PROTOLON (SB-SAM) | (N)TSCGEWOEU | (N)TSCGECEWOEU | MV trailing | 3.6/6–18/30 kV source range | Open-cast mining

PROTOLON (SB-SAM) — Complete Engineering Guide to the Medium-Voltage Trailing Cable Series

A source-controlled technical reference covering the current optimized-wall-thickness cable, the archival high-voltage extension, the copper-core-screen version, detailed material architecture, mechanical boundaries, electrical data, document conflicts and field selection.

36 current rows | 18 archival HV rows | 54 screened rows | 108 non-duplicate matrix rows | 5 engineering diagrams

Current core range
3.6/6–12/20 kV
2019/2025 matrix

Archival extended range
14/25–18/30 kV
2016 matrix

Current tensile rule
20 N/mm²
table-verified on 3 phase cores

Torsion
±100 / ±25°/m
unshielded / screened

Contents

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1. Scope and source hierarchy

CURRENT

2025 / 2019 core series

The primary matrix contains 36 constructions from 3.6/6 to 12/20 kV. The 2025 brochure supplies the newest construction wording; the 2019 catalogue supplies selected Part and MLFB identifiers.

ARCHIVAL

2016 extended voltage range

The 2016 catalogue includes 14/25 and 18/30 kV unshielded cables and a complete screened range through 18/30 kV. These rows are useful for legacy assets, not proof of current availability.

INFERENCE

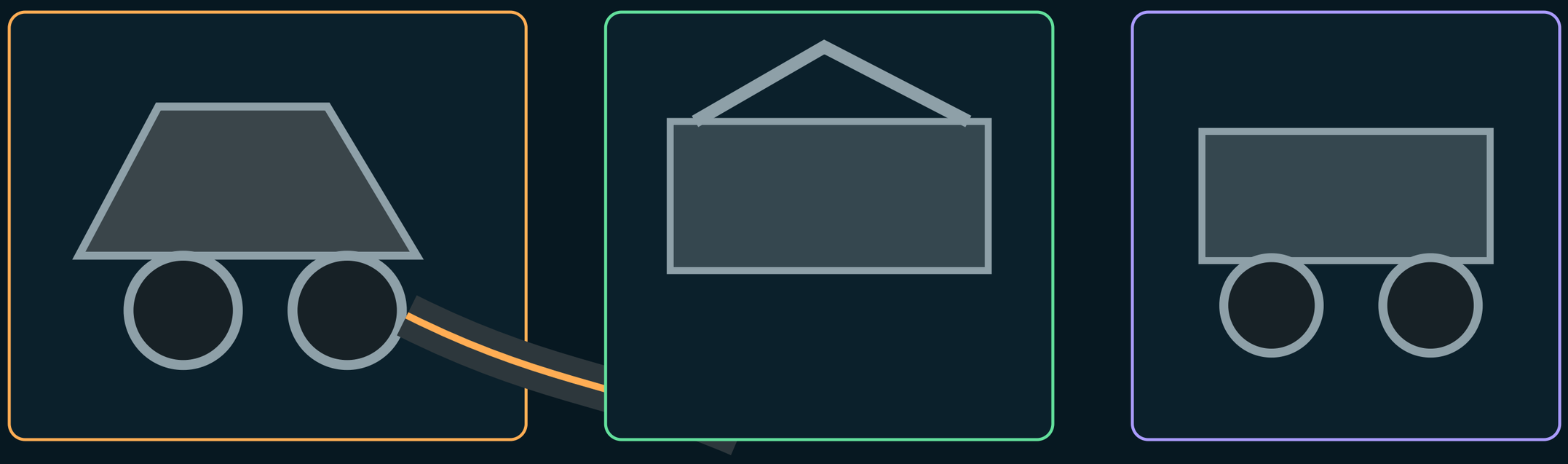
Force-rule reconciliation

Where a 2016 table force equals 15 × 3S despite a 20 N/mm² text statement, the calculated 15 N/mm² basis is shown explicitly and treated as a document conflict.

Contractual rule: the approved data sheet and production drawing for the exact order override every catalogue comparison in this article.

2. Application: heavy open-cast trailing duty

Open-cast trailing duty: drag, abrasion, impact and repeated repositioning



Trailing is the primary duty. Reeling/festoon capability must be confirmed by the exact product and installation design.

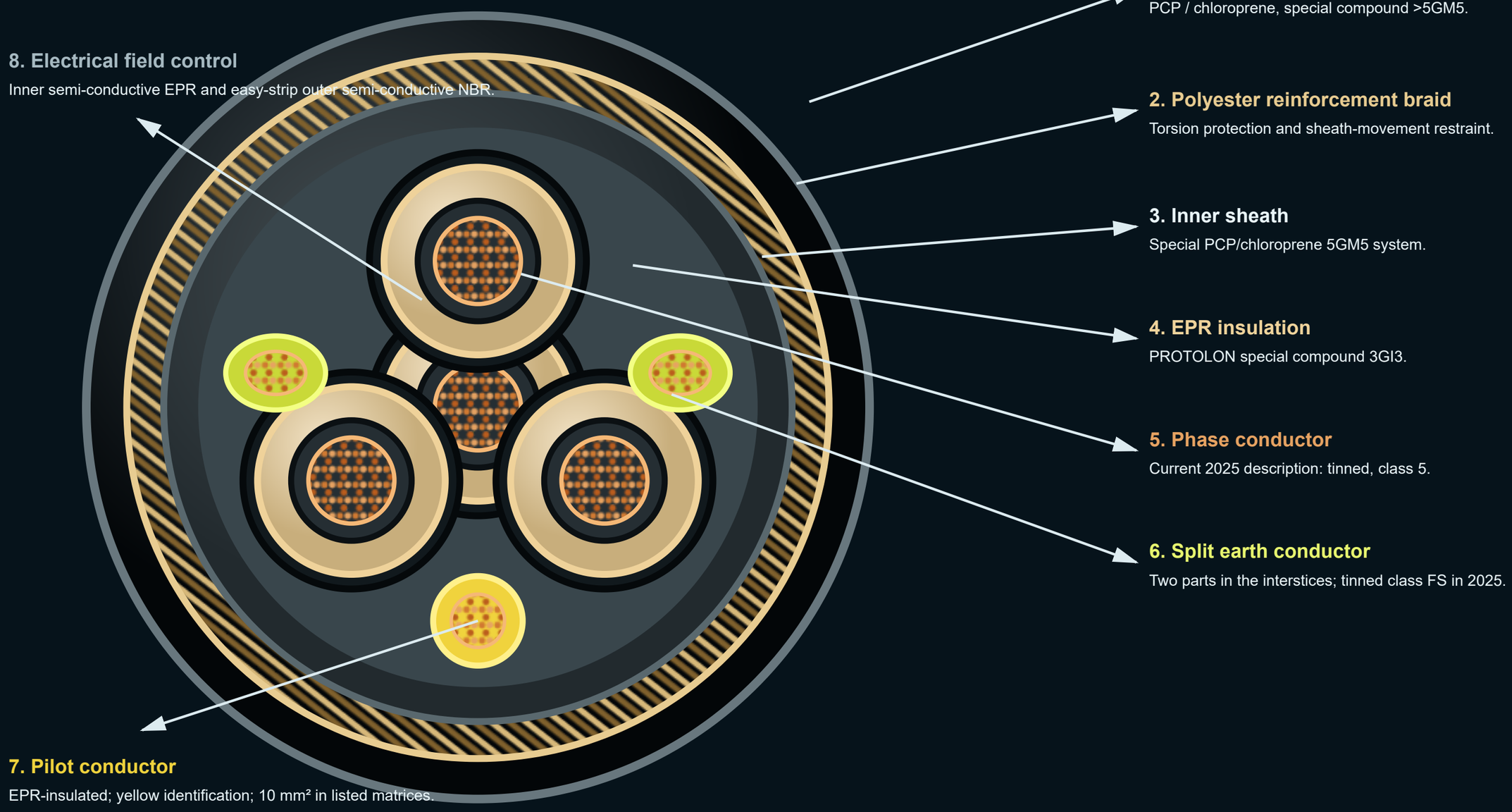
Primary use: power supply or connection of large mobile material-handling machines, including excavators, shovels, stackers, reclaimers, dumpers and mobile crushers in open-cast mines where abrasion and chafing are expected during trailing.

Do not generalize to high-speed reeling: SB-SAM is primarily a trailing cable. Any reel, festoon, multiple-plane or travel-speed claim must be verified against the exact installation and product document.

3. Detailed standard cross-section — (N)TSCGEWOEU

PROTOLON (SB-SAM) (N)TSCGEWOEU — detailed trailing-cable cross-section

Engineering reconstruction from official 2019/2025 construction descriptions; relative thicknesses are not manufacturing dimensions.



No metallic concentric screen is shown in this standard (N)TSCGEWOEU reconstruction.

Core architecture: three screened-by-semiconductive-layer phase cores, a two-part split earth conductor and one yellow pilot are laid with a tear-resistant reinforcement system inside bonded heavy-duty sheaths.

4. Detailed copper-core-screen cross-section — (N)TSCGECEWOEU

PROTOLON (SB-SAM) Screen (N)TSCGECEWOEU — copper core shield

Archival 2016 screen architecture: a metallic concentric screen is applied over each main core.



1. Complete bonded sheath system
Abrasion- and tear-resistant chloroprene/PCP, 5GM5.

2. Reinforcing tape / braid
Prevents relative sheath movement under trailing stress.

3. Metallic concentric core screen
Applied over every main core in the archival screened design.

4. EPR insulation and field control
PROTOLON 3GI3 with inner and outer semi-conductive rubber.

5. Phase conductor
Archival 2016 description: bare, finely stranded class 5.

6. Split PE and yellow pilot
Placed in the outer interstices around the three main cores.

Engineering caution
The core screen changes diameter, mass, torsional limit and termination design. It is not a cosmetic option.

Functional change: the metallic concentric screen is applied over each main core. It increases diameter and mass, reduces the permitted torsional angle in the archival product description, and changes jointing, earthing and fault-current design.

5. Layer-by-layer construction

Layer / element	Current 2025 wording	2016/2019 wording	Engineering function
Phase conductor	Tinned, finely stranded copper, class 5	Bare / untinned finely stranded copper, class 5	Flexible phase-current path; conductor finish is version-dependent.
Earth conductor	Tinned, very finely stranded copper, class FS, with semiconductive rubber	Bare / untinned class FS; split into two parts	Protective earth continuity in two interstices.
Inner field-control layer	Semiconductive EPR	Black semiconductive rubber compound	Controls electric stress at the conductor/insulation interface.
Insulation	PROTOLON EPR, special compound 3GI3	PROTOLON EPR, better than / minimum 3GI3	Medium-voltage dielectric and flexible thermal system.
Outer field-control layer	Easy-strip semiconductive NBR	Cold-strippable black semiconductive rubber	Controls the insulation-screen interface and supports joint preparation.
Core screen	Special metallic-screen design available	Concentric metallic screen over every main core in (N)TSCGECEWOEU	Core shielding, earth/fault-current path and field containment.
Pilot conductor	10 mm² pilot in published matrices	EPR-insulated class FS copper, yellow	Ground-check, interlock or control function as defined by the system.
Reinforcement	Tear-resistant reinforcing tape plus polyester braiding	Extremely tear-resistant tape preventing sheath movement	Stabilizes the assembly under dragging, bending and torsion.
Inner sheath	PCP/chloroprene heavy-duty system, compound 5GM5	Bonded inner part of complete sheath	Bedding, mechanical support and environmental barrier.
Outer sheath	PCP/chloroprene, special compound >5GM5	5GM5, abrasion- and tear-resistant; bonded to inner sheath	Primary abrasion, chafing, ozone, UV and moisture protection.

6. Electrical, thermal and environmental ratings

Current rated voltages

3.6/6, 6/10, 8.7/15 and 12/20 kV in the 2019/2025 core matrix.

Archival rated voltages

14/25 and 18/30 kV appear in the 2016 unshielded and screened catalogues.

AC test voltage

11, 17, 24 and 29 kV for the current four voltage classes; archival 14/25 and 18/30 documents list 36 and 43 kV.

Conductor temperature

90 °C continuous; 250 °C short circuit.

Ambient range

Fixed: −40…+80 °C. Fully flexible: −30…+60 °C in the detailed 2019/2025 product sheet.

Resistance

Flame performance to EN/IEC 60332-1-2, oil resistance to IEC 60811-404, and resistance to ozone, UV and moisture.

Water boundary: water resistance is referenced to HD 22.16 / EN 50525-2-21, but no numerical immersion depth is published for SB-SAM. Do not infer a depth rating.

7. Mechanical operating envelope

Document evolution and parameter conflicts

2016 catalogue

Unscreened and screened: 3.6/6–18/30 kV

Text: 20 N/mm²

Tables: F values equal 15 × 3S

Unscreened torsion: ±100°/m

Screened torsion: ±25°/m

Bare phase conductor stated

2019 catalogue

Core matrix: 3.6/6–12/20 kV

F values equal 20 × 3S

Published Part/MLFB on selected rows

Bare phase and PE conductors stated

Metallic screen available as special design

2025 opencast brochure

Core matrix repeats 36 current rows

20 N/mm² static; ±100°/m

6D fixed / 10D flexible

Tinned class 5 phase conductor stated

Tinned class FS split PE stated

Flexible temperature: −30…+60 °C

Rule: do not merge conductor finish, voltage range or tensile values across document generations.
The exact contractual data sheet and production drawing take precedence.

Current unshielded

20 N/mm² static tensile rule, ±100°/m torsion, 6D fixed and 10D flexible bending rule.

Archival screened

±25°/m torsion. The 2016 table force values equal 15 N/mm² on the three phase conductors even though its text says 20 N/mm².

S-bends

Avoid tight reverse bends. A project-specific path analysis is required because the current product sheet provides 6D/10D rules but no universal operating S-bend distance.

Trailing pull

Calculate steady pull, startup peaks, ground friction, slope, cable self-weight and localized snag loads separately.

8. Current core matrix — 36 rows

The following table uses the current 2019/2025 dimensions and electrical data. Part and MLFB identifiers are included only where the 2019 catalogue publishes them.

▼ **Current core matrix · 3.6/6 kV · 9 rows**

Construction	Part number	MLFB	Conductor Ø	Dmin	Dmax	kg/km	Fmax	R20	C	L	A	Isc 1 s	F/(3S)
3x25+2x25/2+1x10ST	20203078	5DK3246	6.5	35.5	42.5	2,670	1,500	0.78	0.35	0.32	131	3.58	20 N/mm²
3x35+2x25/2+1x10ST	20181804	5DK3249	7.6	41.9	44.9	3,020	2,100	0.554	0.39	0.31	162	5.01	20 N/mm²
3x50+2x25/2+1x10ST	20183832	5DK3***	9.1	42.8	45.8	3,510	3,000	0.386	0.45	0.29	202	7.15	20 N/mm²

Construction	Part number	MLFB	Conductor Ø	Dmin	Dmax	kg/km	Fmax	R20	C	L	A	Isc 1 s	F/(3S)
3x70+2x35/2+1x10ST	*not published*	—	10.9	46.5	49.5	4,300	4,200	0.272	0.52	0.28	250	10.01	20 N/mm²
3x95+2x50/2+1x10ST	*not published*	—	12.7	52.9	56.9	5,600	5,700	0.206	0.58	0.27	301	13.59	20 N/mm²
3x120+2x70/2+1x10ST	*not published*	—	14.4	56.5	60.5	6,750	7,200	0.161	0.65	0.26	352	17.16	20 N/mm²
3x150+2x70/2+1x10ST	*not published*	—	16.2	63	67	8,100	9,000	0.129	0.71	0.25	404	21.45	20 N/mm²
3x185+2x95/2+1x10ST	*not published*	—	17.8	66.4	70.4	9,400	11,100	0.106	0.77	0.25	461	26.46	20 N/mm²
3x240+2x120/2+1x10ST	*not published*	—	20.6	72.3	76.3	11,700	14,400	0.08	0.88	0.24	540	34.32	20 N/mm²

▼ Current core matrix · 6/10 kV · 9 rows

Construction	Part number	MLFB	Conductor Ø	Dmin	Dmax	kg/km	Fmax	R20	C	L	A	Isc 1 s	F/(3S)
3x25+2x25/2+1x10ST	*not published*	—	6.5	40.8	43.8	2,700	1,500	0.78	0.3	0.34	131	3.58	20 N/mm²
3x35+2x25/2+1x10ST	20036708	5DK4548	7.6	41.1	44.1	3,030	2,100	0.554	0.33	0.32	162	5.01	20 N/mm²
3x50+2x25/2+1x10ST	*not published*	—	9.1	45.3	48.3	3,600	3,000	0.386	0.38	0.31	202	7.15	20 N/mm²
3x70+2x35/2+1x10ST	20079290	5DK4459	10.9	47.7	50.7	4,540	4,200	0.272	0.43	0.29	250	10.01	20 N/mm²
3x95+2x50/2+1x10ST	*not published*	—	12.7	54.2	58.2	5,700	5,700	0.206	0.48	0.28	301	13.59	20 N/mm²
3x120+2x70/2+1x10ST	20006948	5DK4243	14.4	57.7	61.7	7,130	7,200	0.161	0.54	0.27	352	17.16	20 N/mm²
3x150+2x70/2+1x10ST	*not published*	—	16.2	64.2	68.2	8,300	9,000	0.129	0.59	0.26	404	21.45	20 N/mm²
3x185+2x95/2+1x10ST	*not published*	—	17.8	67.6	71.6	9,600	11,100	0.106	0.64	0.26	461	26.46	20 N/mm²
3x240+2x120/2+1x10ST	20008103	5DK4246	20.6	72.3	76.3	12,060	14,400	0.08	0.72	0.25	540	34.32	20 N/mm²

▼ Current core matrix · 8.7/15 kV · 9 rows

Construction	Part number	MLFB	Conductor Ø	Dmin	Dmax	kg/km	Fmax	R20	C	L	A	Isc 1 s	F/(3S)
3x25+2x25/2+1x10ST	*not published*	—	6.5	41.9	44.9	2,600	1,500	0.78	0.22	0.37	139	3.58	20 N/mm²
3x35+2x25/2+1x10ST	20069641	5DK5412	7.6	45.5	48.5	3,440	2,100	0.554	0.25	0.35	172	5.01	20 N/mm²
3x50+2x25/2+1x10ST	*not published*	—	9.1	47.4	50.4	3,700	3,000	0.386	0.28	0.33	215	7.15	20 N/mm²
3x70+2x35/2+1x10ST	20069640	5DK5414	10.9	53.7	57.7	5,380	4,200	0.272	0.32	0.31	265	10.01	20 N/mm²
3x95+2x50/2+1x10ST	*not published*	—	12.7	57.6	61.6	6,150	5,700	0.206	0.35	0.3	319	13.59	20 N/mm²
3x120+2x70/2+1x10ST	20088941	5DK5416	14.4	63	67	7,840	7,200	0.161	0.39	0.29	371	17.16	20 N/mm²
3x150+2x70/2+1x10ST	20088942	5DK5417	16.2	66.8	70.8	8,990	9,000	0.129	0.43	0.28	428	21.45	20 N/mm²
3x185+2x95/2+1x10ST	*not published*	—	17.8	71	75	10,100	11,100	0.106	0.46	0.27	488	26.46	20 N/mm²
3x240+2x120/2+1x10ST	20216531	5DK5***	20.6	78.3	83.3	12,800	14,400	0.08	0.52	0.27	574	34.32	20 N/mm²

▼ Current core matrix · 12/20 kV · 9 rows

Construction	Part number	MLFB	Conductor Ø	Dmin	Dmax	kg/km	Fmax	R20	C	L	A	Isc 1 s	F/(3S)
3x25+2x25/2+1x10ST	*not published*	—	6.5	44.9	47.9	3,000	1,500	0.78	0.22	0.37	139	3.58	20 N/mm²
3x35+2x25/2+1x10ST	20203799	5DK6***	7.6	47.2	50.2	3,500	2,100	0.554	0.24	0.35	172	5.01	20 N/mm²
3x50+2x25/2+1x10ST	*not published*	—	9.1	51.7	55.7	4,350	3,000	0.386	0.27	0.33	215	7.15	20 N/mm²
3x70+2x35/2+1x10ST	*not published*	—	10.9	55.5	59.5	5,400	4,200	0.272	0.31	0.32	265	10.01	20 N/mm²
3x95+2x50/2+1x10ST	*not published*	—	12.7	60.5	64.5	6,500	5,700	0.206	0.35	0.3	319	13.59	20 N/mm²
3x120+2x70/2+1x10ST	*not published*	—	14.4	65.9	69.9	8,000	7,200	0.161	0.38	0.29	371	17.16	20 N/mm²
3x150+2x70/2+1x10ST	*not published*	—	16.2	70.6	74.6	9,200	9,000	0.129	0.42	0.28	428	21.45	20 N/mm²
3x185+2x95/2+1x10ST	*not published*	—	17.8	75.8	79.8	10,850	11,100	0.106	0.45	0.28	488	26.46	20 N/mm²
3x240+2x120/2+1x10ST	*not published*	—	20.6	81.2	86.2	13,300	14,400	0.08	0.51	0.27	574	34.32	20 N/mm²

9. Archival unshielded high-voltage extension — 18 rows

These 14/25 and 18/30 kV rows were published in 2016. They are retained for legacy-asset engineering and dimensional comparison; current manufacture must be confirmed.

▼ **Archival unshielded high-voltage extension (2016) · 18 rows**

U0/U	Construction	Conductor Ø	Dmin	Dmax	kg/km	F table	F/(3S)	R20	C	L	A	Isc 1 s
14/25	3x25+2x25/2+1x10ST	6.5	48.2	52.2	3,500	1,125	15 N/mm²	0.78	0.19	0.39	139	3.58
14/25	3x35+2x25/2+1x10ST	7.6	52.3	56.3	4,100	1,575	15 N/mm²	0.554	0.21	0.37	172	5.01
14/25	3x50+2x25/2+1x10ST	9.1	55.5	59.5	4,800	2,250	15 N/mm²	0.386	0.23	0.35	215	7.15
14/25	3x70+2x35/2+1x10ST	10.9	59.3	63.3	5,800	3,150	15 N/mm²	0.272	0.26	0.33	265	10.01
14/25	3x95+2x50/2+1x10ST	12.7	66.2	70.2	7,300	4,275	15 N/mm²	0.206	0.29	0.32	319	13.6
14/25	3x120+2x70/2+1x10ST	14.4	69.8	73.8	8,600	5,400	15 N/mm²	0.161	0.32	0.31	371	17.16
14/25	3x150+2x70/2+1x10ST	16.2	76.2	80.2	10,100	6,750	15 N/mm²	0.129	0.35	0.3	428	21.45
14/25	3x185+2x95/2+1x10ST	17.8	79.1	84.1	11,600	8,352	15 N/mm²	0.106	0.38	0.29	488	26.46
14/25	3x240+2x120/2+1x10ST	20.6	86.8	91.8	14,200	10,800	15 N/mm²	0.08	0.42	0.28	574	34.32
18/30	3x25+2x25/2+1x10ST	6.5	53.3	57.3	4,000	1,125	15 N/mm²	0.78	0.17	0.41	139	3.58
18/30	3x35+2x25/2+1x10ST	7.6	55.7	59.7	4,600	1,575	15 N/mm²	0.554	0.18	0.39	172	5.01
18/30	3x50+2x25/2+1x10ST	9.1	58.9	62.9	5,300	2,250	15 N/mm²	0.386	0.2	0.37	215	7.15
18/30	3x70+2x35/2+1x10ST	10.9	64.5	68.5	6,200	3,150	15 N/mm²	0.272	0.23	0.35	265	10.01
18/30	3x95+2x50/2+1x10ST	12.7	69.5	73.5	8,000	4,275	15 N/mm²	0.206	0.25	0.33	319	13.6
18/30	3x120+2x70/2+1x10ST	14.4	74.9	78.9	9,200	5,400	15 N/mm²	0.161	0.28	0.32	371	17.16
18/30	3x150+2x70/2+1x10ST	16.2	79.1	84.1	10,900	6,750	15 N/mm²	0.129	0.3	0.31	428	21.45
18/30	3x185+2x95/2+1x10ST	17.8	82.5	87.5	12,200	8,352	15 N/mm²	0.106	0.32	0.3	488	26.46
18/30	3x240+2x120/2+1x10ST	20.6	90.2	95.2	15,000	10,800	15 N/mm²	0.08	0.36	0.29	574	34.32

10. Archival copper-core-screen matrix — 54 rows

The screened matrix covers six voltage classes and nine conductor sizes. The published table force values are shown without silent correction.

▼ **Archival copper-core-screen matrix · 3.6/6 kV · 9 rows**

U0/U	Construction	Conductor Ø	Dmin	Dmax	kg/km	F table	F/(3S)	R20	C	L	A	Isc 1 s
3.6/6	3x25+2x25/2+1x10ST	6.5	41.6	44.6	2,860	1,125	15 N/mm²	0.78	0.37	0.35	131	3.58
3.6/6	3x35+2x25/2+1x10ST	7.6	44	47	3,290	1,575	15 N/mm²	0.554	0.43	0.32	162	5.01
3.6/6	3x50+2x25/2+1x10ST	9.1	47.1	50.1	3,950	2,250	15 N/mm²	0.386	0.49	0.28	202	7.15
3.6/6	3x70+2x35/2+1x10ST	10.9	52.3	56.3	5,100	3,150	15 N/mm²	0.272	0.55	0.27	250	10.01
3.6/6	3x95+2x50/2+1x10ST	12.7	56.1	60.1	6,130	4,275	15 N/mm²	0.206	0.63	0.26	301	13.6
3.6/6	3x120+2x70/2+1x10ST	14.4	59.7	63.7	7,360	5,400	15 N/mm²	0.161	0.7	0.25	352	17.16
3.6/6	3x150+2x70/2+1x10ST	16.2	66.3	70.3	8,770	6,750	15 N/mm²	0.129	0.76	0.25	404	21.45
3.6/6	3x185+2x95/2+1x10ST	17.8	69.7	73.7	10,140	8,352	15 N/mm²	0.106	0.82	0.24	462	26.46
3.6/6	3x240+2x120/2+1x10ST	20.6	77.4	81.4	12,790	10,800	15 N/mm²	0.08	0.93	0.24	540	34.32

▼ **Archival copper-core-screen matrix · 6/10 kV · 9 rows**

U0/U	Construction	Conductor Ø	Dmin	Dmax	kg/km	F table	F/(3S)	R20	C	L	A	Isc 1 s
6/10	3x25+2x25/2+1x10ST	6.5	42.6	45.6	2,970	1,125	15 N/mm²	0.78	0.33	0.35	131	3.58
6/10	3x35+2x25/2+1x10ST	7.6	45.5	48.5	3,460	1,575	15 N/mm²	0.554	0.38	0.32	162	5.01
6/10	3x50+2x25/2+1x10ST	9.1	48.4	51.4	4,080	2,250	15 N/mm²	0.386	0.43	0.28	202	7.15
6/10	3x70+2x35/2+1x10ST	10.9	53.5	57.5	5,240	3,150	15 N/mm²	0.272	0.49	0.27	250	10.01
6/10	3x95+2x50/2+1x10ST	12.7	57.4	61.4	6,320	4,275	15 N/mm²	0.206	0.56	0.26	301	13.6
6/10	3x120+2x70/2+1x10ST	14.4	62.8	66.8	7,770	5,400	15 N/mm²	0.161	0.62	0.25	352	17.16

U0/U	Construction	Conductor Ø	Dmin	Dmax	kg/km	F table	F/(3S)	R20	C	L	A	Isc 1 s
6/10	3x150+2x70/2+1x10ST	16.2	67.6	71.6	8,990	6,750	15 N/mm²	0.129	0.67	0.25	404	21.45
6/10	3x185+2x95/2+1x10ST	17.8	71	75	10,330	8,352	15 N/mm²	0.106	0.73	0.24	462	26.46
6/10	3x240+2x120/2+1x10ST	20.6	78.7	82.7	12,990	10,800	15 N/mm²	0.08	0.82	0.24	540	34.32

▼ Archival copper-core-screen matrix · 8.7/15 kV · 9 rows

U0/U	Construction	Conductor Ø	Dmin	Dmax	kg/km	F table	F/(3S)	R20	C	L	A	Isc 1 s
8.7/15	3x25+2x25/2+1x10ST	6.5	46.3	49.3	3,330	1,125	15 N/mm²	0.78	0.26	0.36	131	3.58
8.7/15	3x35+2x25/2+1x10ST	7.6	48.1	52.1	3,770	1,575	15 N/mm²	0.554	0.31	0.33	162	5.01
8.7/15	3x50+2x25/2+1x10ST	9.1	53.1	57.1	4,690	2,250	15 N/mm²	0.386	0.35	0.31	202	7.15
8.7/15	3x70+2x35/2+1x10ST	10.9	57	61	5,640	3,150	15 N/mm²	0.272	0.38	0.3	250	10.01
8.7/15	3x95+2x50/2+1x10ST	12.7	60.8	64.8	6,750	4,275	15 N/mm²	0.206	0.43	0.28	301	13.6
8.7/15	3x120+2x70/2+1x10ST	14.4	66.1	70.1	8,220	5,400	15 N/mm²	0.161	0.48	0.27	352	17.16
8.7/15	3x150+2x70/2+1x10ST	16.2	71	75	9,490	6,750	15 N/mm²	0.129	0.53	0.27	404	21.45
8.7/15	3x185+2x95/2+1x10ST	17.8	76.1	80.1	11,180	8,352	15 N/mm²	0.106	0.57	0.26	462	26.46
8.7/15	3x240+2x120/2+1x10ST	20.6	82.1	86.1	13,560	10,800	15 N/mm²	0.08	0.64	0.25	540	34.32

▼ Archival copper-core-screen matrix · 12/20 kV · 9 rows

U0/U	Construction	Conductor Ø	Dmin	Dmax	kg/km	F table	F/(3S)	R20	C	L	A	Isc 1 s
12/20	3x25+2x25/2+1x10ST	6.5	48.8	52.8	3,620	1,125	15 N/mm²	0.78	0.23	0.36	131	3.58
12/20	3x35+2x25/2+1x10ST	7.6	52.9	56.9	4,350	1,575	15 N/mm²	0.554	0.26	0.34	162	5.01
12/20	3x50+2x25/2+1x10ST	9.1	56.1	60.1	5,020	2,250	15 N/mm²	0.386	0.3	0.32	202	7.15
12/20	3x70+2x35/2+1x10ST	10.9	59.9	63.9	6,040	3,150	15 N/mm²	0.272	0.33	0.31	250	10.01
12/20	3x95+2x50/2+1x10ST	12.7	65.5	69.5	7,390	4,275	15 N/mm²	0.206	0.37	0.3	301	13.6
12/20	3x120+2x70/2+1x10ST	14.4	69	73	8,680	5,400	15 N/mm²	0.161	0.41	0.29	352	17.16
12/20	3x150+2x70/2+1x10ST	16.2	75.7	79.7	10,280	6,750	15 N/mm²	0.129	0.44	0.28	404	21.45
12/20	3x185+2x95/2+1x10ST	17.8	79.2	83.2	11,670	8,352	15 N/mm²	0.106	0.48	0.27	462	26.46
12/20	3x240+2x120/2+1x10ST	20.6	86.4	91.4	14,560	10,800	15 N/mm²	0.08	0.54	0.26	540	34.32

▼ Archival copper-core-screen matrix · 14/25 kV · 9 rows

U0/U	Construction	Conductor Ø	Dmin	Dmax	kg/km	F table	F/(3S)	R20	C	L	A	Isc 1 s
14/25	3x25+2x25/2+1x10ST	6.5	54.4	58.4	4,290	1,125	15 N/mm²	0.78	0.2	0.38	131	3.58
14/25	3x35+2x25/2+1x10ST	7.6	56.8	60.8	4,780	1,575	15 N/mm²	0.554	0.22	0.36	162	5.01
14/25	3x50+2x25/2+1x10ST	9.1	59.9	63.9	5,540	2,250	15 N/mm²	0.386	0.26	0.34	202	7.15
14/25	3x70+2x35/2+1x10ST	10.9	65.5	69.5	6,800	3,150	15 N/mm²	0.272	0.28	0.32	250	10.01
14/25	3x95+2x50/2+1x10ST	12.7	69.3	73.3	7,980	4,275	15 N/mm²	0.206	0.31	0.31	301	13.6
14/25	3x120+2x70/2+1x10ST	14.4	74.7	78.7	9,540	5,400	15 N/mm²	0.161	0.35	0.3	352	17.16
14/25	3x150+2x70/2+1x10ST	16.2	79.6	83.6	10,900	6,750	15 N/mm²	0.129	0.37	0.29	404	21.45
14/25	3x185+2x95/2+1x10ST	17.8	83	87	12,450	8,352	15 N/mm²	0.106	0.4	0.28	462	26.46
14/25	3x240+2x120/2+1x10ST	20.6	90.2	95.2	15,250	10,800	15 N/mm²	0.08	0.45	0.27	540	34.32

▼ Archival copper-core-screen matrix · 18/30 kV · 9 rows

U0/U	Construction	Conductor Ø	Dmin	Dmax	kg/km	F table	F/(3S)	R20	C	L	A	Isc 1 s
18/30	3x25+2x25/2+1x10ST	6.5	56.5	60.5	4,360	1,125	15 N/mm²	0.78	0.17	0.41	131	3.58
18/30	3x35+2x25/2+1x10ST	7.6	58.8	62.8	5,090	1,575	15 N/mm²	0.554	0.18	0.39	162	5.01

U0/U	Construction	Conductor Ø	Dmin	Dmax	kg/km	F table	F/(3S)	R20	C	L	A	Isc 1 s
18/30	3x50+2x25/2+1x10ST	9.1	63.8	67.8	5,920	2,250	15 N/mm²	0.386	0.2	0.37	202	7.15
18/30	3x70+2x35/2+1x10ST	10.9	67.6	71.6	6,950	3,150	15 N/mm²	0.272	0.23	0.35	250	10.01
18/30	3x95+2x50/2+1x10ST	12.7	74.5	78.5	8,880	4,275	15 N/mm²	0.206	0.25	0.33	301	13.6
18/30	3x120+2x70/2+1x10ST	14.4	78.1	82.1	10,210	5,400	15 N/mm²	0.161	0.28	0.32	352	17.16
18/30	3x150+2x70/2+1x10ST	16.2	82.7	87.7	12,040	6,750	15 N/mm²	0.129	0.3	0.31	404	21.45
18/30	3x185+2x95/2+1x10ST	17.8	87.9	92.9	13,470	8,352	15 N/mm²	0.106	0.32	0.3	462	26.46
18/30	3x240+2x120/2+1x10ST	20.6	93.9	98.9	16,400	10,800	15 N/mm²	0.08	0.36	0.29	540	34.32

11. Critical document conflicts and engineering interpretation

Tensile-force conflict: the 2016 product text states 20 N/mm², but every table force equals 15 × 3 × phase section. A regional legacy document also states 15 N/mm². The 2019/2025 current table forces equal 20 × 3 × phase section.

Conductor finish changed: 2016/2019 descriptions state bare or untinned copper, while the 2025 brochure states tinned phase and PE conductors. Do not specify conductor finish from the family name alone.

Voltage range changed: the 2016 catalogue includes 14/25 and 18/30 kV; the 2019/2025 core matrix stops at 12/20 kV. The archival rows do not establish current availability.

Electrical-parameter header omission: the 2025 electrical summary line lists 3.6/6, 6/10 and 12/20 kV, while the adjacent current matrix also includes 8.7/15 kV. The 8.7/15 kV test and system values remain supported by the 2019 catalogue and table.

Reasoned inference: the most likely explanation for the archival tensile mismatch is that the tables retained a 15 N/mm² phase-conductor rule while the descriptive text was updated to 20 N/mm². This is an inference, not a corrected source value.

12. Representative engineering calculations

Three-phase apparent power: S = √3 × Uline × I
Active power example: P = S × 0.90
Resistance-only voltage drop: ΔU_R = √3 × I × R20 × 0.1 km
100 m cable weight force: W = mass(kg/km) × 0.1 × 9.81
Flexible minimum loop diameter (simple geometric check): approximately 2 × 10D

Not calculated without project data:
- complex voltage drop and reactive power under actual load, despite published C and L;
- reflected-wave overvoltage, because source impedance, switching waveform and termination are unknown;
- pilot-loop protection settings and core-screen fault current;
- dragging force, because friction, slope and snag factors are installation-specific.

U0/U	Construction	A	MVA	MW @0.9	ΔU_R/100 m	100 m weight	Fmax	2×10Dmax
3.6/6	3x95+2x50/2+1x10ST	301	3.13	2.82	0.179%	5.49 kN	5,700 N	569 mm
6/10	3x150+2x70/2+1x10ST	404	7	6.3	0.09%	8.14 kN	9,000 N	682 mm
8.7/15	3x240+2x120/2+1x10ST	574	14.91	13.42	0.053%	12.56 kN	14,400 N	833 mm
12/20	3x185+2x95/2+1x10ST	488	16.9	15.21	0.045%	10.64 kN	11,100 N	798 mm

13. Selection workflow

PROTOLON (SB-SAM) engineering selection workflow

1. Voltage
current or archival class

2. Core screen
none / concentric Cu

3. Mechanics
drag · F · R · torsion

4. Interface
pilot · PE · termination

- Select the exact U0/U and verify maximum system voltage and AC test voltage.
- Decide whether each phase requires a metallic concentric screen and redesign the termination accordingly.
- Calculate trailing pull, dynamic peaks, bending radius, abrasion path and permitted torsion.
- Confirm the two-part PE, 10 mm² pilot, pilot voltage/function and sealed termination dimensions.
- Treat 14/25 and 18/30 kV matrices as archival until current manufacture is contractually confirmed.

14. Installation, termination and acceptance

- Confirm the full designation, voltage class, conductor finish, screen option, phase section, split-PE section and pilot construction.
- Use sealed medium-voltage terminations sized to the exact Dmin/Dmax, semiconductive-layer design and core-screen architecture.
- Define whether the pilot is used for ground-check, interlock or control; verify voltage, current and continuity-monitoring equipment.
- For screened cores, engineer the bonding point, screen-fault current, touch voltage and protection clearing time.
- Verify the dragging route for abrasion, sharp rock edges, vehicle crossings, slope, water accumulation and cable recovery procedure.
- Control torsion: ±100°/m belongs to the unshielded product description; ±25°/m belongs to the archival screened design.
- Record conductor resistance, insulation/withstand results, PE continuity, pilot-loop resistance and dimensional inspection before commissioning.

15. FMEA — common failure modes

Wrong screen variant: an unshielded termination is used on a screened cable, creating field-control and earthing errors.

Archival force misread: 20 N/mm² is applied to a legacy table whose published force equals 15 N/mm².

Torsion overload: ±100°/m is applied to the screened design that was published at ±25°/m.

Pilot misuse: the 10 mm² pilot is connected without matching the ground-check or control system.

Sheath damage: dragging over sharp rock creates cuts that propagate through the bonded sheath system.

Version substitution: a 2016 bare-conductor design is replaced by a current tinned-conductor design without approval.

16. Source map and traceability

Role	Document	Pages	Use in this article
Current technical description	Prysmian Powering the Surface, 2025	pp. 32–35	Construction, 36-row matrix, 20 N/mm², ±100°/m, 6D/10D, tinned conductors.
Current identifiers	Prysmian Mining & Tunnelling General Catalogue, 2019	pp. 40–42	Selected Part/MLFB numbers and the same 36-row core matrix.
Archival extended range	Prysmian Solutions for the Mining Industry, 2016	pp. 40–47	Unscreened 14/25 and 18/30 kV data; 54-row copper-core-screen matrix.
Regional legacy cross-check	Legacy CSA-oriented SB-SAM screen document	pp. 1–4	15 N/mm², ±25°/m and screened construction; used only to explain the archival force conflict.

This guide is for preliminary engineering and source comparison. It does not certify present availability, approvals, compound identity, conductor finish, water depth or interchangeability of different document generations.

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