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Selection and dimensioning criteria

Refer to Section 4 for further details



Type	PROTOLON(SMK)	Page	4/2	
Type designation	(N)TSCGEWÖU	Page	4/3	
Approvals/standards	DIN VDE 0250, Part 813, MSHA P - 189-4	Pages and	4/4 4/5	
Application	Flexible H.V. reeling cable, also suitable for festoon systems, for high to extreme mechanical stresses, e.g. high travel speeds, dynamic tensile loads, multiple changes of direction into different planes, churning on running over rollers and torsional stresses. Mainly for mobile equipment, e.g. fast-moving container cranes, cranes, large mobile equipment and excavators. Also for applications to which DIN VDE 0168 and 0118 apply: Open-cast and underground mining.	Pages and	4/6 4/7	
Electrical parameters	Rated voltage	$U_0/U = 1.8/3 \text{ kV to } 18/30 \text{ kV}$	Pages to	4/8 4/13
	Maximum permissible operating voltage in AC systems	$U_0/U = 2.1/3.6 \text{ kV to } 20.8/36 \text{ kV}$		
	Maximum permissible operating voltage in DC systems	$U_0/U = 2.7/5.4 \text{ kV to } 27/54 \text{ kV}$		
	AC test voltage	6.0 kV to 43.0 kV according to DIN VDE 0250, Part 813		
	Current-carrying capacity	According to DIN VDE 0298, Part 4. Higher values are permissible in specific cases. Please consult the manufacturer.		
	Bus compatibility	A special cable design with fibre-optics can be used to achieve absolute immunity of data transmission from interference.		
	EMC	This design exhibits an extremely low interference level as a result of use of a symmetrical three-core design with very narrow manufacturing tolerances.	Pages and	4/12 4/13
Thermal parameters	Ambient temperature	- 35 °C to + 60 °C - 50 °C to + 80 °C	Pages and	4/14 4/15
	<ul style="list-style-type: none"> ● Fully flexible operation ● Fixed installation 			
	Maximum permissible operating temperature of the conductor	90 °C		
	Short-circuit temperature of the conductor	250 °C		

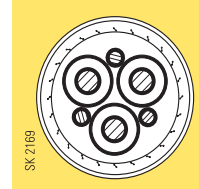
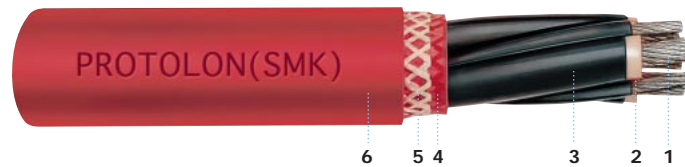
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Mechanical parameters	Tensile load	Up to 20 N/mm ²	Page	4/16
	Torsional stresses	± 25 °/m	Page	4/16
	Minimum bending radii	According to DIN VDE 0298 Part 3	Page	4/17
	Minimum distance with S-type directional changes	20 x D (cable diameter)		
	Travel speed	No restriction. For travel speeds > 180 m/min, the cable manufacturer should be consulted. Up to 120 m/min. Consult the manufacturer for higher speeds	Page	4/18
	<ul style="list-style-type: none"> • Gantry (reeling operation) • Trolley 			
	Additional tests	Reversed bending test, torsional stress test	Pages and	4/19 4/20
Chemical parameters	Resistance to oil	Given to DIN VDE 0473, Part 811-2-1, Para. 10	Page	4/21
	Weather resistance	Unrestricted use outdoors and indoors, resistant to ozone, UV and moisture		
	Water compatibility	According to HD2216		

- 1 Conductor
- 2 Insulation
- 3 Outer semiconductive layer
- 4 First sheath
- 5 Anti-torsion braid
- 6 Sandwich-type sheath



Design features

Refer to Section 4 for further details →

Type	PROTOLON(SMK)	Page	4/2
Conductor and protective-earth conductor (refer also to DIN VDE 0295)	Electrolytic copper tinned, very finely stranded, class "FS"	Pages and	4/22 4/23
Insulation (refer also to DIN VDE 0207 Part 20)	PROTOLON HS Newly developed special compound based on high-quality EPR (at least 3GI3); improved mechanical and electrical characteristics	Pages to	4/24 4/26
Field control	For designs from 3 to 30 kV: inner semiconductive layer of EPR, outer semiconductive layer of modified NBR, capable of being stripped when cold and thus extremely easy to prepare (Easy Strip design)	Page	4/27
Core identification	From 3.6/6 kV: natural coloured insulation with black semiconductive layer		
Core arrangement	Laid-up with length of lay 7 x D (core diameter), three-core design, protective-earth conductor split into 3 in the outer filler	Pages and	4/28 4/29
Sheath system	<ul style="list-style-type: none"> • PROTOFIRM Special: First sheath Newly developed special compound based on EPR, quality at least 5GM3, also serving as water barrier, colour: red • Anti-torsion braid: reinforced braid made of polyester threads, in a vulcanized bond between the sheaths. Resulting in high strength of the sheath system. • PROTOFIRM Sandwich: 2nd and 3rd sheath A sheath system with a unique combination of flexibility and robustness has been achieved through the use of a new sandwich structure. Abrasion and tear-proof special rubber compounds based on PCP, quality at least 5GM5 colour: bright red/red 	Pages to	4/24 4/26
		Page	4/30
		Page to	4/24 4/26
Marking	PROTOLON(SMK) (N)TSCGEWÖU (number of cores) x (cross-section) (rated voltage) (year of manufacture) (serial number)	Page	4/31

PROTOLON(SMK) stocking policy

We keep PROTOLON(SMK) reeling cables in stock. Thus most cables for a wide range of applications can be delivered immediately from stock.

Please note the following in this connection:

- Voltage level 0.6/1 kV
Please select our new three-core CORDAFLEX(SMK) designs with protective-earth conductor split in 3. These supersede the previous PROTOLON designs and are stock items (pages 2/3 to 2/6).

- Voltage level 1.8/3 kV and 3.6/6 kV
Please make a selection from our stock types for the voltage level 6/10 kV. Selection is possible without any restriction whatsoever regarding the dimensions or the weight. Alternatively, we are prepared to manufacture cables either to your specification or using traditional designs. Please note that in such cases the delivery time is dependent on manufacturing capacity and that the minimum length which can be ordered is 100 m.

- Voltage level 6/10 kV
Cables of cross-sections
25 mm²
35 mm²
50 mm²
70 mm²
with and without fibre-optics (LWL), are kept in stock for this voltage level.
- Voltage level 15 to 30 kV
Cables for this voltage level are generally manufactured as special types for specific projects. For this reason these cables are not stocked. Please enquire.

Selection data

Number of cores and nominal cross-section mm ²	Main conductor diameter (guidance value) mm	Protective-earth conductor diameter (guidance value) mm	Overall diameter of cable		Approx. net weight for 1000 m kg	Maximum permissible tensile force N
			Min. value (guidance value) mm	Max. value (guidance value) mm		

1.8/3 kV (N)TSCGEWÖU

3 x 25 + 3 x 25/3	7.1	4.2	40.4	43.4	2680	1500
3 x 35 + 3 x 25/3	8.3	4.2	43.0	46.0	3150	2100
3 x 50 + 3 x 25/3	9.9	4.2	46.4	49.4	3840	3000
3 x 70 + 3 x 35/3	11.8	5.0	52.0	56.0	5070	4200
3 x 95 + 3 x 50/3	13.8	5.9	58.5	62.5	6490	5700
3 x 120 + 3 x 70/3	15.4	7.0	63.8	67.8	8010	7200
3 x 150 + 3 x 70/3	17.2	7.0	67.7	71.7	9240	9000
3 x 185 + 3 x 95/3	19.0	8.0	71.6	75.6	10750	11100
3 x 240 + 3 x 120/3	21.8	9.0	79.4	83.4	13640	14400
3 x 300 + 3 x 150/3	24.4	10.0	84.7	89.7	16230	18000

3.6/6 kV (N)TSCGEWÖU

3 x 25 + 3 x 25/3	7.1	4.2	36.1	39.1	2190	1500
3 x 35 + 3 x 25/3	8.3	4.2	39.6	42.6	2710	2100
3 x 50 + 3 x 25/3	9.9	4.2	43.1	46.1	3360	3000
3 x 70 + 3 x 35/3	11.8	5.0	47.2	50.2	4290	4200
3 x 95 + 3 x 50/3	13.8	5.9	52.4	56.4	5520	5700
3 x 120 + 3 x 70/3	15.4	7.0	55.9	59.9	6680	7200
3 x 150 + 3 x 70/3	17.2	7.0	61.2	65.2	8010	9000
3 x 185 + 3 x 95/3	19.0	8.0	65.1	69.1	9480	11000
3 x 240 + 3 x 120/3	21.8	9.0	72.5	76.5	12120	14400
3 x 300 + 3 x 150/3	24.4	10.0	78.2	82.2	14580	18000

6/10 kV (N)TSCGEWÖU

3 x 25 + 3 x 25/3 *	7.1	4.2	38.4	41.4	2380	1500
3 x 35 + 3 x 35/3 *	8.3	5.0	40.9	43.9	2880	2100
3 x 50 + 3 x 25/3 *	9.9	4.2	44.4	47.4	3480	3000
3 x 70 + 3 x 35/3 *	11.8	5.0	49.4	53.4	4590	4200
3 x 95 + 3 x 50/3	13.8	5.9	53.7	57.7	5660	5700
3 x 120 + 3 x 70/3	15.4	7.0	57.2	61.2	6830	7200
3 x 150 + 3 x 70/3	17.2	7.0	62.5	66.5	8180	9000
3 x 185 + 3 x 95/3	19.0	8.0	66.4	70.4	9660	11000
3 x 240 + 3 x 120/3	21.8	9.0	73.8	77.8	12310	14400
3 x 300 + 3 x 150/3	24.4	10.0	79.5	83.5	14780	18000

8.7/15 kV (N)TSCGEWÖU

3 x 25 + 3 x 25/3	7.1	4.2	41.8	44.8	2670	1500
3 x 35 + 3 x 25/3	8.3	4.2	44.4	47.4	3130	2100
3 x 50 + 3 x 25/3	9.9	4.2	47.9	50.9	3810	3000
3 x 70 + 3 x 35/3	11.8	5.0	52.9	56.9	4960	4220
3 x 95 + 3 x 50/3	13.8	5.9	57.2	61.2	6070	5700
3 x 120 + 3 x 70/3	15.4	7.0	62.1	66.1	7480	7200
3 x 150 + 3 x 70/3	17.2	7.0	65.9	69.9	8630	11250
3 x 185 + 3 x 95/3	19.0	8.0	69.8	73.8	10140	9000
3 x 240 + 3 x 120/3	21.8	9.0	77.3	81.3	12860	14400
3 x 300 + 3 x 150/3	24.4	10.0	84.2	89.2	15730	18000

**PROTOLON(SMK)
(N)TSCGEWÖU
H.V. Reeling Cables 3 to 30 kV**

Selection data

Number of cores and nominal cross-section mm ²	Main conductor diameter (guidance value) mm	Protective-earth conductor diameter (guidance value) mm	Overall diameter of cable		Approx. net weight for 1000 m kg	Maximum permissible tensile force N
			Min. value (guidance value) mm	Max. value (guidance value) mm		
12/20 kV (N)TSCGEWÖU						
3 x 25 + 3 x 25/3	7.1	4.2	44.8	47.8	2940	1500
3 x 35 + 3 x 25/3	8.3	4.2	47.4	50.4	3420	2100
3 x 50 + 3 x 25/3	9.9	4.2	51.8	55.8	4300	3000
3 x 70 + 3 x 35/3	11.8	5.0	55.9	59.9	5300	5250
3 x 95 + 3 x 50/3	13.8	5.9	61.6	65.6	6660	5700
3 x 120 + 3 x 70/3	15.4	7.0	65.1	69.1	7870	7200
3 x 150 + 3 x 70/3	17.2	7.0	69.0	73.0	9060	9000
3 x 185 + 3 x 95/3	19.0	8.0	74.3	78.3	10850	11100
3 x 240 + 3 x 120/3	21.8	9.0	80.3	84.3	13340	14400
3 x 300 + 3 x 150/3	24.4	10.0	87.2	92.2	16250	18000
14/25 kV (N)TSCGEWÖU						
3 x 25 + 3 x 25/3	7.1	4.2	49.6	53.6	3490	1500
3 x 35 + 3 x 25/3	8.3	4.2	52.2	56.2	3990	2100
3 x 50 + 3 x 25/3	9.9	4.2	55.7	59.7	4740	3000
3 x 70 + 3 x 35/3	11.8	5.0	61.2	65.2	5990	4200
3 x 95 + 3 x 50/3	13.8	5.9	65.5	69.5	7170	5700
3 x 120 + 3 x 70/3	15.4	7.0	69.0	73.0	8410	7200
3 x 150 + 3 x 70/3	17.2	7.0	74.3	78.3	9890	9000
3 x 185 + 3 x 95/3	19.0	8.0	78.2	82.2	11460	11000
3 x 240 + 3 x 120/3	21.8	9.0	85.5	90.5	14380	14400
3 x 300 + 3 x 150/3	24.4	10.0	91.1	96.1	16970	18000
18/30 kV (N)TSCGEWÖU						
3 x 25 + 3 x 25/3	7.1	4.2	53.1	57.1	3860	1500
3 x 35 + 3 x 25/3	8.3	4.2	55.7	59.7	4390	2100
3 x 50 + 3 x 25/3	9.9	4.2	59.1	63.1	5140	3000
3 x 70 + 3 x 35/3	11.8	5.0	64.7	68.7	6440	4200
3 x 95 + 3 x 50/3	13.8	5.9	69.0	73.0	7660	7125
3 x 120 + 3 x 70/3	15.4	7.0	73.8	77.8	9160	7200
3 x 150 + 3 x 70/3	17.2	7.0	77.7	81.7	10420	9000
3 x 185 + 3 x 95/3	19.0	8.0	81.6	85.6	12020	11100
3 x 240 + 3 x 120/3	21.8	9.0	89.0	94.0	15010	14400
3 x 300 + 3 x 150/3	24.4	10.0	95.6	100.6	17900	18000