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Scottish Cables
Electrical And Mining Supplies

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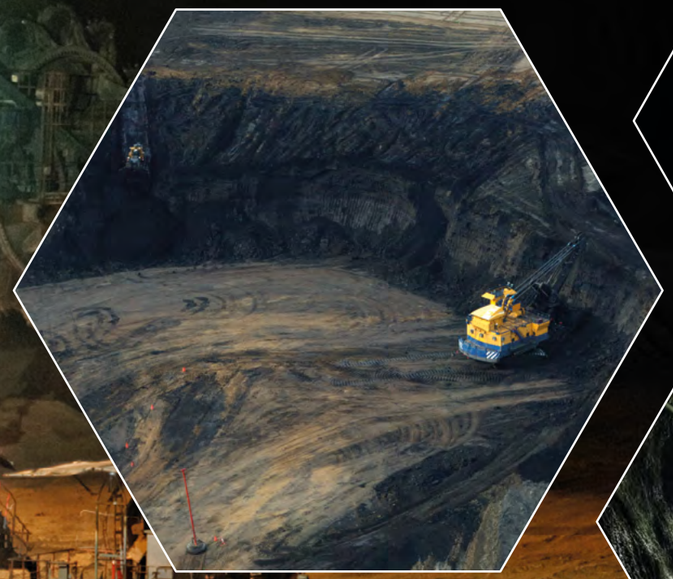
Prysmian mining cables – stronger, faster, safer.

Cables used in hazardous areas must be of particularly high quality. Our mining cables are manufactured to apply to all relevant standards and has a proven track record of long-lived, safe and reliable performance. To match different kinds of mining operations, you can count on our cables being tailored to suit very varied tasks and challenges. So, rest assured, we'll be with you – all the way.



Based on SANS

Hardwearing

Superior impact and abrasion resistance, in cold as well as in warm ambient conditions.

Great longevity

The mix of quality components increase the service life, even in very hot environments.

Flexible

Very pliable and easy to work with, also in low temperatures.

Impervious

Resistant to oil, ozone, UV, moisture and water.

Top performing

First-rate mechanical and electrical characteristics.

Double function

Provides both electricity and digital information.

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German Art of Engineering.

Made in Germany

Having total control over everything – from choice in raw materials to designing, manufacturing, testing and transporting – we're able to guarantee our customers highest possible quality in all that we do.

We've been making cables in Germany for more than 160 years. During all this time we've done what Germans do best: provided customers and communities worldwide with products and solutions based on state-of-the-art technology, consistent excellence in execution and in-depth understanding of the needs of an evolving market. At our disposal we have both Centres of Excellence with highly-developed R&D teams and cable plants all across the country, making sure that we deliver the highest quality with service beyond the ordinary and within set time frames.

It is not for nothing that German Art of Engineering is well-known throughout the world.

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Product designation**	Application and voltage level	Construction	Mechanical stress	Sheath quality	Special feature	Page
PROTOMONT TRAILING, REELING & PUMP CABLES ACC. TO SANS 1520-1						
 **TYPE 41**	PUMP & TRAILING & REELING 1.1 kV	3-cores screened and 1-pilot screened or unscreened	Medium	Special CPE, highly abrasion resistant (better than RS6)	Special sheath combination for water immersion (500m depth)	Page 6
 **TYPE 61A**	TRAILING & REELING 1.1 kV	3-cores screened and 3-pilots unscreened	High	Special CPE, highly abrasion resistant (better than RS6)	Highly flexible construction for improved reeling performances	Page 10
 **TYPE 61B**	TRAILING 1.1 kV	3-cores screened and 3-pilots unscreened	High	Special CPE, highly abrasion resistant (better than RS6)	Reinforced with central support element for very high tensile load	Page 12
 **TYPE 63**	TRAILING 3.3 kV	3-cores screened and 3-pilots unscreened	High	Special CPE, highly abrasion resistant (better than RS6)	Reinforced with central support element for very high tensile load	Page 14
 **TRACKLESS**	TRAILING 1.1 kV	3-cores screened, 1-pilot unscreened, 2-pilots unscreened, 1-ECC, 2-ECC	High	Special CPE, highly abrasion resistant (better than RS6)	Highly flexible construction for improved performances	Page 16
PROTOLON MV TRAILING CABLES ACC. TO SANS 1520-2						
 **TYPE 66 / ECC**	TRAILING 6.6 kV	3-cores screened, 2-pilots unscreened, 1-ECC	High	Special PCP, highly abrasion resistant (better than RS6)	Extremely robust and tough against abrasion and tearing	Page 18
 **TYPE 611 / ECC**	TRAILING 11 kV	3-cores screened, 2-pilots unscreened, 1-ECC	High	Special PCP, highly abrasion resistant (better than RS6)	Extremely robust and tough against abrasion and tearing	Page 20
 **TYPE 622 / ECC**	TRAILING 22 kV	3-cores screened, 2-pilots unscreened, 1-ECC	High	Special PCP, highly abrasion resistant (better than RS6)	Extremely robust and tough against abrasion and tearing	Page 22
MV MINING CABLES BASED ON VDE						
 **PROTOLON(M)-R(SB)**	TRAILING & REELING 10 kV	3-cores with non-metallic screen, 2-pilots, 1-earth	Very high	Special PCP, highly abrasion resistant (better than RS6)	Highly flexible construction for improved reeling performances and extremely robust and tough against abrasion and tearing	Page 24
 **TENAX-LUMEN**	TRAILING 6 kV	3-cores* with non-metallic screen, 2-pilots, 1-earth	Very high	Special PUR, highly abrasion resistant and transparent	With self-illuminating function for improved visibility at night	Page 26
 **TENAX-LUMEN**	TRAILING 10 kV	3-cores* with non-metallic screen, 2-pilots, 1-earth	Very high	Special PUR, highly abrasion resistant and transparent	With self-illuminating function for improved visibility at night	Page 29

*available also as screened version.

**all cables shown in this table are also available as LUMEN version.

PROTOMONT TYPE 41 (3+1) 640/1100V SANS

PUMP & TRAILING CABLES acc. to SANS 1520-1

Optimized cable for movable electric equipment in underground mines, e.g. pumps, drills, shuttle cars, subject to medium mechanical stress. Suitable for permanent immersion in water up to 500m depth. 16 and 25mm² also suitable for reeling.

STANDARDS / APPROVALS

Acc. to SANS 1520-1	General
SANS 1411-1	Conductor
SANS 1411-3	Compounds
DIN EN 60332-1-2 / IEC 60332-1-2	Fire performance
IEC 60811-404	Chemical behaviour
DIN VDE 0298-3	Application
DIN VDE 0298-4	Electrical parameters

CABLE DESIGN

Conductor	Finely stranded copper, tinned, class 5
Core insulation material	EPR rubber
-	Special compound > RD3
Screen construction	Braiding
Screen material	Copper, tinned
-	Mix braid of copper/nylon
Pilot conductor	Copper, tinned cl.5; EPR-insulation
Core arrangement	Four core design with three mix screened power cores and one unscreened pilot core . Lay Ratio 8xPCD Core identification: red, yellow and blue power cores and one grey pilot. Tear-resistant reinforcing polyester braid for 16 and 25mm² between sheath which prevents sheath movement.
Armouring/reinforcement	Braiding
Material inner sheath	Rubber
Material outer sheath	Chlorinated polyethylene (CM/CPE)
-	Special compound > RS6

ELECTRICAL PARAMETERS

Rated voltage U0/U (Um)	0,64/1,1 kV
Test voltage [kV]	3
Nominal voltage U [V]	1,100

THERMAL PARAMETERS

Max. conductor temperature [°C]	90
Max. conductor temperature at short circuit [°C]	250
Ambient temperature fix installation (min) [°C]	-40
Ambient temperature fix installation (max) [°C]	80
Ambient temperature flexible installation (min) [°C]	-20
Ambient temperature flexible installation (max) [°C]	60

CHEMICAL PARAMETERS

Flame retardant	In accordance with EN/IEC 60332-1-2
Oil resistant	Yes
Ozone resistance	Yes
Resistant to UV	Yes
Sea water resistance	Excellent
Max. water depth [m]	500

MECHANICAL PARAMETERS

Permanent tensile strength (rule)	15 N/mm²
Bending radius (rule)	Acc. to VDE 0298-3: 4 X D fixed installation 5 X D flexible operation

CABLE PROPERTIES

Basic construction	SAP code	Diameter conductor [mm]	Cable diameter (min) [mm]	Cable diameter (max) [mm]	Nominal cross section pilot/reduced core [mm²]	Cable weight [kg/km]	Max. tensile strength [N]	Bending radius moving (min) [mm]	Conductor resistance at 20° C [Ohm/km]	Screen DC resistance [Ohm/km]
4	20390367	2.48	24	26	4	900	180	130	5.09	5.1
6	20431116		25	28	6	1,100	270	140	3.39	3.4
16	20377027	5.5	32	35	16	1,800	720	175	1.24	2.5

*Current carrying capacity acc. SANS 1520
*Screen resistance= comb. screen resistance in Ohm/km
*Other cross-section on request

PROTOMONT TYPE 41 SP 640/1100V SANS

PUMP & TRAILING CABLES acc. to SANS 1520-1

Optimized cable for movable electric equipment in underground mines, e.g. pumps, drills, shuttle cars, subject to medium mechanical stress. Suitable for permanent immersion in water up to 500m depth. 16 and 25mm² also suitable for reeling.

STANDARDS / APPROVALS

Acc. to SANS 1520-1	General
SANS 1411-1	Conductor
SANS 1411-3	Compounds
DIN EN 60332-1-2 / IEC 60332-1-2	Fire performance
IEC 60811-404	Chemical behaviour
DIN VDE 0298-3	Application
DIN VDE 0298-4	Electrical parameters

CABLE DESIGN

Conductor	Finely stranded copper, tinned, class 5
Core insulation material	EPR rubber
-	Special compound > RD3
Screen construction	Braiding
Screen material	Copper, tinned
-	Mix braid of copper/nylon
Pilot conductor	Copper, tinned cl.5; EPR-insulation
Core arrangement	Four core design with three mix screened power cores and one screened pilot core. Lay Ratio 8xPCD Core identification: red, yellow and blue power cores and one grey pilot. Tear-resistant reinforcing polyester braid for 16 and 25mm² between sheath which prevents sheath movement.
Armouring/reinforcement	Braiding
Material inner sheath	Rubber
Material outer sheath	Chlorinated polyethylene (CM/CPE)
-	Special compound > RS6

ELECTRICAL PARAMETERS

Rated voltage U0/U (Um)	0,64/1,1 kV
Test voltage [kV]	3
Nominal voltage U [V]	1,100

THERMAL PARAMETERS

Max. conductor temperature [°C]	90
Max. conductor temperature at short circuit [°C]	250
Ambient temperature fix installation (min) [°C]	-40
Ambient temperature fix installation (max) [°C]	80
Ambient temperature flexible installation (min) [°C]	-20
Ambient temperature flexible installation (max) [°C]	60

CHEMICAL PARAMETERS

Flame retardant	In accordance with EN/IEC 60332-1-2
Oil resistant	Yes
Ozone resistance	Yes
Resistant to UV	Yes
Sea water resistance	Excellent
Max. water depth [m]	500

MECHANICAL PARAMETERS

Permanent tensile strength (rule)	15 N/mm²
Bending radius (rule)	Acc. to VDE 0298-3: 4 X D fixed installation 5 X D flexible operation

CABLE PROPERTIES

Basic construction	SAP code	Diameter conductor [mm]	Cable diameter (min) [mm]	Cable diameter (max) [mm]	Nominal cross section pilot/reduced core [mm²]	Cable weight [kg/km]	Max. tensile strength [N]	Bending radius moving (min) [mm]	Conductor resistance at 20° C [Ohm/km]	Screen DC resistance [Ohm/km]
4x2,5+4x2,5/4E* based on SANS	20353488	1.96	17	19	2.5	450	112	95	8.21	8.21
4 SP	20355802	2.48	24	26	4	900	180	130	5.09	5.1
10 SP	20403545		28	31	10	1,500	450	155	1.91	3.4
16 SP	20377415	5.5	32	35	16	1,800	720	175	1.24	2.5
25 SP	20377028	6.5	35	38	25	2,500	1,125	190	0.795	1.6

*Current carrying capacity acc. SANS 1520
*Screen resistance= comb. screen resistance in Ohm/km
*Other cross-section on request

PROTOMONT TYPE 61A 640/1100V SANS

TRAILING & REELING CABLES acc. to SANS 1520-1

Optimized reeling cable for self propelled electrically driven machines in underground mines, e.g. shuttle cars and LHD's, subject to the high mechanical stress expected in trailing and slow reeling operation.

STANDARDS / APPROVALS

Acc. to SANS 1520-1	General
SANS 1411-1	Conductor
SANS 1411-3	Compounds
DIN EN 60332-1-2 / IEC 60332-1-2	Fire performance
IEC 60811-404	Chemical behaviour
DIN VDE 0298-3	Application
DIN VDE 0298-4	Electrical parameters

CABLE DESIGN

Conductor	Finely stranded copper, tinned, class 5
Core insulation material	EPR rubber
-	Special compound > RD3
Screen construction	Braiding
Screen material	Copper, tinned
-	Mix braid of copper/nylon
Pilot conductor	Copper, tinned cl.5; EPR-insulation
Core arrangement	Three power core design with three unscreened pilots in the interstices laid up around a semiconductive cradle centre. (16mm² without cradle centre) Core identification: red, yellow and blue power cores and pilots in black, grey, brown. Tear-resistant reinforcing polyester braid between sheath which prevents sheath movement.
Armouring/reinforcement	Braiding
Armouring/reinforcement material	Polyester
Material outer sheath	Chlorinated polyethylene (CM/CPE)
-	Special compound > RS6

ELECTRICAL PARAMETERS

Rated voltage U0/U (Um)	0,64/1,1 kV
Test voltage [kV]	3
Nominal voltage U [V]	1,100

THERMAL PARAMETERS

Max. conductor temperature [°C]	90
Max. conductor temperature at short circuit [°C]	250
Ambient temperature fix installation (min) [°C]	-40
Ambient temperature fix installation (max) [°C]	80
Ambient temperature flexible installation (min) [°C]	-20
Ambient temperature flexible installation (max) [°C]	60

CHEMICAL PARAMETERS

Flame retardant	In accordance with EN/IEC 60332-1-2
Oil resistant	Yes
Ozone resistance	Yes
Resistant to UV	Yes

MECHANICAL PARAMETERS

Permanent tensile strength (rule)	15 N/mm²
Bending radius (rule)	Acc. to VDE 0298-3: 4 X D fixed installation 5 X D flexible operation

CABLE PROPERTIES

Basic construction	SAP code	Diameter conductor [mm]	Cable diameter (min) [mm]	Cable diameter (max) [mm]	Nominal cross section pilot/reduced core [mm²]	Cable weight [kg/km]	Max. tensile strength [N]	Bending radius moving (min) [mm]	Conductor resistance at 20° C [Ohm/km]	Screen DC resistance [Ohm/km]
16	20377786	5.5	30	33	6		960	165	1.24	2.5
25	20403547	6.5	37	40	10	2,600	1,500	200	0.795	1.6
35	20431044	7.65	42	45	10		2,100	225	0.565	1.2

*Current carrying capacity acc. SANS 1520
*Screen resistance= comb. screen resistance in Ohm/km
*Other cross-section on request

PROTOMONT TYPE 61B 640/1100V SANS

TRAILING CABLES acc. to SANS 1520-1

Optimized trailing cable for movable electric equipment in underground mines, e.g. roadheader, subject to very high mechanical stresses in which abrasion and pulling tension are to be expected in trailing operation.

STANDARDS / APPROVALS

Acc. to SANS 1520-1	General
SANS 1411-1	Conductor
SANS 1411-3	Compounds
DIN EN 60332-1-2 / IEC 60332-1-2	Fire performance
IEC 60811-404	Chemical behaviour
DIN VDE 0298-3	Application
DIN VDE 0298-4	Electrical parameters

CABLE DESIGN

Conductor	Finely stranded copper, tinned, class 5
Core insulation material	EPR rubber
-	Special compound > RD3
Screen construction	Braiding
Screen material	Copper, tinned
-	Mix braid of copper/nylon
Pilot conductor	Copper, tinned cl.5; EPR-insulation
Core arrangement	Three power core design with three unscreened pilots in the interstices laid up. Core identification: red, yellow and blue power cores and pilots in black, grey, brown. Tear-resistant reinforcing polyester braid between sheath which prevents sheath movement.
Armouring/reinforcement	Braiding
Armouring/reinforcement material	Polyester
Material outer sheath	Chlorinated polyethylene (CM/CPE)
-	Special compound > RS6

ELECTRICAL PARAMETERS

Rated voltage U0/U (Um)	0,64/1,1 kV
Test voltage [kV]	3
Nominal voltage U [V]	1,100

THERMAL PARAMETERS

Max. conductor temperature [°C]	90
Max. conductor temperature at short circuit [°C]	250
Ambient temperature fix installation (min) [°C]	-40
Ambient temperature fix installation (max) [°C]	80
Ambient temperature flexible installation (min) [°C]	-20
Ambient temperature flexible installation (max) [°C]	60

CHEMICAL PARAMETERS

Flame retardant	In accordance with EN/IEC 60332-1-2
Oil resistant	Yes
Ozone resistance	Yes
Resistant to UV	Yes

MECHANICAL PARAMETERS

Permanent tensile strength (rule)	15 N/mm² (optional with central support element)
Bending radius (rule)	Acc. to VDE 0298-3: 4 X D fixed installation 5 X D flexible operation

CABLE PROPERTIES

Basic construction	SAP code	Diameter conductor [mm]	Cable diameter (min) [mm]	Cable diameter (max) [mm]	Nominal cross section pilot/reduced core [mm²]	Cable weight [kg/km]	Max. tensile strength [N]	Bending radius moving (min) [mm]	Conductor resistance at 20° C [Ohm/km]	Screen DC resistance [Ohm/km]
3x4+3x4/3E +3x2,5P based on	20396925	2.48	24	26	2.5	850	180	130	5.09	5.1
35	20403548	7.65	36	39	6		2,475	195	0.554	1.2
50	20403549	9.2	41	45	6		3,150	225	0.386	0.8
70	20403550		47	51	10		4,050	255	0.272	0.7
95	20396926		52	56	16		6,075	280	0.21	0.6
120	PMT_61B_03		56	60	16		7,200	300	0.164	0.6

*Current carrying capacity acc. SANS 1520
*Screen resistance= comb. screen resistance in Ohm/km
*Other cross-section on request

PROTOMONT TYPE 63 1900/3300V SANS

TRAILING CABLES acc. to SANS 1520-1

Optimized trailing cable for movable electric equipment in underground mines, e.g. roadheader, subject to very high mechanical stresses in which abrasion and pulling tension are to be expected in trailing operation.

STANDARDS / APPROVALS

Acc. to SANS 1520-1	General
SANS 1411-1	Conductor
SANS 1411-3	Compounds
DIN EN 60332-1-2 / IEC 60332-1-2	Fire performance
IEC 60811-404	Chemical behaviour
DIN VDE 0298-3	Application
DIN VDE 0298-4	Electrical parameters

CABLE DESIGN

Conductor	Finely stranded copper, tinned, class 5
Core insulation material	EPR rubber
-	Special compound > RD3
Screen construction	Braiding
Screen material	Copper, tinned
-	Mix braid of copper/nylon
Pilot conductor	Copper, tinned cl.5; EPR-insulation
Core arrangement	Three power core design with three unscreened pilots in the interstices laid up around a semiconductive cradle centre up to 95mm². Core identification: red, yellow and blue power cores and pilots in black, grey, brown. Tear-resistant reinforcing polyester braid between sheath which prevents sheath movement.
Armouring/reinforcement	Braiding
Armouring/reinforcement material	Polyester
Material outer sheath	Chlorinated polyethylene (CM/CPE)
-	Special compound > RS6

ELECTRICAL PARAMETERS

Rated voltage U0/U (Um)	1,9/3,3 (4) kV
Test voltage [kV]	7.5
Nominal voltage U [V]	3,300

THERMAL PARAMETERS

Max. conductor temperature [°C]	90
Max. conductor temperature at short circuit [°C]	250
Ambient temperature fix installation (min) [°C]	-40
Ambient temperature fix installation (max) [°C]	80
Ambient temperature flexible installation (min) [°C]	-20
Ambient temperature flexible installation (max) [°C]	60

CHEMICAL PARAMETERS

Flame retardant	In accordance with EN/IEC 60332-1-2
Oil resistant	Yes
Ozone resistance	Yes
Resistant to UV	Yes

MECHANICAL PARAMETERS

Permanent tensile strength (rule)	15 N/mm²
Bending radius (rule)	Acc. to VDE 0298-3: 4 X D fixed installation 5 X D flexible operation

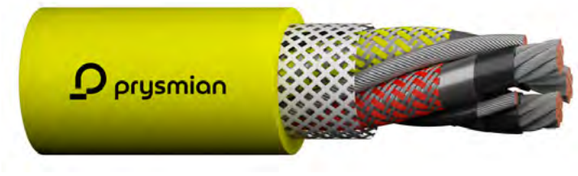
CABLE PROPERTIES

Basic construction	SAP code	Diameter conductor [mm]	Cable diameter (min) [mm]	Cable diameter (max) [mm]	Nominal cross section pilot/reduced core [mm²]	Cable weight [kg/km]	Max. tensile strength [N]	Bending radius moving (min) [mm]	Conductor resistance at 20° C [Ohm/km]	Screen DC resistance [Ohm/km]
50	20403581	9.2	50	54	16		4,050	270	0.393	0.8
70	20415718		56	60	16		4,950	300	0.277	0.7
95	20403582		60	64	16		6,075	320	0.21	0.6
120	20415719		62	66	16		7,200	330	0.164	0.6
150	20415720		65	70	25		8,550	350	0.132	0.6
185	20415781		71	76	25		10,125	380	0.108	0.6
240	20415782		77	82	25		12,600	410	0.0817	0.6

*Current carrying capacity acc. SANS 1520
*Screen resistance= comb. screen resistance in Ohm/km
*Other cross-section on request

PROTOMONT TRACKLESS 640/1100V

TRAILING CABLES based on SANS 1520-1



Optimized trailing cable for self propelled electrically driven machines in underground mines, e.g. drill-rigs, subject to the high mechanical stress expected in trailing operation.

STANDARDS / APPROVALS

Based on SANS 1520-1	General
SANS 1411-1	Conductor
SANS 1411-3	Compounds
DIN EN 60332-1-2 / IEC 60332-1-2	Fire performance
IEC 60811-404	Chemical behaviour
DIN VDE 0298-3	Application
DIN VDE 0298-4	Electrical parameters

CABLE DESIGN

Conductor	Finely stranded copper, tinned, class 5
Core insulation material	EPR rubber
-	Special compound > RD3
Screen construction	Braiding
Screen material	Copper, tinned
-	Mix braid of copper/nylon
Pilot conductor	Copper, tinned cl.5; EPR-insulation
Core arrangement	Three power cores with two/one pilots and one/two earth in the interstices. Lay Ratio 8xPCD Core identification: red, yellow and blue power cores and pilots in black and bare earth. Tear-resistant reinforcing braid over assembly which prevents sheath movement.
Armouring/reinforcement	Braiding
Armouring/reinforcement material	Polyester
Material outer sheath	Chlorinated polyethylene (CM/CPE)
-	Special compound > RS6

ELECTRICAL PARAMETERS

Rated voltage U0/U (Um)	0,64/1,1 kV
Test voltage [kV]	3
Nominal voltage U [V]	1,100

THERMAL PARAMETERS

Max. conductor temperature [°C]	90
Max. conductor temperature at short circuit [°C]	250
Ambient temperature fix installation (min) [°C]	-40
Ambient temperature fix installation (max) [°C]	80
Ambient temperature flexible installation (min) [°C]	-20
Ambient temperature flexible installation (max) [°C]	60

CHEMICAL PARAMETERS

Flame retardant	In accordance with EN/IEC 60332-1-2
Oil resistant	Yes
Ozone resistance	Yes
Resistant to UV	Yes

MECHANICAL PARAMETERS

Permanent tensile strength (rule)	15 N/mm²
Bending radius (rule)	Acc. to VDE 0298-3: 4 X D fixed installation 5 X D flexible operation

CABLE PROPERTIES

Basic construction	SAP code	Diameter conductor [mm]	Cable diameter (min) [mm]	Cable diameter (max) [mm]	Nominal cross section pilot/reduced core [mm²]	Cable weight [kg/km]	Max. tensile strength [N]	Bending radius moving (min) [mm]	Conductor resistance at 20° C [Ohm/km]	Screen DC resistance [Ohm/km]
3x35+1x16+2x6P	20377126	7.65	37.1	40.1	6	2,850	1,575	199	0.565	1.2
3x50+2x10+1x10P	20416142	9.2	44	47	10	3,800	2,250	235	0.393	0.8

*Current carrying capacity acc. SANS 1520
*Screen resistance= comb. screen resistance in Ohm/km
*Other cross-section on request

PROTOLON(SB) TYPE 66 ECC 3,8/6,6kV SANS

MV TRAILING CABLES acc. to SANS 1520-2

For connection of large material handling machines such as excavators, shovels, draglines in open-cast mines, in trailing applications, with a reinforced outer sheath suitable for high demanding trailing operation, extremely robust and tough against abrasion and tearing.

STANDARDS / APPROVALS

Acc. to SANS 1520-2	General
SANS 1411-1	Conductor
SANS 1411-3	Compounds
DIN EN 60332-1-2 / IEC 60332-1-2	Fire performance
IEC 60811-404	Chemical behaviour
DIN VDE 0298-3	Application
DIN VDE 0298-4	Electrical parameters

CABLE DESIGN

Conductor	Finely stranded copper, tinned, class 5
Inner semi-conducting layer	Yes
-	Semi-conductive EPR
Core insulation material	EPR rubber
-	Special compound > RD3
Outer semi-conducting layer	Yes
-	Semi-conductive NBR easy-strip
Screen construction	Braiding
Screen material	Copper, tinned
-	Mix braid of copper/nylon
Pilot conductor	Copper, tinned cl.5; EPR-insulation
Core arrangement	Three power core design with two pilots and one ECC in the interstices. Core identification: red, yellow and blue power cores and pilots in white with black numbers. Tear-resistant reinforcing mesh tape over assembly and between sheath which prevents sheath movement.
Armouring/reinforcement	Mesh tape
Material outer sheath	Rubber - polychloroprene (PCP)
-	Special compound > RS6

ELECTRICAL PARAMETERS

Rated voltage U0/U (Um)	3.8/6.6 (7.2) kV
Test voltage [kV]	11
Nominal voltage U [V]	6,600

THERMAL PARAMETERS

Max. conductor temperature [°C]	90
Max. conductor temperature at short circuit [°C]	250
Ambient temperature fix installation (min) [°C]	-40
Ambient temperature fix installation (max) [°C]	80
Ambient temperature flexible installation (min) [°C]	-20
Ambient temperature flexible installation (max) [°C]	60

CHEMICAL PARAMETERS

Flame retardant	In accordance with EN/IEC 60332-1-2
Oil resistant	Yes
Ozone resistance	Yes
Resistant to UV	Yes

MECHANICAL PARAMETERS

Permanent tensile strength (rule)	15 N/mm²
Bending radius (rule)	Acc. to VDE 0298-3: 6 X D fixed installation 10 X D flexible operation

CABLE PROPERTIES

Basic construction	SAP code	Diameter conductor [mm]	Cable diameter (min) [mm]	Cable diameter (max) [mm]	Nominal cross section pilot/reduced core [mm²]	Cable weight [kg/km]	Max. tensile strength [N]	Bending radius moving (min) [mm]	Conductor resistance at 20° C [Ohm/km]	Screen DC resistance [Ohm/km]
35 ECC	20399550		54	58	10		1,575	580	0.565	0.5
50 ECC	20377427		58	62	10		2,250	620	0.393	0.5
70 ECC	20377426		61	65	16		3,150	650	0.277	0.4
95 ECC	20402421		65	69	16		4,275	690	0.21	0.3
120 ECC	20415410		70	74	16		5,400	740	0.164	0.23
150 ECC	20415561		77	81	25		6,750	810	0.132	0.18
240 ECC	20415562		89.5	94.5	25		10,800	945	0.082	0.15

*Current carrying capacity acc. SANS 1520
*Screen resistance= comb. screen+ECC resistance in Ohm/km
*Other cross-section on request

PROTOLON(SB) TYPE 611 ECC 6,35/11kV SANS

MV TRAILING CABLES acc. to SANS 1520-2

For connection of large material handling machines such as excavators, shovels, draglines in open-cast mines, in trailing applications, with a reinforced outer sheath suitable for high demanding trailing operation, extremely robust and tough against abrasion and tearing.

STANDARDS / APPROVALS

Acc. to SANS 1520-2	General
SANS 1411-1	Conductor
SANS 1411-3	Compounds
DIN EN 60332-1-2 / IEC 60332-1-2	Fire performance
IEC 60811-404	Chemical behaviour
DIN VDE 0298-3	Application
DIN VDE 0298-4	Electrical parameters

CABLE DESIGN

Conductor	Finely stranded copper, tinned, class 5
Inner semi-conducting layer	Yes
-	Semi-conductive EPR
Core insulation material	EPR rubber
-	Special compound > RD3
Outer semi-conducting layer	Yes
-	Semi-conductive NBR easy-strip
Screen construction	Braiding
Screen material	Copper, tinned
-	Mix braid of copper/nylon
Pilot conductor	Copper, tinned cl.5; EPR-insulation
Core arrangement	Three power core design with two pilots and one ECC in the interstices. Core identification: red, yellow and blue power cores and pilots in white with black numbers. Tear-resistant reinforcing mesh tape over assembly and between sheath which prevents sheath movement.
Armouring/reinforcement	Mesh tape
Material outer sheath	Rubber - polychloroprene (PCP)
-	Special compound > RS6

ELECTRICAL PARAMETERS

Rated voltage U0/U (Um)	6.35/11 (12) kV
Test voltage [kV]	17
Nominal voltage U [V]	11,000

THERMAL PARAMETERS

Max. conductor temperature [°C]	90
Max. conductor temperature at short circuit [°C]	250
Ambient temperature fix installation (min) [°C]	-40
Ambient temperature fix installation (max) [°C]	80
Ambient temperature flexible installation (min) [°C]	-20
Ambient temperature flexible installation (max) [°C]	60

CHEMICAL PARAMETERS

Flame retardant	In accordance with EN/IEC 60332-1-2
Oil resistant	Yes
Ozone resistance	Yes
Resistant to UV	Yes

MECHANICAL PARAMETERS

Permanent tensile strength (rule)	15 N/mm²
Bending radius (rule)	Acc. to VDE 0298-3: 6 X D fixed installation 10 X D flexible operation

CABLE PROPERTIES

Basic construction	SAP code	Diameter conductor [mm]	Cable diameter (min) [mm]	Cable diameter (max) [mm]	Nominal cross section pilot/reduced core [mm²]	Cable weight [kg/km]	Max. tensile strength [N]	Bending radius moving (min) [mm]	Conductor resistance at 20° C [Ohm/km]	Screen DC resistance [Ohm/km]
35 ECC	611_ECC_01		63	67	10		1,575	670	0.565	0.5
50 ECC YE	20403583		65	69	16		2,250	690	0.393	0.5
70 ECC	20370743		67	71	16		3,150	710	0.277	0.4
95 ECC YE	20403584		73	77	16		4,275	770	0.21	0.3
120 ECC	611_ECC_05		78	82	25		5,400	820	0.164	0.23

*Current carrying capacity acc. SANS 1520
*Screen resistance= comb. screen+ECC resistance in Ohm/km
*Other cross-section on request

PROTOLON(SB) TYPE 622 ECC 12,7/22kV SANS

MV TRAILING CABLES acc. to SANS 1520-2

For connection of large material handling machines such as excavators, shovels, draglines in open-cast mines, in trailing applications, with a reinforced outer sheath suitable for high demanding trailing operation, extremely robust and tough against abrasion and tearing.

STANDARDS / APPROVALS

Acc. to SANS 1520-2	General
SANS 1411-1	Conductor
SANS 1411-3	Compounds
DIN EN 60332-1-2 / IEC 60332-1-2	Fire performance
IEC 60811-404	Chemical behaviour
DIN VDE 0298-3	Application
DIN VDE 0298-4	Electrical parameters

CABLE DESIGN

Conductor	Finely stranded copper, tinned, class 5
Inner semi-conducting layer	Yes
-	Semi-conductive EPR
Core insulation material	EPR rubber
-	Special compound > RD3
Outer semi-conducting layer	Yes
-	Semi-conductive NBR easy-strip
Screen construction	Braiding
Screen material	Copper, tinned
-	Mix braid of copper/nylon
Pilot conductor	Copper, tinned cl.5; EPR-insulation
Core arrangement	Three power core design with two pilots and one ECC in the interstices. Core identification: red, yellow and blue power cores and pilots in white with black numbers. Tear-resistant reinforcing mesh tape over assembly and between sheath which prevents sheath movement.
Armouring/reinforcement	Mesh tape
Material outer sheath	Rubber - polychloroprene (PCP)
-	Special compound > RS6

ELECTRICAL PARAMETERS

Rated voltage U0/U (Um)	12.7/22 (24) kV
Test voltage [kV]	29
Nominal voltage U [V]	22,000

THERMAL PARAMETERS

Max. conductor temperature [°C]	90
Max. conductor temperature at short circuit [°C]	250
Ambient temperature fix installation (min) [°C]	-40
Ambient temperature fix installation (max) [°C]	80
Ambient temperature flexible installation (min) [°C]	-20
Ambient temperature flexible installation (max) [°C]	60

CHEMICAL PARAMETERS

Flame retardant	In accordance with EN/IEC 60332-1-2
Oil resistant	Yes
Ozone resistance	Yes
Resistant to UV	Yes

MECHANICAL PARAMETERS

Permanent tensile strength (rule)	15 N/mm²
Bending radius (rule)	Acc. to VDE 0298-3: 6 X D fixed installation 10 X D flexible operation

CABLE PROPERTIES

Basic construction	SAP code	Diameter conductor [mm]	Cable diameter (min) [mm]	Cable diameter (max) [mm]	Nominal cross section pilot/reduced core [mm²]	Cable weight [kg/km]	Max. tensile strength [N]	Bending radius moving (min) [mm]	Conductor resistance at 20° C [Ohm/km]	Screen DC resistance [Ohm/km]
35 ECC	622_ECC_01		72	76	16		1,575	760	0.565	0.5
50 ECC	20396121		76	80	16		2,250	800	0.393	0.5
70 ECC	20415409		78	82	16		3,150	820	0.277	0.4
95 ECC	622_ECC_04		82	86	16		4,275	860	0.21	0.3
120 ECC	20348131		88.5	93.5	16		5,400	935	0.164	0.23
240 ECC	20392400		104.5	109.5	25		10,800	1,095	0.082	0.15

*Current carrying capacity acc. SANS 1520
*Screen resistance= comb. screen+ECC resistance in Ohm/km
*Other cross-section on request

PROTOLON (M)-R(SB) (N)TSCGEWOEU 6/10KV

Medium voltage reeling cable

For connection of large material handling machines such as excavators, shovels, draglines in open-cast mines, in trailing and reeling applications. Combines a highly flexible MV cable design suitable for reeling operation on mono spiral and cylindrical reels under high mechanical stresses, with a reinforced outer sheath suitable for high demanding trailing operation, extremely robust and tough against abrasion and tearing (5GM5+).

STANDARDS / APPROVALS

DIN VDE 0207-21	Compound
DIN VDE 0298-3	Mechanical parameters
Based on DIN VDE 0250-813	General
DIN VDE 0298-4	Electrical parameters
DIN EN 60811-404 / IEC 60811-404	Chemical behaviour
DIN EN 60332-1-2 / IEC 60332-1-2	Fire performance

CABLE DESIGN

Conductor	Very finely stranded copper, bare (class FS) PE: Very finely stranded copper, bare (class FS)
Inner semi-conducting layer	Yes
-	Semi-conductive EPR
Core insulation material	EPR rubber
-	PROTOLON
-	Special compound > 3GI3
Outer semi-conducting layer	Yes
-	Semi-conductive NBR easy-strip
Core arrangement	Three core design, with earth conductor and two controll cores in the interstices. Reinforcement with open mesh tape over assembly.
Material inner sheath	Rubber
-	Special sandwich EPR/CR
Armouring/reinforcement	Braiding
Armouring/reinforcement material	Polyester
Material outer sheath	Rubber - polychloroprene (PCP)
-	Special compound > 5GM5

ELECTRICAL PARAMETERS

Rated voltage U0/U (Um)	6/10 (12) kV
Test voltage [kV]	17
Nominal voltage U [V]	10,000

THERMAL PARAMETERS

Max. conductor temperature [°C]	90
Max. conductor temperature at short circuit [°C]	250
Ambient temperature fix installation (min) [°C]	-40
Ambient temperature fix installation (max) [°C]	80
Ambient temperature flexible installation (min) [°C]	-35
Ambient temperature flexible installation (max) [°C]	80

CHEMICAL PARAMETERS

Flame retardant	In accordance with EN/IEC 60332-1-2
Oil resistant	Yes
Ozone resistance	Yes
Resistant to UV	Yes
Sea water resistance	Yes

MECHANICAL PARAMETERS

Torsional stress +/- [°/m]	100
Permanent tensile strength (rule)	20 N/mm² static 25 N/mm² dynamic
Travel speed	On rewinding: up to 100 m/min Reeling operation: up to 120 m/min
Bending radius (rule)	Acc. to VDE 0298-3: 6 X D fixed installation 10 X D flexible operation

CABLE PROPERTIES

Basic construction	SAP code	External code	Diameter conductor [mm]	Cable diameter (min) [mm]	Cable diameter (max) [mm]	Cable weight [kg/km]
3X120+1X70+2x16ST	20342223	5DK4738	15.5	63.7	67.7	8,650
3X150+1X95+2x16ST	20388149	5DK4***	17.4	69.6	73.6	10,500

Basic construction	SAP code	External code	Max. tensile strength [N]	Nominal operation capacitance [nF/km]	Operation self inductance [mH/km]	Conductor resistance at 20° C [Ohm/km]	Current carrying capacity [A]
3X120+1X70+2x16ST	20342223	5DK4738	7,200	650	0.29	0.161	352
3X150+1X95+2x16ST	20388149	5DK4***	9,000	690	0.28	0.129	404

Current carrying capacity acc. VDE 0298-4, Tab. 15, on a surface at 30°C ambient temperature.

TENAX-LUMEN (N)TSCGH3S 3,6/6KV

Luminescent power cable for trailing application

TENAX-LUMEN is a self-illuminating medium voltage trailing cable for the power supply to large mobile equipment in mines, such as shovels and draglines. Especially intended for application where, to guarantee the safety of personnel and equipment, the cable must be visible in the dark. The active illuminating element, embedded under a transparent polyurethane outer sheath, allows the cable illumination also when not energized. The outer sheath is extremely robust and tough against abraison and tearing, suitable for fully flexible operation down to -50°C.

STANDARDS / APPROVALS

Based on DIN VDE 0250-813	General
DIN EN 60228/ IEC 60228 / VDE 0295	Conductor
DIN EN 60332-1-2 / IEC 60332-1-2	Fire performance
IEC 60754-2	Fire performance
DIN VDE 0298-4	Electrical parameters
DIN EN 60811-404 / IEC 60811-404	Chemical behaviour
GOST -R/-K/-B Fire Certificate of Russian Federation	Certifications / Approvals

CABLE DESIGN

Conductor	Finely stranded copper, tinned, class 5 PE: Finely stranded copper, tinned, class 5 with semi conductive special rubber compound
Inner semi-conducting layer	Yes
-	Semi-conductive EPR
Core insulation material	EPR rubber
-	Special compound 3GI3
Outer semi-conducting layer	Yes
-	Semi-conductive NBR easy-strip
Pilot conductor	Copper, tinned cl.5; EPR-insulation
Core arrangement	Cores laid up around semiconductive central filler with armid yarns; EL-strings in the outer interstices
-	Special electroluminescent string designed for high visibility and low power consumption
Material outer sheath	Polyurethane (PUR)
-	Special compound transparent

NOTES ON INSTALLATION:

Complete termination & installation set can be offered on request. The illuminating strings shall be connected to an AC/AC inverter suitable for electroluminescent strings, with output voltage of max. 130Vac and output frequency of 800-1300Hz.

ELECTRICAL PARAMETERS

Rated voltage U0/U (Um)	3.6/6 (7.2) kV
Test voltage [kV]	11
Nominal voltage U [V]	6,000

LUMEN

Parameters of electroluminescent strings	
Voltage max.	125 V AC
Frequency max.	2000 Hz
Current absorption	~ 15 A/km
Heat development	none
Light homogeneity	> 95%
Irradiation	360°

THERMAL PARAMETERS

Max. conductor temperature [°C]	90
Max. conductor temperature at short circuit [°C]	250
Ambient temperature fix installation (min) [°C]	-50
Ambient temperature fix installation (max) [°C]	80
Ambient temperature flexible installation (min) [°C]	-50
Ambient temperature flexible installation (max) [°C]	60

CHEMICAL PARAMETERS

Flame retardant	In accordance with EN/IEC 60332-1-2
Halogen free	Yes
Oil resistant	Yes
Ozone resistance	Yes
Resistant to UV	Yes

MECHANICAL PARAMETERS

Torsional stress +/- [°/m]	100
Permanent tensile strength (rule)	25 N/mm²
Bending radius (rule)	Acc. to VDE 0298-3: 6 X D fixed installation 10 X D flexible operation 20 X D min distance with S-type directional changes

Current carrying capacity acc. VDE 0298-4, Tab. 15, on a surface at 30°C ambient temperature.

CABLE PROPERTIES

Basic construction	SAP code	Diameter conductor [mm]	Cable diameter (min) [mm]	Cable diameter (max) [mm]	Cable weight [kg/km]
3x35+3x25/3	20296568	7.5	45.2	48.5	3,100
3x35+2x16+1x16	20408751	7.5	44.5	48.5	3,150
3x50+2x16+1x16	20262553	9	49.3	53.8	3,800
3x70+3x35/3	20339281	10.6	52	56	4,650
3x95+2x25+1x16	20301807	12.6	58.9	63.4	5,750
3x70+2x25+1x16	LUMEN_6KV_003	10.6	52	56	4,700
3x150+2x35+1x16	20312671	16	68.8	72.4	8,350
3x120+2x35+1x16	20347960	14.8	60.5	64.5	6,700
3x185+2x50+1x16	20310636	17.7	71.7	76.2	9,850
3x240+2x70+1x16	LUMEN_6KV_001	20.3	74.3	78.3	12,000

CABLE PROPERTIES ELECTRIC / MECHANICAL

Basic construction	SAP code	Max. tensile strength [N]	Nominal operation capacitance [nF/km]	Operation self inductance [mH/km]	Conductor resistance at 20° C [Ohm/km]	Current carrying capacity [A]
3x35+3x25/3	20296568	2,625	260	0.34	0.565	162
3x35+2x16+1x16	20408751	2,625	260	0.34	0.565	162
3x50+2x16+1x16	20262553	3,750	290	0.32	0.393	202
3x70+3x35/3	20339281	5,250	320	0.3	0.277	250
3x95+2x25+1x16	20301807	7,125	370	0.29	0.21	301
3x70+2x25+1x16	LUMEN_6KV_003	5,250	320	0.3	0.277	250
3x150+2x35+1x16	20312671	11,250	440	0.27	0.132	404
3x120+2x35+1x16	20347960	9,000	400	0.28	0.164	352
3x185+2x50+1x16	20310636	13,875	480	0.27	0.108	461
3x240+2x70+1x16	LUMEN_6KV_001	18,000	540	0.26	0.0817	540

TENAX-LUMEN (N)TSCGH3S 6/10KV

Luminescent power cable for trailing application

TENAX-LUMEN is a self-illuminating medium voltage trailing cable for the power supply to large mobile equipment in mines, such as shovels and draglines. Especially intended for application where, to guarantee the safety of personnel and equipment, the cable must be visible in the dark. The active illuminating element, embedded under a transparent polyurethane outer sheath, allows the cable illumination also when not energized. The outer sheath is extremely robust and tough against abraison and tearing, suitable for fully flexible operation down to -50°C.

STANDARDS / APPROVALS

DIN VDE 0298-4	Electrical parameters
Based on DIN VDE 0250-813	General
DIN EN 60228/ IEC 60228 / VDE 0295	Conductor
DIN EN 60811-404 / IEC 60811-404	Chemical behaviour
DIN EN 60332-1-2 / IEC 60332-1-2	Fire performance
IEC 60754-2	Fire performance
GOST -R/-K/-B Fire Certificate of Russian Federation	Certifications / Approvals

CABLE DESIGN

Conductor	Finely stranded copper, tinned, class 5 PE: Finely stranded copper, tinned, class 5 with semi conductive special rubber compound
Inner semi-conducting layer	Yes
-	Semi-conductive EPR
Core insulation material	EPR rubber
-	Special compound 3GI3
Outer semi-conducting layer	Yes
-	Semi-conductive NBR easy-strip
Pilot conductor	Copper, tinned cl.5; EPR-insulation
Core arrangement	Cores laid up around semiconductive central filler with armid yarns; EL-strings in the outer interstices
-	Special electroluminescent string designed for high visibility and low power consumption
Material outer sheath	Polyurethane (PUR)
-	Special compound transparent

NOTES ON INSTALLATION:

Complete termination & installation set can be offered on request. The illuminating strings shall be connected to an AC/AC inverter suitable for electroluminescent strings, with output voltage of max. 130Vac and output frequency of 800-1300Hz.

ELECTRICAL PARAMETERS

Rated voltage U0/U (Um)	6/10 (12) kV
Test voltage [kV]	17
Nominal voltage U [V]	10,000

LUMEN

Parameters of electroluminescent strings

Voltage max.	125 V AC
Frequency max.	2000 Hz
Current absorption	~ 15 A/km
Heat development	none
Light homogeneity	> 95%
Irradiation	360°

THERMAL PARAMETERS

Max. conductor temperature [°C]	90
Max. conductor temperature at short circuit [°C]	250
Ambient temperature fix installation (min) [°C]	-50
Ambient temperature fix installation (max) [°C]	80
Ambient temperature flexible installation (min) [°C]	-50
Ambient temperature flexible installation (max) [°C]	60

CHEMICAL PARAMETERS

Flame retardant	In accordance with EN/IEC 60332-1-2
Halogen free	Yes
Oil resistant	Yes
Ozone resistance	Yes
Resistant to UV	Yes

MECHANICAL PARAMETERS

Torsional stress +/- [°/m]	100
Permanent tensile strength (rule)	25 N/mm²
Bending radius (rule)	Acc. to VDE 0298-3: 6 X D fixed installation 10 X D flexible operation 20 X D min distance with S-type directional changes

Current carrying capacity acc. VDE 0298-4, Tab. 15, on a surface at 30°C ambient temperature.

CABLE PROPERTIES

Basic construction	SAP code	Diameter conductor [mm]	Cable diameter (min) [mm]	Cable diameter (max) [mm]	Cable weight [kg/km]
3x35+2x16+1x16	20330776	7.5	46	50	3,380
3x50+2x16+1x16	20299287	9	49.2	53.2	3,950
3x70+2x25+1x16	20317279	10.6	53.5	57.5	4,850
3x95+2x25+1x16	20330777	12.6	57	61	5,700
3x120+2x35+1x16	20330778	14.8	61.7	65.7	6,990
3x150+2x35+1x16	LUMEN_10KV_001	16	65.5	69.5	7,800
3x185+2x50+1x16	LUMEN_10KV_002	17.7	72.8	76.8	10,000
3x240+2x70+1x16	LUMEN_10KV_003	20.3	77.3	81.3	12,500
3x50+3x25/3	20339232	9	49.2	53.2	3,900
3x70+3x35/3	20339233	10.6	53.5	57.5	4,800

CABLE PROPERTIES ELECTRIC / MECHANICAL

Basic construction	SAP code	Max. tensile strength [N]	Nominal operation capacitance [nF/km]	Operation self inductance [mH/km]	Conductor resistance at 20° C [Ohm/km]	Current carrying capacity [A]
3x35+2x16+1x16	20330776	2,625	240	0.35	0.565	162
3x50+2x16+1x16	20299287	3,750	270	0.33	0.393	202
3x70+2x25+1x16	20317279	5,250	310	0.31	0.277	250
3x95+2x25+1x16	20330777	7,125	340	0.3	0.21	301
3x120+2x35+1x16	20330778	9,000	380	0.29	0.164	352
3x150+2x35+1x16	LUMEN_10KV_001	11,250	410	0.28	0.132	404
3x185+2x50+1x16	LUMEN_10KV_002	13,875	440	0.27	0.108	461
3x240+2x70+1x16	LUMEN_10KV_003	18,000	490	0.26	0.0817	540
3x50+3x25/3	20339232	3,750	270	0.33	0.393	202
3x70+3x35/3	20339233	5,250	310	0.31	0.277	250

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