

Prysmian Group is constantly striving for innovation with the aim of developing outstanding products able to cope with ever-increasing performance requirements from the most demanding industries and anticipating their future challenges to satisfy the end-user's needs. In consequence we developed a new design for our PROTOCOLON cable family with integrated fiber optics especially for high speed moving cranes (e.g. ARMG and ASC).

The most important facts are:

- **Higher tensile load** reached by a central carrier element embedded in the cradle separator
- **Higher travelling speed (270m/min and faster)**
- **Lead-free insulation** and optimized wall-thickness
- **Better mechanical protection** due to increased inner and outer sheath thickness
- **Highest number of optical fibers** in the cable (24)

The cable dimensions, namely outer diameter and weight, will remain unchanged compared to the equivalent (SMK)-LWL design. All other mechanical and electrical performances will also be unvaried, as well as the definition of the application range.

The new design is available from April 2017.



HIGHER PERFORMANCES FOR THE FASTEST CRANES!

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PROTOCOLON (SMK+HS)

MV reeling cable for high speed moving cranes



 PRYSMIAN
 Draka
 General Cable

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 Draka
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PROTOLON(SMK+HS) (N)TSKCGEWOEU

Medium voltage reeling cable for high speed moving cranes



Application

Flexible medium voltage reeling cable with integrated fibre-optics for the combined transmission of energy and data, for application under high or extreme mechanical stresses and very high travel speeds, dynamic tensile loads, multiple changes of direction into different planes, churning on running over rollers and torsional stresses. Especially suitable for fast-moving container cranes (> 240 m/min).

Global data				
Brand	PROTOLON(SMK+HS)			
Type designation	(N)TSKCGEWOEU			
Standard	Based on DIN VDE 0250-813			
Notes on installation				
Notes on installation	Preparation of fibre-optics requires special skills and use of elaborate tools. It is therefore recommended that performance of this work is entrusted to our customer service (Factory assembly). Please provide the connection dimensions.			
Design features				
Conductor	Conductor and earth conductor made of electrolytic copper tinned, very finely stranded, class FS (refer also to DIN VDE 0295)			
Insulation	PROTOLON HS+, lead-free, with optimized wall thickness High grade special compound based on high-quality EPR (at least 3GI3); improved mechanical and electrical characteristics (refer also to DIN VDE 0207, Part 20).			
Electrical field control	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)			
Core identification	Natural coloured insulation with black semiconductive layer			
Optical fiber	Fibre core diameter 62,5, 50 or 9µm; diameter across the cladding 125µm, diameter over the coating 250µm			
Optical fiber parameter	Fiber Class: Type:	G62,5/125µm Multi-mode graded index	G50/125µm Multi-mode graded index	E9/125µm Single-mode
	Attenuation at 850nm	< 3,3dB/km	< 2,8dB/km	
	Attenuation at 1310nm	< 0,9dB/km	< 0,8dB/km	< 0,4dB/km
	Attenuation at 1550nm			< 0,3dB/km
	Bandwidth at 850nm	> 400MHz	> 400MHz	
	Bandwidth at 1310nm	> 600MHz	> 1200MHz	
	Numerical Aperture	0,275 +/- 0,02	0,2 +/- 0,02	0,14 +/- 0,02
	Chromatic Dispersion at 1300nm			< 3,5ps/nm km
	Chromatic Dispersion at 1550nm			< 3,5ps/nm km
Fiber coding	Specially developed color code for identification of the individual fibres			
Fiber covering	Loose tube with filling compound, Basic material: ETFE, Compound: 7YI 1, Natural color			
Core arrangement	Three core design with cradle separator and support element in the centre, earth conductor splitted into 2 parts positioned in two interstices. Optical element: six tubes, laid up around a central support element, with one, two or three optical fibers in each, positioned in the third interstice.			
Support element	Central aramid support element, embedded into the cradle separator, to increase the max. permissible tensile force on the cable			
Inner sheath	PROTOFIRM Sandwich - double layer inner sheath with increased thickness for additional mechanical protection.			
Reinforcement	Special compound based on EPR, quality at least 5GM3, also served as water barrier, color: red			
	Anti-torsion reinforced braid made of polyester threads, in a vulcanized bond between the sheaths, resulting in high strength of the sheath system			
Outer sheath	PROTOFIRM Sandwich - double layer outer sheath with higher abrasion resistance for additional mechanical protection. 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 high grade rubber compounds based on PCP, quality at least 5GM5, colour: bright red/red.			

Electrical parameters			
Rated voltage	6/10 kV	8.7/15 kV	12/20 kV
Max. permissible operating voltage AC	6,9/12 kV	10.4/18 kV	13.9/24 kV
Max. permissible operating voltage DC	9/18 kV	13.5/27 kV	18/36 kV
AC test voltage	17 kV	24 kV	29 kV
EMC	This design exhibits an extremely low interference level as a result of use a symmetrical three-core design with very narrow manufacturing rates.		
Data transmission	Special design with fibre-optics for trouble free data transmission at high data rates.		
Current Carrying Capacity description	According to DIN VDE 0298, Part 4. Higher values are permissible in specific cases (please consult the manufacturer).		
Chemical parameters			
Resistance to oil	Acc. to DIN EN 60811-404 and DIN VDE 0473-811-404, paragraph 10		
Weather resistance	Unrestricted use outdoors and indoors, resistant to ozone, UV and moisture.		
Water resistance	According to HD 2216		
Thermal parameters			
Max. permissible temperature at conductor	90 °C		
Max. short circuit temperature of the conductor	250 °C		
Ambient temperature for fixed installation	min -50 °C ; max +80 °C		
Ambient temperature in fully flexible operation	min -35 °C ; max +80 °C		

Mechanical parameters	
Max. tensile load	Increased tensile load through additional support element (see table)
Torsional stress	± 25 °/m
Min. bending radius	Acc. to DIN VDE 0298 part 3
Min. distance with S-type directional changes	20 x D (cable diameter)
Travel speed	Gantry (reeling operation): no restriction. For speeds beyond 270 m/min it is recommended to consult the cable manufacturer
Additional tests	Reversed bending test, torsional stress test, abrasion resistance, compression test.

Rated voltage 6/10 kV

Number of cores x cross section	Conduc-tor diameter max. mm	Earth conduc-tor diameter max. mm	Outer diameter min. mm	Outer diameter max. mm	Bending radius free moving min. mm	Weight (approx.) kg/km	Permis-sible tensile force max. N	Dynamic tensile force max. N	Con-ductor resis-tance at 20°C max. Ω/km	Current carrying capacity (1) A	Short Circuit Current (conduc-tor) kA
3x25+2x25/2+1x(24G62,5)	7.1	5	40.7	43.7	437	2640	2200	3250	0.795	131	3.58
3x35+2x25/2+1x(24G62,5)	8.3	5	42.7	45.7	457	3040	2800	4150	0.565	162	5.01
3x50+2x25/2+1x(24G62,5)	9.9	5	46.1	49.1	491	3710	3700	5500	0.393	202	7.15
3x70+2x35/2+1x(24G62,5)	11.8	5.9	51.1	55.1	551	4870	5200	7600	0.277	250	10.01
3x95+2x50/2+1x(24G62,5)	13.8	7.2	56.1	60.1	601	6070	7700	11350	0.21	301	13.59
3x120+2x70/2+1x(24G62,5)	15.4	8.3	60.9	64.9	649	7500	9500	14000	0.164	352	17.16

Design with G50 or E9 types available upon request.
(1) Nominal current carrying capacity for rubber cables laid on a surface, at 30°C ambient temperature (see also VDE 0298-4, Table 15).

Rated voltage 8.7/15 kV

Number of cores x cross section	Conduc-tor diameter max. mm	Earth conduc-tor diameter max. mm	Outer diameter min. mm	Outer diameter max. mm	Bending radius free moving min. mm	Weight (approx.) kg/km	Permis-sible tensile force max. N	Dynamic tensile force max. N	Con-ductor resistance at 20°C max. Ω/km	Current carrying capacity (1) A	Short Circuit Current (conduc-tor) kA
3x25+2x25/2+1x(24G62,5)	7.1	5	43.5	46.5	465	2890	2200	3250	0.795	139	3.58
3x35+2x25/2+1x(24G62,5)	8.3	5	46.1	49.1	491	3360	2800	4150	0.565	172	5.01
3x50+2x25/2+1x(24G62,5)	9.9	5	50.5	54.5	545	4240	3700	5500	0.393	215	7.15
3x70+2x35/2+1x(24G62,5)	11.8	5.9	55.2	59.2	592	5340	5200	7600	0.277	265	10.01
3x95+2x50/2+1x(24G62,5)	13.8	7.2	60.9	64.9	649	6700	7700	11350	0.21	319	13.59
3x120+2x70/2+1x(24G62,5)	15.4	8.3	64.4	68.4	684	7870	9500	14000	0.164	371	17.16

(1) Nominal current carrying capacity for rubber cables laid on a surface, at 30°C ambient temperature (see also VDE 0298-4, Table 15). Design with G50 or E9 types available upon request.

Rated voltage 12/20 kV

Number of cores x cross section	Conduc-tor diameter max. mm	Earth conduc-tor diameter max. mm	Outer diameter min. mm	Outer diameter max. mm	Bending radius free moving min. mm	Weight (approx.) kg/km	Permis-sible tensile force max. N	Dynamic tensile force max. N	Con-ductor resistance at 20°C max. Ω/km	Current carrying capacity (1) A	Short Circuit Current (conduc-tor) kA
3x25+2x25/2+1x(24G62,5)	7.1	5	46.6	49.6	496	3200	2200	3250	0.795	139	3.58
3x35+2x25/2+1x(24G62,5)	8.3	5	50.1	54.1	541	3860	2800	4150	0.565	172	5.01
3x50+2x25/2+1x(24G62,5)	9.9	5	54.1	58.1	581	4670	3700	5500	0.393	215	7.15
3x70+2x35/2+1x(24G62,5)	11.8	5.9	58.2	62.2	622	5640	5200	7600	0.277	265	10.01
3x95+2x50/2+1x(24G62,5)	13.8	7.2	64	68	680	7050	7700	11350	0.21	319	13.59
3x120+2x70/2+1x(24G62,5)	15.4	8.3	68	72	720	8360	9500	14000	0.164	371	17.16

(1) Nominal current carrying capacity for rubber cables laid on a surface, at 30°C ambient temperature (see also VDE 0298-4, Table 15). Design with G50 or E9 types available upon request.