-□□□	71.7	86.0	270	350
3 x 185 + 3 x 95/3	5GU9 849-□□□	77.0	92.4	270	350

12/20 kV

3 x 25 + 3 x 25/3	5GU9 852-□□□	51.9	62.3	310	430
3 x 35 + 3 x 25/3	5GU9 853-□□□	54.7	65.6	310	430
3 x 50 + 3 x 25/3	5GU9 854-□□□	58.4	70.1	310	430
3 x 70 + 3 x 35/3	5GU9 855-□□□	63.5	76.2	310	430
3 x 95 + 3 x 50/3	5GU9 856-□□□	67.8	81.4	310	430
3 x 120 + 3 x 70/3	5GU9 857-□□□	71.9	86.3	310	430
3 x 150 + 3 x 70/3	5GU9 858-□□□	77.0	92.4	310	430
3 x 185 + 3 x 95/3	5GU9 859-□□□	80.9	97.1	310	430

14/25 kV

3 x 25 + 3 x 25/3	5GU9 862-□□□	55.4	66.5	350	500
3 x 35 + 3 x 25/3	5GU9 863-□□□	58.2	69.8	350	500
3 x 50 + 3 x 25/3	5GU9 864-□□□	63.2	75.8	350	500
3 x 70 + 3 x 35/3	5GU9 865-□□□	66.9	80.3	350	500
3 x 95 + 3 x 50/3	5GU9 866-□□□	71.2	85.4	350	500
3 x 120 + 3 x 70/3	5GU9 867-□□□	76.7	92.0	350	500
3 x 150 + 3 x 70/3	5GU9 868-□□□	80.4	96.5	350	500
3 x 185 + 3 x 95/3	5GU9 869-□□□	86.1	103.3	350	500

18/30 kV



- 7 S I Indoor set of materials
- 7 S F Outdoor set of materials
- 8 S I Installation of indoor design at works
- 8 S F Installation of outdoor design at works

Notes on Works Assembly of Hybrid Sealing Ends (Preparation)

Order No.

Type: **PROTOLON** **NTS**

X / kV

Cable length m

Hybrid and hybrid (S) design sealing end 5GU9-8

Internal width of the hollow shaft mm

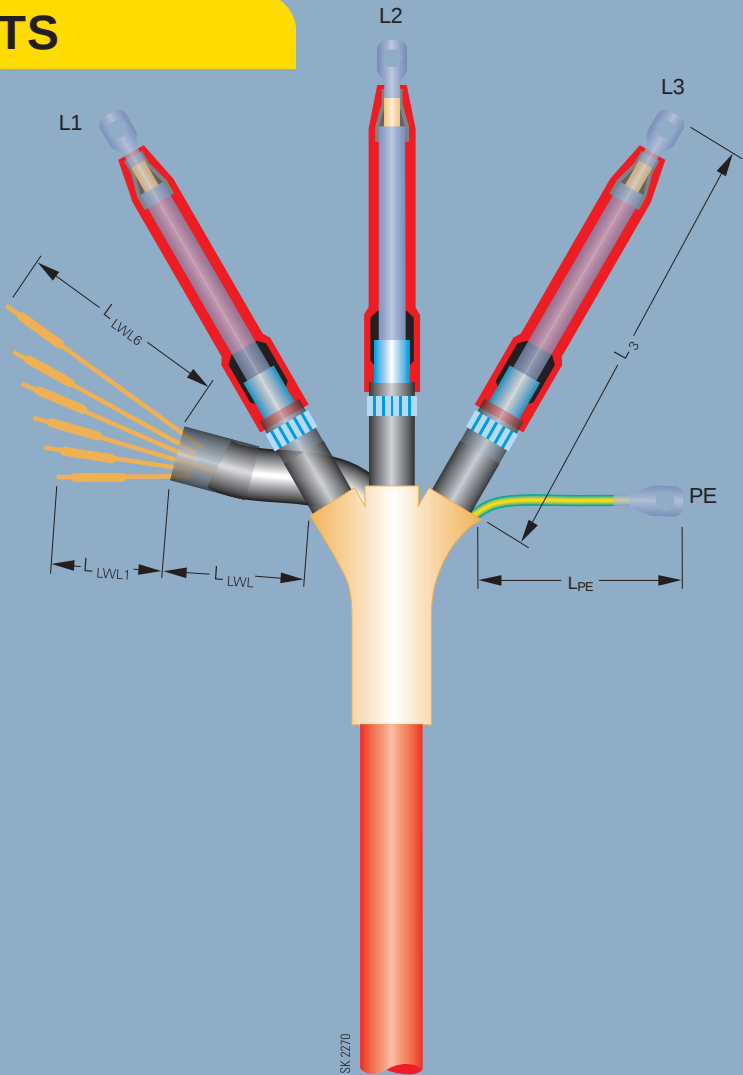
Spread lengths	L1	mm
	L2	mm
	L3	mm
	LPE	mm

Cable lug bore	L1... L3	ø mm
	PE	ø mm

Length of fibre-optic	LLWL	mm
	LLWL1	mm
	LLWL2	mm
	LLWL3	mm
	LLWL4	mm
	LLWL5	mm
	LLWL6	mm

Fibre-optic connector	(please tick)	
	ST	☐
	FC - PC	☐
	Others	☐

Remarks

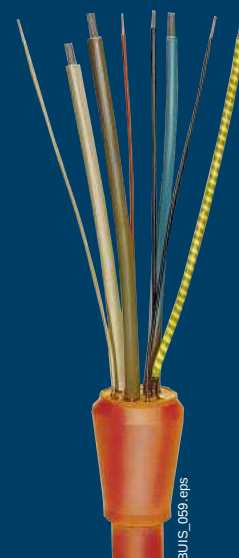


Minimum dimensions for L (mm)

Voltage	Indoors	Outdoors
3.6/6	180	250
7/10	180	250
8.7/15	230	300
12/20	270	350
14.5/25	310	430
18/30	350	500

Selection and dimensioning criteria

Type	SUPROMONT sealing end
Approvals/standards	According to DIN VDE 0278-629-1 DIN VDE 0291 Part 2, LOBA approval
Application	For connection of shielded medium-voltage cables NYHSSYCY and N3GHSSYCY in underground mines. The design of the dividing mould has been selected so that use in stress-cone sleeves supplied by company Gothe is assured.
Rated voltage	$U_0/U = 3.6/6$ kV to $6/10$ kV
Max. permissible operating voltage	
In AC systems	$U_0/U = 4.2/7.2$ kV to $6.9/12$ kV
In DC systems	$U_0/U = 5.4/10.8$ kV to $8/18$ kV
Test voltage	According to DIN VDE 0278-629-1
Current-carrying capacity	According to DIN VDE 0298, Part 4
Ambient temperature	- 40 °C to + 80 °C
Maximum permissible operating temperature of the conductor	90 °C
Dynamic short-circuit strength	63 kA



Selection and ordering data

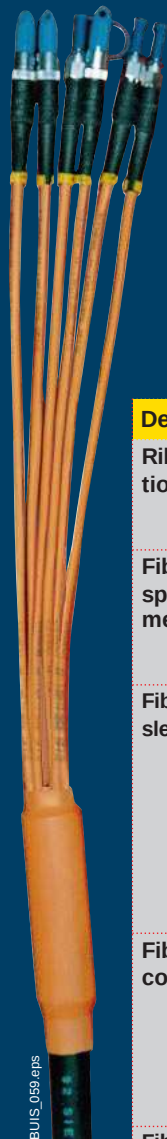
Number of cores and nominal cross-section mm ²	Order No. Set of materials	Order No. Assembly at works	Max. cable diameter mm	Max. core diameter mm	Max. diameter of sealing end mm
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3.6/6 kV NYHSSYCY

3 x 25 + 3 x 16/3E + 3 x 2.5St + ÜL	5GU9 712-7	5GU9 712-8	51	13.7	100
3 x 35 + 3 x 16/3E + 3 x 2.5St + ÜL	5GU9 713-7	5GU9 713-8	55	15.0	100
3 x 50 + 3 x 25/3E + 3 x 2.5St + ÜL	5GU9 714-7	5GU9 714-8	58	16.0	100
3 x 70 + 3 x 35/3E + 3 x 2.5St + ÜL	5GU9 715-7	5GU9 715-8	63	18.1	110
3 x 95 + 3 x 50/3E + 3 x 2.5St + ÜL	5GU9 716-7	5GU9 716-8	67	20.0	110

6/10 kV (N)3GHSSYCY

3 x 25 + 3 x 16/3E + 3 x 2.5St + ÜL	5GU9 722-7	5GU9 722-8	58	16.7	100
3 x 35 + 3 x 16/3E + 3 x 2.5St + ÜL	5GU9 723-7	5GU9 723-8	61	18.0	100
3 x 50 + 3 x 25/3E + 3 x 2.5St + ÜL	5GU9 724-7	5GU9 724-8	65	19.6	100
3 x 70 + 3 x 25/3E + 3 x 2.5St + ÜL	5GU9 725-7	5GU9 725-8	69	21.1	110
3 x 95 + 3 x 25/3E + 3 x 2.5St + ÜL	5GU9 726-7	5GU9 726-8	73	23.0	110



Sealing end used for PROTON flexible cables with integrated fibre-optics both in combination with the previously mentioned power sealing ends (lead out of the fibre-optic element from the splitting filler of the power sealing end by means of a plastic ribbed protection sleeve) or as sealing end for OPTOFLEX cables.

Design features

Ribbed protection sleeve	Plastic ribbed protection sleeve	Electrically insulated (since it is often used in close proximity to H.V. cores) <u>Advantages:</u> Immune to transverse pressure, extremely flexible (minimum bending radius: 125 mm) and therefore especially suitable for restricted and confined areas.
Fibre-optic splitting element	Plastic conduit	Length approx. 70 mm, diameter 20 mm (for PG 21) filled with cast-resin. <u>Advantages:</u> The fibre-optic element is completely sealed against moisture, the "round design" of the cable elements is maintained. Immune to transverse pressure and therefore suitable for standard PG glands.
Fibre protection sleeves	Special covering (orange colour)	Reinforced with Kevlar rovings. Outer diameter approx. 4 mm. <u>Advantages:</u> Simple installation (fibre-optics can be handled like "control cores"); signal effect (orange colour) since fibre-optic connections are involved. Minimum bending radius 60 mm. Safe stress relief: The Kevlar rovings are attached to the fibre-optic connector shaft via the crimp lug barrel and cast at the other end in the fibre-optic splitting element in order to keep away tensile forces from the fibres reliably and safely.
Fibre-optic connector	ST connector	The ST connector has been accepted and proven in practice; SMA, FC-PC and E2000 connectors can also be supplied. <u>Advantages:</u> The ST connector is standardized to IEC-SC 86B and is therefore compatible with fibre-optic components without the necessity for time-consuming technical clarification. Connector surfaces are finished with a special polishing machine in order to achieve a uniform quality. Subjective evaluation criteria are thus unnecessary.
Fibre-optic sealing end General	• Robust and therefore able to withstand the normal vibrations and temperature variations on material handling equipment. • Weather resistant and sealed against moisture and dust • Safe stress relief of the fibres • No specialists required for installation and plug-in • Insertion via PG 21 gland possible, whereby the degree of protection can be maintained • No parts, which can be lost, such as screws, etc. • No metallic components, i.e. absolute electrical isolation	

Fibre type Number of fibres and connector type	Order No. Set of materials	Order No. Assembly at works ¹⁾	Max. cable diameter mm	Max. core diameter mm	Max. outer diameter of sealing end mm
6 fibres					
E9/125µm - ST connector	5GU9 600-7LA61	5GU9 600-8LA61	10	3.5	28.5 (PG 21)
E9/125µm - FC connector	5GU9 600-7LC61	5GU9 600-8LC61	10	3.5	28.5 (PG 21)
E9/125µm - E2000 connector	5GU9 600-7LL61	5GU9 600-8LL61	10	3.5	28.5 (PG 21)
50-62.5/125µm - ST connector	5GU9 600-7LA66	5GU9 600-8LA66	10	3.5	28.5 (PG 21)
50-62.5/125µm - FC connector	5GU9 600-7LC66	5GU9 600-8LC66	10	3.5	28.5 (PG 21)
50-62.5/125µm - E2000 connector	5GU9 600-7LL66	5GU9 600-8LL66	10	3.5	28.5 (PG 21)
12 fibres					
E9/125µm - ST connector	5GU9 600-7LA71	5GU9 600-8LA71	10	3.5	28.5 (PG 21)
E9/125µm - FC connector	5GU9 600-7LC71	5GU9 600-8LC71	10	3.5	28.5 (PG 21)
E9/125µm - E2000-Secker	5GU9 600-7LL71	5GU9 600-8LL71	10	3.5	28.5 (PG 21)
50-62.5/125 - ST connector	5GU9 600-7LA76	5GU9 600-8LA76	10	3.5	28.5 (PG 21)
50-62.5/125 - FC connector	5GU9 600-7LC76	5GU9 600-8LC76	10	3.5	28.5 (PG 21)
50-62.5/125 - E2000 connector	5GU9 600-7LL76	5GU9 600-8LL76	10	3.5	28.5 (PG 21)
18 fibres					
E9/125 - ST connector	5GU9 600-7LA81	5GU9 600-8LA81	10	3.5	28.5 (PG 21)
E9/125µm - FC connector	5GU9 600-7LC81	5GU9 600-8LC81	10	3.5	28.5 (PG 21)
E9/125µm - E2000-Secker	5GU9 600-7LL81	5GU9 600-8LL81	10	3.5	28.5 (PG 21)
50-62.5/125µm - ST connector	5GU9 600-7LA86	5GU9 600-8LA86	10	3.5	28.5 (PG 21)
50-62.5/125µm - FC connector	5GU9 600-7LC86	5GU9 600-8LC86	10	3.5	28.5 (PG 21)
50-62.5/125µm - E2000 connector	5GU9 600-7LL86	5GU9 600-8LL86	10	3.5	28.5 (PG 21)

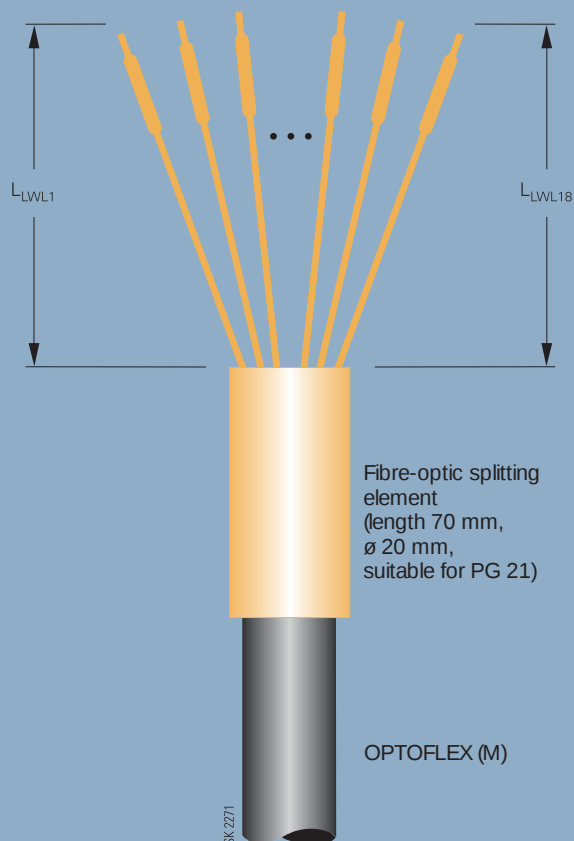
1) When ordering works assembled sealing ends, please enter the details in the dimension drawing on page 3/11.

Notes on Works Assembly of OPTOFLEX (M) Sealing Ends (Preparation)

Order No.

Type: **OPTOFLEX (M)**

X	/	125 µ
Cable length		m
OPTOFLEX (M) 5GU9		
Spread lengths	LWL ₁	mm
	LWL ₂	mm
	LWL ₃	mm
	LWL ₄	mm
	LWL ₅	mm
	LWL ₆	mm
	LWL ₇	mm
	LWL ₈	mm
	LWL ₉	mm
	LWL ₁₀	mm
	LWL ₁₁	mm
	LWL ₁₂	mm
	LWL ₁₃	mm
	LWL ₁₄	mm
	LWL ₁₅	mm
	LWL ₁₆	mm
	LWL ₁₇	mm
	LWL ₁₈	mm
Fibre-optic connector	(please tick)	
	ST	☐
	FC - PC	☐
	Others	☐



Medium-voltage connector

Medium-voltage plug connectors are employed where the cable is to be directly connected to existing post insulator bushings, MV switchgear or similar equipment. Both inner cone connectors or outer cone connectors according to DIN VDE 0278 can be assembled.

In the case of multi-core cables, a filler splitter is provided and the three main conductors are supplied with an assembled medium-voltage connector.



HA40049a.tif

Assembled trailing cable with three medium-voltage connectors

Medium-voltage 3-phase plug connector

Medium-voltage 3-phase plug connectors are employed for numerous open-cast mining and tunnel construction applications.

These plug connectors are suitable for stringent conditions and are enclosed and protected against accidental contact. Contacts for the three phases and the protective-earth conductor in addition to numerous control cores and monitoring conductor are provided in a plug connector housing.

The advantage of this system lies in the rapid connection capability and the suitability for use under strenuous service conditions.



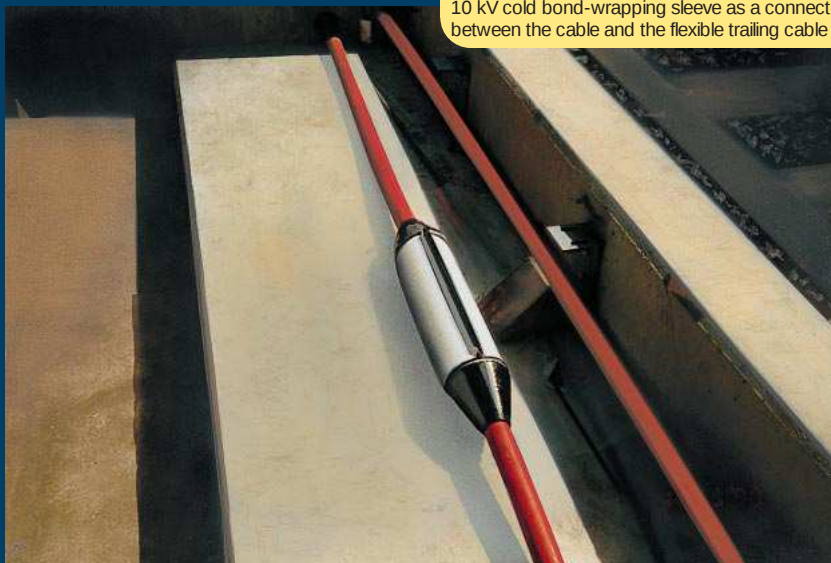
BUIS_061eps

Complete plug connector

Medium-voltage transition sleeve

In numerous plants, it is necessary to directly connect a cable laid in earth with the power supply trailing cable for mobile equipment (excavators, cranes, etc.).

An extremely variable connection technique is available for use in such cases. It is thus possible to connect various types of power supply cables (single-core, multi-core, differing cross-sections) to the flexible trailing cables. In these cases the cable connection is crimped and the semiconductive layers and insulation are joined using cold bond-wrapping techniques and combined to a cast sleeve using flexible cast-resin.



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10 kV cold bond-wrapping sleeve as a connection between the cable and the flexible trailing cable

Repair Materials for Rubber-Sheathed Flexible Cables and Trailing Cables

3

13

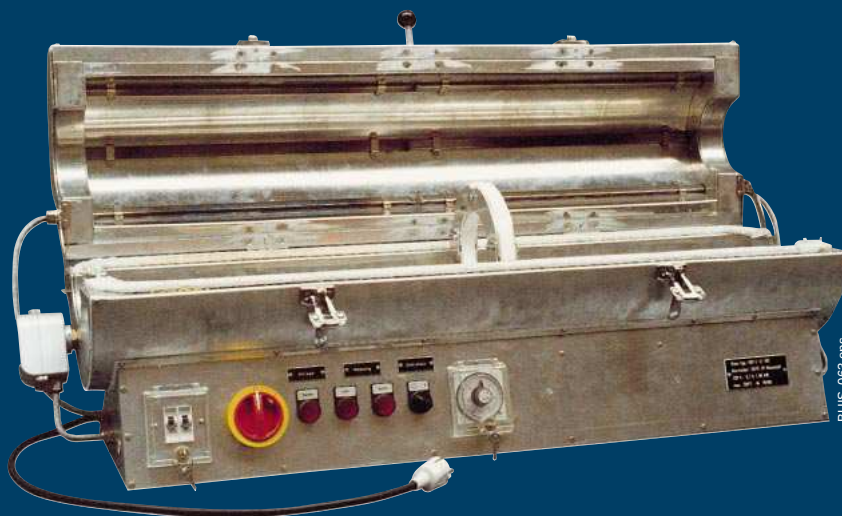
Diverse repair material is available for repair of damaged rubber-sheathed flexible cables and trailing cables (refer to page 3/15) as an alternative to delegation of special erectors from our works. Skilled personnel experienced in processing rubber materials for vulcanized rubber-sheathed flexible cables and trailing cables are required for execution of such repair work.

Repair material for conductor connections			
Repair	Application	Material	Unit
Crimped connections	Connection of two conductors which are either installed so as to be fixed or seldom moved	Compression connection	Piece
Cadweld welding	Connection of two conductors in the case of reeling cables with a travel speed of max. 60 m/min.	Welding form, holder, driving charge	Piece
Splicing	Connection of two conductors in the case of reeling cables without restriction for drum operation	Special silver solder	Piece
Repair material for insulation and semiconductive layers			
Semiconductive layer	Restoration of the inner and outer semiconductive layers	Semiconductive compound on roll, 20 x 0.45 m	kg
Insulation	Restoration of the core insulation	Insulation compound on roll, 20 x 0.45 m	kg
Repair material for inner sheaths			
Filler cords	Filler in the laid-up interstices	Round dia. 6 mm Triangular section 12 x 12 x 12 mm	kg
Inner sheath	Restoration of the inner sheath	Inner sheath compound on roll, 40 x 0.45 m	kg
Repair material for braids (metallic/textile)			
Braid	Restoration of the braid	Nylon screen tape on roll 60 mm wide	m
Braid	Restoration of the braid	Special repair braids to customer specification (metallic)	m
Repair material for outer sheaths			
Outer sheath	Restoration of the outer sheath	Rubber cloth 0.75 to 5 mm thick, red, black, yellow	kg
Vulcanizing material			
Vulcanization	Supporting/pressure bandage	Cuprophane foil on roll 30/60 mm wide	kg
Vulcanization	Supporting/pressure bandage	Cellulose wool tape on roll 30/60 mm wide	kg
Vulcanization	Supporting/pressure bandage	Perlon tape on roll 30/60 mm wide	kg
Vulcanization	Supporting/pressure bandage	Vulcanized rubber tape on roll, 30/60 mm wide	kg

Vulcanizing machine

The use of a vulcanizing machine is indispensable for the repair of rubber-sheathed flexible cables. The repair points are vulcanized at a vulcanizing temperature of 200 °C and thus achieve the elastomeric properties of the original cable.

The vulcanizing machine is a special design, by means of which cores and cables of any length up to a max. length of 120 mm can be processed. The necessary repair materials and vulcanizing materials can be ordered in the quantities required. (Refer also to page 3/13)



BULS_063.eps

Technical data

Power supply voltage	230 V, 50 Hz
Power requirement	2000 W
Vulcanization temperature	200 °C
Max. diameter of the cable	120 mm
Max. length of the repair section	1000 mm
Weight	Approx. 30 kg

We ensure the correct connection

between rubber-insulated special cables and likewise between special cables and permanently installed cables.

Always taking specified criteria into account:

- Suitable for the application
- In accordance with the shrink method, cast-resin technology and the vulcanization technology employed
- Using proven repair materials
- Executed by trained special erectors
- With consistent intrinsic value characteristics



We train your specialists

to favourable conditions, in all our speciality areas. You can always contribute your special requirements. From scheduling to structuring the training schemes including the scope and duration of training. The training location is open – at our works or at a location of your choice. Conclusion of training is always accompanied by exhaustive documentation and a certificate.

In the case of major or minor damage

we will help you quickly – in an economically justifiable manner. We can repair your rubber-insulated cables either directly on site or at our works. In every event we use original repair materials and employ proven techniques. Our skilled specialists ensure that the intrinsic value characteristics of your cables are not impaired.

We assemble glass fibre-optic installations

for industrial applications employing all types of connector technologies:

- With high mechanical strength
- Protected against moisture
- In modern design
- With minimum dimensions
- With 6, 12 or 18 fibres

At our works or directly on site –

we assemble your special cables (AC 1 – 35 kV) ready to connect, as specified by you.

We supply sets of assembly material, which are specially geared to your needs.

- Sealing ends of cast-resin design, hybrid design and vulcanized design
- Special sealing ends
- Medium-voltage plug connectors

We connect glass fibre-optic cables

and combined cables with integrated fibre-optics:

- With splicing cassette
- Using crimping techniques (with quick connection sleeve)
- Employing the fusion splicing method
- Using repair techniques for combined cables with integrated fibre-optics

We have all current fibre-optic measuring techniques at our disposal

in order to satisfy all your requirements:

- Visual checks
- Attenuation measurement at different wavelengths using the transmitted light technique
- Attenuation measurement and fault point location using the reflection method (OTDR, OFL)
- Temperature measurement of multi-mode fibres throughout their entire run (monitoring / sensing)