



XLPE-INSULATED POWER CABLES

for voltages from 45 kV up to 330 kV

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About company



75 years of experience in the cable industry



We are among the eight largest producers of cable products in the CIS



More than 15 000 different brands and sizes of cables and wires



Member of the international associations Electrocable and Intercable



About 1000 employees



23 hectare area



ISO 9001 and ISO 14001 management systems implemented



Among our customers are enterprises of different industries



Cables and cable systems installation and supervising



100% continuous automated testing



Winner of the award Business Initiative Directions - International Gold Star



Testing centre of cable products is accredited in the National agency for accreditation of Ukraine



Recognized supplier of cable products for nuclear power plants

KEMA



KEMA (Netherlands), VDE (Germany), innogy SE Eurotest (Germany), IEn (Poland) certification



Clients from Armenia, Azerbaijan, Belarus, Bulgaria, France, Georgia, Germany, India, Iran, Israel, Kazakhstan, Kenya, Kyrgyzstan, Lithuania, Moldova, Poland, Russia, Tajikistan, Turkmenistan, Ukraine, Uzbekistan



XLPE-insulated power cables produced by YUZHicable WORKS PJSC

CONSTRUCTION:

- conductor — compacted copper or aluminum conductor, nominal conductor cross-section from 35 mm² up to 2000 mm²;
- inner semiconductor layer, insulation, outer semiconductor layer — ultra-smooth semiconductor layers create a uniform electric field and are tightly connected with insulation, which increases the cable's resistance to short-circuit currents and the effects of heating and cooling cycles;
- screen — copper wire and copper tape counter-helix, nominal screen cross-section from 16 mm² up to 400 mm², longitudinal sealing with water swelling tape and radial sealing with aluminum foil;
- outer sheath — depending on the cable laying, it can be made of high-density polyethylene, a flame retardant polymer composition, a halogen free polymer composition or polyvinyl chloride plastic.

CABLES TYPE:

- with compacted conductors sealed of water-blocking yarns;
- with aluminum single-wire conductors;
- with conductor cross-section from 1200 mm² up to 2000 mm² (Milliken);
- flame retardant outer sheath;
- flame retardant with low smoke and corrosive gases outer sheath;
- with halogen free outer sheath;
- tropical;
- with semiconductor layer on the outer sheath;
- with metal sheath (aluminum or lead);
- with aluminum screen.

TECHNOLOGY AND MATERIALS:

- the use of vacuum packaging for the transportation of insulating materials and the closed process of their loading and extrusion provides maximum purity of insulation;
- conductive wires are twisted and compacted on a Cortinovis twisting machine. The use of layer compression allows to have



a high coefficient of compacting of the conductor and its smooth surface. Water-blocking materials are also laying on a twisting machine, if necessary;

- simultaneous insulating and laying of semiconducting screens are carried out on catenary gas vulcanization lines manufactured by Troester and Maillefer, vulcanization is carrying out in a nitrogen medium at high temperatures and pressures (dry heat vulcanization), which makes it possible to exclude moisture from entering the insulation and obtain a smooth and homogeneous insulation without voids and inclusions, with tightly adhering semiconducting screens. The thickness and eccentricity of the layers are continuously monitored by X-ray inspection devices;
- laying of water swelling tapes, shields of copper wires and tapes, twisting of the core of three-core cables and armoring are made on the universal twisting machine Pourtier Drum Twister;
- extrusion of the outer sheaths of cables and covering with aluminopolymer tapes (if necessary) are made in the extrusion lines manufactured by Troester and Maillefer equipped with diameter measuring instruments, sheath tightness control and a device for marking with a printing tape;
- Hipotronics test equipment complex allows to conduct partial discharge testing of cable insulation, as well as testing of finished cables with increased voltage;
- all of the above mentioned equipment has a computerized control of technological processes and tests based on mathematical, software and technical support developed by Siemens, including recipe managing system and reporting system;

MANUFACTURING MANAGEMENT SYSTEM INCLUDES THE FOLLOWING FUNCTIONS:

- automatic calculation of technological parameters of the lines (for example, for the inclined line of gas vulcanization — the layered temperature ratio as a function of time, based on the calculation of heat transfer between layers, the temperature dependence of the half-life of the peroxide, etc.);



- ensuring full synchronization of all units of lines depending on the parameters of the technological process and their changes;
- alarm and monitoring in the event of the achievement by one or more technological parameters of its critical values;
- monitoring the stability of process parameters and providing an almost instantaneous reaction to their current measurements;

The control system is equipped with modern industrial computers with an interface that allows to create, store, and if necessary, issue technological parameters or test results for making management decisions

TESTS

The cables pass routine tests, sample tests, type tests, prequalification test.

Routine tests:

- Partial discharge test
- Voltage test
- Electrical test on oversheath of the cable

Sample tests:

- Conductor examination
- Measurement of electrical resistance of conductor and of metal screen/sheath
- Measurement of thickness of insulation and cable oversheath
- Measurement of thickness of metal sheath
- Measurement of diameters
- Hot set test
- Measurement of capacitance
- Measurement of density of insulation
- Lightning impulse voltage test
- Water penetration test
- Tests on components of cables with a longitudinally applied metal tape or foil, bonded to the oversheath



Type tests:

- Bending test
- Partial discharge tests
- Tan δ measurement
- Heating cycle voltage test
- Impulse voltage tests
- Resistivity of semi-conducting screens
- Check of cable construction
- Tests for determining the mechanical properties of insulation before and after ageing
- Tests for determining the mechanical properties of oversheaths before and after ageing
- Ageing tests on pieces of complete cable to check compatibility of materials
- Loss of mass test on PVC oversheaths
- Pressure test at high temperature on oversheaths
- Test on PVC oversheaths at low temperature
- Heat shock test for PVC oversheaths
- Hot set test for insulation
- Measurement of density of insulation
- Measurement of carbon black content of black PE oversheaths
- Test under fire conditions
- Water penetration test
- Tests on components of cables with a longitudinally applied metal tape or foil, bonded to the oversheath
- Shrinkage test for insulations (220–330 kV)
- Shrinkage test for oversheaths (220–330 kV)

Prequalification test:

- Heating cycle voltage test
- Lightning impulse voltage test

YUZH CABLE WORKS PJSC got the certificates and reports from leading world laboratories: KEMA (Netherlands), VDE (Germany), innogy SE Eurotest (Germany), IEn (Poland), VNIIEP JSC (Russia).

System of cable designation

Outer sheath	X	HDPE outer sheath
	Y	PVC outer sheath
	Xn	fire-retardant PE outer sheath
Water sealing	R	radial watertight cable
	U	longitudinal watertight cable
Cable construction	H	cable with radial electrical field
Conductor material	-	copper conductor
	A	aluminum conductor
Cable type	K	power cable
Insulation	XS	XLPE insulation
Metal sheath	-	no metal sheath
	(PB)	lead alloy sheath
Other	-WTS	watertight conductor
	-«x»T«y»FM	copper screen of cable contains «x» optical modules with «y» multi-mode optical fibers (example: 2T4FM)
	-«x»T«y»FS	copper screen of cable contains «x» optical modules with «y» single-mode optical fibers (example: 2T4FS)
	RMC	round multi-wire compacted conductor (example: 1x400RMC)
	RMS	round multi-wire compacted conductor of Milliken construction (example: 1x1200RMS)

Rated voltages

U_0 , kV	U, kV	U_m , kV
26	45	52
36	60	72,5
64	110	126
76	132	145
87	150	172
127	220	252
190	330	363

In the voltage designation of cables $U_0/U(U_m)$:

U_0 — is the rated power frequency voltage between conductor and earth or metallic screen for which the cable is designed;

U — is the rated power frequency voltage between conductors for which the cable is designed;

U_m — is the maximum value of the «highest system voltage» for which the equipment may be used (see IEC 60038).

Cable types ratio

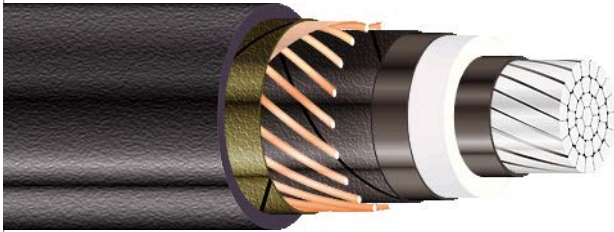
Ukraine	Russia	Germany	Poland
Copper core			
ПвЭВ	ПвВ	N2XSY, N2XSEY	YHKXS
ПвЭВнг	ПвВнг	N2XSY, N2XSEY	YnHKXS
ПвЭВнгд	ПвВнг-LS	–	–
ПвЭгП	ПвПг	N2XS(F)2Y	XUHKXS
ПвЭгПу	ПвПуг	N2XS(F)2Y	XUHKXS
ПвЭгаПу	ПвПу2г	N2XS(FL)2Y	XRUHKXS
ПвЭгаП	ПвП2г	N2XS(FL)2Y	XRUHKXS
ПвЭБВ	ПвБВ	–	–
ПвЭБП	ПвБП	–	–
ПвЭКП	ПвКП	–	–
ПвЭАкВ	ПвКав	–	–
ПвЭгПнг, ПвЭгПнг-HF	ПвПнг(A)-HF	N2XS(F)H, N2XSE(F)H	XnHKXS
ПвЭгаПнг, ПвЭгаПнг-HF	–	–	XnRUHKXS
Aluminum core			
АПвЭВ	АПвВ	NA2XSY, NA2XSEY	YHAKXS
АПвЭВнг	АПвВнг	NA2XSY, NA2XSEY	YnHAKXS
АПвЭВнгд	АПвВнг-LS	–	–
АПвЭгП	АПвПг	NA2XS(F)2Y	XUHAKXS
АПвЭгПу	АПвПуг	NA2XS(F)2Y	XUHAKXS
АПвЭгаПу	АПвПу2г	NA2XS(FL)2Y	XRUHAKXS
АПвЭгаП	АПвП2г	NA2XS(FL)2Y	XRUHAKXS
АПвЭБВ	АПвБВ	–	–
АПвЭБП	АПвБП	–	–
АПвЭКП	АПвКП	–	–
АПвЭАкВ	АПвКав	–	–
АПвЭгПнг, АПвЭгПнг-HF	АПвПнг(A)-HF	NA2XS(F)H, NA2XSE(F)H	XnHAKXS
АПвЭгаПнг, АПвЭгаПнг-HF	–	–	XnRUHAKXS

45–150 kV | SINGLE-CORE CABLES

XUHAKXS, XRUHAKXS

ALUMINUM SINGLE-CORE CABLES WITH PE OUTER SHEATH



IEC 60840





Design

- aluminum compacted conductor RMC, cl. 2 (above 1200 mm² — RMS Milliken type)
- inner semiconductor layer
- XLPE insulation
- outer semiconductor layer
- semiconducting water-blocking tape
- copper wire screen and copper tape counter-helix
- semiconducting water-blocking tape
- aluminum water-blocking foil (for XRUHAKXS)
- PE outer sheath

Application	<ul style="list-style-type: none"> – for laying in the ground (trenches), regardless of the degree of corrosive activity of soils and waters, with protection against mechanical damage – for laying in damp, partly flooded premises, in non-navigable reservoirs (for XRUHAKXS)
Ambient temperature	from –60 °C up to +50 °C
Permissible conductor temperature:	
– normal mode	90 °C
– alarm mode	130 °C
– short-circuit mode	250 °C
Permissible screen short-circuit temperature	350 °C
Minimum bending radius	16·D
Test voltage (50 Hz)	2,5·U ₀ , 30 min
Partial discharge level at 1,5·U₀ A.C.	5 pC
Maximum permissible pulling force at installing	30 N/mm ²
Minimum permissible temperature at installing	–20 °C
Design options	<ul style="list-style-type: none"> – conductor sealed of water-blocking yarns – semiconductor layer on the outer sheath – fibre optic module in the screen
Flame resistance	not determined
CPR - reaction to fire class according to EN 50575	Fca

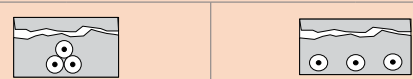
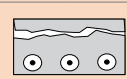
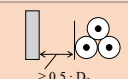
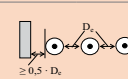
45 kV											
Number of cores × nom. cross-section area of core/ screen, mm ²	Screen cross- section, mm ²		Conductor electrical resistance, Ohm/km, no more than		Calculated capacitance, μF/km	Calculated inductance, mH/km		Cable outer diameter, mm		Calculated cable weight, kg/km	
	min.	max.	d.c. 20 °C	a.c. 90 °C				XUHAKXS	XRUHAKXS	XUHAKXS	XRUHAKXS
1×70/35	25	50	0,443	0,568	0,135	0,661	0,510	42	44	1720	1860
1×95/35	25	70	0,320	0,411	0,148	0,636	0,483	44	46	1870	2010
1×120/35	25	95	0,253	0,325	0,158	0,618	0,464	45	47	1990	2140
1×150/35	25	120	0,206	0,264	0,168	0,602	0,447	47	49	2120	2270
1×185/35	25	120	0,164	0,211	0,181	0,587	0,429	48	51	3140	3520
1×240/35	25	120	0,125	0,161	0,197	0,567	0,408	51	53	3400	3800
1×300/35	25	120	0,100	0,129	0,215	0,551	0,390	53	56	3710	4100
1×350/35	35	120	0,089	0,115	0,227	0,541	0,379	55	58	3950	4320
1×400/35	35	150	0,0778	0,101	0,235	0,534	0,371	56	59	4090	4530
1×500/35	35	185	0,0605	0,079	0,257	0,519	0,354	60	62	4560	5020
1×630/35	35	185	0,0469	0,062	0,283	0,505	0,338	64	66	6270	6650
1×800/50	35	185	0,0367	0,049	0,310	0,491	0,322	68	70	6960	7380
1×1000/50	35	185	0,0291	0,037	0,340	0,486	0,316	72	74	8280	8750
1×1200/70	50	240	0,0247	0,032	0,424	0,478	0,307	85	87	9040	9530
1×1400/70	50	240	0,0212	0,028	0,452	0,470	0,297	89	92	9940	10430
1×1600/70	50	240	0,0186	0,024	0,466	0,466	0,293	91	94	10700	11210
1×2000/70	50	240	0,0149	0,020	0,501	0,457	0,282	97	99	12120	12650

60 kV											
Number of cores × nom. cross-section area of core/ screen, mm ²	Screen cross- section, mm ²		Conductor electrical resistance, Ohm/km, no more than		Calculated capacitance, μF/km	Calculated inductance, mH/km		Cable outer diameter, mm		Calculated cable weight, kg/km	
	min.	max.	d.c. 20 °C	a.c. 90 °C				XUHAKXS	XRUHAKXS	XUHAKXS	XRUHAKXS
1×95/35	25	70	0,320	0,411	0,127	0,671	0,521	46	48	1990	2140
1×120/35	25	95	0,253	0,325	0,139	0,646	0,494	47	49	2120	2270
1×150/35	25	120	0,206	0,264	0,148	0,628	0,474	49	51	2260	2420
1×185/35	25	120	0,164	0,211	0,158	0,612	0,458	50	53	3290	3630
1×240/35	35	120	0,125	0,161	0,169	0,595	0,439	53	55	3570	3910
1×300/35	35	120	0,100	0,129	0,185	0,576	0,418	55	58	3890	4220
1×350/35	35	120	0,089	0,115	0,200	0,559	0,399	57	60	4130	4470
1×400/35	35	150	0,0778	0,101	0,219	0,543	0,381	58	61	4280	4630
1×500/35	35	185	0,0605	0,079	0,239	0,527	0,363	62	64	4760	5120
1×630/35	35	185	0,0469	0,062	0,262	0,512	0,346	66	68	6490	6870
1×800/50	35	185	0,0367	0,049	0,287	0,498	0,330	70	72	7190	7600
1×1000/50	35	185	0,0291	0,037	0,315	0,489	0,319	74	77	8540	8990
1×1200/70	50	240	0,0247	0,032	0,391	0,484	0,313	87	89	9310	9780
1×1400/70	50	240	0,0212	0,028	0,416	0,475	0,304	91	94	10220	10730
1×1600/70	50	240	0,0186	0,024	0,429	0,471	0,299	93	96	11000	11520
1×2000/70	50	240	0,0149	0,020	0,461	0,462	0,288	99	101	12400	12980

110 kV											
Number of cores × nom. cross-section area of core/ screen, mm ²	Screen cross-section, mm ²		Conductor electrical resistance, Ohm/km, no more than		Calculated capacitance, μF/km	Calculated inductance, mH/km		Cable outer diameter, mm		Calculated cable weight, kg/km	
	min.	max.	d.c. 20 °C	a.c. 90 °C		⊙ ⊙ ⊙	⊙ ⊙ ⊙	XUHAKXS	XRUHAKXS	XUHAKXS	XRUHAKXS
1×185/35	35	150	0,164	0,211	0,137	0,655	0,503	67	69	4390	4750
1×240/35	35	185	0,125	0,161	0,153	0,627	0,473	67	70	4510	4870
1×300/35	35	240	0,100	0,129	0,164	0,608	0,453	70	72	5980	6370
1×350/35	35	240	0,089	0,115	0,172	0,596	0,440	72	74	6240	6660
1×400/35	35	300	0,0778	0,101	0,177	0,590	0,433	73	75	6430	6830
1×500/35	35	300	0,0605	0,079	0,191	0,572	0,414	76	79	6960	7380
1×630/50	50	300	0,0469	0,062	0,217	0,549	0,387	78	80	7360	7820
1×800/50	50	300	0,0367	0,049	0,236	0,533	0,370	82	84	8140	8590
1×1000/50	50	300	0,0291	0,037	0,274	0,511	0,345	84	87	9330	9810
1×1200/70	50	300	0,0247	0,032	0,320	0,503	0,336	96	98	10130	10640
1×1400/70	50	300	0,0212	0,028	0,340	0,494	0,325	100	102	11090	11640
1×1600/70	50	300	0,0186	0,024	0,350	0,489	0,320	102	105	11900	12460
1×2000/70	50	300	0,0149	0,020	0,375	0,480	0,309	108	110	13350	13960

132 kV											
Number of cores × nom. cross-section area of core/ screen, mm ²	Screen cross-section, mm ²		Conductor electrical resistance, Ohm/km, no more than		Calculated capacitance, μF/km	Calculated inductance, mH/km		Cable outer diameter, mm		Calculated cable weight, kg/km	
	min.	max.	d.c. 20 °C	a.c. 90 °C		⊙ ⊙ ⊙	⊙ ⊙ ⊙	XUHAKXS	XRUHAKXS	XUHAKXS	XRUHAKXS
1×240/35	35	185	0,125	0,161	0,137	0,646	0,494	74	76	5150	5490
1×300/35	35	240	0,100	0,129	0,146	0,627	0,473	76	79	6650	7070
1×350/50	50	240	0,089	0,115	0,153	0,615	0,460	78	81	6960	7380
1×400/50	50	300	0,0778	0,101	0,163	0,602	0,446	77	80	6870	7300
1×500/50	50	300	0,0605	0,079	0,176	0,584	0,426	81	83	7430	7900
1×630/50	50	300	0,0469	0,062	0,198	0,561	0,401	82	85	7870	8320
1×800/50	50	300	0,0367	0,049	0,215	0,544	0,383	86	89	8650	9120
1×1000/50	50	300	0,0291	0,037	0,236	0,527	0,363	91	93	10180	10700
1×1200/70	70	300	0,0247	0,032	0,274	0,518	0,353	102	105	11010	11590
1×1400/70	70	300	0,0212	0,028	0,291	0,508	0,341	106	109	12030	12610
1×1600/70	70	300	0,0186	0,024	0,299	0,503	0,336	109	111	12870	13460
1×2000/70	70	300	0,0149	0,020	0,320	0,493	0,324	114	116	14390	15000

150 kV											
Number of cores × nom. cross-section area of core/ screen, mm ²	Screen cross-section, mm ²		Conductor electrical resistance, Ohm/km, no more than		Calculated capacitance, μF/km	Calculated inductance, mH/km		Cable outer diameter, mm		Calculated cable weight, kg/km	
	min.	max.	d.c. 20 °C	a.c. 90 °C		⊙ ⊙ ⊙	⊙ ⊙ ⊙	XUHAKXS	XRUHAKXS	XUHAKXS	XRUHAKXS
1×300/50	50	240	0,100	0,129	0,139	0,631	0,478	78	81	6890	7320
1×350/50	50	240	0,089	0,115	0,146	0,618	0,464	80	83	7170	7610
1×400/50	50	300	0,0778	0,101	0,156	0,606	0,450	79	82	7120	7560
1×500/50	50	300	0,0605	0,079	0,167	0,588	0,431	83	85	7680	8140
1×630/50	50	300	0,0469	0,062	0,188	0,564	0,405	84	87	8130	8600
1×800/50	50	300	0,0367	0,049	0,204	0,548	0,387	88	91	8920	9410
1×1000/50	50	300	0,0291	0,037	0,221	0,536	0,374	93	95	10480	11020
1×1200/70	70	300	0,0247	0,032	0,262	0,523	0,358	104	107	11330	11890
1×1400/70	70	300	0,0212	0,028	0,278	0,512	0,346	109	111	12370	12950
1×1600/70	70	300	0,0186	0,024	0,286	0,508	0,341	111	113	13210	13820
1×2000/70	70	300	0,0149	0,020	0,306	0,497	0,329	116	119	14710	15340

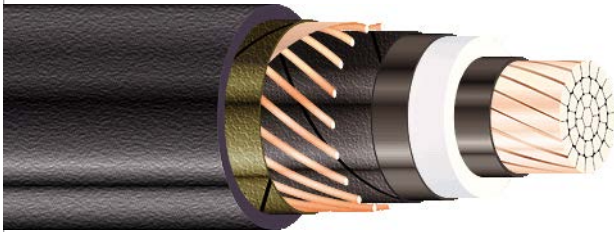
Nominal cross-section area of core, mm ²	Current carrying capacity, A																
	in the ground				in the air												
																	
	BE*	SPB/CB*	BE*	SPB/CB*	BE*	SPB/CB*	BE*	SPB/CB*									
45 and 60 kV																	
70	203	205	207	213	233	235	272	279									
95	240	243	244	253	279	281	322	334									
120	271	276	273	287	317	321	363	381									
150	301	307	301	320	355	360	403	428									
185	338	346	335	361	401	410	450	485									
240	387	399	379	416	464	477	511	565									
300	432	448	417	468	524	541	564	640									
350	457	477	438	499	558	579	593	684									
400	486	511	462	534	597	622	625	735									
500	546	580	509	609	677	714	688	843									
630	610	658	557	693	765	818	749	965									
800	674	740	602	783	855	928	807	1097									
1000	734	819	643	872	938	1034	854	1221									
1200	854	998	733	1056	1212	1377	1159	1662									
1400	901	1075	760	1140	1283	1487	1181	1785									
1600	941	1144	782	1216	1342	1584	1204	1899									
2000	1008	1269	819	1355	1444	1761	1233	2106									
110, 132 and 150 kV																	
185	342	349	341	364	417	423	460	484									
240	394	405	388	422	487	496	533	572									
300	440	455	428	476	549	563	591	649									
350	466	484	450	506	585	602	624	694									
400	497	518	475	543	626	647	660	745									
500	559	590	524	618	711	742	730	855									
630	627	672	576	707	810	855	809	992									
800	694	757	623	799	905	970	873	1126									
1000	760	843	668	897	1005	1095	936	1282									
1200	866	1005	746	1063	1245	1395	1216	1659									
1400	914	1083	775	1148	1319	1507	1240	1784									
1600	955	1153	797	1225	1382	1605	1265	1899									
2000	1024	1281	834	1366	1488	1786	1295	2108									
Permissible current loads are calculated for following conditions:					* grounding method: BE — Both-ends; SPB — Single Point Bonding; CB — Cross-bonding.												
– conductor temperature 90 °C; – air temperature 30 °C; – ground temperature 20 °C; – laying depth in ground 1,5 m; – soil thermal resistance 1,0 K·m/W; – nominal cross-section area of screen 95 mm ²																	
Nominal cross-section area of core, mm ²	70	95	120	150	185	240	300	350	400	500	630	800	1000	1200	1400	1600	2000
1-second short-circuit conductor capacity*, kA	6,6	8,9	11,3	14,2	17,5	22,7	28,2	32,9	37,6	47,0	59,0	75,2	94	112,8	131,6	150,4	188
Nominal cross-section area of screen, mm ²	25	35	50	70	95	120	150	185	240	300							
1-second short-circuit screen capacity*, kA	5,1	7,1	10,2	14,2	19,3	24,4	30,4	37,6	48,7	60,8							

* if the short-circuit time is different from 1 s, this value must be multiplied by the factor $(1/\sqrt{t})$

45–150 kV | SINGLE-CORE CABLES XUHKXS, XRUHKXS

COPPER SINGLE-CORE CABLES WITH PE OUTER SHEATH

IEC 60840





Design



- copper compacted conductor RMC, cl. 2 (above 1200 mm² — RMS Milliken type)
- inner semiconductor layer
- XLPE insulation
- outer semiconductor layer
- semiconducting water-blocking tape
- copper wire screen and copper tape counter-helix
- semiconducting water-blocking tape
- aluminum water-blocking foil (for XRUHKXS)
- PE outer sheath



Application	<ul style="list-style-type: none"> – for laying in the ground (trenches), regardless of the degree of corrosive activity of soils and waters, with protection against mechanical damage – for laying in damp, partly flooded premises, in non-navigable reservoirs (for XRUHKXS)
Ambient temperature	from –60 °C up to +50 °C
Permissible conductor temperature:	
– normal mode	90 °C
– alarm mode	130 °C
– short-circuit mode	250 °C
Permissible screen short-circuit temperature	350 °C
Minimum bending radius	16·D
Test voltage (50 Hz)	2,5·U ₀ , 30 min
Partial discharge level at 1,5·U₀ A.C.	5 pC
Maximum permissible pulling force at installing	50 N/mm ²
Minimum permissible temperature at installing	–20 °C
Design options	<ul style="list-style-type: none"> – conductor sealed of water-blocking yarns – semiconductor layer on the outer sheath – fibre optic module in the screen
Flame resistance	not determined
CPR - reaction to fire class according to EN 50575	Fca

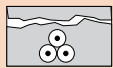
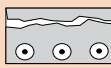
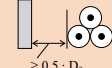
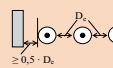
45 kV											
Number of cores × nom. cross-section area of core/ screen, mm ²	Screen cross- section, mm ²		Conductor electrical resistance, Ohm/km, no more than		Calculated capacitance, μF/km	Calculated inductance, mH/km		Cable outer diameter, mm		Calculated cable weight, kg/km	
	min.	max.	d.c. 20 °C	a.c. 90 °C		⊙ ⊙ ⊙	⊙ ⊙ ⊙	XUHKXS	XRUHKXS	XUHKXS	XRUHKXS
						⊙ ⊙ ⊙	⊙ ⊙ ⊙				
1×70/35	25	50	0,268	0,342	0,135	0,661	0,510	42	44	2150	2280
1×95/35	25	70	0,193	0,246	0,148	0,636	0,483	44	46	2460	2600
1×120/35	25	95	0,153	0,196	0,158	0,618	0,464	45	47	2740	2890
1×150/35	25	120	0,124	0,159	0,168	0,602	0,447	47	49	3050	3200
1×185/35	25	120	0,0991	0,127	0,181	0,587	0,429	48	51	4300	4690
1×240/35	25	120	0,0754	0,097	0,197	0,567	0,408	51	53	4920	5320
1×300/35	25	120	0,0543	0,071	0,215	0,551	0,390	53	56	5590	5990
1×350/35	35	120	0,0601	0,078	0,227	0,541	0,379	55	58	6120	6510
1×400/35	35	150	0,0470	0,061	0,235	0,534	0,371	56	59	6500	6920
1×500/35	35	185	0,0366	0,048	0,257	0,519	0,354	60	62	7630	8090
1×630/35	35	185	0,0283	0,038	0,283	0,505	0,338	64	66	10230	10610
1×800/50	35	185	0,0221	0,031	0,310	0,491	0,322	68	70	12040	12460
1×1000/50	35	185	0,0176	0,022	0,340	0,486	0,316	72	74	14780	15250
1×1200/70	50	240	0,0151	0,020	0,424	0,478	0,307	85	87	16840	17330
1×1400/70	50	240	0,0129	0,018	0,452	0,470	0,297	89	92	19040	19530
1×1600/70	50	240	0,0113	0,016	0,466	0,466	0,293	91	94	21100	21610
1×2000/70	50	240	0,0090	0,013	0,501	0,457	0,282	97	99	25120	25650

60 kV											
Number of cores × nom. cross-section area of core/ screen, mm ²	Screen cross- section, mm ²		Conductor electrical resistance, Ohm/km, no more than		Calculated capacitance, μF/km	Calculated inductance, mH/km		Cable outer diameter, mm		Calculated cable weight, kg/km	
	min.	max.	d.c. 20 °C	a.c. 90 °C		⊙ ⊙ ⊙	⊙ ⊙ ⊙	XUHKXS	XRUHKXS	XUHKXS	XRUHKXS
						⊙ ⊙ ⊙	⊙ ⊙ ⊙				
1×95/35	25	70	0,193	0,246	0,127	0,671	0,521	46	48	2580	2730
1×120/35	25	95	0,153	0,196	0,139	0,646	0,494	47	49	2870	3020
1×150/35	25	120	0,124	0,159	0,148	0,628	0,474	49	51	3190	3340
1×185/35	25	120	0,0991	0,127	0,158	0,612	0,458	50	53	4450	4790
1×240/35	35	120	0,0754	0,097	0,169	0,595	0,439	53	55	5090	5430
1×300/35	35	120	0,0543	0,071	0,185	0,576	0,418	55	58	5770	6100
1×350/35	35	120	0,0601	0,078	0,200	0,559	0,399	57	60	6300	6650
1×400/35	35	150	0,0470	0,061	0,219	0,543	0,381	58	61	6690	7040
1×500/35	35	185	0,0366	0,048	0,239	0,527	0,363	62	64	7830	8200
1×630/35	35	185	0,0283	0,038	0,262	0,512	0,346	66	68	10450	10840
1×800/50	35	185	0,0221	0,031	0,287	0,498	0,330	70	72	12270	12680
1×1000/50	35	185	0,0176	0,022	0,315	0,489	0,319	74	77	15040	15490
1×1200/70	50	240	0,0151	0,020	0,391	0,484	0,313	87	89	17110	17580
1×1400/70	50	240	0,0129	0,018	0,416	0,475	0,304	91	94	19320	19830
1×1600/70	50	240	0,0113	0,016	0,429	0,471	0,299	93	96	21400	21920
1×2000/70	50	240	0,0090	0,013	0,461	0,462	0,288	99	101	25400	25980

110 kV											
Number of cores × nom. cross-section area of core/ screen, mm ²	Screen cross-section, mm ²		Conductor electrical resistance, Ohm/km, no more than		Calculated capacitance, μF/km	Calculated inductance, mH/km		Cable outer diameter, mm		Calculated cable weight, kg/km	
	min.	max.	d.c. 20 °C	a.c. 90 °C				XUHKXS	XRUHKXS	XUHKXS	XRUHKXS
1×185/35	35	150	0,0991	0,127	0,137	0,655	0,503	67	69	5550	5910
1×240/35	35	185	0,0754	0,097	0,153	0,627	0,473	67	70	6030	6400
1×300/35	35	240	0,0543	0,071	0,164	0,608	0,453	70	72	7860	8250
1×350/35	35	240	0,0601	0,078	0,172	0,596	0,440	72	74	8410	8820
1×400/35	35	300	0,0470	0,061	0,177	0,590	0,433	73	75	8830	9240
1×500/35	35	300	0,0366	0,048	0,191	0,572	0,414	76	79	10030	10450
1×630/50	50	300	0,0283	0,038	0,217	0,549	0,387	78	80	11320	11770
1×800/50	50	300	0,0221	0,031	0,236	0,533	0,370	82	84	13230	13680
1×1000/50	50	300	0,0176	0,022	0,274	0,511	0,345	84	87	15820	16410
1×1200/70	50	300	0,0151	0,020	0,320	0,503	0,336	96	98	17930	18440
1×1400/70	50	300	0,0129	0,018	0,340	0,494	0,325	100	102	20170	20730
1×1600/70	50	300	0,0113	0,016	0,350	0,489	0,320	102	105	22300	22860
1×2000/70	50	300	0,0090	0,013	0,375	0,480	0,309	108	110	26340	26960

132 kV											
Number of cores × nom. cross-section area of core/ screen, mm ²	Screen cross-section, mm ²		Conductor electrical resistance, Ohm/km, no more than		Calculated capacitance, μF/km	Calculated inductance, mH/km		Cable outer diameter, mm		Calculated cable weight, kg/km	
	min.	max.	d.c. 20 °C	a.c. 90 °C				XUHKXS	XRUHKXS	XUHKXS	XRUHKXS
1×240/35	35	185	0,0754	0,097	0,137	0,646	0,494	74	76	6670	7020
1×300/35	35	240	0,0543	0,071	0,146	0,627	0,473	76	79	8530	8940
1×350/50	50	240	0,0601	0,078	0,153	0,615	0,460	78	81	9110	9530
1×400/50	50	300	0,0470	0,061	0,163	0,602	0,446	77	80	9280	9700
1×500/50	50	300	0,0366	0,048	0,176	0,584	0,426	81	83	10500	10960
1×630/50	50	300	0,0283	0,038	0,198	0,561	0,401	82	85	11820	12260
1×800/50	50	300	0,0221	0,031	0,215	0,544	0,383	86	89	13740	14240
1×1000/50	50	300	0,0176	0,022	0,236	0,527	0,363	91	93	16680	17200
1×1200/70	70	300	0,0151	0,020	0,274	0,518	0,353	102	105	18810	19390
1×1400/70	70	300	0,0129	0,018	0,291	0,508	0,341	106	109	21130	21710
1×1600/70	70	300	0,0113	0,016	0,299	0,503	0,336	109	111	23270	23860
1×2000/70	70	300	0,0090	0,013	0,320	0,493	0,324	114	116	27930	28000

150 kV											
Number of cores × nom. cross-section area of core/ screen, mm ²	Screen cross-section, mm ²		Conductor electrical resistance, Ohm/km, no more than		Calculated capacitance, μF/km	Calculated inductance, mH/km		Cable outer diameter, mm		Calculated cable weight, kg/km	
	min.	max.	d.c. 20 °C	a.c. 90 °C				XUHKXS	XRUHKXS	XUHKXS	XRUHKXS
1×300/50	50	240	0,0543	0,071	0,139	0,631	0,478	78	81	8770	9190
1×350/50	50	240	0,0601	0,078	0,146	0,618	0,464	80	83	9340	9760
1×400/50	50	300	0,0470	0,061	0,156	0,606	0,450	79	82	9530	9950
1×500/50	50	300	0,0366	0,048	0,167	0,588	0,431	83	85	10760	11200
1×630/50	50	300	0,0283	0,038	0,188	0,564	0,405	84	87	12050	12530
1×800/50	50	300	0,0221	0,031	0,204	0,548	0,387	88	91	14010	14500
1×1000/50	50	300	0,0176	0,022	0,221	0,536	0,374	93	95	16980	17520
1×1200/70	70	300	0,0151	0,020	0,262	0,523	0,358	104	107	19130	19690
1×1400/70	70	300	0,0129	0,018	0,278	0,512	0,346	109	111	21470	22050
1×1600/70	70	300	0,0113	0,016	0,286	0,508	0,341	111	113	23610	24220
1×2000/70	70	300	0,0090	0,013	0,306	0,497	0,329	116	119	27710	28340

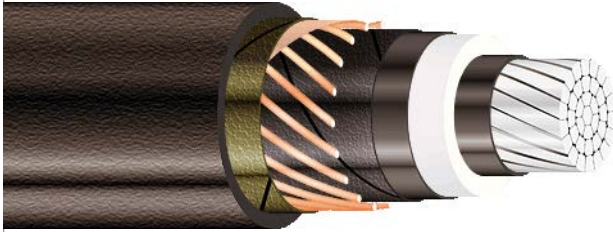
Nominal cross-section area of core, mm ²	Current carrying capacity, A																	
	in the ground									in the air								
																		
	BE*	SPB/CB*		BE*	SPB/CB*		BE*	SPB/CB*		BE*	SPB/CB*		BE*	SPB/CB*				
45 and 60 kV																		
70	260	264		263	275		299	302		344	359							
95	308	314		307	327		357	363		406	431							
120	346	355		342	370		405	414		455	491							
150	384	396		375	413		453	465		502	552							
185	428	445		413	464		510	527		554	625							
240	488	513		462	536		587	613		621	727							
300	541	576		504	603		659	695		678	823							
350	567	607		523	636		695	737		704	872							
400	603	651		549	683		742	793		738	940							
500	668	734		595	774		832	903		797	1071							
630	735	824		639	875		926	1024		851	1219							
800	798	913		679	979		1016	1146		899	1370							
1000	852	994		712	1074		1094	1254		935	1503							
1200	995	1247		807	1327		1426	1721		1279	2088							
1400	1039	1334		830	1426		1492	1846		1288	2234							
1600	1072	1408		847	1512		1544	1950		1299	2361							
2000	1127	1536		874	1664		1629	2132		1311	2586							
110, 132 and 150 kV																		
185	435	449		422	468		532	545		573	624							
240	498	520		475	544		619	639		658	737							
300	554	585		519	612		695	724		722	835							
350	581	617		540	646		733	767		753	886							
400	619	662		567	694		784	826		792	954							
500	687	748		615	787		881	941		860	1088							
630	761	845		664	894		989	1075		934	1255							
800	827	939		705	1000		1086	1204		987	1410							
1000	887	1027		741	1106		1180	1333		1036	1580							
1200	1012	1258		824	1337		1476	1746		1358	2086							
1400	1057	1348		847	1438		1546	1874		1366	2234							
1600	1092	1424		865	1524		1602	1982		1379	2364							
2000	1149	1556		892	1678		1690	2170		1387	2590							
Permissible current loads are calculated for following conditions: – conductor temperature 90 °C; – air temperature 30 °C; – ground temperature 20 °C; – laying depth in ground 1,5 m; – soil thermal resistance 1,0 K·m/W; – nominal cross-section area of screen 95 mm ²																		
* grounding method: BE — Both-ends; SPB — Single Point Bonding; CB — Cross-bonding.																		
Nominal cross-section area of core, mm²	70	95	120	150	185	240	300	350	400	500	630	800	1000	1200	1400	1600	2000	
1-second short-circuit conductor capacity*, kA	10	13,6	17,2	21,5	26,5	34,3	42,9	50,1	57,2	71,5	90,1	114,4	143	171,6	200,2	228,8	286	
Nominal cross-section area of screen, mm²	25	35	50	70	95	120	150	185	240	300								
1-second short-circuit screen capacity*, kA	5,1	7,1	10,2	14,2	19,3	24,4	30,4	37,6	48,7	60,8								

* if the short-circuit time is different from 1 s, this value must be multiplied by the factor $(1/\sqrt{t})$

45–150 kV | SINGLE-CORE CABLES YnHAKXS

ALUMINUM SINGLE-CORE CABLES WITH PVC FLAME-RETARDANT OUTER SHEATH

IEC 60840



Design

- aluminum compacted conductor RMC, cl. 2 (above 1200 mm² — RMS Milliken type)
- inner semiconductor layer
- XLPE insulation
- outer semiconductor layer
- semiconducting water-blocking tape
- copper wire screen and copper tape counter-helix
- glass wool tape
- PVC flame-retardant outer sheath

Application

- in premises, tunnels, canals, mines, dry ground and outdoors under a canopy with protection against mechanical damage
- for group laying in cable structures, premises (including those in fire hazardous areas)
- for laying at facilities where requirements are imposed for reduced smoke emission during combustion and smoldering: nuclear power plants, power stations, subways, high-rise buildings, large industrial facilities, etc.

Ambient temperature

from –50 °C up to +50 °C

Permissible conductor temperature:

- normal mode 90 °C
- alarm mode 130 °C
- short-circuit mode 250 °C

Permissible screen short-circuit temperature

350 °C

Minimum bending radius

16·D

Test voltage (50 Hz)

2,5·U₀, 30 min

Partial discharge level at 1,5·U₀ A.C.

5 pC

Maximum permissible pulling force at installing

30 N/mm²

Minimum permissible temperature at installing

–15 °C

Design options



- conductor sealed of water-blocking yarns
- semiconductor layer on the outer sheath
- fibre optic module in the screen
- PVC flame-retardant outer sheath



Flame resistance



EN 60332-1-2



CPR - reaction to fire class according to EN 50575



Eca

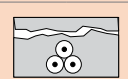
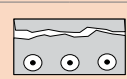
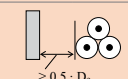
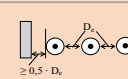
45 kV									
Number of cores × nom. cross-section area of core/ screen, mm ²	Screen cross- section, mm ²		Conductor electrical resistance, Ohm/km, no more than		Calculated capacitance, μF/km	Calculated inductance, mH/km		Cable outer diameter, mm	Calculated cable weight, kg/km
	min.	max.	d.c. 20 °C	a.c. 90 °C					
1×70/35	25	50	0,443	0,568	0,135	0,661	0,510	42	2000
1×95/35	25	70	0,320	0,411	0,148	0,636	0,483	44	2150
1×120/35	25	95	0,253	0,325	0,158	0,618	0,464	45	2290
1×150/35	25	120	0,206	0,264	0,168	0,602	0,447	47	2430
1×185/35	25	120	0,164	0,211	0,181	0,587	0,429	48	3880
1×240/35	25	120	0,125	0,161	0,197	0,567	0,408	51	4170
1×300/35	25	120	0,100	0,129	0,215	0,551	0,390	53	4490
1×350/35	35	120	0,089	0,115	0,227	0,541	0,379	55	4740
1×400/35	35	150	0,0778	0,101	0,235	0,534	0,371	56	4900
1×500/35	35	185	0,0605	0,079	0,257	0,519	0,354	60	5390
1×630/35	35	185	0,0469	0,062	0,283	0,505	0,338	64	7130
1×800/50	35	185	0,0367	0,049	0,310	0,491	0,322	68	7840
1×1000/50	35	185	0,0291	0,037	0,340	0,486	0,316	72	9200
1×1200/70	50	240	0,0247	0,032	0,424	0,478	0,307	85	9970
1×1400/70	50	240	0,0212	0,028	0,452	0,470	0,297	89	10870
1×1600/70	50	240	0,0186	0,024	0,466	0,466	0,293	91	11640
1×2000/70	50	240	0,0149	0,020	0,501	0,457	0,282	97	13040

60 kV									
Number of cores × nom. cross-section area of core/ screen, mm ²	Screen cross- section, mm ²		Conductor electrical resistance, Ohm/km, no more than		Calculated capacitance, μF/km	Calculated inductance, mH/km		Cable outer diameter, mm	Calculated cable weight, kg/km
	min.	max.	d.c. 20 °C	a.c. 90 °C					
1×95/35	25	70	0,320	0,411	0,127	0,671	0,521	46	2290
1×120/35	25	95	0,253	0,325	0,139	0,646	0,494	47	2430
1×150/35	25	120	0,206	0,264	0,148	0,628	0,474	49	2580
1×185/35	25	120	0,164	0,211	0,158	0,612	0,458	50	4050
1×240/35	35	120	0,125	0,161	0,169	0,595	0,439	53	4350
1×300/35	35	120	0,100	0,129	0,185	0,576	0,418	55	4680
1×350/35	35	120	0,089	0,115	0,200	0,559	0,399	57	4930
1×400/35	35	150	0,0778	0,101	0,219	0,543	0,381	58	5100
1×500/35	35	185	0,0605	0,079	0,239	0,527	0,363	62	5600
1×630/35	35	185	0,0469	0,062	0,262	0,512	0,346	66	7350
1×800/50	35	185	0,0367	0,049	0,287	0,498	0,330	70	8070
1×1000/50	35	185	0,0291	0,037	0,315	0,489	0,319	74	9450
1×1200/70	50	240	0,0247	0,032	0,391	0,484	0,313	87	10230
1×1400/70	50	240	0,0212	0,028	0,416	0,475	0,304	91	11150
1×1600/70	50	240	0,0186	0,024	0,429	0,471	0,299	93	11930
1×2000/70	50	240	0,0149	0,020	0,461	0,462	0,288	99	13340

110 kV									
Number of cores × nom. cross-section area of core/ screen, mm ²	Screen cross- section, mm ²		Conductor electrical resistance, Ohm/km, no more than		Calculated capacitance, μF/km	Calculated inductance, mH/km		Cable outer diameter, mm	Calculated cable weight, kg/km
	min.	max.	d.c. 20 °C	a.c. 90 °C					
1×185/35	35	150	0,164	0,211	0,137	0,655	0,503	67	5230
1×240/35	35	185	0,125	0,161	0,153	0,627	0,473	67	5350
1×300/35	35	240	0,100	0,129	0,164	0,608	0,453	70	6850
1×350/35	35	240	0,089	0,115	0,172	0,596	0,440	72	7130
1×400/35	35	300	0,0778	0,101	0,177	0,590	0,433	73	7310
1×500/35	35	300	0,0605	0,079	0,191	0,572	0,414	76	7850
1×630/50	50	300	0,0469	0,062	0,217	0,549	0,387	78	8280
1×800/50	50	300	0,0367	0,049	0,236	0,533	0,370	82	9050
1×1000/50	50	300	0,0291	0,037	0,274	0,511	0,345	84	10260
1×1200/70	50	300	0,0247	0,032	0,320	0,503	0,336	96	11060
1×1400/70	50	300	0,0212	0,028	0,340	0,494	0,325	100	12030
1×1600/70	50	300	0,0186	0,024	0,350	0,489	0,320	102	12830
1×2000/70	50	300	0,0149	0,020	0,375	0,480	0,309	108	14280

132 kV									
Number of cores × nom. cross-section area of core/ screen, mm ²	Screen cross- section, mm ²		Conductor electrical resistance, Ohm/km, no more than		Calculated capacitance, μF/km	Calculated inductance, mH/km		Cable outer diameter, mm	Calculated cable weight, kg/km
	min.	max.	d.c. 20 °C	a.c. 90 °C					
1×240/35	35	185	0,125	0,161	0,137	0,646	0,494	74	6020
1×300/35	35	240	0,100	0,129	0,146	0,627	0,473	76	7540
1×350/50	50	240	0,089	0,115	0,153	0,615	0,460	78	7840
1×400/50	50	300	0,0778	0,101	0,163	0,602	0,446	77	7780
1×500/50	50	300	0,0605	0,079	0,176	0,584	0,426	81	8350
1×630/50	50	300	0,0469	0,062	0,198	0,561	0,401	82	8780
1×800/50	50	300	0,0367	0,049	0,215	0,544	0,383	86	9580
1×1000/50	50	300	0,0291	0,037	0,236	0,527	0,363	91	11110
1×1200/70	70	300	0,0247	0,032	0,274	0,518	0,353	102	11950
1×1400/70	70	300	0,0212	0,028	0,291	0,508	0,341	106	12960
1×1600/70	70	300	0,0186	0,024	0,299	0,503	0,336	109	13790
1×2000/70	70	300	0,0149	0,020	0,320	0,493	0,324	114	15270

150 kV									
Number of cores × nom. cross-section area of core/ screen, mm ²	Screen cross- section, mm ²		Conductor electrical resistance, Ohm/km, no more than		Calculated capacitance, μF/km	Calculated inductance, mH/km		Cable outer diameter, mm	Calculated cable weight, kg/km
	min.	max.	d.c. 20 °C	a.c. 90 °C					
1×300/50	50	240	0,100	0,129	0,139	0,631	0,478	78	7790
1×350/50	50	240	0,089	0,115	0,146	0,618	0,464	80	8090
1×400/50	50	300	0,0778	0,101	0,156	0,606	0,450	79	8020
1×500/50	50	300	0,0605	0,079	0,167	0,588	0,431	83	8600
1×630/50	50	300	0,0469	0,062	0,188	0,564	0,405	84	9040
1×800/50	50	300	0,0367	0,049	0,204	0,548	0,387	88	9850
1×1000/50	50	300	0,0291	0,037	0,221	0,536	0,374	93	11410
1×1200/70	70	300	0,0247	0,032	0,262	0,523	0,358	104	12260
1×1400/70	70	300	0,0212	0,028	0,278	0,512	0,346	109	13280
1×1600/70	70	300	0,0186	0,024	0,286	0,508	0,341	111	14120
1×2000/70	70	300	0,0149	0,020	0,306	0,497	0,329	116	15610

Nominal cross-section area of core, mm ²	Current carrying capacity, A																	
	in the ground									in the air								
																		
	BE*	SPB/CB*	BE*	SPB/CB*	BE*	SPB/CB*	BE*	SPB/CB*	BE*	SPB/CB*	BE*	SPB/CB*	BE*	SPB/CB*	BE*	SPB/CB*		
45 and 60 kV																		
70	203	205	207	213	233	235	272	279										
95	240	243	244	253	279	281	322	334										
120	271	276	273	287	317	321	363	381										
150	301	307	301	320	355	360	403	428										
185	338	346	335	361	401	410	450	485										
240	387	399	379	416	464	477	511	565										
300	432	448	417	468	524	541	564	640										
350	457	477	438	499	558	579	593	684										
400	486	511	462	534	597	622	625	735										
500	546	580	509	609	677	714	688	843										
630	610	658	557	693	765	818	749	965										
800	674	740	602	783	855	928	807	1097										
1000	734	819	643	872	938	1034	854	1221										
1200	854	998	733	1056	1212	1377	1159	1662										
1400	901	1075	760	1140	1283	1487	1181	1785										
1600	941	1144	782	1216	1342	1584	1204	1899										
2000	1008	1269	819	1355	1444	1761	1233	2106										
110, 132 and 150 kV																		
185	342	349	341	364	417	423	460	484										
240	394	405	388	422	487	496	533	572										
300	440	455	428	476	549	563	591	649										
350	466	484	450	506	585	602	624	694										
400	497	518	475	543	626	647	660	745										
500	559	590	524	618	711	742	730	855										
630	627	672	576	707	810	855	809	992										
800	694	757	623	799	905	970	873	1126										
1000	760	843	668	897	1005	1095	936	1282										
1200	866	1005	746	1063	1245	1395	1216	1659										
1400	914	1083	775	1148	1319	1507	1240	1784										
1600	955	1153	797	1225	1382	1605	1265	1899										
2000	1024	1281	834	1366	1488	1786	1295	2108										
Permissible current loads are calculated for following conditions:											* grounding method: BE — Both-ends; SPB — Single Point Bonding; CB — Cross-bonding.							
– conductor temperature 90 °C;																		
– air temperature 30 °C;																		
– ground temperature 20 °C;																		
– laying depth in ground 1,5 m;																		
– soil thermal resistance 1,0 K·m/W;																		
– nominal cross-section area of screen 95 mm ²																		
Nominal cross-section area of core, mm ²	70	95	120	150	185	240	300	350	400	500	630	800	1000	1200	1400	1600	2000	
1-second short-circuit conductor capacity*, kA	6,6	8,9	11,3	14,2	17,5	22,7	28,2	32,9	37,6	47,0	59,0	75,2	94	112,8	131,6	150,4	188	
Nominal cross-section area of screen, mm ²	25	35	50	70	95	120	150	185	240	300								
1-second short-circuit screen capacity*, kA	5,1	7,1	10,2	14,2	19,3	24,4	30,4	37,6	48,7	60,8								

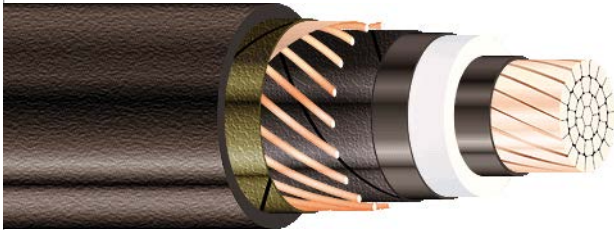
* if the short-circuit time is different from 1 s, this value must be multiplied by the factor $(1/\sqrt{t})$

45–150 kV | SINGLE-CORE CABLES

YnHKXS

COPPER SINGLE-CORE CABLES WITH PVC FLAME-RETARDANT OUTER SHEATH



IEC 60840







Design



- copper compacted conductor RMC, cl. 2 (above 1200 mm² — RMS Milliken type)
- inner semiconductor layer
- XLPE insulation
- outer semiconductor layer
- semiconducting water-blocking tape
- copper wire screen and copper tape counter-helix
- glass wool tape
- PVC flame-retardant outer sheath



Application	<ul style="list-style-type: none"> – in premises, tunnels, canals, mines, dry ground and outdoors under a canopy with protection against mechanical damage – for group laying in cable structures, premises (including those in fire hazardous areas) – for laying at facilities where requirements are imposed for reduced smoke emission during combustion and smoldering: nuclear power plants, power stations, subways, high-rise buildings, large industrial facilities, etc.
Ambient temperature	from –50 °C up to +50 °C
Permissible conductor temperature:	
– normal mode	90 °C
– alarm mode	130 °C
– short-circuit mode	250 °C
Permissible screen short-circuit temperature	350 °C
Minimum bending radius	16·D
Test voltage (50 Hz)	2,5·U ₀ , 30 min
Partial discharge level at 1,5·U₀ A.C.	5 pC
Maximum permissible pulling force at installing	50 N/mm ²
Minimum permissible temperature at installing	–15 °C
Design options	<ul style="list-style-type: none"> – conductor sealed of water-blocking yarns – semiconductor layer on the outer sheath – fibre optic module in the screen – PVC flame-retardant outer sheath
Flame resistance	EN 60332-1-2
CPR - reaction to fire class according to EN 50575	Eca

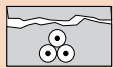
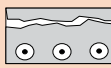
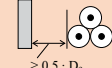
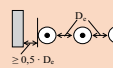
45 kV									
Number of cores × nom. cross-section area of core/ screen, mm ²	Screen cross- section, mm ²		Conductor electrical resistance, Ohm/km, no more than		Calculated capacitance, μF/km	Calculated inductance, mH/km		Cable outer diameter, mm	Calculated cable weight, kg/km
	min.	max.	d.c. 20 °C	a.c. 90 °C					
1×70/35	25	50	0,268	0,342	0,135	0,661	0,510	42	2420
1×95/35	25	70	0,193	0,246	0,148	0,636	0,483	44	2750
1×120/35	25	95	0,153	0,196	0,158	0,618	0,464	45	3040
1×150/35	25	120	0,124	0,159	0,168	0,602	0,447	47	3360
1×185/35	25	120	0,0991	0,127	0,181	0,587	0,429	48	5030
1×240/35	25	120	0,0754	0,097	0,197	0,567	0,408	51	5690
1×300/35	25	120	0,0543	0,071	0,215	0,551	0,390	53	6370
1×350/35	35	120	0,0601	0,078	0,227	0,541	0,379	55	6910
1×400/35	35	150	0,0470	0,061	0,235	0,534	0,371	56	7310
1×500/35	35	185	0,0366	0,048	0,257	0,519	0,354	60	8460
1×630/35	35	185	0,0283	0,038	0,283	0,505	0,338	64	11080
1×800/50	35	185	0,0221	0,031	0,310	0,491	0,322	68	12930
1×1000/50	35	185	0,0176	0,022	0,340	0,486	0,316	72	15700
1×1200/70	50	240	0,0151	0,020	0,424	0,478	0,307	85	17770
1×1400/70	50	240	0,0129	0,018	0,452	0,470	0,297	89	19970
1×1600/70	50	240	0,0113	0,016	0,466	0,466	0,293	91	22040
1×2000/70	50	240	0,0090	0,013	0,501	0,457	0,282	97	26040

60 kV									
Number of cores × nom. cross-section area of core/ screen, mm ²	Screen cross- section, mm ²		Conductor electrical resistance, Ohm/km, no more than		Calculated capacitance, μF/km	Calculated inductance, mH/km		Cable outer diameter, mm	Calculated cable weight, kg/km
	min.	max.	d.c. 20 °C	a.c. 90 °C					
1×95/35	25	70	0,193	0,246	0,127	0,671	0,521	46	2880
1×120/35	25	95	0,153	0,196	0,139	0,646	0,494	47	3180
1×150/35	25	120	0,124	0,159	0,148	0,628	0,474	49	3510
1×185/35	25	120	0,0991	0,127	0,158	0,612	0,458	50	5210
1×240/35	35	120	0,0754	0,097	0,169	0,595	0,439	53	5870
1×300/35	35	120	0,0543	0,071	0,185	0,576	0,418	55	6560
1×350/35	35	120	0,0601	0,078	0,200	0,559	0,399	57	7100
1×400/35	35	150	0,0470	0,061	0,219	0,543	0,381	58	7500
1×500/35	35	185	0,0366	0,048	0,239	0,527	0,363	62	8670
1×630/35	35	185	0,0283	0,038	0,262	0,512	0,346	66	11300
1×800/50	35	185	0,0221	0,031	0,287	0,498	0,330	70	13160
1×1000/50	35	185	0,0176	0,022	0,315	0,489	0,319	74	15950
1×1200/70	50	240	0,0151	0,020	0,391	0,484	0,313	87	18040
1×1400/70	50	240	0,0129	0,018	0,416	0,475	0,304	91	20250
1×1600/70	50	240	0,0113	0,016	0,429	0,471	0,299	93	22330
1×2000/70	50	240	0,0090	0,013	0,461	0,462	0,288	99	26340

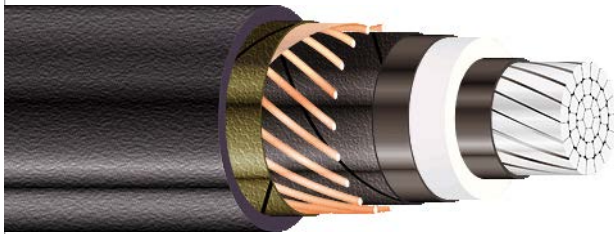
110 kV									
Number of cores × nom. cross-section area of core/ screen, mm ²	Screen cross- section, mm ²		Conductor electrical resistance, Ohm/km, no more than		Calculated capacitance, μF/km	Calculated inductance, mH/km		Cable outer diameter, mm	Calculated cable weight, kg/km
	min.	max.	d.c. 20 °C	a.c. 90 °C					
1×185/35	35	150	0,0991	0,127	0,137	0,655	0,503	67	6390
1×240/35	35	185	0,0754	0,097	0,153	0,627	0,473	67	6880
1×300/35	35	240	0,0543	0,071	0,164	0,608	0,453	70	8730
1×350/35	35	240	0,0601	0,078	0,172	0,596	0,440	72	9290
1×400/35	35	300	0,0470	0,061	0,177	0,590	0,433	73	9710
1×500/35	35	300	0,0366	0,048	0,191	0,572	0,414	76	10920
1×630/50	50	300	0,0283	0,038	0,217	0,549	0,387	78	12220
1×800/50	50	300	0,0221	0,031	0,236	0,533	0,370	82	14140
1×1000/50	50	300	0,0176	0,022	0,274	0,511	0,345	84	16760
1×1200/70	50	300	0,0151	0,020	0,320	0,503	0,336	96	18860
1×1400/70	50	300	0,0129	0,018	0,340	0,494	0,325	100	21120
1×1600/70	50	300	0,0113	0,016	0,350	0,489	0,320	102	23230
1×2000/70	50	300	0,0090	0,013	0,375	0,480	0,309	108	27280

132 kV									
Number of cores × nom. cross-section area of core/ screen, mm ²	Screen cross- section, mm ²		Conductor electrical resistance, Ohm/km, no more than		Calculated capacitance, μF/km	Calculated inductance, mH/km		Cable outer diameter, mm	Calculated cable weight, kg/km
	min.	max.	d.c. 20 °C	a.c. 90 °C					
1×240/35	35	185	0,0754	0,097	0,137	0,646	0,494	74	7550
1×300/35	35	240	0,0543	0,071	0,146	0,627	0,473	76	9420
1×350/50	50	240	0,0601	0,078	0,153	0,615	0,460	78	10002
1×400/50	50	300	0,0470	0,061	0,163	0,602	0,446	77	10190
1×500/50	50	300	0,0366	0,048	0,176	0,584	0,426	81	11420
1×630/50	50	300	0,0283	0,038	0,198	0,561	0,401	82	12720
1×800/50	50	300	0,0221	0,031	0,215	0,544	0,383	86	14670
1×1000/50	50	300	0,0176	0,022	0,236	0,527	0,363	91	17610
1×1200/70	70	300	0,0151	0,020	0,274	0,518	0,353	102	19750
1×1400/70	70	300	0,0129	0,018	0,291	0,508	0,341	106	22060
1×1600/70	70	300	0,0113	0,016	0,299	0,503	0,336	109	24190
1×2000/70	70	300	0,0090	0,013	0,320	0,493	0,324	114	28270

150 kV									
Number of cores × nom. cross-section area of core/ screen, mm ²	Screen cross- section, mm ²		Conductor electrical resistance, Ohm/km, no more than		Calculated capacitance, μF/km	Calculated inductance, mH/km		Cable outer diameter, mm	Calculated cable weight, kg/km
	min.	max.	d.c. 20 °C	a.c. 90 °C					
1×300/50	50	240	0,0543	0,071	0,139	0,631	0,478	78	9670
1×350/50	50	240	0,0601	0,078	0,146	0,618	0,464	80	10250
1×400/50	50	300	0,0470	0,061	0,156	0,606	0,450	79	10430
1×500/50	50	300	0,0366	0,048	0,167	0,588	0,431	83	11670
1×630/50	50	300	0,0283	0,038	0,188	0,564	0,405	84	12980
1×800/50	50	300	0,0221	0,031	0,204	0,548	0,387	88	14940
1×1000/50	50	300	0,0176	0,022	0,221	0,536	0,374	93	17910
1×1200/70	70	300	0,0151	0,020	0,262	0,523	0,358	104	20060
1×1400/70	70	300	0,0129	0,018	0,278	0,512	0,346	109	22380
1×1600/70	70	300	0,0113	0,016	0,286	0,508	0,341	111	24520
1×2000/70	70	300	0,0090	0,013	0,306	0,497	0,329	116	28610

Nominal cross-section area of core, mm ²	Current carrying capacity, A																	
	in the ground									in the air								
																		
	BE*	SPB/CB*		BE*	SPB/CB*		BE*	SPB/CB*		BE*	SPB/CB*		BE*	SPB/CB*				
45 and 60 kV																		
70	260	264		263	275		299	302		344	359							
95	308	314		307	327		357	363		406	431							
120	346	355		342	370		405	414		455	491							
150	384	396		375	413		453	465		502	552							
185	428	445		413	464		510	527		554	625							
240	488	513		462	536		587	613		621	727							
300	541	576		504	603		659	695		678	823							
350	567	607		523	636		695	737		704	872							
400	603	651		549	683		742	793		738	940							
500	668	734		595	774		832	903		797	1071							
630	735	824		639	875		926	1024		851	1219							
800	798	913		679	979		1016	1146		899	1370							
1000	852	994		712	1074		1094	1254		935	1503							
1200	995	1247		807	1327		1426	1721		1279	2088							
1400	1039	1334		830	1426		1492	1846		1288	2234							
1600	1072	1408		847	1512		1544	1950		1299	2361							
2000	1127	1536		874	1664		1629	2132		1311	2586							
110, 132 and 150 kV																		
185	435	449		422	468		532	545		573	624							
240	498	520		475	544		619	639		658	737							
300	554	585		519	612		695	724		722	835							
350	581	617		540	646		733	767		753	886							
400	619	662		567	694		784	826		792	954							
500	687	748		615	787		881	941		860	1088							
630	761	845		664	894		989	1075		934	1255							
800	827	939		705	1000		1086	1204		987	1410							
1000	887	1027		741	1106		1180	1333		1036	1580							
1200	1012	1258		824	1337		1476	1746		1358	2086							
1400	1057	1348		847	1438		1546	1874		1366	2234							
1600	1092	1424		865	1524		1602	1982		1379	2364							
2000	1149	1556		892	1678		1690	2170		1387	2590							
Permissible current loads are calculated for following conditions: – conductor temperature 90 °C; – air temperature 30 °C; – ground temperature 20 °C; – laying depth in ground 1,5 m; – soil thermal resistance 1,0 K·m/W; – nominal cross-section area of screen 95 mm ²																		
* grounding method: BE — Both-ends; SPB — Single Point Bonding; CB — Cross-bonding.																		
Nominal cross-section area of core, mm²	70	95	120	150	185	240	300	350	400	500	630	800	1000	1200	1400	1600	2000	
1-second short-circuit conductor capacity*, kA	10	13,6	17,2	21,5	26,5	34,3	42,9	50,1	57,2	71,5	90,1	114,4	143	171,6	200,2	228,8	286	
Nominal cross-section area of screen, mm²	25	35	50	70	95	120	150	185	240	300								
1-second short-circuit screen capacity*, kA	5,1	7,1	10,2	14,2	19,3	24,4	30,4	37,6	48,7	60,8								

* if the short-circuit time is different from 1 s, this value must be multiplied by the factor (1/√t)



XnHAKXS, XnRUHAKXS, XnHAKXS-HF, XnRUHAKXS-HF**ALUMINUM SINGLE-CORE CABLES WITH POLYMER COMPOSITION FLAME-RETARDANT OUTER SHEATH****IEC 60840****Design**



- aluminum compacted conductor RMC, cl. 2 (above 1200 mm² — RMS Milliken type)
- inner semiconductor layer
- XLPE insulation
- outer semiconductor layer
- semiconducting water-blocking tape
- copper wire screen and copper tape counter-helix
- semiconducting water-blocking tape (XnRUHAKXS, XnRUHAKXS-HF) or glass wool tape (XnHAKXS, XnHAKXS-HF)
- aluminum water-blocking foil (XnRUHAKXS, XnRUHAKXS-HF)
- polymer composition flame-retardant outer sheath (XnHAKXS, XnRUHAKXS) or halogen free outer sheath (XnHAKXS-HF, XnRUHAKXS-HF)



Application	<ul style="list-style-type: none"> – in premises, tunnels, canals, mines, dry ground and outdoors under a canopy with protection against mechanical damage – for group laying in cable structures, premises (including those in fire hazardous areas) – for laying at facilities where requirements are imposed for reduced smoke emission during combustion and smoldering: nuclear power plants, power stations, subways, high-rise buildings, large industrial facilities, etc. (XnHAKXS-HF, XnRUHAKXS-HF) – for laying in damp, partly flooded premises (XnRUHAKXS, XnRUHAKXS-HF)
Ambient temperature	from –60 °C up to +50 °C
Permissible conductor temperature:	
– normal mode	90 °C
– alarm mode	130 °C
– short-circuit mode	250 °C
Permissible screen short-circuit temperature	350 °C
Minimum bending radius	16·D
Test voltage (50 Hz)	2,5·U ₀ , 30 min
Partial discharge level at 1,5·U₀ A.C.	5 pC
Maximum permissible pulling force at installing	30 N/mm ²
Minimum permissible temperature at installing	–15 °C
Design options	<ul style="list-style-type: none"> – conductor sealed of water-blocking yarns – semiconductor layer on the outer sheath – fibre optic module in the screen – PVC flame-retardant outer sheath
Flame resistance	EN 60332-1-2
CPR - reaction to fire class according to EN 50575	Eca

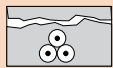
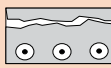
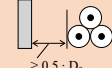
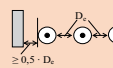
45 kV											
Number of cores × nom. cross-section area of core/ screen, mm ²	Screen cross- section, mm ²		Conductor electrical resistance, Ohm/km, no more than		Calculated capacitance, μF/km	Calculated inductance, mH/km		Cable outer diameter, mm		Calculated cable weight, kg/km	
	min.	max.	d.c. 20 °C	a.c. 90 °C		⊙ ⊙ ⊙ ⊙		XnHAKXS, XnHAKXS-HF	XnRUHAKXS, XnRUHAKXS-HF	XnHAKXS, XnHAKXS-HF	XnRUHAKXS, XnRUHAKXS-HF
						⊙ ⊙					
1×70/35	25	50	0,443	0,568	0,135	0,661	0,510	44	44	2130	2210
1×95/35	25	70	0,320	0,411	0,148	0,636	0,483	46	46	2290	2370
1×120/35	25	95	0,253	0,325	0,158	0,618	0,464	47	47	2460	2540
1×150/35	25	120	0,206	0,264	0,168	0,602	0,447	49	49	2610	2690
1×185/35	25	120	0,164	0,211	0,181	0,587	0,429	51	51	3760	3880
1×240/35	25	120	0,125	0,161	0,197	0,567	0,408	53	53	4050	4170
1×300/35	25	120	0,100	0,129	0,215	0,551	0,390	56	56	4370	4490
1×350/35	35	120	0,089	0,115	0,227	0,541	0,379	58	58	4610	4730
1×400/35	35	150	0,0778	0,101	0,235	0,534	0,371	59	59	4770	4890
1×500/35	35	185	0,0605	0,079	0,257	0,519	0,354	62	62	5290	5450
1×630/35	35	185	0,0469	0,062	0,283	0,505	0,338	66	66	7200	7220
1×800/50	35	185	0,0367	0,049	0,310	0,491	0,322	70	70	7840	8010
1×1000/50	35	185	0,0291	0,037	0,340	0,486	0,316	74	74	9320	9510
1×1200/70	50	240	0,0247	0,032	0,424	0,478	0,307	87	87	10140	10340
1×1400/70	50	240	0,0212	0,028	0,452	0,470	0,297	92	92	11150	11310
1×1600/70	50	240	0,0186	0,024	0,466	0,466	0,293	94	94	11970	12140
1×2000/70	50	240	0,0149	0,020	0,501	0,457	0,282	99	99	13490	13670

60 kV											
Number of cores × nom. cross-section area of core/ screen, mm ²	Screen cross- section, mm ²		Conductor electrical resistance, Ohm/km, no more than		Calculated capacitance, μF/km	Calculated inductance, mH/km		Cable outer diameter, mm		Calculated cable weight, kg/km	
	min.	max.	d.c. 20 °C	a.c. 90 °C		⊙ ⊙ ⊙ ⊙		XnHAKXS, XnHAKXS-HF	XnRUHAKXS, XnRUHAKXS-HF	XnHAKXS, XnHAKXS-HF	XnRUHAKXS, XnRUHAKXS-HF
						⊙ ⊙					
1×95/35	25	70	0,320	0,411	0,127	0,671	0,521	48	48	2460	2540
1×120/35	25	95	0,253	0,325	0,139	0,646	0,494	49	49	2610	2690
1×150/35	25	120	0,206	0,264	0,148	0,628	0,474	51	51	2780	2870
1×185/35	25	120	0,164	0,211	0,158	0,612	0,458	53	53	3940	4050
1×240/35	35	120	0,125	0,161	0,169	0,595	0,439	55	55	4230	4350
1×300/35	35	120	0,100	0,129	0,185	0,576	0,418	58	58	4560	4680
1×350/35	35	120	0,089	0,115	0,200	0,559	0,399	60	60	4840	4960
1×400/35	35	150	0,0778	0,101	0,219	0,543	0,381	61	61	5000	5120
1×500/35	35	185	0,0605	0,079	0,239	0,527	0,363	64	64	5530	5660
1×630/35	35	185	0,0469	0,062	0,262	0,512	0,346	68	68	7420	7480
1×800/50	35	185	0,0367	0,049	0,287	0,498	0,330	72	72	8110	8250
1×1000/50	35	185	0,0291	0,037	0,315	0,489	0,319	77	77	9620	9774
1×1200/70	50	240	0,0247	0,032	0,391	0,484	0,313	89	89	10460	10340
1×1400/70	50	240	0,0212	0,028	0,416	0,475	0,304	94	94	11480	11650
1×1600/70	50	240	0,0186	0,024	0,429	0,471	0,299	96	96	12320	12490
1×2000/70	50	240	0,0149	0,020	0,461	0,462	0,288	101	101	13800	14030

110 kV											
Number of cores × nom. cross-section area of core/ screen, mm ²	Screen cross-section, mm ²		Conductor electrical resistance, Ohm/km, no more than		Calculated capacitance, μF/km	Calculated inductance, mH/km		Cable outer diameter, mm		Calculated cable weight, kg/km	
	min.	max.	d.c. 20 °C	a.c. 90 °C		Calculated inductance, mH/km		XnHAKXS, XnHAKXS-HF	XnRUHAKXS, XnRUHAKXS-HF	XnHAKXS, XnHAKXS-HF	XnRUHAKXS, XnRUHAKXS-HF
											
1×185/35	35	150	0,164	0,211	0,137	0,655	0,503	69	69	5160	5310
1×240/35	35	185	0,125	0,161	0,153	0,627	0,473	70	70	5280	5440
1×300/35	35	240	0,100	0,129	0,164	0,608	0,453	72	72	6850	6980
1×350/35	35	240	0,089	0,115	0,172	0,596	0,440	74	74	7130	7300
1×400/35	35	300	0,0778	0,101	0,177	0,590	0,433	75	75	7340	7480
1×500/35	35	300	0,0605	0,079	0,191	0,572	0,414	79	79	7930	8070
1×630/50	50	300	0,0469	0,062	0,217	0,549	0,387	80	80	8360	8540
1×800/50	50	300	0,0367	0,049	0,236	0,533	0,370	84	84	9220	9370
1×1000/50	50	300	0,0291	0,037	0,274	0,511	0,345	87	87	10520	10690
1×1200/70	50	300	0,0247	0,032	0,320	0,503	0,336	98	98	11400	11570
1×1400/70	50	300	0,0212	0,028	0,340	0,494	0,325	102	102	12480	12660
1×1600/70	50	300	0,0186	0,024	0,350	0,489	0,320	105	105	13350	13540
1×2000/70	50	300	0,0149	0,020	0,375	0,480	0,309	110	110	14880	15120

132 kV											
Number of cores × nom. cross-section area of core/ screen, mm ²	Screen cross-section, mm ²		Conductor electrical resistance, Ohm/km, no more than		Calculated capacitance, μF/km	Calculated inductance, mH/km		Cable outer diameter, mm		Calculated cable weight, kg/km	
	min.	max.	d.c. 20 °C	a.c. 90 °C		Calculated inductance, mH/km		XnHAKXS, XnHAKXS-HF	XnRUHAKXS, XnRUHAKXS-HF	XnHAKXS, XnHAKXS-HF	XnRUHAKXS, XnRUHAKXS-HF
											
1×240/35	35	185	0,125	0,161	0,137	0,646	0,494	76	76	5950	6190
1×300/35	35	240	0,100	0,129	0,146	0,627	0,473	79	79	7580	7760
1×350/50	50	240	0,089	0,115	0,153	0,615	0,460	81	81	7880	8100
1×400/50	50	300	0,0778	0,101	0,163	0,602	0,446	80	80	7820	8000
1×500/50	50	300	0,0605	0,079	0,176	0,584	0,426	83	83	8380	8660
1×630/50	50	300	0,0469	0,062	0,198	0,561	0,401	85	85	8860	9100
1×800/50	50	300	0,0367	0,049	0,215	0,544	0,383	89	89	9800	9960
1×1000/50	50	300	0,0291	0,037	0,236	0,527	0,363	93	93	11510	11680
1×1200/70	70	300	0,0247	0,032	0,274	0,518	0,353	105	105	12400	12640
1×1400/70	70	300	0,0212	0,028	0,291	0,508	0,341	109	109	13550	13740
1×1600/70	70	300	0,0186	0,024	0,299	0,503	0,336	111	111	14450	14650
1×2000/70	70	300	0,0149	0,020	0,320	0,493	0,324	116	116	16080	16280

150 kV											
Number of cores × nom. cross-section area of core/ screen, mm ²	Screen cross-section, mm ²		Conductor electrical resistance, Ohm/km, no more than		Calculated capacitance, μF/km	Calculated inductance, mH/km		Cable outer diameter, mm		Calculated cable weight, kg/km	
	min.	max.	d.c. 20 °C	a.c. 90 °C		Calculated inductance, mH/km		XnHAKXS, XnHAKXS-HF	XnRUHAKXS, XnRUHAKXS-HF	XnHAKXS, XnHAKXS-HF	XnRUHAKXS, XnRUHAKXS-HF
											
1×300/50	50	240	0,100	0,129	0,139	0,631	0,478	81	81	7910	8050
1×350/50	50	240	0,089	0,115	0,146	0,618	0,464	83	83	8210	8360
1×400/50	50	300	0,0778	0,101	0,156	0,606	0,450	82	82	8150	8290
1×500/50	50	300	0,0605	0,079	0,167	0,588	0,431	85	85	7990	8920
1×630/50	50	300	0,0469	0,062	0,188	0,564	0,405	87	87	9260	9410
1×800/50	50	300	0,0367	0,049	0,204	0,548	0,387	91	91	10120	10280
1×1000/50	50	300	0,0291	0,037	0,221	0,536	0,374	95	95	11870	12050
1×1200/70	70	300	0,0247	0,032	0,262	0,523	0,358	107	107	12780	12960
1×1400/70	70	300	0,0212	0,028	0,278	0,512	0,346	111	111	13940	14130
1×1600/70	70	300	0,0186	0,024	0,286	0,508	0,341	113	113	14850	15050
1×2000/70	70	300	0,0149	0,020	0,306	0,497	0,329	119	119	16440	16640

Nominal cross-section area of core, mm ²	Current carrying capacity, A																	
	in the ground									in the air								
																		
	BE*	SPB/CB*		BE*	SPB/CB*		BE*	SPB/CB*		BE*	SPB/CB*		BE*	SPB/CB*		BE*	SPB/CB*	
45 and 60 kV																		
70	203	205		207	213		233	235		272	279							
95	240	243		244	253		279	281		322	334							
120	271	276		273	287		317	321		363	381							
150	301	307		301	320		355	360		403	428							
185	338	346		335	361		401	410		450	485							
240	387	399		379	416		464	477		511	565							
300	432	448		417	468		524	541		564	640							
350	457	477		438	499		558	579		593	684							
400	486	511		462	534		597	622		625	735							
500	546	580		509	609		677	714		688	843							
630	610	658		557	693		765	818		749	965							
800	674	740		602	783		855	928		807	1097							
1000	734	819		643	872		938	1034		854	1221							
1200	854	998		733	1056		1212	1377		1159	1662							
1400	901	1075		760	1140		1283	1487		1181	1785							
1600	941	1144		782	1216		1342	1584		1204	1899							
2000	1008	1269		819	1355		1444	1761		1233	2106							
110, 132 and 150 kV																		
185	342	349		341	364		417	423		460	484							
240	394	405		388	422		487	496		533	572							
300	440	455		428	476		549	563		591	649							
350	466	484		450	506		585	602		624	694							
400	497	518		475	543		626	647		660	745							
500	559	590		524	618		711	742		730	855							
630	627	672		576	707		810	855		809	992							
800	694	757		623	799		905	970		873	1126							
1000	760	843		668	897		1005	1095		936	1282							
1200	866	1005		746	1063		1245	1395		1216	1659							
1400	914	1083		775	1148		1319	1507		1240	1784							
1600	955	1153		797	1225		1382	1605		1265	1899							
2000	1024	1281		834	1366		1488	1786		1295	2108							
Permissible current loads are calculated for following conditions: – conductor temperature 90 °C; – air temperature 30 °C; – ground temperature 20 °C; – laying depth in ground 1,5 m; – soil thermal resistance 1,0 K·m/W; – nominal cross-section area of screen 95 mm ²																		
* grounding method: BE — Both-ends; SPB — Single Point Bonding; CB — Cross-bonding.																		
Nominal cross-section area of core, mm²	70	95	120	150	185	240	300	350	400	500	630	800	1000	1200	1400	1600	2000	
1-second short-circuit conductor capacity*, kA	6,6	8,9	11,3	14,2	17,5	22,7	28,2	32,9	37,6	47,0	59,0	75,2	94	112,8	131,6	150,4	188	
Nominal cross-section area of screen, mm²	25	35	50	70	95	120	150	185	240	300								
1-second short-circuit screen capacity*, kA	5,1	7,1	10,2	14,2	19,3	24,4	30,4	37,6	48,7	60,8								

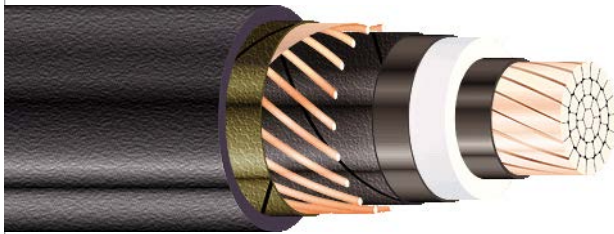
* if the short-circuit time is different from 1 s, this value must be multiplied by the factor $(1/\sqrt{t})$

45–150 kV | SINGLE-CORE CABLES

XnHKXS, XnRUHKXS, XnHKXS-HF, XnRUHKXS-HF

COPPER SINGLE-CORE CABLES WITH POLYMER COMPOSITION FLAME-RETARDANT OUTER SHEATH

IEC 60840





Design



- copper compacted conductor RMC, cl. 2 (above 1200 mm² — RMS Milliken type)
- inner semiconductor layer
- XLPE insulation
- outer semiconductor layer
- semiconducting water-blocking tape
- copper wire screen and copper tape counter-helix
- semiconducting water-blocking tape (XnRUHAKXS, XnRUHAKXS-HF) or glass wool tape (XnHAKXS, XnHAKXS-HF)
- aluminum water-blocking foil (XnRUHAKXS, XnRUHAKXS-HF)
- polymer composition flame-retardant outer sheath (XnHAKXS, XnRUHAKXS) or halogen free outer sheath (XnHAKXS-HF, XnRUHAKXS-HF)



Application	<ul style="list-style-type: none"> – in premises, tunnels, canals, mines, dry ground and outdoors under a canopy with protection against mechanical damage – for group laying in cable structures, premises (including those in fire hazardous areas) – for laying at facilities where requirements are imposed for reduced smoke emission during combustion and smoldering: nuclear power plants, power stations, subways, high-rise buildings, large industrial facilities, etc. (XnHKXS-HF, XnRUHKXS-HF) – for laying in damp, partly flooded premises (XnRUHKXS, XnRUHKXS-HF)
Ambient temperature	from –60 °C up to +50 °C
Permissible conductor temperature:	
– normal mode	90 °C
– alarm mode	130 °C
– short-circuit mode	250 °C
Permissible screen short-circuit temperature	350 °C
Minimum bending radius	16·D
Test voltage (50 Hz)	2,5·U ₀ , 30 min
Partial discharge level at 1,5·U₀ A.C.	5 pC
Maximum permissible pulling force at installing	50 N/mm ²
Minimum permissible temperature at installing	–15 °C
Design options	<ul style="list-style-type: none"> – conductor sealed of water-blocking yarns – semiconductor layer on the outer sheath – fibre optic module in the screen – PVC flame-retardant outer sheath
Flame resistance	EN 60332-1-2
CPR - reaction to fire class according to EN 50575	Eca

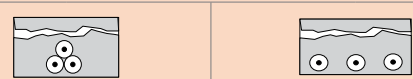
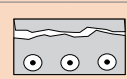
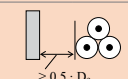
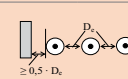
45 kV											
Number of cores × nom. cross-section area of core/ screen, mm ²	Screen cross- section, mm ²		Conductor electrical resistance, Ohm/km, no more than		Calculated capacitance, μF/km	Calculated inductance, mH/km		Cable outer diameter, mm		Calculated cable weight, kg/km	
	min.	max.	d.c. 20 °C	a.c. 90 °C		⊙ ⊙ ⊙ ⊙		XnHKXS, XnHKXS-HF	XnRUHKXS, XnRUHKXS-HF	XnHKXS, XnHKXS-HF	XnRUHKXS, XnRUHKXS-HF
						⊙ ⊙ ⊙					
1×70/35	25	50	0,268	0,342	0,135	0,661	0,510	44	44	2450	2520
1×95/35	25	70	0,193	0,246	0,148	0,636	0,483	46	46	2770	2850
1×120/35	25	95	0,153	0,196	0,158	0,618	0,464	47	47	3090	3170
1×150/35	25	120	0,124	0,159	0,168	0,602	0,447	49	49	3410	3490
1×185/35	25	120	0,0991	0,127	0,181	0,587	0,429	51	51	4920	5040
1×240/35	25	120	0,0754	0,097	0,197	0,567	0,408	53	53	5570	5690
1×300/35	25	120	0,0543	0,071	0,215	0,551	0,390	56	56	6250	6370
1×350/35	35	120	0,0601	0,078	0,227	0,541	0,379	58	58	6780	6910
1×400/35	35	150	0,0470	0,061	0,235	0,534	0,371	59	59	7180	7310
1×500/35	35	185	0,0366	0,048	0,257	0,519	0,354	62	62	8360	8530
1×630/35	35	185	0,0283	0,038	0,283	0,505	0,338	66	66	11050	11180
1×800/50	35	185	0,0221	0,031	0,310	0,491	0,322	70	70	12930	13100
1×1000/50	35	185	0,0176	0,022	0,340	0,486	0,316	74	74	15820	16210
1×1200/70	50	240	0,0151	0,020	0,424	0,478	0,307	87	87	17940	18140
1×1400/70	50	240	0,0129	0,018	0,452	0,470	0,297	92	92	20250	20410
1×1600/70	50	240	0,0113	0,016	0,466	0,466	0,293	94	94	22370	22540
1×2000/70	50	240	0,0090	0,013	0,501	0,457	0,282	99	99	26490	26670

60 kV											
Number of cores × nom. cross-section area of core/ screen, mm ²	Screen cross- section, mm ²		Conductor electrical resistance, Ohm/km, no more than		Calculated capacitance, μF/km	Calculated inductance, mH/km		Cable outer diameter, mm		Calculated cable weight, kg/km	
	min.	max.	d.c. 20 °C	a.c. 90 °C		⊙ ⊙ ⊙ ⊙		XnHKXS, XnHKXS-HF	XnRUHKXS, XnRUHKXS-HF	XnHKXS, XnHKXS-HF	XnRUHKXS, XnRUHKXS-HF
						⊙ ⊙ ⊙					
1×95/35	25	70	0,193	0,246	0,127	0,671	0,521	48	48	2930	3020
1×120/35	25	95	0,153	0,196	0,139	0,646	0,494	49	49	3230	3310
1×150/35	25	120	0,124	0,159	0,148	0,628	0,474	51	51	3580	3670
1×185/35	25	120	0,0991	0,127	0,158	0,612	0,458	53	53	5090	5210
1×240/35	35	120	0,0754	0,097	0,169	0,595	0,439	55	55	5760	5870
1×300/35	35	120	0,0543	0,071	0,185	0,576	0,418	58	58	6440	6560
1×350/35	35	120	0,0601	0,078	0,200	0,559	0,399	60	60	7010	7130
1×400/35	35	150	0,0470	0,061	0,219	0,543	0,381	61	61	7400	7530
1×500/35	35	185	0,0366	0,048	0,239	0,527	0,363	64	64	8600	8730
1×630/35	35	185	0,0283	0,038	0,262	0,512	0,346	68	68	11300	11430
1×800/50	35	185	0,0221	0,031	0,287	0,498	0,330	72	72	13200	13340
1×1000/50	35	185	0,0176	0,022	0,315	0,489	0,319	77	77	16120	16270
1×1200/70	50	240	0,0151	0,020	0,391	0,484	0,313	89	89	18260	18410
1×1400/70	50	240	0,0129	0,018	0,416	0,475	0,304	94	94	20580	20750
1×1600/70	50	240	0,0113	0,016	0,429	0,471	0,299	96	96	22720	22890
1×2000/70	50	240	0,0090	0,013	0,461	0,462	0,288	101	101	26800	27030

110 kV											
Number of cores × nom. cross-section area of core/ screen, mm ²	Screen cross-section, mm ²		Conductor electrical resistance, Ohm/km, no more than		Calculated capacitance, μF/km	Calculated inductance, mH/km		Cable outer diameter, mm		Calculated cable weight, kg/km	
	min.	max.	d.c. 20 °C	a.c. 90 °C				XnHKXS, XnHKXS-HF	XnRUHKXS, XnRUHKXS-HF	XnHKXS, XnHKXS-HF	XnRUHKXS, XnRUHKXS-HF
1×185/35	35	150	0,0991	0,127	0,137	0,655	0,503	69	69	6340	6460
1×240/35	35	185	0,0754	0,097	0,153	0,627	0,473	70	70	6840	6960
1×300/35	35	240	0,0543	0,071	0,164	0,608	0,453	72	72	8730	8860
1×350/35	35	240	0,0601	0,078	0,172	0,596	0,440	74	74	9290	9460
1×400/35	35	300	0,0470	0,061	0,177	0,590	0,433	75	75	9750	9880
1×500/35	35	300	0,0366	0,048	0,191	0,572	0,414	79	79	11000	11140
1×630/50	50	300	0,0283	0,038	0,217	0,549	0,387	80	80	12310	12480
1×800/50	50	300	0,0221	0,031	0,236	0,533	0,370	84	84	14310	14460
1×1000/50	50	300	0,0176	0,022	0,274	0,511	0,345	87	87	17030	17190
1×1200/70	50	300	0,0151	0,020	0,320	0,503	0,336	98	98	19200	19370
1×1400/70	50	300	0,0129	0,018	0,340	0,494	0,325	102	102	21580	21760
1×1600/70	50	300	0,0113	0,016	0,350	0,489	0,320	105	105	23750	23930
1×2000/70	50	300	0,0090	0,013	0,375	0,480	0,309	110	110	27870	28120

132 kV											
Number of cores × nom. cross-section area of core/ screen, mm ²	Screen cross-section, mm ²		Conductor electrical resistance, Ohm/km, no more than		Calculated capacitance, μF/km	Calculated inductance, mH/km		Cable outer diameter, mm		Calculated cable weight, kg/km	
	min.	max.	d.c. 20 °C	a.c. 90 °C				XnHKXS, XnHKXS-HF	XnRUHKXS, XnRUHKXS-HF	XnHKXS, XnHKXS-HF	XnRUHKXS, XnRUHKXS-HF
1×240/35	35	185	0,0754	0,097	0,137	0,646	0,494	76	76	7590	7710
1×300/35	35	240	0,0543	0,071	0,146	0,627	0,473	79	79	9500	9630
1×350/50	50	240	0,0601	0,078	0,153	0,615	0,460	81	81	10120	10250
1×400/50	50	300	0,0470	0,061	0,163	0,602	0,446	80	80	10270	10400
1×500/50	50	300	0,0366	0,048	0,176	0,584	0,426	83	83	11540	11720
1×630/50	50	300	0,0283	0,038	0,198	0,561	0,401	85	85	12890	13040
1×800/50	50	300	0,0221	0,031	0,215	0,544	0,383	89	89	14890	15100
1×1000/50	50	300	0,0176	0,022	0,236	0,527	0,363	93	93	18010	18180
1×1200/70	70	300	0,0151	0,020	0,274	0,518	0,353	105	105	20210	20440
1×1400/70	70	300	0,0129	0,018	0,291	0,508	0,341	109	109	22650	22840
1×1600/70	70	300	0,0113	0,016	0,299	0,503	0,336	111	111	24850	25050
1×2000/70	70	300	0,0090	0,013	0,320	0,493	0,324	116	116	29080	29280

150 kV											
Number of cores × nom. cross-section area of core/ screen, mm ²	Screen cross-section, mm ²		Conductor electrical resistance, Ohm/km, no more than		Calculated capacitance, μF/km	Calculated inductance, mH/km		Cable outer diameter, mm		Calculated cable weight, kg/km	
	min.	max.	d.c. 20 °C	a.c. 90 °C				XnHKXS, XnHKXS-HF	XnRUHKXS, XnRUHKXS-HF	XnHKXS, XnHKXS-HF	XnRUHKXS, XnRUHKXS-HF
1×300/50	50	240	0,0543	0,071	0,139	0,631	0,478	81	81	8380	8510
1×350/50	50	240	0,0601	0,078	0,146	0,618	0,464	83	83	9010	9140
1×400/50	50	300	0,0470	0,061	0,156	0,606	0,450	82	82	9140	9330
1×500/50	50	300	0,0366	0,048	0,167	0,588	0,431	85	85	10470	10610
1×630/50	50	300	0,0283	0,038	0,188	0,564	0,405	87	87	11790	11930
1×800/50	50	300	0,0221	0,031	0,204	0,548	0,387	91	91	15210	15380
1×1000/50	50	300	0,0176	0,022	0,221	0,536	0,374	95	95	18370	18540
1×1200/70	70	300	0,0151	0,020	0,262	0,523	0,358	107	107	20580	20760
1×1400/70	70	300	0,0129	0,018	0,278	0,512	0,346	111	111	23040	23230
1×1600/70	70	300	0,0113	0,016	0,286	0,508	0,341	113	113	25250	25450
1×2000/70	70	300	0,0090	0,013	0,306	0,497	0,329	119	119	29430	29640

Nominal cross-section area of core, mm ²	Current carrying capacity, A																
	in the ground				in the air												
																	
	BE*	SPB/CB*	BE*	SPB/CB*	BE*	SPB/CB*	BE*	SPB/CB*									
45 and 60 kV																	
70	260	264	263	275	299	302	344	359									
95	308	314	307	327	357	363	406	431									
120	346	355	342	370	405	414	455	491									
150	384	396	375	413	453	465	502	552									
185	428	445	413	464	510	527	554	625									
240	488	513	462	536	587	613	621	727									
300	541	576	504	603	659	695	678	823									
350	567	607	523	636	695	737	704	872									
400	603	651	549	683	742	793	738	940									
500	668	734	595	774	832	903	797	1071									
630	735	824	639	875	926	1024	851	1219									
800	798	913	679	979	1016	1146	899	1370									
1000	852	994	712	1074	1094	1254	935	1503									
1200	995	1247	807	1327	1426	1721	1279	2088									
1400	1039	1334	830	1426	1492	1846	1288	2234									
1600	1072	1408	847	1512	1544	1950	1299	2361									
2000	1127	1536	874	1664	1629	2132	1311	2586									
110, 132 and 150 kV																	
185	435	449	422	468	532	545	573	624									
240	498	520	475	544	619	639	658	737									
300	554	585	519	612	695	724	722	835									
350	581	617	540	646	733	767	753	886									
400	619	662	567	694	784	826	792	954									
500	687	748	615	787	881	941	860	1088									
630	761	845	664	894	989	1075	934	1255									
800	827	939	705	1000	1086	1204	987	1410									
1000	887	1027	741	1106	1180	1333	1036	1580									
1200	1012	1258	824	1337	1476	1746	1358	2086									
1400	1057	1348	847	1438	1546	1874	1366	2234									
1600	1092	1424	865	1524	1602	1982	1379	2364									
2000	1149	1556	892	1678	1690	2170	1387	2590									
Permissible current loads are calculated for following conditions:					* grounding method: BE — Both-ends; SPB — Single Point Bonding; CB — Cross-bonding.												
<ul style="list-style-type: none"> – conductor temperature 90 °C; – air temperature 30 °C; – ground temperature 20 °C; – laying depth in ground 1,5 m; – soil thermal resistance 1,0 K·m/W; – nominal cross-section area of screen 95 mm² 																	
Nominal cross-section area of core, mm ²	70	95	120	150	185	240	300	350	400	500	630	800	1000	1200	1400	1600	2000
1-second short-circuit conductor capacity*, kA	10	13,6	17,2	21,5	26,5	34,3	42,9	50,1	57,2	71,5	90,1	114,4	143	171,6	200,2	228,8	286
Nominal cross-section area of screen, mm ²	25	35	50	70	95	120	150	185	240	300							
1-second short-circuit screen capacity*, kA	5,1	7,1	10,2	14,2	19,3	24,4	30,4	37,6	48,7	60,8							

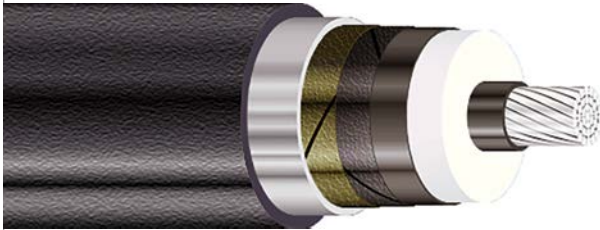
* if the short-circuit time is different from 1 s, this value must be multiplied by the factor $(1/\sqrt{t})$

45–150 kV | SINGLE-CORE CABLES

Aluminum cables with lead sheath

ALUMINUM SINGLE-CORE CABLES WITH LEAD SHEATH



IEC 60840







Design



- aluminum compacted conductor RMC, cl. 2 (above 1200 mm² — RMS Milliken type)
- inner semiconductor layer
- XLPE insulation
- outer semiconductor layer
- semiconducting water-blocking tape
- semiconducting tape
- extruded lead alloy sheath
- outer sheath: of PE, PVC, flame-retardant PVC or halogen-free flame-retardant polymer compound



Application	<ul style="list-style-type: none"> – for laying in damp, partly flooded premises, in non-navigable reservoirs (halogen-free flame-retardant cables) – for laying in very wet soils, in marshy areas, with high corrosivity of soil and water (PE sheathed cables) – in premises, tunnels, canals, mines and outdoors (PVC sheathed cables) – for group laying in cable structures, premises (including those in fire hazardous areas) (flame-retardant PVC sheathed cables) – for laying at facilities where requirements are imposed for reduced smoke emission during combustion and smoldering (flame-retardant PVC or halogen-free sheathed cables) and for low corrosion activity of combustion products (halogen-free flame-retardant sheathed cables) – if mechanical stresses are possible, excluded significant tensile forces
Ambient temperature	from –50 °C up to +50 °C (PVC and flame-retardant PVC sheathed cables) from –60 °C up to +50 °C (the rest types)
Permissible conductor temperature: – normal mode – alarm mode – short-circuit mode	90 °C 130 °C 250 °C
Permissible screen short-circuit temperature	210 °C
Minimum bending radius	25·D
Test voltage (50 Hz)	2,5·U ₀ , 30 min
Partial discharge level at 1,5·U₀ A.C.	5 pC
Maximum permissible pulling force at installing	30 N/mm ²
Minimum permissible temperature at installing	–20 °C (PE sheathed cables) –15 °C (the rest types)
Design options	<ul style="list-style-type: none"> – conductor sealed of water-blocking yarns – semiconductor layer on the outer sheath – PVC flame-retardant outer sheath
Flame resistance	not determined (PE sheathed cables) / EN 60332-1-2 (the rest types)
CPR - reaction to fire class according to EN 50575	Fca (PE sheathed cables) / Eca (the rest types)

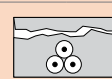
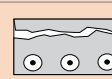
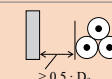
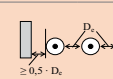
45 kV							
Number of cores × nom. cross-section area of core/ screen, mm ²	Conductor electrical resistance, Ohm/km, no more than		Calculated capacitance, μF/km	Calculated inductance, mH/km		Cable outer diameter, mm	Calculated cable weight, kg/km
	d.c. 20 °C	a.c. 90 °C					
1×70/25	0,443	0,568	0,135	0,661	0,510	47	4540
1×95/25	0,320	0,411	0,148	0,636	0,483	49	4940
1×120/25	0,253	0,325	0,158	0,618	0,464	51	5250
1×150/50	0,206	0,264	0,168	0,602	0,447	53	5620
1×185/50	0,164	0,211	0,181	0,587	0,429	54	6070
1×240/50	0,125	0,161	0,197	0,567	0,408	57	6680
1×300/50	0,100	0,129	0,215	0,551	0,390	60	7390
1×350/50	0,089	0,115	0,227	0,541	0,379	62	7890
1×400/50	0,0778	0,101	0,235	0,534	0,371	63	8240
1×500/70	0,0605	0,079	0,257	0,519	0,354	66	9250
1×630/70	0,0469	0,062	0,283	0,505	0,338	70	10430
1×800/70	0,0367	0,049	0,310	0,491	0,322	74	11820
1×1000/70	0,0291	0,037	0,340	0,486	0,316	80	13720
1×1200/95	0,0247	0,032	0,424	0,478	0,307	92	17480
1×1400/95	0,0212	0,028	0,452	0,470	0,297	96	19220
1×1600/95	0,0186	0,024	0,466	0,466	0,293	99	20430
1×2000/95	0,0149	0,020	0,501	0,457	0,282	104	23160

60 kV							
Number of cores × nom. cross-section area of core/ screen, mm ²	Conductor electrical resistance, Ohm/km, no more than		Calculated capacitance, μF/km	Calculated inductance, mH/km		Cable outer diameter, mm	Calculated cable weight, kg/km
	d.c. 20 °C	a.c. 90 °C					
1×95/25	0,320	0,411	0,127	0,671	0,521	52	5350
1×120/25	0,253	0,325	0,139	0,646	0,494	53	5690
1×150/50	0,206	0,264	0,148	0,628	0,474	55	6050
1×185/50	0,164	0,211	0,158	0,612	0,458	57	6530
1×240/50	0,125	0,161	0,169	0,595	0,439	59	7170
1×300/50	0,100	0,129	0,185	0,576	0,418	62	7900
1×350/50	0,089	0,115	0,200	0,559	0,399	64	8390
1×400/50	0,0778	0,101	0,219	0,543	0,381	65	8770
1×500/70	0,0605	0,079	0,239	0,527	0,363	69	9800
1×630/70	0,0469	0,062	0,262	0,512	0,346	72	11010
1×800/70	0,0367	0,049	0,287	0,498	0,330	76	12420
1×1000/70	0,0291	0,037	0,315	0,489	0,319	82	14360
1×1200/95	0,0247	0,032	0,391	0,484	0,313	94	18230
1×1400/95	0,0212	0,028	0,416	0,475	0,304	99	20010
1×1600/95	0,0186	0,024	0,429	0,471	0,299	101	21200
1×2000/95	0,0149	0,020	0,461	0,462	0,288	106	24010

110 kV							
Number of cores × nom. cross-section area of core/ screen, mm ²	Conductor electrical resistance, Ohm/km, no more than		Calculated capacitance, μF/km	Calculated inductance, mH/km		Cable outer diameter, mm	Calculated cable weight, kg/km
	d.c. 20 °C	a.c. 90 °C					
1×185/50	0,164	0,211	0,137	0,655	0,503	68	9100
1×240/50	0,125	0,161	0,153	0,627	0,473	71	9840
1×300/50	0,100	0,129	0,164	0,608	0,453	71	10080
1×350/50	0,089	0,115	0,172	0,596	0,440	73	10630
1×400/50	0,0778	0,101	0,177	0,590	0,433	74	11050
1×500/70	0,0605	0,079	0,191	0,572	0,414	78	12190
1×630/70	0,0469	0,062	0,217	0,549	0,387	82	13510
1×800/70	0,0367	0,049	0,236	0,533	0,370	86	15040
1×1000/70	0,0291	0,037	0,274	0,511	0,345	89	16420
1×1200/95	0,0247	0,032	0,320	0,503	0,336	101	20560
1×1400/95	0,0212	0,028	0,340	0,494	0,325	105	22450
1×1600/95	0,0186	0,024	0,350	0,489	0,320	108	23720

132 kV							
Number of cores × nom. cross-section area of core/ screen, mm ²	Conductor electrical resistance, Ohm/km, no more than		Calculated capacitance, μF/km	Calculated inductance, mH/km		Cable outer diameter, mm	Calculated cable weight, kg/km
	d.c. 20 °C	a.c. 90 °C					
1×240/70	0,125	0,161	0,137	0,646	0,494	78	11640
1×300/70	0,100	0,129	0,146	0,627	0,473	80	12540
1×350/70	0,089	0,115	0,153	0,615	0,460	82	13140
1×400/70	0,0778	0,101	0,163	0,602	0,446	81	12930
1×500/70	0,0605	0,079	0,176	0,584	0,426	85	14150
1×630/70	0,0469	0,062	0,198	0,561	0,401	86	14880
1×800/95	0,0367	0,049	0,215	0,544	0,383	90	16470
1×1000/95	0,0291	0,037	0,236	0,527	0,363	96	18630
1×1200/120	0,0247	0,032	0,274	0,518	0,353	108	23020

150 kV							
Number of cores × nom. cross-section area of core/ screen, mm ²	Conductor electrical resistance, Ohm/km, no more than		Calculated capacitance, μF/km	Calculated inductance, mH/km		Cable outer diameter, mm	Calculated cable weight, kg/km
	d.c. 20 °C	a.c. 90 °C					
1×300/70	0,100	0,129	0,139	0,631	0,478	82	13180
1×350/70	0,089	0,115	0,146	0,618	0,464	84	13820
1×400/70	0,0778	0,101	0,156	0,606	0,450	83	13600
1×500/70	0,0605	0,079	0,167	0,588	0,431	87	14850
1×630/70	0,0469	0,062	0,188	0,564	0,405	88	15560
1×800/95	0,0367	0,049	0,204	0,548	0,387	93	17210
1×1000/95	0,0291	0,037	0,221	0,536	0,374	98	19390

Nominal cross-section area of core, mm ²	Current carrying capacity, A																
	in the ground				in the air												
																	
	BE*	SPB/CB*	BE*	SPB/CB*	BE*	SPB/CB*	BE*	SPB/CB*									
45 and 60 kV																	
70	203	205	207	213	233	235	272	279									
95	240	243	244	253	279	281	322	334									
120	271	276	273	287	317	321	363	381									
150	301	307	301	320	355	360	403	428									
185	338	346	335	361	401	410	450	485									
240	387	399	379	416	464	477	511	565									
300	432	448	417	468	524	541	564	640									
350	457	477	438	499	558	579	593	684									
400	486	511	462	534	597	622	625	735									
500	546	580	509	609	677	714	688	843									
630	610	658	557	693	765	818	749	965									
800	674	740	602	783	855	928	807	1097									
1000	734	819	643	872	938	1034	854	1221									
1200	854	998	733	1056	1212	1377	1159	1662									
1400	901	1075	760	1140	1283	1487	1181	1785									
1600	941	1144	782	1216	1342	1584	1204	1899									
2000	1008	1269	819	1355	1444	1761	1233	2106									
110, 132 and 150 kV																	
185	342	349	341	364	417	423	460	484									
240	394	405	388	422	487	496	533	572									
300	440	455	428	476	549	563	591	649									
350	466	484	450	506	585	602	624	694									
400	497	518	475	543	626	647	660	745									
500	559	590	524	618	711	742	730	855									
630	627	672	576	707	810	855	809	992									
800	694	757	623	799	905	970	873	1126									
1000	760	843	668	897	1005	1095	936	1282									
1200	866	1005	746	1063	1245	1395	1216	1659									
1400	914	1083	775	1148	1319	1507	1240	1784									
1600	955	1153	797	1225	1382	1605	1265	1899									
Permissible current loads are calculated for following conditions:					* grounding method: BE — Both-ends; SPB — Single Point Bonding; CB — Cross-bonding.												
– conductor temperature 90 °C; – air temperature 30 °C; – ground temperature 20 °C; – laying depth in ground 1,5 m; – soil thermal resistance 1,0 K·m/W; – nominal cross-section area of screen 95 mm ²																	
Nominal cross-section area of core, mm ²	70	95	120	150	185	240	300	350	400	500	630	800	1000	1200	1400	1600	2000
1-second short-circuit conductor capacity*, kA	6,6	8,9	11,3	14,2	17,5	22,7	28,2	32,9	37,6	47,0	59,0	75,2	94	112,8	131,6	150,4	188
Nominal cross-section area of screen, mm ²	25		35		50		70		95		120						
1-second short-circuit screen capacity*, kA	5,1		7,1		10,2		14,2		19,3		24,4						

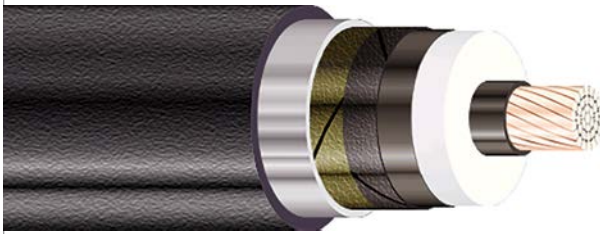
* if the short-circuit time is different from 1 s, this value must be multiplied by the factor $(1/\sqrt{t})$. In the above tables, not the actual cross-section of the lead sheath is given, but the cross-section of the copper screen that allows the same short-circuit current capacity.

45–150 kV | SINGLE-CORE CABLES

Copper cables with lead sheath

COPPER SINGLE-CORE CABLES WITH LEAD SHEATH

IEC 60840



Design

- copper compacted conductor RMC, cl. 2 (above 1200 mm² — RMS Milliken type)
- inner semiconductor layer
- XLPE insulation
- outer semiconductor layer
- semiconducting water-blocking tape
- semiconducting tape
- extruded lead alloy sheath
- outer sheath: of PE, PVC, flame-retardant PVC or halogen-free flame-retardant polymer compound

Application

- for laying in damp, partly flooded premises, in non-navigable reservoirs (halogen-free flame-retardant cables)
- for laying in very wet soils, in marshy areas, with high corrosivity of soil and water (PE sheathed cables)
- in premises, tunnels, canals, mines and outdoors (PVC sheathed cables)
- for group laying in cable structures, premises (including those in fire hazardous areas) (flame-retardant PVC sheathed cables)
- for laying at facilities where requirements are imposed for reduced smoke emission during combustion and smoldering (flame-retardant PVC or halogen-free sheathed cables) and for low corrosion activity of combustion products (halogen-free flame-retardant sheathed cables)
- if mechanical stresses are possible, excluded significant tensile forces

Ambient temperature

- from –50 °C up to +50 °C (PVC and flame-retardant PVC sheathed cables)
- from –60 °C up to +50 °C (the rest types)

Permissible conductor temperature:

- normal mode 90 °C
- alarm mode 130 °C
- short-circuit mode 250 °C

Permissible screen short-circuit temperature

210 °C

Minimum bending radius

25·D

Test voltage (50 Hz)

2,5·U₀, 30 min

Partial discharge level at 1,5·U₀ A.C.

5 pC

Maximum permissible pulling force at installing

50 N/mm²

Minimum permissible temperature at installing

- 20 °C (PE sheathed cables)
- 15 °C (the rest types)

Design options



- conductor sealed of water-blocking yarns
- semiconductor layer on the outer sheath
- PVC flame-retardant outer sheath



Flame resistance



- not determined (PE sheathed cables) /
- EN 60332-1-2 (the rest types)



CPR - reaction to fire class according to EN 50575



Fca (PE sheathed cables) / Eca (the rest types)

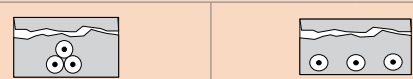
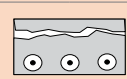
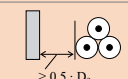
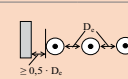
45 kV							
Number of cores × nom. cross-section area of core/ screen, mm ²	Conductor electrical resistance, Ohm/km, no more than		Calculated capacitance, μF/km	Calculated inductance, mH/km		Cable outer diameter, mm	Calculated cable weight, kg/km
	d.c. 20 °C	a.c. 90 °C					
1×70/25	0,268	0,342	0,135	0,661	0,510	47	4990
1×95/25	0,193	0,246	0,148	0,636	0,483	50	5570
1×120/25	0,153	0,196	0,158	0,618	0,464	51	6080
1×150/50	0,124	0,159	0,168	0,602	0,447	53	6620
1×185/50	0,0991	0,127	0,181	0,587	0,429	55	7290
1×240/50	0,0754	0,097	0,197	0,567	0,408	57	8320
1×300/50	0,0543	0,071	0,215	0,551	0,390	60	9370
1×350/50	0,0601	0,078	0,227	0,541	0,379	62	10190
1×400/50	0,0470	0,061	0,235	0,534	0,371	63	10770
1×500/70	0,0366	0,048	0,257	0,519	0,354	66	12470
1×630/70	0,0283	0,038	0,283	0,505	0,338	70	14590
1×800/70	0,0221	0,031	0,310	0,491	0,322	75	17340
1×1000/70	0,0176	0,022	0,340	0,486	0,316	83	21440
1×1200/95	0,0151	0,020	0,424	0,478	0,307	92	25280
1×1400/95	0,0129	0,018	0,452	0,470	0,297	96	28320
1×1600/95	0,0113	0,016	0,466	0,466	0,293	99	30830
1×2000/95	0,0090	0,013	0,501	0,457	0,282	104	36160

60 kV							
Number of cores × nom. cross-section area of core/ screen, mm ²	Conductor electrical resistance, Ohm/km, no more than		Calculated capacitance, μF/km	Calculated inductance, mH/km		Cable outer diameter, mm	Calculated cable weight, kg/km
	d.c. 20 °C	a.c. 90 °C					
1×95/25	0,193	0,246	0,127	0,671	0,521	52	5980
1×120/25	0,153	0,196	0,139	0,646	0,494	53	6520
1×150/50	0,124	0,159	0,148	0,628	0,474	55	7050
1×185/50	0,0991	0,127	0,158	0,612	0,458	57	7760
1×240/50	0,0754	0,097	0,169	0,595	0,439	60	8800
1×300/50	0,0543	0,071	0,185	0,576	0,418	62	9870
1×350/50	0,0601	0,078	0,200	0,559	0,399	64	10690
1×400/50	0,0470	0,061	0,219	0,543	0,381	65	11300
1×500/70	0,0366	0,048	0,239	0,527	0,363	69	13030
1×630/70	0,0283	0,038	0,262	0,512	0,346	72	15170
1×800/70	0,0221	0,031	0,287	0,498	0,330	78	17960
1×1000/70	0,0176	0,022	0,315	0,489	0,319	85	22100
1×1200/95	0,0151	0,020	0,391	0,484	0,313	94	26030
1×1400/95	0,0129	0,018	0,416	0,475	0,304	99	29110
1×1600/95	0,0113	0,016	0,429	0,471	0,299	101	31600
1×2000/95	0,0090	0,013	0,461	0,462	0,288	106	37010

110 kV							
Number of cores × nom. cross-section area of core/ screen, mm ²	Conductor electrical resistance, Ohm/km, no more than		Calculated capacitance, μF/km	Calculated inductance, mH/km		Cable outer diameter, mm	Calculated cable weight, kg/km
	d.c. 20 °C	a.c. 90 °C					
1×185/50	0,0991	0,127	0,137	0,655	0,503	68	10330
1×240/50	0,0754	0,097	0,153	0,627	0,473	71	11480
1×300/50	0,0543	0,071	0,164	0,608	0,453	71	12050
1×350/50	0,0601	0,078	0,172	0,596	0,440	73	12930
1×400/50	0,0470	0,061	0,177	0,590	0,433	74	13570
1×500/70	0,0366	0,048	0,191	0,572	0,414	78	15410
1×630/70	0,0283	0,038	0,217	0,549	0,387	81	17670
1×800/70	0,0221	0,031	0,236	0,533	0,370	87	20620
1×1000/70	0,0176	0,022	0,274	0,511	0,345	92	24260
1×1200/95	0,0151	0,020	0,320	0,503	0,336	101	28360
1×1400/95	0,0129	0,018	0,340	0,494	0,325	105	31550
1×1600/95	0,0113	0,016	0,350	0,489	0,320	108	34120

132 kV							
Number of cores × nom. cross-section area of core/ screen, mm ²	Conductor electrical resistance, Ohm/km, no more than		Calculated capacitance, μF/km	Calculated inductance, mH/km		Cable outer diameter, mm	Calculated cable weight, kg/km
	d.c. 20 °C	a.c. 90 °C					
1×240/70	0,0754	0,097	0,137	0,646	0,494	78	13290
1×300/70	0,0543	0,071	0,146	0,627	0,473	80	14510
1×350/70	0,0601	0,078	0,153	0,615	0,460	82	15450
1×400/70	0,0470	0,061	0,163	0,602	0,446	81	15460
1×500/70	0,0366	0,048	0,176	0,584	0,426	85	17380
1×630/70	0,0283	0,038	0,198	0,561	0,401	86	19030
1×800/95	0,0221	0,031	0,215	0,544	0,383	91	22030
1×1000/50	0,0176	0,022	0,236	0,527	0,363	99	26510
1×1200/70	0,0151	0,020	0,274	0,518	0,353	108	30820

150 kV							
Number of cores × nom. cross-section area of core/ screen, mm ²	Conductor electrical resistance, Ohm/km, no more than		Calculated capacitance, μF/km	Calculated inductance, mH/km		Cable outer diameter, mm	Calculated cable weight, kg/km
	d.c. 20 °C	a.c. 90 °C					
1×300/70	0,0543	0,071	0,139	0,631	0,478	82	15150
1×350/70	0,0601	0,078	0,146	0,618	0,464	84	16130
1×400/70	0,0470	0,061	0,156	0,606	0,450	83	16130
1×500/70	0,0366	0,048	0,167	0,588	0,431	87	18070
1×630/70	0,0283	0,038	0,188	0,564	0,405	88	19720
1×800/95	0,0221	0,031	0,204	0,548	0,387	93	22780
1×1000/95	0,0176	0,022	0,221	0,536	0,374	101	27320

Nominal cross-section area of core, mm ²	Current carrying capacity, A																
	in the ground				in the air												
																	
	BE*	SPB/CB*	BE*	SPB/CB*	BE*	SPB/CB*	BE*	SPB/CB*									
45 and 60 kV																	
70	260	264	263	275	299	302	344	359									
95	308	314	307	327	357	363	406	431									
120	346	355	342	370	405	414	455	491									
150	384	396	375	413	453	465	502	552									
185	428	445	413	464	510	527	554	625									
240	488	513	462	536	587	613	621	727									
300	541	576	504	603	659	695	678	823									
350	567	607	523	636	695	737	704	872									
400	603	651	549	683	742	793	738	940									
500	668	734	595	774	832	903	797	1071									
630	735	824	639	875	926	1024	851	1219									
800	798	913	679	979	1016	1146	899	1370									
1000	852	994	712	1074	1094	1254	935	1503									
1200	995	1247	807	1327	1426	1721	1279	2088									
1400	1039	1334	830	1426	1492	1846	1288	2234									
1600	1072	1408	847	1512	1544	1950	1299	2361									
2000	1127	1536	874	1664	1629	2132	1311	2586									
110, 132 and 150 kV																	
185	435	449	422	468	532	545	573	624									
240	498	520	475	544	619	639	658	737									
300	554	585	519	612	695	724	722	835									
350	581	617	540	646	733	767	753	886									
400	619	662	567	694	784	826	792	954									
500	687	748	615	787	881	941	860	1088									
630	761	845	664	894	989	1075	934	1255									
800	827	939	705	1000	1086	1204	987	1410									
1000	887	1027	741	1106	1180	1333	1036	1580									
1200	1012	1258	824	1337	1476	1746	1358	2086									
1400	1057	1348	847	1438	1546	1874	1366	2234									
1600	1092	1424	865	1524	1602	1982	1379	2364									
Permissible current loads are calculated for following conditions:					* grounding method: BE — Both-ends; SPB — Single Point Bonding; CB — Cross-bonding.												
– conductor temperature 90 °C; – air temperature 30 °C; – ground temperature 20 °C; – laying depth in ground 1,5 m; – soil thermal resistance 1,0 K·m/W; – nominal cross-section area of screen 95 mm ²																	
Nominal cross-section area of core, mm ²	70	95	120	150	185	240	300	350	400	500	630	800	1000	1200	1400	1600	2000
1-second short-circuit conductor capacity*, kA	10	13,6	17,2	21,5	26,5	34,3	42,9	50,1	57,2	71,5	90,1	114,4	143	171,6	200,2	228,8	286
Nominal cross-section area of screen, mm ²	25		35			50			70			95					
1-second short-circuit screen capacity*, kA	5,1		7,1			10,2			14,2			19,3					

* if the short-circuit time is different from 1 s, this value must be multiplied by the factor $(1/\sqrt{t})$. In the above tables, not the actual cross-section of the lead sheath is given, but the cross-section of the copper screen that allows the same short-circuit current capacity.

Aluminum cables with lead sheath with copper screen

ALUMINUM SINGLE-CORE CABLES WITH LEAD SHEATH WITH COPPER SCREEN

IEC 60840



Design

- aluminum compacted conductor RMC, cl. 2 (above 1200 mm² — RMS Milliken type)
- inner semiconductor layer
- XLPE insulation
- outer semiconductor layer
- semiconducting water-blocking tape
- copper wire screen and copper tape counter-helix
- semiconducting water-blocking tape
- semiconducting tape
- extruded lead alloy sheath
- outer sheath: of PE, PVC, flame-retardant PVC or halogen-free flame-retardant polymer compound

Application

- for laying in damp, partly flooded premises, in non-navigable reservoirs (halogen-free flame-retardant cables)
- for laying in very wet soils, in marshy areas, with high corrosivity of soil and water (PE sheathed cables)
- in premises, tunnels, canals, mines and outdoors (PVC sheathed cables)
- for group laying in cable structures, premises (including those in fire hazardous areas) (flame-retardant PVC sheathed cables)
- for laying at facilities where requirements are imposed for reduced smoke emission during combustion and smoldering (flame-retardant PVC or halogen-free sheathed cables) and for low corrosion activity of combustion products (halogen-free flame-retardant sheathed cables)
- if mechanical stresses are possible, excluded significant tensile forces

Ambient temperature

- from –50 °C up to +50 °C (PVC and flame-retardant PVC sheathed cables)
- from –60 °C up to +50 °C (the rest types)

Permissible conductor temperature:

- normal mode 90 °C
- alarm mode 130 °C
- short-circuit mode 250 °C

Permissible screen short-circuit temperature

210 °C

Minimum bending radius

25·D

Test voltage (50 Hz)

2,5·U₀, 30 min

Partial discharge level at 1,5·U₀ A.C.

5 pC

Maximum permissible pulling force at installing

30 N/mm²

Minimum permissible temperature at installing

- 20 °C (PE sheathed cables)
- 15 °C (the rest types)

Design options



- conductor sealed of water-blocking yarns
- semiconductor layer on the outer sheath
- PVC flame-retardant outer sheath



Flame resistance



- not determined (PE sheathed cables) /
- EN 60332-1-2 (the rest types)



CPR - reaction to fire class according to EN 50575



- Fca (PE sheathed cables) / Eca (the rest types)

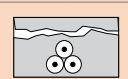
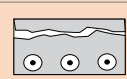
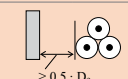
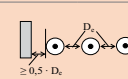
45 kV							
Number of cores × nom. cross-section area of core/ screen, mm ²	Conductor electrical resistance, Ohm/km, no more than		Calculated capacitance, μF/km	Calculated inductance, mH/km		Cable outer diameter, mm	Calculated cable weight, kg/km
	d.c. 20 °C	a.c. 90 °C					
1×70/50	0,443	0,568	0,135	0,661	0,510	51	5170
1×95/50	0,320	0,411	0,148	0,636	0,483	53	5580
1×120/70	0,253	0,325	0,158	0,618	0,464	54	5910
1×150/70	0,206	0,264	0,168	0,602	0,447	56	6310
1×185/70	0,164	0,211	0,181	0,587	0,429	58	6760
1×240/70	0,125	0,161	0,197	0,567	0,408	60	7410
1×300/70	0,100	0,129	0,215	0,551	0,390	63	8130
1×350/70	0,089	0,115	0,227	0,541	0,379	65	8640
1×400/70	0,0778	0,101	0,235	0,534	0,371	66	9000
1×500/95	0,0605	0,079	0,257	0,519	0,354	70	10060
1×630/95	0,0469	0,062	0,283	0,505	0,338	74	11240
1×800/95	0,0367	0,049	0,310	0,491	0,322	78	12680
1×1000/95	0,0291	0,037	0,340	0,486	0,316	83	14620
1×1200/120	0,0247	0,032	0,424	0,478	0,307	95	18510
1×1400/120	0,0212	0,028	0,452	0,470	0,297	100	20330
1×1600/150	0,0186	0,024	0,466	0,466	0,293	102	21550
1×2000/150	0,0149	0,020	0,501	0,457	0,282	105	23670

60 kV							
Number of cores × nom. cross-section area of core/ screen, mm ²	Conductor electrical resistance, Ohm/km, no more than		Calculated capacitance, μF/km	Calculated inductance, mH/km		Cable outer diameter, mm	Calculated cable weight, kg/km
	d.c. 20 °C	a.c. 90 °C					
1×95/50	0,320	0,411	0,127	0,671	0,521	55	6010
1×120/70	0,253	0,325	0,139	0,646	0,494	57	6360
1×150/70	0,206	0,264	0,148	0,628	0,474	58	6760
1×185/70	0,164	0,211	0,158	0,612	0,458	60	7240
1×240/70	0,125	0,161	0,169	0,595	0,439	63	7920
1×300/70	0,100	0,129	0,185	0,576	0,418	66	8650
1×350/70	0,089	0,115	0,200	0,559	0,399	67	9160
1×400/70	0,0778	0,101	0,219	0,543	0,381	69	9550
1×500/95	0,0605	0,079	0,239	0,527	0,363	72	10640
1×630/95	0,0469	0,062	0,262	0,512	0,346	76	11850
1×800/95	0,0367	0,049	0,287	0,498	0,330	80	13320
1×1000/95	0,0291	0,037	0,315	0,489	0,319	85	15280
1×1200/120	0,0247	0,032	0,391	0,484	0,313	97	19250
1×1400/150	0,0212	0,028	0,416	0,475	0,304	102	21140
1×1600/150	0,0186	0,024	0,429	0,471	0,299	104	22380
1×2000/150	0,0149	0,020	0,461	0,462	0,288	107	24490

110 kV							
Number of cores × nom. cross-section area of core/ screen, mm ²	Conductor electrical resistance, Ohm/km, no more than		Calculated capacitance, μF/km	Calculated inductance, mH/km		Cable outer diameter, mm	Calculated cable weight, kg/km
	d.c. 20 °C	a.c. 90 °C					
1×185/70	0,164	0,211	0,137	0,655	0,503	72	9910
1×240/70	0,125	0,161	0,153	0,627	0,473	74	10690
1×300/70	0,100	0,129	0,164	0,608	0,453	75	10910
1×350/70	0,089	0,115	0,172	0,596	0,440	76	11470
1×400/70	0,0778	0,101	0,177	0,590	0,433	78	11900
1×500/95	0,0605	0,079	0,191	0,572	0,414	81	13100
1×630/95	0,0469	0,062	0,217	0,549	0,387	85	14420
1×800/95	0,0367	0,049	0,236	0,533	0,370	89	16020
1×1000/95	0,0291	0,037	0,274	0,511	0,345	92	17430
1×1200/120	0,0247	0,032	0,320	0,503	0,336	104	21670
1×1400/120	0,0212	0,028	0,340	0,494	0,325	109	23630

132 kV							
Number of cores × nom. cross-section area of core/ screen, mm ²	Conductor electrical resistance, Ohm/km, no more than		Calculated capacitance, μF/km	Calculated inductance, mH/km		Cable outer diameter, mm	Calculated cable weight, kg/km
	d.c. 20 °C	a.c. 90 °C					
1×240/95	0,125	0,161	0,137	0,646	0,494	81	12550
1×300/95	0,100	0,129	0,146	0,627	0,473	84	13440
1×350/95	0,089	0,115	0,153	0,615	0,460	86	14060
1×400/95	0,0778	0,101	0,163	0,602	0,446	85	13840
1×500/95	0,0605	0,079	0,176	0,584	0,426	88	15120
1×630/95	0,0469	0,062	0,198	0,561	0,401	90	15830
1×800/120	0,0367	0,049	0,215	0,544	0,383	94	17460
1×1000/120	0,0291	0,037	0,236	0,527	0,363	99	19670

150 kV							
Number of cores × nom. cross-section area of core/ screen, mm ²	Conductor electrical resistance, Ohm/km, no more than		Calculated capacitance, μF/km	Calculated inductance, mH/km		Cable outer diameter, mm	Calculated cable weight, kg/km
	d.c. 20 °C	a.c. 90 °C					
1×300/95	0,100	0,129	0,139	0,631	0,478	86	14130
1×350/95	0,089	0,115	0,146	0,618	0,464	88	14760
1×400/95	0,0778	0,101	0,156	0,606	0,450	87	14530
1×500/95	0,0605	0,079	0,167	0,588	0,431	90	15840
1×630/95	0,0469	0,062	0,188	0,564	0,405	92	16530
1×800/120	0,0367	0,049	0,204	0,548	0,387	96	18220
1×1000/120	0,0291	0,037	0,221	0,536	0,374	102	20470

Nominal cross-section area of core, mm ²	Current carrying capacity, A							
	in the ground				in the air			
								
	BE*	SPB/CB*	BE*	SPB/CB*	BE*	SPB/CB*	BE*	SPB/CB*
45 and 60 kV								
70	203	205	207	213	233	235	272	279
95	240	243	244	253	279	281	322	334
120	271	276	273	287	317	321	363	381
150	301	307	301	320	355	360	403	428
185	338	346	335	361	401	410	450	485
240	387	399	379	416	464	477	511	565
300	432	448	417	468	524	541	564	640
350	457	477	438	499	558	579	593	684
400	486	511	462	534	597	622	625	735
500	546	580	509	609	677	714	688	843
630	610	658	557	693	765	818	749	965
800	674	740	602	783	855	928	807	1097
1000	734	819	643	872	938	1034	854	1221
1200	854	998	733	1056	1212	1377	1159	1662
1400	901	1075	760	1140	1283	1487	1181	1785
1600	941	1144	782	1216	1342	1584	1204	1899
2000	1008	1269	819	1355	1444	1761	1233	2106
110, 132 and 150 kV								
185	342	349	341	364	417	423	460	484
240	394	405	388	422	487	496	533	572
300	440	455	428	476	549	563	591	649
350	466	484	450	506	585	602	624	694
400	497	518	475	543	626	647	660	745
500	559	590	524	618	711	742	730	855
630	627	672	576	707	810	855	809	992
800	694	757	623	799	905	970	873	1126
1000	760	843	668	897	1005	1095	936	1282
1200	866	1005	746	1063	1245	1395	1216	1659
1400	914	1083	775	1148	1319	1507	1240	1784

Permissible current loads are calculated for following conditions:
 – conductor temperature 90 °C;
 – air temperature 30 °C;
 – ground temperature 20 °C;
 – laying depth in ground 1,5 m;
 – soil thermal resistance 1,0 K-m/W;
 – nominal cross-section area of screen 95 mm²

* grounding method:
 BE — Both-ends;
 SPB — Single Point Bonding;
 CB — Cross-bonding.

Nominal cross-section area of core, mm ²	70	95	120	150	185	240	300	350	400	500	630	800	1000	1200	1400	1600	2000
1-second short-circuit conductor capacity*, kA	6,6	8,9	11,3	14,2	17,5	22,7	28,2	32,9	37,6	47,0	59,0	75,2	94	112,8	131,6	150,4	188

Nominal cross-section area of core, mm ²	50	70	95	120	150	185	240	300
1-second short-circuit screen capacity*, kA	10,2	14,2	19,3	24,4	30,4	37,6	48,7	60,8

* if the short-circuit time is different from 1 s, this value must be multiplied by the factor $(1/\sqrt{t})$. In the above tables, not the actual cross-section of the copper screen and lead sheath is given, but the cross-section of the copper screen that allows the same short-circuit current capacity. In the calculations, the minimal cross-section of the copper screen under the lead sheath is assumed. If it is necessary to increase the short-circuit current capacity, the cable may have an increased cross-section of the copper screen.

Copper with lead sheath with copper screen

COPPER SINGLE-CORE CABLES WITH LEAD SHEATH WITH COPPER SCREEN

IEC 60840



Design

- copper compacted conductor RMC, cl. 2 (above 1200 mm² — RMS Milliken type)
- inner semiconductor layer
- XLPE insulation
- outer semiconductor layer
- semiconducting water-blocking tape
- copper wire screen and copper tape counter-helix
- semiconducting water-blocking tape
- semiconducting tape
- extruded lead alloy sheath
- outer sheath: of PE, PVC, flame-retardant PVC or halogen-free flame-retardant polymer compound

Application

- for laying in damp, partly flooded premises, in non-navigable reservoirs (halogen-free flame-retardant cables)
- for laying in very wet soils, in marshy areas, with high corrosivity of soil and water (PE sheathed cables)
- in premises, tunnels, canals, mines and outdoors (PVC sheathed cables)
- for group laying in cable structures, premises (including those in fire hazardous areas) (flame-retardant PVC sheathed cables)
- for laying at facilities where requirements are imposed for reduced smoke emission during combustion and smoldering (flame-retardant PVC or halogen-free sheathed cables) and for low corrosion activity of combustion products (halogen-free flame-retardant sheathed cables)
- if mechanical stresses are possible, excluded significant tensile forces

Ambient temperature

- from –50 °C up to +50 °C (PVC and flame-retardant PVC sheathed cables)
- from –60 °C up to +50 °C (the rest types)

Permissible conductor temperature:

- normal mode 90 °C
- alarm mode 130 °C
- short-circuit mode 250 °C

Permissible screen short-circuit temperature

210 °C

Minimum bending radius

25·D

Test voltage (50 Hz)

2,5·U₀, 30 min

Partial discharge level at 1,5·U₀ A.C.

5 pC

Maximum permissible pulling force at installing

50 N/mm²

Minimum permissible temperature at installing

- 20 °C (PE sheathed cables)
- 15 °C (the rest types)

Design options



- conductor sealed of water-blocking yarns
- semiconductor layer on the outer sheath
- PVC flame-retardant outer sheath



Flame resistance



not determined (PE sheathed cables) / EN 60332-1-2 (the rest types)



CPR - reaction to fire class according to EN 50575



Fca (PE sheathed cables) / Eca (the rest types)

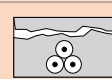
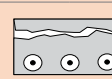
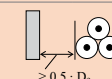
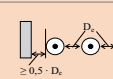
45 kV							
Number of cores × nom. cross-section area of core/ screen, mm ²	Conductor electrical resistance, Ohm/km, no more than		Calculated capacitance, μF/km	Calculated inductance, mH/km		Cable outer diameter, mm	Calculated cable weight, kg/km
	d.c. 20 °C	a.c. 90 °C					
1×70/50	0,268	0,342	0,135	0,661	0,510	51	5620
1×95/50	0,193	0,246	0,148	0,636	0,483	53	6230
1×120/70	0,153	0,196	0,158	0,618	0,464	54	6740
1×150/70	0,124	0,159	0,168	0,602	0,447	56	7290
1×185/70	0,0991	0,127	0,181	0,587	0,429	58	7980
1×240/70	0,0754	0,097	0,197	0,567	0,408	61	9030
1×300/70	0,0543	0,071	0,215	0,551	0,390	63	10100
1×350/70	0,0601	0,078	0,227	0,541	0,379	65	10940
1×400/70	0,0470	0,061	0,235	0,534	0,371	66	11530
1×500/95	0,0366	0,048	0,257	0,519	0,354	70	13280
1×630/95	0,0283	0,038	0,283	0,505	0,338	73	15410
1×800/95	0,0221	0,031	0,310	0,491	0,322	79	18230
1×1000/95	0,0176	0,022	0,340	0,486	0,316	87	22360
1×1200/120	0,0151	0,020	0,424	0,478	0,307	95	26310
1×1400/150	0,0129	0,018	0,452	0,470	0,297	100	29430
1×1600/150	0,0113	0,016	0,466	0,466	0,293	102	31950
1×2000/150	0,0090	0,013	0,501	0,457	0,282	105	36670

60 kV							
Number of cores × nom. cross-section area of core/ screen, mm ²	Conductor electrical resistance, Ohm/km, no more than		Calculated capacitance, μF/km	Calculated inductance, mH/km		Cable outer diameter, mm	Calculated cable weight, kg/km
	d.c. 20 °C	a.c. 90 °C					
1×95/50	0,193	0,246	0,127	0,671	0,521	55	6660
1×120/70	0,153	0,196	0,139	0,646	0,494	57	7200
1×150/70	0,124	0,159	0,148	0,628	0,474	58	7740
1×185/70	0,0991	0,127	0,158	0,612	0,458	60	8470
1×240/70	0,0754	0,097	0,169	0,595	0,439	63	9530
1×300/70	0,0543	0,071	0,185	0,576	0,418	66	10630
1×350/70	0,0601	0,078	0,200	0,559	0,399	67	11460
1×400/70	0,0470	0,061	0,219	0,543	0,381	69	12080
1×500/95	0,0366	0,048	0,239	0,527	0,363	72	13860
1×630/95	0,0283	0,038	0,262	0,512	0,346	76	16010
1×800/95	0,0221	0,031	0,287	0,498	0,330	81	18880
1×1000/95	0,0176	0,022	0,315	0,489	0,319	89	23040
1×1200/120	0,0151	0,020	0,391	0,484	0,313	97	27050
1×1400/150	0,0129	0,018	0,416	0,475	0,304	102	30230
1×1600/150	0,0113	0,016	0,429	0,471	0,299	104	32780
1×2000/150	0,0090	0,013	0,461	0,462	0,288	107	37940

110 kV							
Number of cores × nom. cross-section area of core/ screen, mm ²	Conductor electrical resistance, Ohm/km, no more than		Calculated capacitance, μF/km	Calculated inductance, mH/km		Cable outer diameter, mm	Calculated cable weight, kg/km
	d.c. 20 °C	a.c. 90 °C					
1×185/70	0,0991	0,127	0,137	0,655	0,503	72	11140
1×240/70	0,0754	0,097	0,153	0,627	0,473	74	12310
1×300/70	0,0543	0,071	0,164	0,608	0,453	75	12880
1×350/70	0,0601	0,078	0,172	0,596	0,440	76	13780
1×400/70	0,0470	0,061	0,177	0,590	0,433	78	14430
1×500/95	0,0366	0,048	0,191	0,572	0,414	81	16330
1×630/95	0,0283	0,038	0,217	0,549	0,387	85	18580
1×800/95	0,0221	0,031	0,236	0,533	0,370	90	21610
1×1000/95	0,0176	0,022	0,274	0,511	0,345	96	25260
1×1200/120	0,0151	0,020	0,320	0,503	0,336	104	29470
1×1400/150	0,0129	0,018	0,340	0,494	0,325	109	32730

132 kV							
Number of cores × nom. cross-section area of core/ screen, mm ²	Conductor electrical resistance, Ohm/km, no more than		Calculated capacitance, μF/km	Calculated inductance, mH/km		Cable outer diameter, mm	Calculated cable weight, kg/km
	d.c. 20 °C	a.c. 90 °C					
1×240/95	0,0754	0,097	0,137	0,646	0,494	81	14170
1×300/95	0,0543	0,071	0,146	0,627	0,473	84	15420
1×350/95	0,0601	0,078	0,153	0,615	0,460	86	16370
1×400/95	0,0470	0,061	0,163	0,602	0,446	85	16370
1×500/95	0,0366	0,048	0,176	0,584	0,426	88	18350
1×630/95	0,0283	0,038	0,198	0,561	0,401	90	19990
1×800/120	0,0221	0,031	0,215	0,544	0,383	94	23060
1×1000/120	0,0176	0,022	0,236	0,527	0,363	102	27570

150 kV							
Number of cores × nom. cross-section area of core/ screen, mm ²	Conductor electrical resistance, Ohm/km, no more than		Calculated capacitance, μF/km	Calculated inductance, mH/km		Cable outer diameter, mm	Calculated cable weight, kg/km
	d.c. 20 °C	a.c. 90 °C					
1×300/95	0,0543	0,071	0,139	0,631	0,478	86	16100
1×350/95	0,0601	0,078	0,146	0,618	0,464	88	17070
1×400/95	0,0470	0,061	0,156	0,606	0,450	87	17060
1×500/95	0,0366	0,048	0,167	0,588	0,431	90	19070
1×630/95	0,0283	0,038	0,188	0,564	0,405	92	20690
1×800/120	0,0221	0,031	0,204	0,548	0,387	97	23830
1×1000/120	0,0176	0,022	0,221	0,536	0,374	105	28400

Nominal cross-section area of core, mm ²	Current carrying capacity, A																
	in the ground				in the air												
																	
	BE*	SPB/CB*	BE*	SPB/CB*	BE*	SPB/CB*	BE*	SPB/CB*									
45 and 60 kV																	
70	260	264	263	275	299	302	344	359									
95	308	314	307	327	357	363	406	431									
120	346	355	342	370	405	414	455	491									
150	384	396	375	413	453	465	502	552									
185	428	445	413	464	510	527	554	625									
240	488	513	462	536	587	613	621	727									
300	541	576	504	603	659	695	678	823									
350	567	607	523	636	695	737	704	872									
400	603	651	549	683	742	793	738	940									
500	668	734	595	774	832	903	797	1071									
630	735	824	639	875	926	1024	851	1219									
800	798	913	679	979	1016	1146	899	1370									
1000	852	994	712	1074	1094	1254	935	1503									
1200	995	1247	807	1327	1426	1721	1279	2088									
1400	1039	1334	830	1426	1492	1846	1288	2234									
1600	1072	1408	847	1512	1544	1950	1299	2361									
2000	1127	1536	874	1664	1629	2132	1311	2586									
110, 132 and 150 kV																	
185	435	449	422	468	532	545	573	624									
240	498	520	475	544	619	639	658	737									
300	554	585	519	612	695	724	722	835									
350	581	617	540	646	733	767	753	886									
400	619	662	567	694	784	826	792	954									
500	687	748	615	787	881	941	860	1088									
630	761	845	664	894	989	1075	934	1255									
800	827	939	705	1000	1086	1204	987	1410									
1000	887	1027	741	1106	1180	1333	1036	1580									
1200	1012	1258	824	1337	1476	1746	1358	2086									
1400	1057	1348	847	1438	1546	1874	1366	2234									
Permissible current loads are calculated for following conditions:					* grounding method: BE — Both-ends; SPB — Single Point Bonding; CB — Cross-bonding.												
<ul style="list-style-type: none"> – conductor temperature 90 °C; – air temperature 30 °C; – ground temperature 20 °C; – laying depth in ground 1,5 m; – soil thermal resistance 1,0 K·m/W; – nominal cross-section area of screen 95 mm² 																	
Nominal cross-section area of core, mm ²	70	95	120	150	185	240	300	350	400	500	630	800	1000	1200	1400	1600	2000
1-second short-circuit conductor capacity*, kA	10	13,6	17,2	21,5	26,5	34,3	42,9	50,1	57,2	71,5	90,1	114,4	143	171,6	200,2	228,8	286
Nominal cross-section area of core, mm ²	50		70		95		120		150		185		240		300		
1-second short-circuit screen capacity*, kA	10,2		14,2		19,3		24,4		30,4		37,6		48,7		60,8		

* In the above tables, not the actual cross-section of the copper screen and lead sheath is given, but the cross-section of the copper screen that allows the same short-circuit current capacity. In the calculations, the minimal cross-section of the copper screen under the lead sheath is assumed. If it is necessary to increase the short-circuit current capacity, the cable may have an increased cross-section of the copper screen.

220–330 kV | SINGLE-CORE CABLES

XRUHAKXS, XnRUHAKXS

ALUMINUM SINGLE-CORE CABLES

IEC 60840



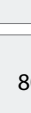
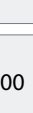
Design


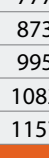
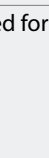

- aluminum compacted conductor RMC, cl. 2 (above 1200 mm² — RMS Milliken type)
- inner semiconductor layer
- XLPE insulation
- outer semiconductor layer
- semiconducting water-blocking tape
- copper wire screen and copper tape counter-helix
- semiconducting water-blocking tape
- aluminum water-blocking foil
- PE outer sheath (XRUHAKXS) or polymer composition flame-retardant outer sheath (XnRUHAKXS)

Application	<ul style="list-style-type: none"> – in premises, tunnels, canals, mines, ground with protection against mechanical damage (for XRUHAKXS) – for group laying in cable structures, premises, tunnels, canals, mines and outdoors with protection against mechanical damage (for XnRUHAKXS)
Ambient temperature	from –60 °C up to +50 °C
Permissible conductor temperature:	
– normal mode	90 °C
– alarm mode	130 °C
– short-circuit mode	250 °C
Permissible screen short-circuit temperature	350 °C
Minimum bending radius	16·D
Test voltage (50 Hz)	318 kV, 30 min (220 kV cable) 420 kV, 60 min (330 kV cable)
Partial discharge level at 1,5-U₀ A.C.	5 pC
Maximum permissible pulling force at installing	30 N/mm ²
Minimum permissible temperature at installing	–5 °C
Design options	<ul style="list-style-type: none"> – conductor sealed of water-blocking yarns – semiconductor layer on the outer sheath – fibre optic module in the screen
Flame resistance	not determined (PE sheathed cables) / EN 60332-1-2 (the rest types)
CPR - reaction to fire class according to EN 50575	Fca (PE sheathed cables) / Eca (the rest types)

220 kV

Number of cores × nom. cross-section area of core/screen, mm ²	Screen cross-section, mm ²		Conductor electrical resistance, Ohm/km, no more than		Calculated capacitance, μF/km	Calculated inductance, mH/km		Cable outer diameter, mm		Calculated cable weight, kg/km	
	min.	max.	d.c. 20 °C	a.c. 90 °C		⊙ ⊙ ⊙	⊙ ⊙ ⊙	XRUHAKXS	XnRUHAKXS	XRUHAKXS	XnRUHAKXS
1×400/185	50	300	0,0778	0,101	0,139	0,632	0,479	90	90	8910	9680
1×500/185	50	300	0,0605	0,079	0,149	0,613	0,458	93	93	8820	9640
1×630/185	50	300	0,0469	0,062	0,160	0,596	0,440	96	96	9560	10420
1×800/185	50	300	0,0367	0,049	0,180	0,571	0,413	99	99	11070	11970
1×1000/185	70	300	0,0291	0,038	0,198	0,555	0,395	105	105	12340	13420
1×1200/185	70	300	0,0247	0,032	0,232	0,536	0,374	111	111	13950	15070
1×1400/185	70	300	0,0212	0,028	0,246	0,526	0,362	115	115	15060	16270
1×1600/185	70	300	0,0186	0,024	0,253	0,521	0,356	117	117	15860	17100

330 kV											
Number of cores × nom. cross-section area of core/screen, mm ²	Screen cross-section, mm ²		Conductor electrical resistance, Ohm/km, no more than		Calculated capacitance, μF/km	Calculated inductance, mH/km		Cable outer diameter, mm		Calculated cable weight, kg/km	
	min.	max.	d.c. 20 °C	a.c. 90 °C				XRUHAKXS	XnRUHAKXS	XRUHAKXS	XnRUHAKXS
1×500/185	70	300	0,0605	0,079	0,128	0,641	0,488	106	106	11550	12580
1×630/185	70	300	0,0469	0,062	0,136	0,624	0,470	110	110	12430	13540
1×800/185	70	300	0,0367	0,049	0,151	0,598	0,442	112	112	13160	14290
1×1000/185	70	300	0,0291	0,038	0,170	0,577	0,419	116	116	14180	15390
1×1200/185	70	300	0,0247	0,032	0,197	0,557	0,397	121	121	15900	25030
1×1400/185	70	300	0,0212	0,028	0,208	0,546	0,384	126	126	17030	18440
1×1600/185	70	300	0,0186	0,024	0,213	0,541	0,379	129	129	17910	19360

Nominal cross-section area of core, mm ²	Current carrying capacity, A							
	in the ground				in the air			
								
	BE*	SPB/CB*	BE*	SPB/CB*	BE*	SPB/CB*	BE*	SPB/CB*
220 kV								
400	504	523	485	547	642	658	679	743
500	570	598	539	628	739	763	771	865
630	643	684	595	719	847	882	867	1004
800	720	777	651	820	968	1019	973	1166
1000	796	873	703	926	1092	1162	1074	1338
1200	867	995	755	1050	1226	1348	1185	1541
1400	925	1082	791	1145	1329	1483	1261	1700
1600	971	1157	818	1226	1410	1594	1316	1831
330 kV								
500	510	529	492	554	656	671	690	750
630	577	605	547	635	754	776	783	871
800	653	693	606	730	871	905	890	1022
1000	731	788	662	833	995	1045	999	1189
1200	868	995	758	1050	1226	1343	1185	1527
1400	926	1082	794	1144	1328	1477	1261	1683
1600	973	1157	821	1225	1410	1588	1319	1814
Permissible current loads are calculated for following conditions:					* grounding method: BE — Both-ends; SPB — Single Point Bonding; CB — Cross-bonding.			
<ul style="list-style-type: none"> – conductor temperature 90 °C; – air temperature 30 °C; – ground temperature 20 °C; – laying depth in ground 1,5 m; – soil thermal resistance 1,0 K·m/W; – nominal cross-section area of screen 95 mm² 								

Nominal cross-section area of core, mm ²	400	500	630	800	1000	1200	1400	1600
1-second short-circuit conductor capacity*, kA	37,6	47,0	59,5	75,6	94,5	113	132	151

Nominal cross-section area of core, mm ²	50	70	95	120	150	185	240	300
1-second short-circuit screen capacity*, kA	10,2	14,2	19,3	24,4	30,4	37,6	48,7	60,8

* if the short-circuit time is different from 1 s, this value must be multiplied by the factor (1/√t)

220–330 kV | SINGLE-CORE CABLES

XRUHKXS, XnRUHKXS

COPPER SINGLE-CORE CABLES

IEC 60840



Design

- copper compacted conductor RMC, cl. 2 (above 1200 mm² — RMS Milliken type)
- inner semiconductor layer
- XLPE insulation
- outer semiconductor layer
- semiconducting water-blocking tape
- copper wire screen and copper tape counter-helix
- semiconducting water-blocking tape
- aluminum water-blocking foil
- PE outer sheath (XRUHAKXS) or polymer composition flame-retardant outer sheath (XnRUHAKXS)

Application	<ul style="list-style-type: none"> – in premises, tunnels, canals, mines, ground with protection against mechanical damage (for XRUHAKXS) – for group laying in cable structures, premises, tunnels, canals, mines and outdoors with protection against mechanical damage (for XnRUHAKXS)
Ambient temperature	from –60 °C up to +50 °C
Permissible conductor temperature:	
– normal mode	90 °C
– alarm mode	130 °C
– short-circuit mode	250 °C
Permissible screen short-circuit temperature	350 °C
Minimum bending radius	16·D
Test voltage (50 Hz)	318 kV, 30 min (220 kV cable) 420 kV, 60 min (330 kV cable)
Partial discharge level at 1,5·U₀ A.C.	5 pC
Maximum permissible pulling force at installing	50 N/mm ²
Minimum permissible temperature at installing	–5 °C
Design options	<ul style="list-style-type: none"> – conductor sealed of water-blocking yarns – semiconductor layer on the outer sheath – fibre optic module in the screen
Flame resistance	not determined (PE sheathed cables) / EN 60332-1-2 (the rest types)
CPR - reaction to fire class according to EN 50575	Fca (PE sheathed cables) / Eca (the rest types)

220 kV

Number of cores × nom. cross-section area of core/screen, mm ²	Screen cross-section, mm ²		Conductor electrical resistance, Ohm/km, no more than		Calculated capacitance, μF/km	Calculated inductance, mH/km		Cable outer diameter, mm		Calculated cable weight, kg/km	
	min.	max.	d.c. 20 °C	a.c. 90 °C		⊙ ⊙ ⊙	⊙ ⊙ ⊙	XRUHKXS	XnRUHKXS	XRUHKXS	XnRUHKXS
1×400/185	50	300	0,0470	0,061	0,139	0,632	0,479	90	90	11310	12090
1×500/185	50	300	0,0366	0,048	0,149	0,613	0,458	93	93	11890	12710
1×630/185	50	300	0,0283	0,038	0,160	0,596	0,440	96	96	13520	14400
1×800/185	50	300	0,0221	0,031	0,180	0,571	0,413	99	99	16120	17050
1×1000/185	70	300	0,0176	0,023	0,198	0,555	0,395	105	105	18700	19920
1×1200/185	70	300	0,0151	0,020	0,232	0,536	0,374	111	111	21750	22870
1×1400/185	70	300	0,0129	0,018	0,246	0,526	0,362	115	115	24160	25370
1×1600/185	70	300	0,0113	0,016	0,253	0,521	0,356	117	117	26260	27500

330 kV											
Number of cores × nom. cross-section area of core/screen, mm ²	Screen cross-section, mm ²		Conductor electrical resistance, Ohm/km, no more than		Calculated capacitance, μF/km	Calculated inductance, mH/km		Cable outer diameter, mm		Calculated cable weight, kg/km	
	min.	max.	d.c. 20 °C	a.c. 90 °C				XRUHKXS	XnRUHKXS	XRUHKXS	XnRUHKXS
1×500/185	70	300	0,0366	0,048	0,128	0,641	0,488	106	106	14610	15640
1×630/185	70	300	0,0283	0,038	0,136	0,624	0,470	110	110	16390	17500
1×800/185	70	300	0,0221	0,031	0,151	0,598	0,442	112	112	18210	19340
1×1000/185	70	300	0,0176	0,023	0,170	0,577	0,419	116	116	20740	21950
1×1200/185	70	300	0,0151	0,020	0,197	0,557	0,397	121	121	23690	25030
1×1400/185	70	300	0,0129	0,018	0,208	0,546	0,384	126	126	26130	27540
1×1600/185	70	300	0,0113	0,016	0,213	0,541	0,379	129	129	28310	29760

Nominal cross-section area of core, mm ²	Current carrying capacity, A							
	in the ground				in the air			
	BE*	SPB/CB*	BE*	SPB/CB*	BE*	SPB/CB*	BE*	SPB/CB*

220 kV								
400	630	668	582	700	808	841	827	951
500	705	760	636	799	922	969	925	1101
630	785	862	690	910	1044	1112	1023	1270
800	865	968	741	1028	1175	1270	1126	1462
1000	937	1069	785	1143	1300	1424	1218	1652
1200	1020	1249	840	1322	1468	1692	1341	1939
1400	1076	1351	870	1435	1575	1850	1411	2131
1600	1118	1434	892	1528	1654	1976	1458	2281

330 kV								
500	638	676	592	709	827	857	844	960
630	715	768	647	808	942	986	944	1109
800	798	874	703	924	1075	1141	1054	1293
1000	878	981	755	1044	1209	1301	1159	1490
1200	1022	1249	843	1321	1470	1686	1345	1923
1400	1078	1351	874	1434	1577	1844	1414	2110
1600	1121	1435	896	1527	1657	1970	1465	2261

Permissible current loads are calculated for following conditions:

- conductor temperature 90 °C;
- air temperature 30 °C;
- ground temperature 20 °C;
- laying depth in ground 1,5 m;
- soil thermal resistance 1,0 K·m/W;
- nominal cross-section area of screen 95 mm²

* grounding method:
BE — Both-ends;
SPB — Single Point Bonding;
CB — Cross-bonding.

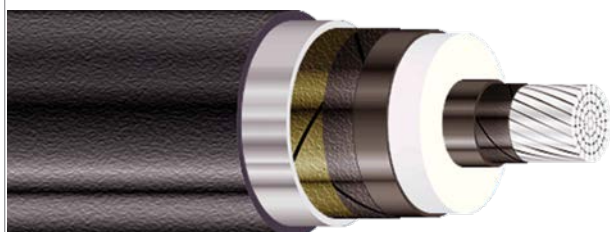
Nominal cross-section area of core, mm ²	400	500	630	800	1000	1200	1400	1600
1-second short-circuit conductor capacity*, kA	57,2	71,5	90,1	114	143	172	200	229
Nominal cross-section area of core, mm ²	50	70	95	120	150	185	240	300
1-second short-circuit screen capacity*, kA	10,2	14,2	19,3	24,4	30,4	37,6	48,7	60,8

* if the short-circuit time is different from 1 s, this value must be multiplied by the factor (1/√t)

Aluminum cables with lead sheath

ALUMINUM SINGLE-CORE CABLES WITH LEAD SHEATH

IEC 60840



Design

- aluminum compacted conductor RMC, cl. 2 (above 1200 mm² — RMS Milliken type)
- inner semiconductor layer
- XLPE insulation
- outer semiconductor layer
- semiconducting water-blocking tape
- semiconducting tape
- extruded lead alloy sheath
- outer sheath: of PE or halogen-free flame-retardant polymer compound

If it is necessary to increase the short-circuit current capacity, the cable may have the copper screen under the lead sheath.

Application

- in premises, tunnels, canals, mines, ground with protection against mechanical damage (PE sheathed cables)
- for group laying in cable structures, premises, tunnels, canals, mines and outdoors with protection against mechanical damage (flame-retardant cables)
- for laying in damp, partly flooded premises, in non-navigable reservoirs (flame-retardant cables)
- for laying in very wet soils, in marshy areas, with high corrosivity of soil and water (PE sheathed cables)

Ambient temperature

from –60 °C up to +50 °C

Permissible conductor temperature:

- normal mode
- alarm mode
- short-circuit mode

90 °C
130 °C
250 °C

Permissible screen short-circuit temperature

350 °C

Minimum bending radius

25·D

Test voltage (50 Hz)

318 kV, 30 min (220 kV cable)

Partial discharge level at 1,5·U₀ A.C.

5 pC

Maximum permissible pulling force at installing

30 N/mm²

Minimum permissible temperature at installing

–5 °C

Design options

- conductor sealed of water-blocking yarns
- semiconductor layer on the outer sheath
- fibre optic module in the screen

Flame resistance

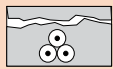
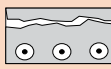
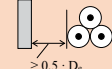
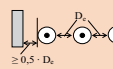
not determined (PE sheathed cables) /
EN 60332-1-2 (the rest types)

CPR - reaction to fire class according to EN 50575

Fca (PE sheathed cables) / Eca (the rest types)

220 kV

Number of cores × nom. cross-section area of core/ screen, mm ²	Conductor electrical resistance, Ohm/km, no more than		Calculated capacitance, μF/km	Calculated inductance, mH/km		Cable outer diameter, mm	Calculated cable weight, kg/km
	d.c. 20 °C	a.c. 90 °C		⊙ ⊙ ⊙	⊙ ⊙		
1×400/95	0,0778	0,101	0,139	0,632	0,479	90	16120
1×500/95	0,0605	0,079	0,149	0,613	0,458	94	17490
1×630/95	0,0469	0,062	0,160	0,596	0,440	98	19030
1×800/95	0,0367	0,049	0,180	0,571	0,413	100	19980
1×1000/120	0,0291	0,038	0,198	0,555	0,395	105	22320

Nominal cross-section area of core, mm ²	Current carrying capacity, A							
	in the ground				in the air			
								
BE*	SPB/CB*	BE*	SPB/CB*	BE*	SPB/CB*	BE*	SPB/CB*	
220 kV								
400	504	523	485	547	642	658	679	743
500	570	598	539	628	739	763	771	865
630	643	684	595	719	847	882	867	1004
800	720	777	651	820	968	1019	973	1166
1000	796	873	703	926	1092	1162	1074	1338
Permissible current loads are calculated for following conditions: – conductor temperature 90 °C; – air temperature 30 °C; – ground temperature 20 °C; – laying depth in ground 1,5 m; – soil thermal resistance 1,0 K·m/W; – nominal cross-section area of screen 95 mm ²					* grounding method: BE — Both-ends; SPB — Single Point Bonding; CB — Cross-bonding.			

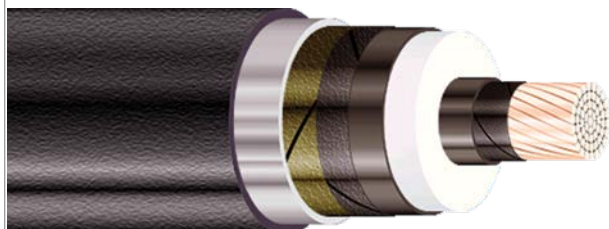
Nominal cross-section area of core, mm ²	400	500	630	800	1000
1-second short-circuit conductor capacity*, kA	37,6	47,0	59,5	75,6	94,5
1-second short-circuit screen capacity*, kA:					
– with copper screen of minimal cross-section	24,6	26,0	27,7	28,5	-
– without copper screen	19,9	21,3	22,9	23,6	26,1

* if the short-circuit time is different from 1 s, this value must be multiplied by the factor $(1/\sqrt{t})$

Copper cables with lead sheath

COPPER SINGLE-CORE CABLES WITH LEAD SHEATH

IEC 60840



Design

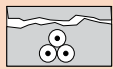
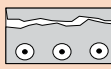
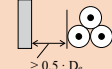
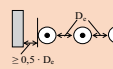
- copper compacted conductor RMC, cl. 2 (above 1200 mm² — RMS Milliken type)
- inner semiconductor layer
- XLPE insulation
- outer semiconductor layer
- semiconducting water-blocking tape
- semiconducting tape
- extruded lead alloy sheath
- outer sheath: of PE or halogen-free flame-retardant polymer compound

If it is necessary to increase the short-circuit current capacity, the cable may have the copper screen under the lead sheath.

Application	<ul style="list-style-type: none"> – in premises, tunnels, canals, mines, ground with protection against mechanical damage (PE sheathed cables) – for group laying in cable structures, premises, tunnels, canals, mines and outdoors with protection against mechanical damage (flame-retardant cables) – for laying in damp, partly flooded premises, in non-navigable reservoirs (flame-retardant cables) – for laying in very wet soils, in marshy areas, with high corrosivity of soil and water (PE sheathed cables)
Ambient temperature	from –60 °C up to +50 °C
Permissible conductor temperature:	
– normal mode	90 °C
– alarm mode	130 °C
– short-circuit mode	250 °C
Permissible screen short-circuit temperature	350 °C
Minimum bending radius	25·D
Test voltage (50 Hz)	318 kV, 30 min (220 kV cable)
Partial discharge level at 1,5·U₀ A.C.	5 pC
Maximum permissible pulling force at installing	50 N/mm ²
Minimum permissible temperature at installing	–5 °C
Design options	<ul style="list-style-type: none"> – conductor sealed of water-blocking yarns – semiconductor layer on the outer sheath – fibre optic module in the screen
Flame resistance	not determined (PE sheathed cables) / EN 60332-1-2 (the rest types)
CPR - reaction to fire class according to EN 50575	Fca (PE sheathed cables) / Eca (the rest types)

220 kV

Number of cores × nom. cross-section area of core/ screen, mm ²	Conductor electrical resistance, Ohm/km, no more than		Calculated capacitance, μF/km	Calculated inductance, mH/km		Cable outer diameter, mm	Calculated cable weight, kg/km
	d.c. 20 °C	a.c. 90 °C		⊙ ⊙ ⊙	⊙ ⊙		
1×400/95	0,0470	0,061	0,139	0,632	0,479	90	18640
1×500/95	0,0366	0,048	0,149	0,613	0,458	94	20720
1×630/95	0,0283	0,038	0,160	0,596	0,440	98	23190
1×800/95	0,0221	0,031	0,180	0,571	0,413	101	25600
1×1000/120	0,0176	0,023	0,198	0,555	0,395	108	30350

Nominal cross-section area of core, mm ²	Current carrying capacity, A							
	in the ground				in the air			
								
BE*	SPB/CB*	BE*	SPB/CB*	BE*	SPB/CB*	BE*	SPB/CB*	
220 kV								
400	630	668	582	700	808	841	827	951
500	705	760	636	799	922	969	925	1101
630	785	862	690	910	1044	1112	1023	1270
800	865	968	741	1028	1175	1270	1126	1462
1000	937	1069	785	1143	1300	1424	1218	1652
Permissible current loads are calculated for following conditions: – conductor temperature 90 °C; – air temperature 30 °C; – ground temperature 20 °C; – laying depth in ground 1,5 m; – soil thermal resistance 1,0 K·m/W; – nominal cross-section area of screen 95 mm ²					* grounding method: BE — Both-ends; SPB — Single Point Bonding; CB — Cross-bonding.			

Nominal cross-section area of core, mm ²	400	500	630	800	1000
1-second short-circuit conductor capacity*, kA	57,2	71,5	90,1	114	143
1-second short-circuit screen capacity*, kA:					
– with copper screen of minimal cross-section	24,6	26,0	27,7	28,5	–
– without copper screen	19,9	21,3	22,9	23,6	26,1

* if the short-circuit time is different from 1 s, this value must be multiplied by the factor $(1/\sqrt{t})$

Note: the cable parameters shown on pages 11–58 are calculated, the technical characteristics of the cables manufactured may differ from those stated.

Correction factors for permissible current calculation

Permissible current loads are calculated for following conditions:

- conductor temperature 90 °C
- both-ends grounding

In air:

- air temperature 30 °C
- single-core cables in flat formation are spacing with a clearance of one cable diameter

In ground:

- ground temperature 20 °C
- laying depth 1.5 m
- soil thermal resistance 1.0 K·m/W
- pipes are not filled by any substances such as bentonite
- single-core cables in flat formation are spacing with a clearance of one cable diameter

If the cables are laid in pipes filled with bentonite, they are treated as directly buried cables.

CORRECTION FACTORS FOR AMBIENT AIR AND GROUND TEMPERATURES

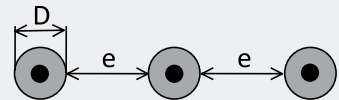
Method of installation	Ambient temperature, °C											
	- 10	- 5	0	5	10	15	20	25	30	35	40	45
in the ground	1,20	1,17	1,13	1,10	1,06	1,03	1,00	0,97	0,93	0,89	0,86	0,82
in the air	1,29	1,25	1,21	1,18	1,14	1,11	1,07	1,04	1,00	0,96	0,92	0,88

CORRECTION FACTORS FOR LAYING DEPTHS OTHER THAN 1,5 m AND SOIL THERMAL RESISTIVITIES OTHER THAN 1,5 K·m/W

Laying depth, m	Correction factor
1,0	1,04
1,2	1,02
1,4	1,01
1,5	1,00
1,6	0,99
1,8	0,98
2,0	0,97
2,5	0,95
3,0	0,93
5,0	0,89
7,0	0,87
9,0	0,85
10,0	0,84

Soil thermal resistivity, K·m/W	Correction factor
0,4	1,37
0,6	1,21
0,8	1,09
1,0	1,00
1,2	0,93
1,4	0,87
1,6	0,83
1,8	0,79
2,2	0,72
2,6	0,67
3,0	0,63

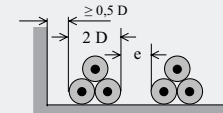
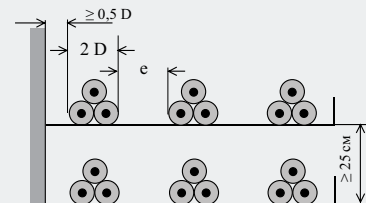
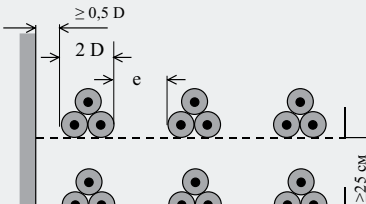
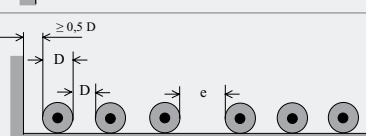
CORRECTION FACTORS DEPENDING ON THE DISTANCE BETWEEN PHASES IN HORIZONTAL FORMATION

e/D	0	0,75	1	1,5	2	3	
in the ground	0,95	0,99	1,00	1,02	1,03	1,06	
in the air	0,80	0,88	1,00	1,00	1,00	1,00	

CORRECTION FACTORS FOR GROUPS OF CABLES LAID DIRECT IN THE GROUND

Distance between the cable groups, mm	Cable group quantity (except the spared)				
	2	3	4	5	6
0 (touching)	0,85	0,76	0,70	0,66	0,62
100	0,87	0,79	0,74	0,70	0,67
300	0,90	0,83	0,79	0,75	0,73
500	0,92	0,85	0,82	0,79	0,77
700	0,93	0,87	0,84	0,82	0,80
900	0,94	0,89	0,86	0,84	0,83
1200	0,95	0,91	0,89	0,87	0,86
1500	0,96	0,92	0,91	0,89	0,89
1800	0,96	0,93	0,92	0,91	0,91
2000	0,97	0,94	0,93	0,92	0,92
3000	0,98	0,96	0,96	0,95	0,95
4000	0,99	0,98	0,97	0,97	0,97
5000	0,99	0,98	0,98	0,98	0,98

CORRECTION FACTORS FOR CABLE GROUPS LAID IN THE AIR

Cable group quantity (except the spared)		1	2	3	Location option
1. Cables are laid on the ground surface ¹		0,97	0,94	0,93	
2. Cables are laid on the shelves (without air circulation) ²	Number of shelves				
	1	0,97	0,94	0,93	
3. Cables are laid on the trays (with air circulation) ²	Number of trays				
	1	1,00	0,97	0,96	
4. Cables are laid on the ground surface ³		0,96	0,91	0,88	

¹ Heating from neighboring groups is taken into account at $e/D: \leq 1$ — for 2 groups; $\leq 1,5$ — for 3 groups

² Heating from neighboring groups is taken into account if the gap between the cable and the shelf located above is smaller than $4D$ and the distance between the cables on one shelf is the same as indicated in ⁽¹⁾

³ Heating from neighboring groups is taken into account at $e/D: \leq 0,5$ — for 2 groups; $\leq 0,75$ — for 3 groups

CORRECTION FACTORS FOR LAYING IN THE PIPES AND CHANNELS

Laying conditions	Pipe internal diameter					
	1.5 De	2 De	2.5 De	3 De	3.5 De	4 De
Cables are laid in separate pipes in the ground or in the air with protection from solar radiation	0,90	0,91	0,92	0,93	0,94	0,95
Three cables are laid in one pipe in the ground or in the air with protection from solar radiation	0,90	0,91	0,92	0,93	0,94	0,95
Three cables are laid in a pipe exposed to solar radiation with an intensity of 1000 W/m ² :						
– in a steel pipe	0,77	0,77	0,78	0,79	0,80	0,81
– in a plastic pipe	0,78	0,79	0,80	0,81	0,82	0,83
Cables are laid in a pipe filled with bentonite	1,00	1,00	1,00	1,00	1,00	1,00

De — cable diameter (when three cables are laid in a pipe, De is equal to 2,15 x diameter of one cable)

CORRECTION FACTORS FOR DIFFERENT SCREEN CROSS-SECTION (BOTH ENDS GROUNDED)

Nominal cross-section area of core, mm ²	Correction factors for copper core cables, screen cross-section, mm ²																	
	35	50	70	95	120	150	185	240	300	35	50	70	95	120	150	185	240	300
	trefoil formation									horizontal formation								
70			1,00						0,99	1,02	1,02							
95	1,01	1,01		1,00		0,99	0,99		0,98	1,04	1,03	1,01		0,99	0,99	0,99		0,99
120								0,98	0,97	1,05	1,04					0,98	0,98	
150									0,97	1,06	1,05	1,02			0,98			
185	1,02		1,01						0,96	1,08	1,06					0,97	0,97	0,98
240		1,02																
300	1,03				0,99	0,98	0,97		0,95	1,10	1,07	1,03		0,98	0,97	0,96	0,96	0,97
350		1,03							0,94	0,93	1,11	1,08						
400	1,04			1,00		0,97	0,95	0,93	0,92	1,14	1,10	1,04	1,00		0,96	0,95	0,95	0,96
500	1,05	1,04	1,02						0,96	0,94	0,92	0,90	1,16	1,11	1,05			
630	1,06	1,05			0,98	0,96	0,94	0,92	0,90	1,16	1,11	1,05		0,97	0,95	0,94	0,94	0,95
800	1,07								0,95	0,93	0,91	0,89	1,19	1,13			0,93	0,93
1000	1,08	1,06	1,03			0,95	0,92	0,90	0,88	1,21	1,14	1,06				0,93	0,93	
1200	1,11	1,09	1,04			0,97	0,94	0,90	0,87	0,85	1,24	1,16	1,07		0,94			0,94
1400	1,13						0,93	0,90	0,86	0,84	1,26	1,17			0,96		0,92	0,92
1600	1,14	1,10	1,05						0,92	0,89	0,85	0,83	1,27	1,18	1,08		0,93	
2000	1,16	1,12	1,06			0,96	0,92	0,88	0,84	0,82	1,29	1,20			0,95	0,91	0,91	0,93

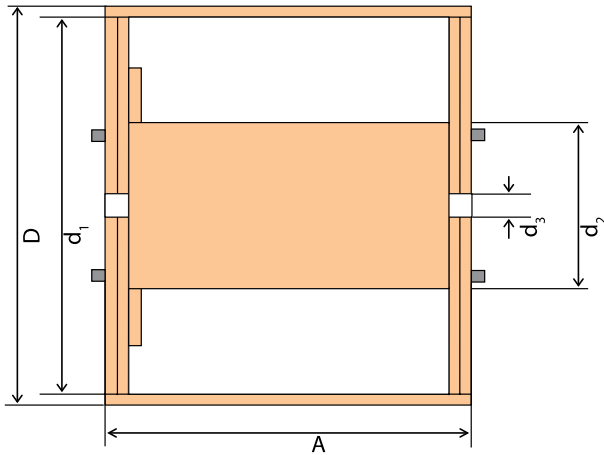
Nominal cross-section area of core, mm ²	Correction factors for aluminum core cables, screen cross-section, mm ²																	
	35	50	70	95	120	150	185	240	300	35	50	70	95	120	150	185	240	300
	trefoil formation									horizontal formation								
70						1,00	1,00				1,01							
95	1,00	1,00						0,99	0,99	1,02				1,00	1,00	1,00	1,00	1,00
120			1,00								1,02	1,01						
150				1,00		0,99	0,99			0,98	1,03				0,99	0,99	0,99	0,99
185	1,01	1,01									1,04	1,03						
240								0,98		0,97	1,05	1,04		0,99		0,98	0,98	
300									0,97	0,96	1,06	1,05	1,02					
350	1,02		1,01								1,07	1,05					0,97	0,97
400		1,02		1,00		0,99	0,98	0,97		0,95	1,08	1,06	1,03	1,00				
500	1,03								0,95	0,95	1,10	1,07			0,98	0,97	0,96	0,97
630	1,04	1,03							0,96	0,94	0,93	1,11	1,08					
800	1,05	1,04	1,02			0,97	0,95	0,93	0,92	1,14	1,10	1,04			0,98	0,96	0,95	0,96
1000	1,06	1,05							0,96	0,94	0,92	0,91	1,16	1,11	1,05			
1200	1,08	1,06	1,03			0,98	0,96	0,93	0,90	0,89	1,18	1,13			0,97	0,95	0,94	0,95
1400	1,09	1,07							0,95	0,92	0,89		1,20	1,14				
1600	1,10	1,08	1,04			0,97	0,94	0,91	0,88	0,87	1,22	1,15				0,94	0,93	0,93
2000	1,12	1,09	1,05			0,96	0,93	0,90	0,87	0,85	1,24	1,16	1,07		0,96	0,93	0,92	0,92

Cables packaging and delivery

Cables are supplied on the lined wooden drums with a snail according to GOST 5151-79.

The ends of the cables during transport and storage are sealed with heat shrinkable caps to prevent the penetration of water, and are fixed. During laying, the cap should be removed directly before installation. If the caps were removed prematurely, the cable ends should be protected from moisture.

During the storage, loading and transportation of cables, it is necessary to ensure control and necessary repair of the outer sheath and protective cap to avoid penetration of water under the outer sheath.



- D — drum diameter with packaging plank
- d_1 — drum flange diameter
- d_2 — drum barrel diameter
- d_3 — diameter of the axial hole
- A — packaging plank length

Drum type	Dimensions, mm					Calculated drum mass, kg	
	D	d_1	d_2	A	d_3	without packaging plank	with packaging plank
22	2260	2200	1320	1236	100	670	820
25	2580	2500	1500	1560	120	1210	1500
26	2680	2600	1500	1780		1370	1700
30	3080	3000	1800	2160	150	2290	2750

Note. The weight of drums is calculated with a moisture content of 30–40% and a specific weight of sawn timber 550 kg/m

CALCULATED CABLE LENGTH ON THE DRUMS

Drum type	Cable outer diameter, mm																	
	45	50	55	60	65	70	75	80	85	90	95	100	105	110	115	120	125	130
22	820	640	620	450	430	–	–	–	–	–	–	–	–	–	–	–	–	–
25	1560	1290	1040	820	620	590	570	430	410	380	270	270	250	250	–	–	–	–
26	2100	1720	1380	1110	1040	850	780	610	580	440	420	420	400	280	280	260	260	240
30	3220	2640	2170	1750	1420	1130	1100	830	800	770	590	560	530	530	380	350	350	330



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