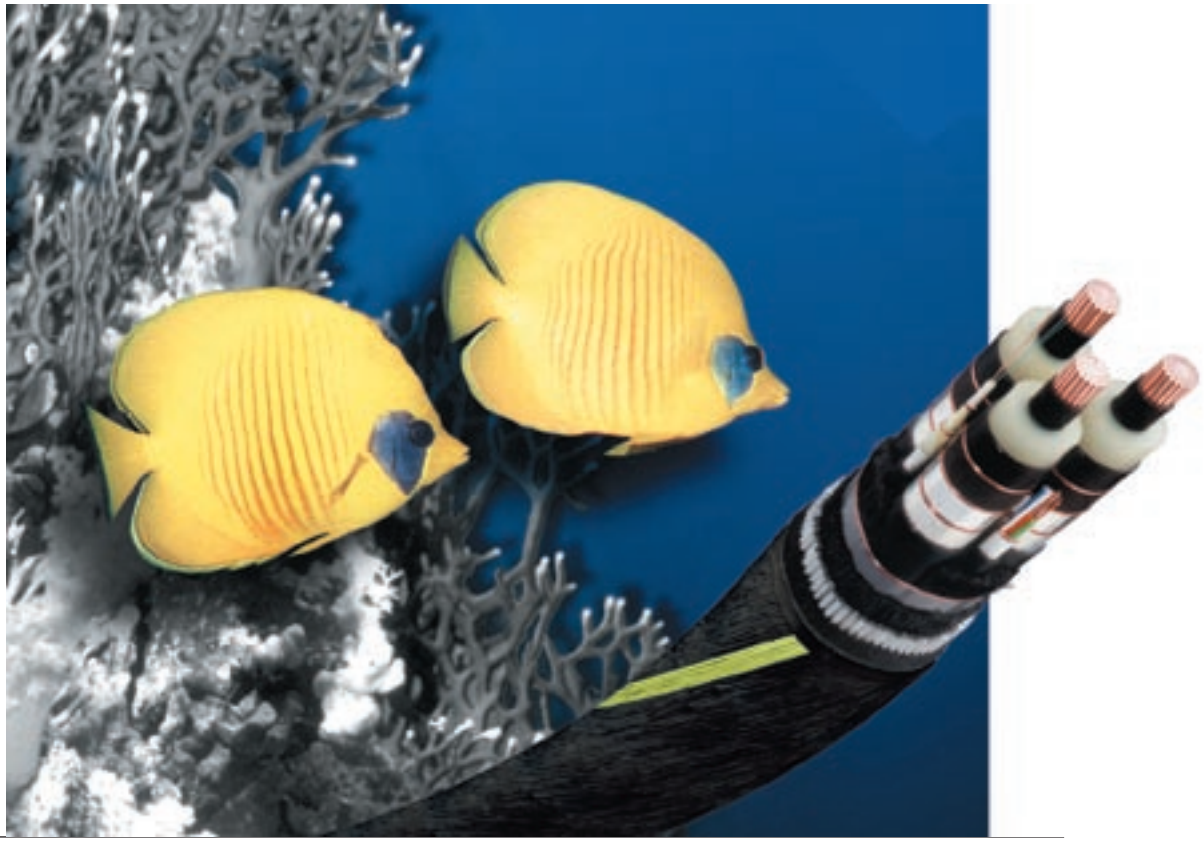
Nexans



Submarine Power Cables

Submarine Power Cables

Since decades Nexans' plant in Hannover is specialised in the design, production and installation of low and medium voltage submarine power cables required for offshore windfarms, river or lake crossings, power supply to islands and platforms for offshore oil and gas production.

Numerous successfully completed projects with our cables in Europe and overseas have proven the capability of Nexans' highly skilled technical staff to cope with submarine cable design, production, transportation and laying problems.

The experience gained by Nexans in the development of extra high voltage cables is further applied in the production of submarine power cables.

High voltage laboratory, partial discharge measurement and ac voltage test

The properties of cross-linked polyethylene (XLPE) and ethylene propylene rubber (EPR) insulated cables

Cross linked polyethylene and EPR have proven as excellent cable insulating compounds for submarine power cables. The main reasons are the outstanding electrical and mechanical properties of these materials:

- XLPE and EPR are solid dielectrics. They are maintenance free.
- XLPE and EPR insulated submarine power cables are usually supplied without a lead sheath. Their construction is therefore of lighter weight permitting longer continuous delivery lengths and easier handling during transportation and laying. The bending radius is small.
- The main electrical and mechanical characteristics of XLPE and EPR insulated medium voltage cables, are shown in table 1.

Cable laying within an offshore windfarm

	Dielectric loss factor tanδ	Dielectric constant ε_r	Insulation resistance	Operating temperature	Short circuit temperature
XLPE	0,0004	2,3	10^{17} Ω·cm	90 °C	250 °C
EPR	0,002	3	10^{14} Ω·cm	90 °C	250 °C

Table 1

Testing

Testing at the factory is done according to the specified national or international standards and furthermore in strict accordance to the rules of the Nexans quality assurance recommendations.

Modern testing facilities permit extensive testing of the cables as: routine tests - special tests - type tests.

Transportation, Laying, Field testing

Special manufacturing, storing and loading facilities for submarine power cables in long lengths have been developed at Nexans including the necessary provisions for transportation to seaports and direct transfer to cable laying vessels or to special loading platforms. Short lengths are supplied on tailor-made cable drums, while longer lengths are normally supplied in coils on steel pallets or in railcar units.

For the actual cable laying operation, these steel pallets can be placed by means of a floating crane onto barges or supply vessels. The cable is then laid directly from the coil into the water through a roller system which is necessary to avoid kinking.

Nexans has transportable special equipment for the transfer or submarine cables into cable vessels at its disposal.

Cable testing after installation and, in case of a damage, fault location with modern measuring equipment can be performed by Nexans as well.

Lifting a submarine power cable drum

Transport of a submarine cable in a railcar unit

Loading of a steel pallet containing 500 tons of submarine cables for China

Transport of a submarine cable drum on a heavy load trailer

Design of medium voltage submarine cables

Nexans supplies different types of submarine power cables depending on specific requirements and conditions at site. The cable constructions are based on the mayor national or international Standards e.g. VDE, IEC and ICEA or according to customers design and standards.

The Nexans Group has produced submarine power cables up to 525 kV A.C. with paper-oil insulation; our plant in Hannover is specialised in the production of submarine power cables with XLPE and EPR insulation up to 36 kV.

Medium-voltage submarine cable, including fibre optic cable

Typical design of a medium-voltage submarine cable with a maximum voltage up to 36 kV, including fibre optic cable.

Type: (F)2XS(FL)2Y>c<RAA

1. Conductor: copper, circular stranded compacted, longitudinally watertight
2. Conductor screening: extruded semi-conductive compound
3. Insulation: XLPE
4. Insulation screening: extruded semi-conductive compound
5. Screen: copper wires and copper helix, swelling powder or tape
6. Laminated sheath: aluminium tape bonded to overlaying PE sheath plus conductive coating
7. Fibre optic cable, optional
8. Fillers: polypropylene strings
9. Binder tapes
10. Bedding: polypropylene strings or polyester tape
11. Armour: galvanized round steel wires
12. Serving: bituminous compound, hessian tapes, polypropylene strings with coloured stripe

Medium-voltage submarine cable, XLPE insulated

Typical design of a medium-voltage submarine cable with a maximum voltage up to 36 kV

Type: (F)2XS2Y>c<RAA

1. Conductor: copper, circular stranded compacted, longitudinal water-tight
2. Conductor screening: extruded semi-conductive compound
3. Insulation: XLPE
4. Insulation screening: extruded semi-conductive compound
5. Screen: copper tapes
6. Separator: plastic foil
7. Sheath: PE
8. Fillers: polypropylene strings
9. Binder tapes
10. Bedding: polypropylene strings ot polyester tape
11. Armour: galvanized round steel wires
12. Serving: bituminous compound, hessian tapes, polypropylene strings with coloured stripe

Medium-voltage submarine cable, EPR insulated

Typical design of a medium-voltage submarine cable with a maximum voltage up to 36 kV

Type: (F)3GSERAA

1. Conductor: copper, circular stranded compacted, longitudinal water-tight
2. Conductor screening: extruded semi-conductive compound
3. Insulation: EPR
4. Insulation screening: extruded semi-conductive compound
5. Screen: copper tapes
6. Fillers: polypropylene strings
7. Binder tapes
8. Bedding: polypropylene strings or polyester tape
9. Armour: galvanized round steel wires
10. Serving: bituminous compound, hessian tapes, polypropylene strings with coloured stripe

Cable Data XLPE

Legend for tables

Constructional Data

1, 2, 3, 4, 5, 6, 7, 8	– Nominal values
9, 10, 11	– Approx. values

Electrical Data

1	– Nominal value
2	– Max. value to IEC 60228
3, 4, 5, 6, 9	– Approx. values
7	– Calculated in accordance to IEC publications 60287 and the following assumptions – Max. conductor temperature at continuous load 90 °C – Frequency 50 Hz – Max. ambient temperature 20 °C – Screens bonded at both ends and connected to earth – burrial depth of cables 1.0 m – Thermal resistivity of surroundings 1.0 K · m/W
8	– at current acc. to 7

Constructional Data, Electrical Data

(F)2XS(FL)2Y>c<RAA 6/10(12) kV — **Constructional Data**

1	2	3	4	5	6		7	8	9	10	11
Nominal cross sectional area of conductor	Conductor copper round stranded diameter over conductor	Insulation XLPE wall thickness	Screen copper wires and counter helix cross sectional area	Metallic tape aluminium wall thickness	Core sheath PE black wall thickness	diameter	Bedding wall thickness	Armour steel wires round galvanized diameter	Serving bitumen fib. material incl. colour strip wall thickness	Outer diameter of cable	Cable weight
(mm²)	(mm)	(mm)	(mm²)	(mm)	(mm)	(mm)	(mm)	(mm)	(mm)	(mm)	(t/km)
35	7.0	3.4	16	0.2	1.6	24	2	4.0	3.5	71	7.4
50	8.2	3.4	16	0.2	1.7	25	2	4.0	3.5	73	8.0
70	9.9	3.4	16	0.2	1.7	28	2	4.0	3.5	79	9.4
95	11.5	3.4	16	0.2	1.8	30	2	4.0	3.5	83	10.5
120	13.0	3.4	16	0.2	1.8	31	2	4.0	3.5	86	11.6
150	14.5	3.4	25	0.2	1.9	33	2	4.0	3.5	89	12.9
185	16.1	3.4	25	0.2	1.9	34	2	4.0	3.5	93	14.4
240	18.6	3.4	25	0.2	2.0	37	2	4.0	3.5	98	16.6

(F)2XS(FL)2Y>c<RAA 6/10(12) kV — **Electrical Data**

1		2	3	4	5	6	7	8	9	
Nominal cross sectional area		Conductor resistance DC 20 °C	Conductor resistance AC 90 °C	Screen resistance 20 °C	Capacitance	Inductance	Current rating	Losses	1s short circuit current after full load at 90 °C conductor temperature	
conductor (mm²)	screen (mm²)	(Ω/km)	(Ω/km)	(Ω/km)	(µF/km)	(mH/km)	(A)	(W/m)	conductor (kA)	screen (kA)
35	16	0.524	0.67	1.15	0.24	0.43	181	67	5.0	3.3
50	16	0.387	0.49	1.15	0.27	0.41	213	69	7.1	3.3
70	16	0.268	0.34	1.15	0.33	0.39	259	71	10.0	3.3
95	16	0.193	0.25	1.15	0.36	0.37	307	73	13.6	3.3
120	16	0.153	0.20	1.15	0.39	0.36	347	75	17.1	3.3
150	25	0.124	0.16	0.73	0.42	0.35	385	77	21.4	5.1
185	25	0.0991	0.13	0.73	0.46	0.34	430	78	26.5	5.1
240	25	0.0754	0.10	0.73	0.51	0.32	491	81	34.3	5.1

(F)2XS(FL)2Y>c<RAA 12/20(24) kV — Constructional Data

1	2	3	4	5	6		7	8	9	10	11
Nominal cross sectional area of conductor (mm²)	Conductor copper round stranded diameter over conductor (mm)	Insulation XLPE wall thickness (mm)	Screen copper wires and counter helix cross sectional area (mm²)	Metallic tape aluminium wall thickness (mm)	Core sheath PE black wall thickness (mm)	diameter (mm)	Bedding wall thickness (mm)	Armour steel wires round galvanized diameter (mm)	Serving bitumen fib. material incl. colour strip wall thickness (mm)	Outer diameter of cable (mm)	Cable weight (t/km)
35	7.0	5.5	16	0.2	1.8	28	2	4.0	3.5	79	8.7
50	8.2	5.5	16	0.2	1.8	29	2	4.0	3.5	82	9.2
70	9.9	5.5	16	0.2	1.9	32	2	4.0	3.5	88	10.6
95	11.5	5.5	16	0.2	1.9	34	2	4.0	3.5	91	11.7
120	13.0	5.5	16	0.2	2.0	35	2	4.0	3.5	95	12.9
150	14.5	5.5	25	0.2	2.0	37	2	4.0	3.5	98	14.4
185	16.1	5.5	25	0.2	2.1	38	2	4.0	3.5	102	15.9
240	18.6	5.5	25	0.2	2.2	41	2	4.0	3.5	107	18.1
300	20.6	5.5	25	0.2	2.2	43	2	4.0	3.5	111	20.4

(F)2XS(FL)2Y>c<RAA 12/20(24) kV — Electrical Data

1		2	3	4	5	6	7	8	9	
Nominal cross sectional area		Conductor resistance DC 20°C	Conductor resistance AC 90°C	Screen resistance 20°C	Capacitance	Inductance	Current rating	Losses	1s short circuit current after full load at 90°C conductor temperature	
conductor (mm²)	screen (mm²)	(Ω/km)	(Ω/km)	(Ω/km)	(µF/km)	(mH/km)	(A)	(W/m)	conductor (kA)	screen (kA)
35	16	0.524	0.67	1.15	0.17	0.46	180	67	5.0	3.3
50	16	0.387	0.49	1.15	0.19	0.44	212	69	7.1	3.3
70	16	0.268	0.34	1.15	0.22	0.42	258	71	10.0	3.3
95	16	0.193	0.25	1.15	0.25	0.40	306	73	13.6	3.3
120	16	0.153	0.20	1.15	0.27	0.38	346	75	17.1	3.3
150	25	0.124	0.16	0.73	0.29	0.37	384	77	21.4	5.1
185	25	0.0991	0.13	0.73	0.31	0.36	429	79	26.5	5.1
240	25	0.0754	0.098	0.73	0.34	0.34	500	86	34.3	5.1
300	25	0.0601	0.079	0.73	0.36	0.33	545	85	43.3	5.1

(F)2XS(FL)2Y>c<RAA 18/30(36) kV — Constructional Data

1	2	3	4	5	6		7	8	9	10	11
Nominal cross sectional area of conductor (mm²)	Conductor copper round stranded diameter over conductor (mm)	Insulation XLPE wall thickness (mm)	Screen copper wires and counter helix cross sectional area (mm²)	Metallic tape aluminium wall thickness (mm)	Core sheath PE black wall thickness (mm)	diameter (mm)	Bedding wall thickness (mm)	Armour steel wires round galvanized diameter (mm)	Serving bitumen fib. material incl. colour strip wall thickness (mm)	Outer diameter of cable (mm)	Cable weight (t/km)
50	8.2	8.0	16	0.2	2.0	34	2	4.0	3.5	92	10.7
70	9.9	8.0	16	0.2	2.1	37	2	4.0	3.5	98	12.2
95	11.5	8.0	16	0.2	2.1	38	2	4.0	3.5	102	13.5
120	13.0	8.0	16	0.2	2.2	40	2	4.0	3.5	105	14.8
150	14.5	8.0	25	0.2	2.2	41	2	4.0	3.5	108	16.0
185	16.1	8.0	25	0.2	2.3	43	2	4.0	3.5	112	17.6
240	18.6	8.0	25	0.2	2.3	46	2	4.0	4.0	118	20.1
300	20.6	8.0	25	0.2	2.4	48	2	4.0	4.0	123	22.5
400	23.8	8.0	35	0.2	2.5	51	2	4.2	4.0	131	26.6
500	26.6	8.0	35	0.2	2.6	54	2	4.5	4.0	138	31.3
630	30.6	8.0	35	0.2	2.7	58	2	4.75	4.0	147	37.2

(F)2XS(FL)2Y>c<RAA 18/30(36) kV — Electrical Data

1		2	3	4	5	6	7	8	9	
Nominal cross sectional area		Conductor resistance DC 20°C	Conductor resistance AC 90°C	Screen resistance 20°C	Capacitance	Inductance	Current rating	Losses	1s short circuit current after full load at 90°C conductor temperature	
conductor (mm²)	screen (mm²)	(Ω/km)	(Ω/km)	(Ω/km)	(µF/km)	(mH/km)	(A)	(W/m)	conductor (kA)	screen (kA)
50	16	0.387	0.49	1.15	0.15	0.47	211	68	7.1	3.3
70	16	0.268	0.34	1.15	0.17	0.45	257	71	10.0	3.3
95	16	0.193	0.25	1.15	0.19	0.43	306	73	13.6	3.3
120	16	0.153	0.20	1.15	0.20	0.41	346	76	17.1	3.3
150	25	0.124	0.16	0.73	0.22	0.40	384	78	21.4	5.1
185	25	0.0991	0.13	0.73	0.23	0.38	430	80	26.5	5.1
240	25	0.0754	0.098	0.73	0.26	0.37	490	83	34.3	5.1
300	25	0.0601	0.079	0.73	0.27	0.36	543	85	43.3	5.1
400	35	0.0470	0.063	0.53	0.30	0.34	600	89	57.8	7.1
500	35	0.0366	0.050	0.53	0.33	0.33	659	93	72.2	7.1
630	35	0.0283	0.041	0.53	0.37	0.32	721	97	91.0	7.1

Cable Data XLPE

Legend for tables

Constructional Data

1, 2, 3, 4, 5, 6, 7, 8	– Nominal values
9, 10, 11	– Approx. values

Electrical Data

1	– Nominal value
2	– Max. value to IEC 60228
3, 4, 5, 6, 9	– Approx. values
7	– Calculated in accordance to IEC publications 60287 and the following assumptions – Max. conductor temperature at continuous load 90 °C – Frequency 50 Hz – Max. ambient temperature 20 °C – Screens bonded at both ends and connected to earth – burrial depth of cables 1.0 m – Thermal resistivity of surroundings 1.0 K · m/W
8	– at current acc. to 7

Constructional Data, Electrical Data

A2XS(FL)2Y>c<RAA 6/10(12) kV — **Constructional Data**

1	2	3	4	5	6		7	8	9	10	11
Nominal cross sectional area of conductor	Conductor aluminium round solid diameter over conductor	Insulation XLPE wall thickness	Screen copper wires and counter helix cross sectional area	Metallic tape aluminium wall thickness	Core sheath PE black wall thickness	diameter	Bedding wall thickness	Armour steel wires round galvanized diameter	Serving bitumen fib. material incl. colour strip wall thickness	Outer diameter of cable	Cable weight
(mm²)	(mm)	(mm)	(mm²)	(mm)	(mm)	(mm)	(mm)	(mm)	(mm)	(mm)	(t/km)
50	7.5	3.4	16	0.2	1.7	25	2	4.0	3.5	72	6.9
70	9.5	3.4	16	0.2	1.7	27	2	4.0	3.5	76	7.6
95	11.0	3.4	16	0.2	1.8	28	2	4.0	3.5	79	8.3
120	12.2	3.4	16	0.2	1.8	29	2	4.0	3.5	82	8.7
150	13.5	3.4	25	0.2	1.9	30	2	4.0	3.5	85	9.6
185	15.0	3.4	25	0.2	1.9	32	2	4.0	3.5	88	10.3
240	17.1	3.4	25	0.2	2.0	34	2	4.0	3.5	92	11.1
300	19.0	3.4	25	0.2	2.1	36	2	4.0	3.5	97	12.2

A2XS(FL)2Y>c<RAA 6/10(12) kV — **Electrical Data**

1		2	3	4	5	6	7	8	9	
Nominal cross sectional area		Conductor resistance DC 20 °C	Conductor resistance AC 90 °C	Screen resistance 20 °C	Capacitance	Inductance	Current rating	Losses	1s short circuit current after full load at 90 °C conductor temperature	
conductor (mm²)	screen (mm²)	(Ω/km)	(Ω/km)	(Ω/km)	(µF/km)	(mH/km)	(A)	(W/m)	conductor (kA)	screen (kA)
50	16	0.641	0.82	1.15	0.25	0.42	164	68	4.9	3.3
70	16	0.443	0.57	1.15	0.29	0.39	201	71	6.8	3.3
95	16	0.320	0.41	1.15	0.33	0.37	239	73	9.2	3.3
120	16	0.253	0.32	1.15	0.35	0.36	271	74	11.7	3.3
150	25	0.206	0.26	0.73	0.38	0.35	300	75	14.5	5.1
185	25	0.164	0.21	0.73	0.41	0.34	338	77	17.8	5.1
240	25	0.125	0.16	0.73	0.46	0.32	388	79	23.1	5.1
300	25	0.100	0.13	0.73	0.50	0.32	433	81	28.9	5.1

A2XS(FL)2Y>c<RAA 12/20(24) kV — Constructional Data

1	2	3	4	5	6		7	8	9	10	11
Nominal cross sectional area of conductor	Conductor aluminium round solid diameter over conductor	Insulation XLPE wall thickness	Screen copper wires and counter helix cross sectional area	Metallic tape aluminium wall thickness	Core sheath PE black wall thickness	diameter	Bedding wall thickness	Armour steel wires round galvanized diameter	Serving bitumen fib. material incl. colour strip wall thickness	Outer diameter of cable	Cable weight
(mm^2)	(mm)	(mm)	(mm^2)	(mm)	(mm)	(mm)	(mm)	(mm)	(mm)	(mm)	(t/km)
50	7.5	5.5	16	0.2	1.8	29	2	4.0	3.5	80	8.1
70	9.5	5.5	16	0.2	1.9	31	2	4.0	3.5	85	8.8
95	11.0	5.5	16	0.2	1.9	32	2	4.0	3.5	88	9.5
120	12.2	5.5	16	0.2	2.0	33	2	4.0	3.5	91	10.0
150	13.5	5.5	25	0.2	2.0	34	2	4.0	3.5	93	10.9
185	15.0	5.5	25	0.2	2.1	36	2	4.0	3.5	97	11.7
240	17.1	5.5	25	0.2	2.2	38	2	4.0	3.5	101	12.6
300	19.0	5.5	25	0.2	2.2	40	2	4.0	3.5	105	13.6
400	21.4	5.5	35	0.2	2.4	43	2	4.0	3.5	112	15.3

A2XS(FL)2Y>c<RAA 12/20(24) kV — Electrical Data

1		2	3	4	5	6	7	8	9	
Nominal cross sectional area		Conductor resistance DC 20°C	Conductor resistance AC 90°C	Screen resistance 20°C	Capacitance	Inductance	Current rating	Losses	1s short circuit current after full load at 90°C conductor temperature	
conductor (mm^2)	screen (mm^2)	(Ω/km)	(Ω/km)	(Ω/km)	(μF/km)	(mH/km)	(A)	(W/m)	conductor (kA)	screen (kA)
50	16	0.641	0.82	1.15	0.18	0.45	164	68	4.9	3.3
70	16	0.443	0.57	1.15	0.21	0.42	201	71	6.8	3.3
95	16	0.320	0.41	1.15	0.22	0.40	238	72	9.2	3.3
120	16	0.253	0.32	1.15	0.24	0.39	270	74	11.7	3.3
150	25	0.206	0.26	0.73	0.26	0.37	299	75	14.5	5.1
185	25	0.164	0.21	0.73	0.28	0.36	337	77	17.8	5.1
240	25	0.125	0.16	0.73	0.31	0.35	387	80	23.1	5.1
300	25	0.100	0.13	0.73	0.33	0.34	433	83	28.9	5.1
400	35	0.0778	0.10	0.53	0.36	0.33	494	88	38.2	7.1

A2XS(FL)2Y>c<RAA 18/30(36) kV — Constructional Data

1	2	3	4	5	6		7	8	9	10	11
Nominal cross sectional area of conductor	Conductor aluminium round solid diameter over conductor	Insulation XLPE wall thickness	Screen copper wires and counter helix cross sectional area	Metallic tape aluminium wall thickness	Core sheath PE black wall thickness	diameter	Bedding wall thickness	Armour steel wires round galvanized diameter	Serving bitumen fib. material incl. colour strip wall thickness	Outer diameter of cable	Cable weight
(mm^2)	(mm)	(mm)	(mm^2)	(mm)	(mm)	(mm)	(mm)	(mm)	(mm)	(mm)	(t/km)
70	9.5	8.0	16	0.2	2.1	35	2	4.0	3.5	95	10.5
95	11.0	8.0	16	0.2	2.1	37	2	4.0	3.5	98	11.2
120	12.2	8.0	16	0.2	2.2	38	2	4.0	3.5	101	11.8
150	13.5	8.0	25	0.2	2.2	39	2	4.0	3.5	104	12.8
185	15.0	8.0	25	0.2	2.3	41	2	4.0	3.5	107	13.3
240	17.1	8.0	25	0.2	2.3	43	2	4.0	3.5	111	14.4
300	19.0	8.0	25	0.2	2.4	45	2	4.0	4.0	117	15.8
400	21.4	8.0	35	0.2	2.5	48	2	4.0	4.0	123	17.5
500	24.5	8.0	35	0.2	2.6	51	2	4.2	4.0	130	19.6
630	27.8	8.0	35	0.2	2.7	54	2	4.5	4.0	138	22.7

A2XS(FL)2Y>c<RAA 18/30(36) kV — Electrical Data

1		2	3	4	5	6	7	8	9	
Nominal cross sectional area		Conductor resistance DC 20°C	Conductor resistance AC 90°C	Screen resistance 20°C	Capacitance	Inductance	Current rating	Losses	1s short circuit current after full load at 90°C conductor temperature	
conductor (mm^2)	screen (mm^2)	(Ω/km)	(Ω/km)	(Ω/km)	(μF/km)	(mH/km)	(A)	(W/m)	conductor (kA)	screen (kA)
70	16	0.443	0.57	1.15	0.16	0.45	200	70	6.8	3.3
95	16	0.320	0.41	1.15	0.17	0.43	237	72	9.2	3.3
120	16	0.253	0.32	1.15	0.19	0.41	269	74	11.7	3.3
150	25	0.206	0.26	0.73	0.20	0.40	299	76	14.5	5.1
185	25	0.164	0.21	0.73	0.21	0.39	337	78	17.8	5.1
240	25	0.125	0.16	0.73	0.22	0.37	388	81	23.1	5.1
300	25	0.100	0.13	0.73	0.25	0.36	432	82	28.9	5.1
400	35	0.0778	0.10	0.53	0.27	0.35	484	85	38.2	7.1
500	35	0.0605	0.080	0.53	0.30	0.33	544	89	47.7	7.1
630	35	0.0469	0.063	0.53	0.33	0.32	606	92	60.1	7.1

Cable Data XLPE

Legend for tables

Constructional Data

1, 2, 3, 4, 5, 6, 7, 8	– Nominal values
9, 10, 11	– Approx. values

Electrical Data

1	– Nominal value
2	– Max. value to IEC 60228
3, 4, 5, 6, 9	– Approx. values
7	– Calculated in accordance to IEC publications 60287 and the following assumptions – Max. conductor temperature at continuous load 90 °C – Frequency 50 Hz – Max. ambient temperature 20 °C – Screens bonded at both ends and connected to earth – burrial depth of cables 1.0 m – Thermal resistivity of surroundings 1.0 K · m/W
8	– at current acc. to 7

Constructional Data, Electrical Data

(F)2XS2Y>c<RAA 6/10(12) kV — **Constructional Data**

1	2	3	4	6		7	8	9	10	11
Nominal cross sectional area of conductor	Conductor copper round stranded diameter over conductor	Insulation XLPE wall thickness	Screen copper wires and counter helix cross sectional area	Core sheath PE black wall thickness	diameter	Bedding wall thickness	Armour steel wires round galvanized diameter	Serving bitumen fib. material incl. colour strip wall thickness	Outer diameter of cable	Cable weight
(mm^2)	(mm)	(mm)	(mm^2)	(mm)	(mm)	(mm)	(mm)	(mm)	(mm)	(t/km)
35	7.0	3.4	4	1.6	22	2	4.0	3.5	67	6.6
50	8.2	3.4	5.4	1.6	24	2	4.0	3.5	70	7.3
70	9.9	3.4	5.4	1.7	26	2	4.0	3.5	76	8.6
95	11.5	3.4	6	1.7	28	2	4.0	3.5	79	9.8
120	13.0	3.4	6	1.8	29	2	4.0	3.5	82	10.8
150	14.5	3.4	6	1.8	31	2	4.0	3.5	86	12.0
185	16.1	3.4	6	1.9	33	2	4.0	3.5	89	13.5
240	18.6	3.4	8	2.0	35	2	4.0	3.5	94	15.7

(F)2XS2Y>c<RAA 6/10(12) kV — **Electrical Data**

1		2	3	4	5	6	7	8	9	
Nominal cross sectional area		Conductor resistance DC 20 °C	Conductor resistance AC 90 °C	Screen resistance 20 °C	Capacitance	Inductance	Current rating	Losses	1s short circuit current after full load at 90 °C conductor temperature	
conductor (mm^2)	screen (mm^2)	(Ω/km)	(Ω/km)	(Ω/km)	(µF/km)	(mH/km)	(A)	(W/m)	conductor (kA)	screen (kA)
35	4	0.524	0.67	1.83	0.24	0.42	180	65	5.0	0.74
50	5.4	0.387	0.49	1.15	0.27	0.40	212	67	7.1	0.99
70	5.4	0.268	0.34	1.15	0.33	0.38	258	70	10.0	0.99
95	6	0.193	0.25	1.05	0.36	0.36	306	71	13.6	1.1
120	6	0.153	0.20	1.05	0.39	0.35	347	73	17.1	1.1
150	6	0.124	0.16	1.05	0.42	0.34	387	75	21.4	1.1
185	6	0.0991	0.13	1.05	0.46	0.33	434	77	26.5	1.1
240	8	0.0754	0.098	0.77	0.51	0.31	497	80	34.3	1.5

(F)2XS2Y>c<RAA 12/20(24) kV — Constructional Data

1	2	3	4	6		7	8	9	10	11
Nominal cross sectional area of conductor	Conductor copper round stranded diameter over conductor	Insulation XLPE wall thickness	Screen copper wires and counter helix cross sectional area	Core sheath PE black wall thickness	diameter	Bedding wall thickness	Armour steel wires round galvanized diameter	Serving bitumen fib. material incl. colour strip wall thickness	Outer diameter of cable	Cable weight
(mm^2)	(mm)	(mm)	(mm^2)	(mm)	(mm)	(mm)	(mm)	(mm)	(mm)	(t/km)
35	7.0	5.5	6	1.7	26	2	4.0	3.5	76	7.9
50	8.2	5.5	6	1.8	28	2	4.0	3.5	78	8.6
70	9.9	5.5	6	1.8	30	2	4.0	3.5	84	9.8
95	11.5	5.5	6	1.9	32	2	4.0	3.5	88	11.1
120	13.0	5.5	6	1.9	33	2	4.0	3.5	91	12.2
150	14.5	5.5	8	2.0	35	2	4.0	3.5	94	13.5
185	16.1	5.5	8	2.1	37	2	4.0	3.5	98	15.0
240	18.6	5.5	8	2.1	39	2	4.0	3.5	103	17.4

(F)2XS2Y>c<RAA 12/20(24) kV — Electrical Data

1		2	3	4	5	6	7	8	9	
Nominal cross sectional area		Conductor resistance DC 20 °C	Conductor resistance AC 90 °C	Screen resistance 20 °C	Capacitance	Inductance	Current rating	Losses	1s short circuit current after full load at 90 °C conductor temperature	
conductor (mm^2)	screen (mm^2)	(Ω/km)	(Ω/km)	(Ω/km)	(μF/km)	(mH/km)	(A)	(W/m)	conductor (kA)	screen (kA)
35	6	0.524	0.67	1.05	0.17	0.45	179	65	5.0	1.1
50	6	0.387	0.49	1.05	0.19	0.43	211	67	7.1	1.1
70	6	0.268	0.34	1.05	0.22	0.41	246	64	10.0	1.1
95	6	0.193	0.25	1.05	0.25	0.39	306	71	13.6	1.1
120	6	0.153	0.20	1.05	0.26	0.37	353	74	17.1	1.1
150	8	0.124	0.16	0.77	0.29	0.36	386	75	21.4	1.5
185	8	0.0991	0.13	0.77	0.31	0.35	433	77	26.5	1.5
240	8	0.0754	0.098	0.77	0.34	0.34	498	81	34.3	1.5

(F)2XS2Y>c<RAA 18/30(36) kV — Constructional Data

1	2	3	4	6		7	8	9	10	11
Nominal cross sectional area of conductor	Conductor copper round stranded diameter over conductor	Insulation XLPE wall thickness	Screen copper wires and counter helix cross sectional area	Core sheath PE black wall thickness	diameter	Bedding wall thickness	Armour steel wires round galvanized diameter	Serving bitumen fib. material incl. colour strip wall thickness	Outer diameter of cable	Cable weight
(mm^2)	(mm)	(mm)	(mm^2)	(mm)	(mm)	(mm)	(mm)	(mm)	(mm)	(t/km)
50	8.2	8.0	6	2.0	32	2	4.0	3.5	88	10.0
70	9.9	8.0	6	2.0	35	2	4.0	3.5	94	11.6
95	11.5	8.0	6	2.1	37	2	4.0	3.5	98	12.8
120	13.0	8.0	6	2.1	38	2	4.0	3.5	101	13.9
150	14.5	8.0	8	2.2	40	2	4.0	3.5	104	15.3
185	16.1	8.0	8	2.2	42	2	4.0	3.5	110	17.2
240	18.6	8.0	8	2.3	44	2	4.0	3.5	113	18.9
300	20.6	8.0	8	2.4	46	2	4.0	4.0	119	21.6

(F)2XS2Y>c<RAA 18/30(36) kV — Electrical Data

1		2	3	4	5	6	7	8	9	
Nominal cross sectional area		Conductor resistance DC 20 °C	Conductor resistance AC 90 °C	Screen resistance 20 °C	Capacitance	Inductance	Current rating	Losses	1s short circuit current after full load at 90 °C conductor temperature	
conductor (mm^2)	screen (mm^2)	(Ω/km)	(Ω/km)	(Ω/km)	(μF/km)	(mH/km)	(A)	(W/m)	conductor (kA)	screen (kA)
50	6	0.387	0.49	1.05	0.15	0.46	214	70	7.1	1.1
70	6	0.268	0.34	1.05	0.17	0.44	256	70	10.0	1.1
95	6	0.193	0.25	1.05	0.19	0.42	305	72	13.6	1.1
120	6	0.153	0.20	1.05	0.20	0.40	346	74	17.1	1.1
150	8	0.124	0.16	0.77	0.22	0.39	386	76	21.4	1.5
185	8	0.0991	0.13	0.77	0.23	0.38	435	79	26.5	1.5
240	8	0.0754	0.098	0.77	0.26	0.36	499	82	34.3	1.5
300	8	0.0601	0.079	0.77	0.27	0.35	554	84	43.3	1.5

Cable Data EPR

Legend for tables

Constructional Data

1, 2, 3, 4, 5, 6 – Nominal values
7, 8, 9 – Approx. values

Electrical Data

1 – Nominal value
2 – Max. value to IEC 60228
3, 4, 5, 6, 9 – Approx. values
7 – Calculated in accordance to IEC publications 60287 and the following assumptions
– Max. conductor temperature at continuous load 90 °C
– Frequency 50 Hz
– Max. ambient temperature 20 °C
– Screens bonded at both ends and connected to earth
– burrial depth of cables 1.0 m
– Thermal resistivity of surroundings 1.0 K · m/W
8 – at current acc. to 7

Constructional Data, Electrical Data

(F)3GSERAA 6/10(12) kV — **Constructional Data**

1	2	3	4	5	6	7	8	9
Nominal cross sectional area of conductor (mm²)	Conductor copper round stranded diameter over conductor (mm)	Insulation EPR wall thickness (mm)	Screen copper tapes cross sectional area (mm²)	Bedding wall thickness (mm)	Armour steel wires round galvanized diameter (mm)	Serving bitumen fib. material incl. colour strip wall thickness (mm)	Outer diameter of cable (mm)	Cable weight (t/km)
35	7.0	3.4	3x4	2	4.0	3.5	56	5.4
50	8.2	3.4	3x4	2	4.0	3.5	58	6.0
70	9.9	3.4	3x5.4	2	4.0	3.5	64	7.3
95	11.5	3.4	3x5.4	2	4.0	3.5	68	8.5
120	13.0	3.4	3x5.4	2	4.0	3.5	71	9.5
150	14.5	3.4	3x6	2	4.0	3.5	74	10.7
185	16.1	3.4	3x6	2	4.0	3.5	78	12.2
240	18.6	3.4	3x6	2	4.0	3.5	83	14.3

(F)3GSERAA 6/10(12) kV — **Electrical Data**

1		2	3	4	5	6	7	8	9	
Nominal cross sectional area		Conductor resistance DC 20 °C	Conductor resistance AC 90 °C	Screen resistance 20 °C	Capacitance	Inductance	Current rating	Losses	1s short circuit current after full load at 90 °C conductor temperature	
conductor (mm²)	screen (mm²)	(Ω/km)	(Ω/km)	(Ω/km)	(µF/km)	(mH/km)	(A)	(W/m)	conductor (kA)	screen (kA)
35	3x4	0.524	0.67	1.83	0.28	0.36	165	55	5.0	2.2
50	3x4	0.387	0.49	1.83	0.31	0.34	195	58	7.1	2.2
70	3x5.4	0.268	0.34	1.15	0.39	0.34	239	61	10.0	2.9
95	3x5.4	0.193	0.25	1.15	0.43	0.32	286	63	13.6	2.9
120	3x5.4	0.153	0.20	1.15	0.46	0.31	325	65	17.1	2.9
150	3x6	0.124	0.16	1.05	0.50	0.30	364	67	21.4	3.3
185	3x6	0.0991	0.13	1.05	0.54	0.29	410	69	26.5	3.3
240	3x6	0.0754	0.099	1.05	0.61	0.28	472	73	34.3	3.3

(F)3GSERAA 12/20(24) kV — Constructional Data

1	2	3	4	5	6	7	8	9
Nominal cross sectional area of conductor (mm²)	Conductor copper round stranded diameter over conductor (mm)	Insulation EPR wall thickness (mm)	Screen copper tapes cross sectional area (mm²)	Bedding wall thickness (mm)	Armour steel wires round galvanized diameter (mm)	Serving bitumen fib. material incl. colour strip wall thickness (mm)	Outer diameter of cable (mm)	Cable weight (t/km)
35	7.0	5.5	3x5.4	2	4.0	3.5	64	6.6
50	8.2	5.5	3x5.4	2	4.0	3.5	67	7.4
70	9.9	5.5	3x6	2	4.0	3.5	73	8.7
95	11.5	5.5	3x6	2	4.0	3.5	76	9.9
120	13.0	5.5	3x6	2	4.0	3.5	80	11.1
150	14.5	5.5	3x6	2	4.0	3.5	83	12.3
185	16.1	5.5	3x6	2	4.0	3.5	86	13.8
240	18.6	5.5	3x10	2	4.0	3.5	92	16.0

(F)3GSERAA 12/20(24) kV — Electrical Data

1		2	3	4	5	6	7	8	9	
Nominal cross sectional area		Conductor resistance DC 20 °C	Conductor resistance AC 90 °C	Screen resistance 20 °C	Capacitance	Inductance	Current rating	Losses	1s short circuit current after full load at 90 °C conductor temperature	
conductor (mm²)	screen (mm²)	(Ω/km)	(Ω/km)	(Ω/km)	(μF/km)	(mH/km)	(A)	(W/m)	conductor (kA)	screen (kA)
35	3x5.4	0.524	0.67	1.05	0.20	0.41	165	56	5.0	2.9
50	3x5.4	0.387	0.49	1.05	0.22	0.39	191	56	7.1	2.9
70	3x6	0.268	0.34	1.05	0.27	0.37	239	61	10.0	3.3
95	3x6	0.193	0.25	1.05	0.29	0.35	286	64	13.6	3.3
120	3x6	0.153	0.20	1.05	0.32	0.34	322	65	17.1	3.3
150	3x6	0.124	0.16	1.05	0.34	0.33	363	68	21.4	3.3
185	3x6	0.0991	0.13	1.05	0.37	0.32	408	70	26.5	3.3
240	3x10	0.0754	0.098	0.63	0.41	0.31	470	74	34.3	5.4

(F)3GSERAA 18/30(36) kV — Constructional Data

1	2	3	4	5	6	7	8	9
Nominal cross sectional area of conductor (mm²)	Conductor copper round stranded diameter over conductor (mm)	Insulation EPR wall thickness (mm)	Screen copper tapes cross sectional area (mm²)	Bedding wall thickness (mm)	Armour steel wires round galvanized diameter (mm)	Serving bitumen fib. material incl. colour strip wall thickness (mm)	Outer diameter of cable (mm)	Cable weight (t/km)
50	8.2	8.0	3x6	2	4.0	3.5	77	9.1
70	9.9	8.0	3x6	2	4.0	3.5	83	10.6
95	11.5	8.0	3x6	2	4.0	3.5	86	11.8
120	13.0	8.0	3x6	2	4.0	3.5	89	13.0
150	14.5	8.0	3x10	2	4.0	3.5	93	14.3
185	16.1	8.0	3x10	2	4.0	3.5	96	15.8
240	18.6	8.0	3x10	2	4.0	3.5	102	18.2

(F)3GSERAA 18/30(36) kV — Electrical Data

1		2	3	4	5	6	7	8	9	
Nominal cross sectional area		Conductor resistance DC 20 °C	Conductor resistance AC 90 °C	Screen resistance 20 °C	Capacitance	Inductance	Current rating	Losses	1s short circuit current after full load at 90 °C conductor temperature	
conductor (mm²)	screen (mm²)	(Ω/km)	(Ω/km)	(Ω/km)	(μF/km)	(mH/km)	(A)	(W/m)	conductor (kA)	screen (kA)
50	3x6	0.387	0.49	1.05	0.17	0.42	195	58	7.1	3.3
70	3x6	0.268	0.34	1.05	0.21	0.41	238	62	10.0	3.3
95	3x6	0.193	0.25	1.05	0.22	0.39	285	64	13.6	3.3
120	3x6	0.153	0.20	1.05	0.24	0.37	323	66	17.1	3.3
150	3x10	0.124	0.16	0.63	0.26	0.36	361	68	21.4	5.4
185	3x10	0.0991	0.13	0.63	0.28	0.35	406	71	26.5	5.4
240	3x10	0.0754	0.098	0.63	0.30	0.33	467	74	34.3	5.4

Applications

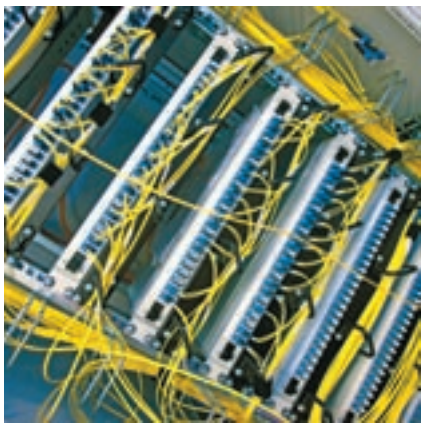
Offshore windfarm

Offshore production platform in Indonesia,
with power supply through a submarine cable

Landing a submarine cable at shore of an Australien Island

34.5 kV shore substation submarine cable project Mindanao, Philippines

Accessories and Services



Accessories

Accessories – from cable hang-offs via sealing ends for the connection to the switchgears up to the splice boxes for optical fibre cables – enable comprehensive solutions for cabling systems. They offer planners and operators a wide variety of standardized components for a high degree of flexibility.

Service

Highspecialized Nexans employees, trained for offshore jobs, carry out the demanding tasks on site – from the connection to switchgears, the splicing of optical fibre cables for data communication, up to the commissioning tests which successfully conclude the installation work.

Project management

Nexans project management teams are looking after the submarine cable projects. The project manager or project team in charge plans and supervises individual operational sequences and coordinates processes – until the successful conclusion of the project.

Engineering

The development of new products, processes and systems in close collaboration with the customer is the concept behind the success of Nexans. The fact that production, project management, sales and engineering are all located at the same premises, is an advantage turned to good account at our Hanover location. This way, the individual technically and economically optimized system solutions are developed to guarantee the safe operation of offshore wind park facilities and other applications.

Environment management

Keeping ecological concerns for the protection of resources in mind, economical advantages can be achieved. A constant reduction of raw materials and energy consumption as well as the consistent improvement of our products, processes and technologies in ecological terms is part of our environmental policy.

Nexans welcomes your inquiries. For elaboration of a proposal most suitable for your individual requirements, detailed informations should be given to the following questions (as far as applicable):

1. Application

Attach plan of layout, if possible .....

2. Transmitted voltage

Rated system voltage (U_O/U) .....
Highest continuous voltage (U_m) .....
Operating frequency .....

3. Transmitted power

Rated transmitted power (kVA) .....
Short circuit current (kA) .....
Short circuit duration (s) .....

4. Type of operation

Public network (load cycling) .....
Continuous full load operation .....
Requirements for control/telecommunication circuits .....

5. Grounding conditions .....

6. Conditions of cable route

Length of cable route (route plan) .....
Water depth .....
Water flow conditions/tide .....
Thermal resistance of the soil .....
Laying depth .....
Soil temperature .....
Conditions of the cable route at the beginning and at the end .....
Cable laying in pipes or in the air .....
Ambient temperature .....
On-shore cable protection requirements .....

7. Transport and laying conditions

Required laying method (laying on bottom, water jet trenching) .....
Will laying be performed by customer or seperate subcontractor .....
Are there limitations for handling sizes and weights .....
Are cable laying barges available .....
Load carrying capacity of the laying barge .....
Dimensions of the loading platform .....

For your notes

For your notes

For your notes

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