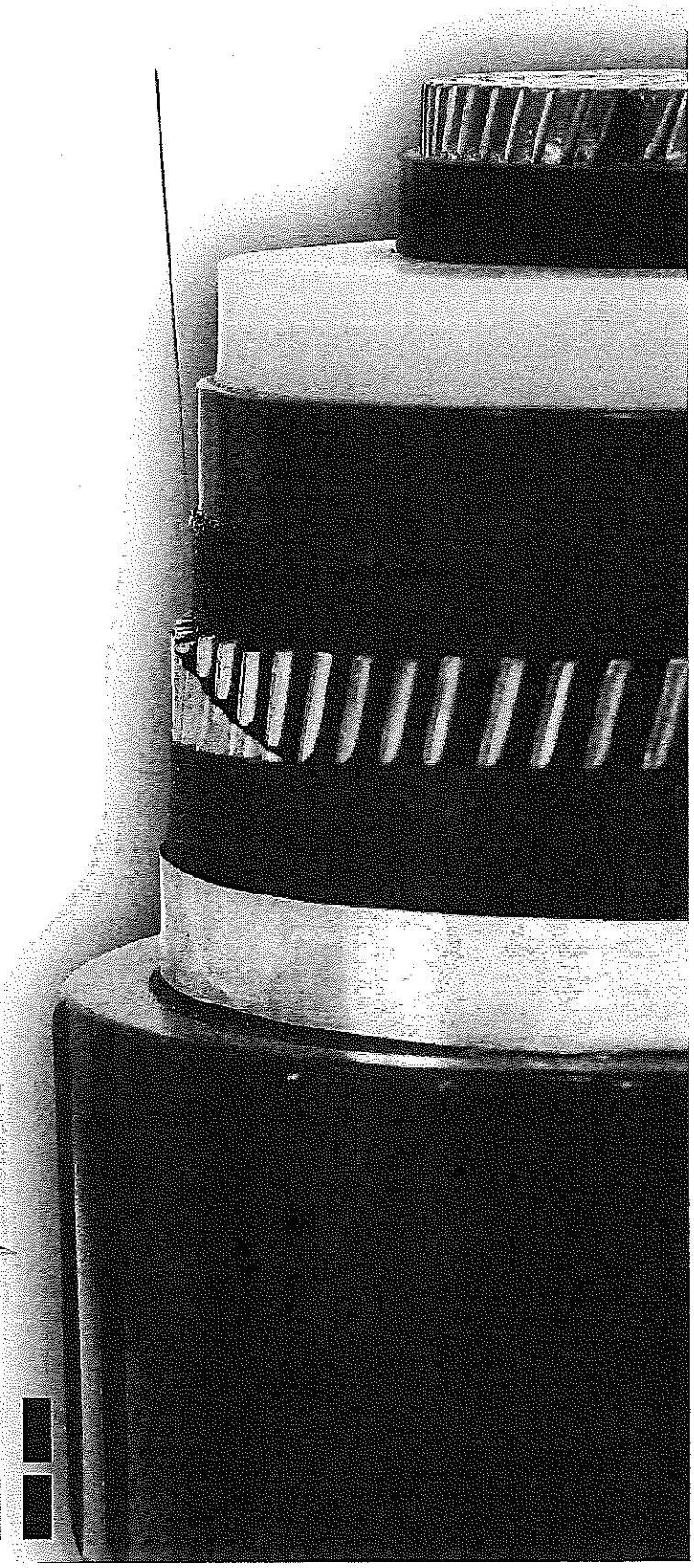
ESTRALIN HVC

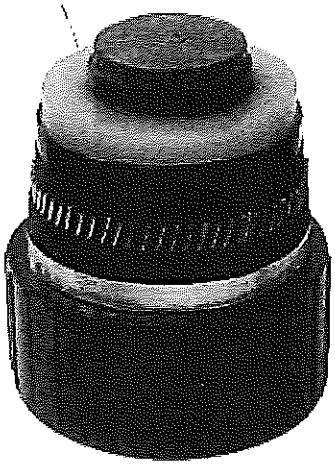
XLPE CABLES
AND CABLE SYSTEMS
66-220 KV

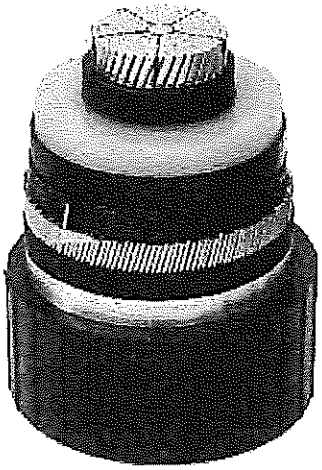


MODERN SOLUTIONS FOR
POWER CABLES/ESTRALIN HVC

стр. ТП-5

XLPE power cables



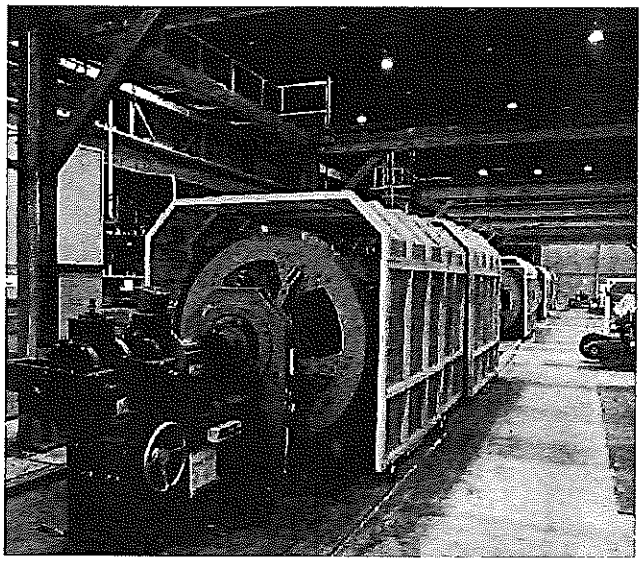


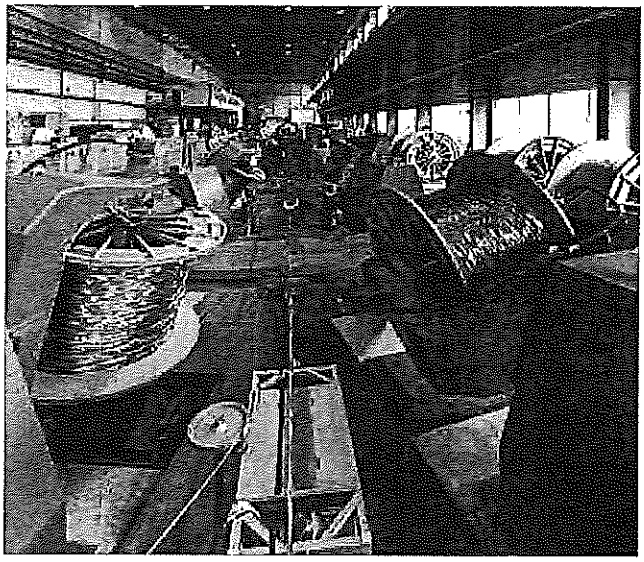
Cables 66-220 kV are widely used for electric energy transmission and distribution especially in large cities and at production plants, where electric energy consumption and load density levels are particularly high. Although basic requirements of cables (i.e. reliability, functionality, low maintenance costs) are obvious, failing in one of these requirements can cause remarkable financial losses as well as interruption of the service being provided.

Unlike cables with paper or oil-filled insulation which have reliability issues as well as high maintenance needs, medium and high voltage XLPE power cables provides very long service life and provide continuous electric power to consumer during their service life without any maintenance needs.

Design, modern production technologies and perfect materials with better electric and mechanical properties makes XLPE cables service life longest among other types of cables.

XLPE cables transfer capability is substantially higher than paper or oil-filled insulated cables. According to international standards, XLPE cables are designed for continuous service with conductor temperature of 90°C and it is still active under emergency conditions even at higher temperatures while oil-filled or paper insulated cables can withstand conductor temperature only up to 70°C which significantly decreases their transfer capability.





XLPE cables are environmentally safe. Absence of liquid inclusions ensures maintaining clean environment, which permits usage at any environmentally demanding projects and service-free maintenance of cable lines.

Due to its single core design, cable laying and installation of accessories, even in the most extreme conditions, are easier. XLPE cables with polyethylene sheath can be laid even temperatures as low as -20°C.

XLPE cable production technology was first introduced in the 1970s. The cross-links are a space lattice constructed using formation of longitudinal and transversal ties between macromolecules of polymer. With its physical and electrical properties, cross-linked polymer suits ideally for insulation of medium, high and extra-high voltage cables.

During production of XLPE cables, as any inclusions to the insulation will reduce life expectancy of the cable, special attention has to be paid regarding the purity and quality of insulation materials. In order to reach the ultimate target of producing reliable cable with a long trouble free operation time, special measures has to be taken by providing high quality raw material from a reliable supplier and treating them in special "clean rooms" in order to avoid contamination of insulating material.

High adhesion between semiconducive screens and insulation is a critical point. Applying insulation and semiconductive screens with triple extrusion technology followed by simultaneous cross linking of all three layers ensures high adhesion.

Based on obvious advantages of enhanced design and modern production technology, XLPE cables proved their universal application in developed countries and cause remarkable, continuous decrease of usage of oil and paper filled insulated cables day by day.

стр. тп-7

Estralin HVC – High Voltage cable production pioneer in Russia

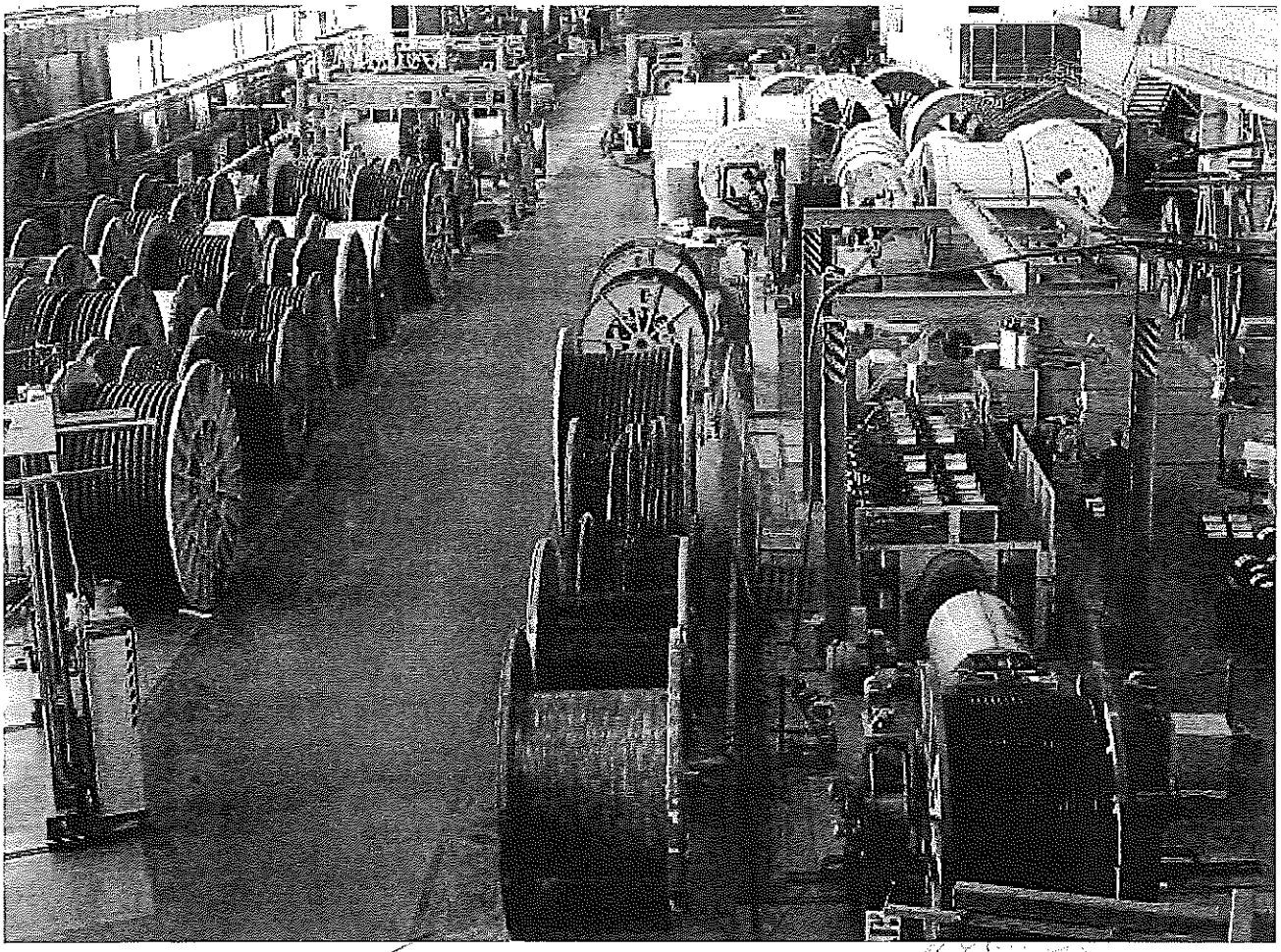
The ultimate target of the «Estralin High Voltage Cables» (Estralin HVC) plant is introduction of innovative technologies in the field of power cable production. Providing high quality production and services, we help our customers to increase their competitiveness as well as reduce the adverse impact upon environment.

Estralin HVC gives utmost importance to Research & Development of new technologies in order to provide high quality, competitive final product. Using best materials from leading global manufacturers for insulation (peroxide-cross-linked polyethylenes, triingostable (TSPE) and copolymer (CCPE) polyethylenes), high skilled personnel are key for us to perfect production which complies International and Russian Standards which put us on par with Western European Manufacturers.

Starting from choosing the right cables and accessories according to project and customer requirements until commissioning of complete cable line, Estralin has continuous control over the project in order to guarantee full satisfaction of final client.

In order to maintain complying to international quality standards, systematic approach has been introduced at the factory. Environmental aspects are very important for Estralin HVC and all necessary measures are being taken accordingly.

Estralin HVC's successes in development, introduction of quality assurance and environmental management systems have been recognized by the largest independent European certification Company, TUV CERT: the Plant was awarded certificates of conformity with regulatory requirements of ISO 9001 : 2008, ISO 14001 : 2004.



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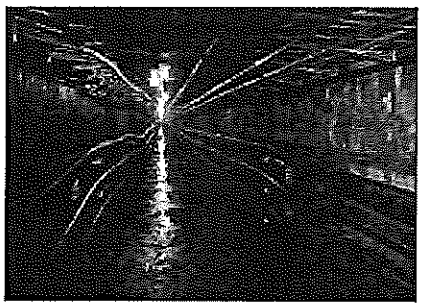
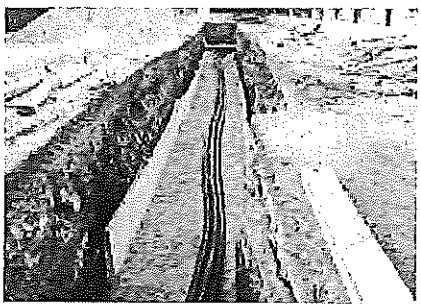
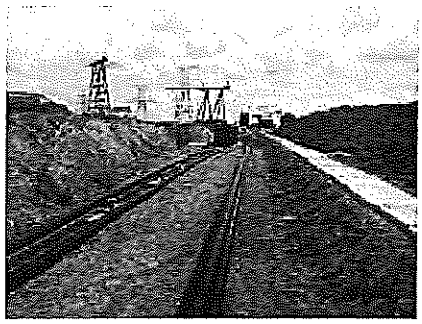
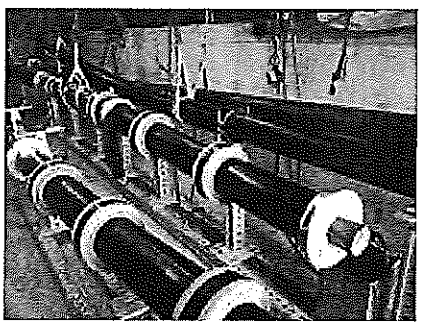
Core production of Estralin HVC is 66-220 kV XLPE cables.

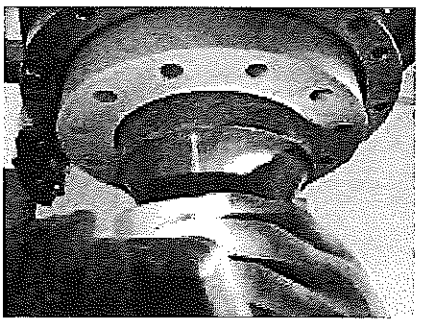
According to their design, all cables technological data and service characteristics comply the international standard requirements:IEC 60840 (66-150 kV cables), and IEC 62067 (220 kV cables), as well as with the GOST R certification, including those with regard to fire safety.

Our company offers:

- medium and high voltage cables
- technical support at all stages of cooperation.






стр. ТП-9

Markings

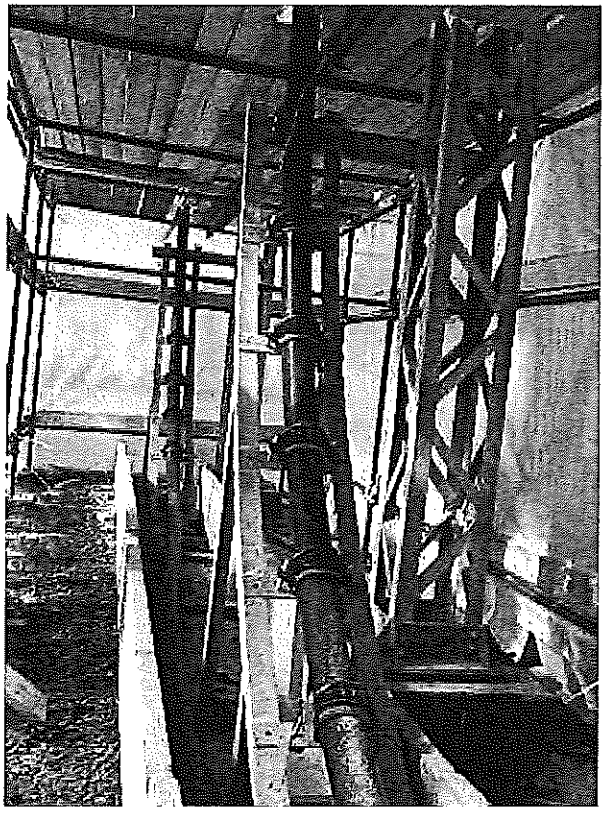
Conductor material	**Without designation**	Copper conductor
	A	Aluminum conductor
	RM	Round conductor
	RMS	Segmented conductor
Insulation material	2X	XLPE insulation
Screen	S	Copper wire and copper tape screen
	SA	Aluminium wire and aluminium tape screen
	(F)	Watertight screen from swelling tape which provides longitudinal water sealing
	(FL)	Watertight screen from swelling tape which provides radial water sealing and laminated polymer
Armouring	AWA	Wires armouring from galvanized steel
Sheath	K	Lead sheath
	Y	PVC sheath
	2Y	XLPE sheath
	H	Halogen free flame retardant sheath
	LWL (following screen designation)	Optic fibers in steel tubing inserted into copper

Example[1]:

A2XS(FL)Y-A-LWL 1x1600RMS/185 64/110 kV

- A — Aluminum conductor
- 2X — XLPE insulation
- S(FL)Y — Dual water sealed, flame retardant PVC outer sheath of category «A»
- LWL — Integrated optical fiber
- 1x — Conductor quantity
- 1600RMS — Longitudinal segmented conductor
- /185 — Screen cross-section
- 64/110 kV — Nominal voltage

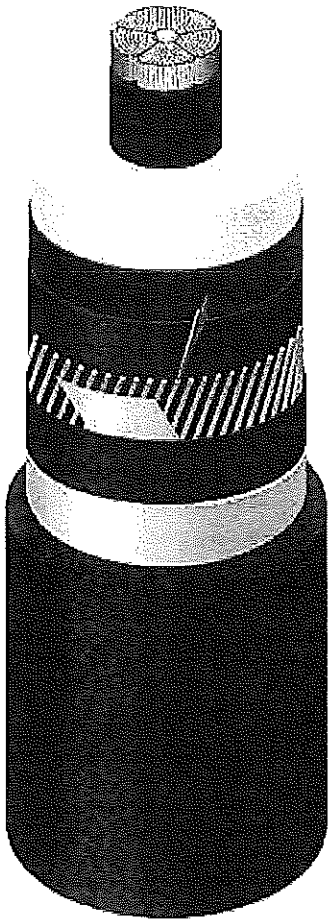
[1] Cable design and markings can be changed when new decisions are implemented.



Comparative characteristics	XLPE cable	High pressure oil-filled cable
Continuous permissible temperature, °C	90	85
Permissible heating in emergency, °C	105	90
Ultimate permissible temperature under short-circuit current flow, °C	250	200
Density of 1-sec. short-circuit current, A/mm² — copper conductor — aluminum conductor	 144 93	 101 67
Relative permittivity ε at 20°C	2,5	3,3
Dielectric loss ratio, tg δ at 20°C	0,001	0,004

Main advantages of XLPE cables are the following:

- high cable transmission capacity due to increased conductor permissible temperature;
- high current of thermal resistance during short-circuit that is of a special importance when a cross-section has been chosen on the basis of short-circuit nominal current only;
- low weight, smaller diameter and bending radius, which facilitates laying in both cable structures and underground along complicated routes;
- strong insulation provides enormous advantages at the laying over a sloping, hilly or rough territory, i.e. along the routes with considerable level difference due to absence of mass dulling effect;
- absence of liquids (oils) under pressure, and consequently, no need for costly refilling equipment, that means the considerable saving in operational costs, simplification of installation equipment, reducing time and cost of cable laying, as well as installation;
- the possibility of fast repair in emergency situation;
- absence of leakages and, therefore, no risks of environmental pollution in case of damage.



Design

XLPE insulated 66-220 kV cables consist of a round or segment copper or aluminum conductor, semiconductive core layer, XLPE insulation, semiconductive insulation layer, semiconductive tape, copper wire screen and copper tape screen, semiconductive tape, outer XLPE-sheath or PVC-compound.

Extruded screen made of semiconductive material, insulation and semiconductive insulation screen is laid over the conductor. Insulation thickness depends on conductor diameter.

The metal screen consists of copper wires and a copper tape laid above them. The screen cross-section is selected from short-circuit (SC) currents flow condition.

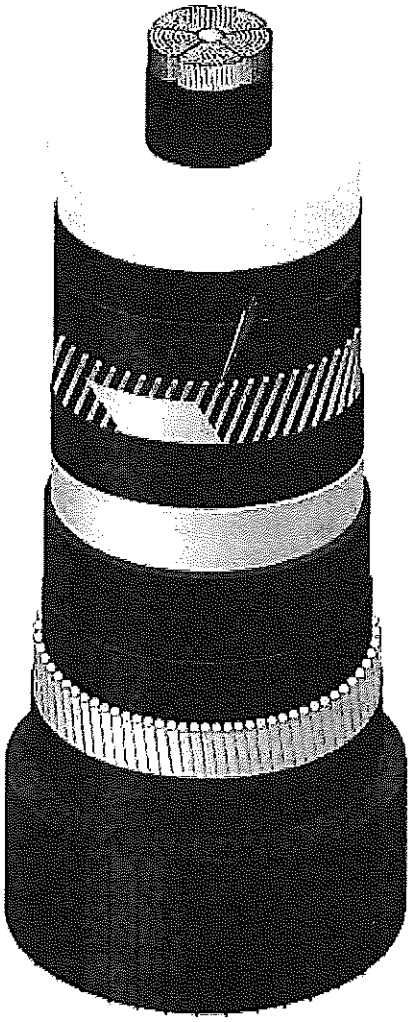
To ensure longitudinal sealing with "F"-index, a layer of waterproofing material should be used. Upon contact with water, the layer swells and makes a lateral barrier, thus preventing spreading of moisture in case of outer sheath failure.

"FL"-index has a sheath made of aluminum polyethylene tape welded together with XLPE- or PVC-sheath. This design allows to have an effective diffusion barrier, which prevents penetration of water vapor, whereas the outer sheath made of black PE serves as the mechanical protection.

Cables with reinforced XLPE-sheath and longitudinal ribs designed for sheath damage control, are used during cable laying.

On the Customer request, a 66-220 kV cable may be manufactured with optical fiber which is used for temperature measurement through the full length of the cable and for signals transmission.

Design



In addition, to ensure the sealing, lead sheath may be used. When this occurs, the cable will have the "K"-index. The lead sheath do not only ensure the sealing but also can replace, partially or in full, the screen transmitting short-circuit currents.

To ensure the additional mechanical protection the aluminum-alloy wire armor with "AWA"-index can be used.

Cables with reinforced XLPE-sheath and longitudinal ribs designed for sheath damage control, are used during cable laying.

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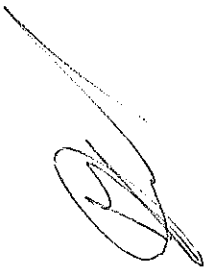

XLPE 66 kV cable specification

Conductor cross-section (S)	mm²	185	240	300	350	400	500	630	800	1000	1200	1400	1600	2000
Screen cross-section	mm²	150	150	150	150	150	150	150	150	150	150	150	150	150
Insulation thickness	mm	11,5	11,0	10,5	10,5	10,5	10,5	10,5	10,5	10,5	10,5	10,5	10,5	10,5
Thickness of outer cover	mm	6,0	6,0	6,0	6,0	6,0	6,0	6,0	6,0	6,0	6,0	6,0	6,0	6,0
Cable diameter (D)	mm	63,6	64,9	66,2	67,8	69,4	72,4	75,6	79,5	83,7	89,3	93,2	96,4	102,4
Weight approx. Al conductor Cu conductor	kg/m	 4,4 5,5	 4,6 6,1	 4,8 6,6	 5,0 7,2	 5,2 7,7	 5,7 8,8	 6,2 10,2	 6,9 11,9	 7,7 14,0	 8,7 16,1	 9,5 18,2	 10,2 20,2	 11,6 24,1
Min. bending radius (15D)	m	0,954	0,974	0,993	1,017	1,041	1,086	1,134	1,193	1,256	1,340	1,398	1,446	1,536
Maximum pulling force Al (30 S) Cu (50 S)	kN	 5,55 9,25	 7,20 12,00	 9,00 15,00	 10,5 17,5	 12,0 20,00	 15,0 25,0	 18,9 31,5	 24,0 40,0	 30,0 50,0	 36,0 60,0	 42,0 70,0	 48,0 80,0	 60,0 100,0
DC resistance Cu conductor Al conductor	Ω/km	 0,1640 0,0991	 0,1250 0,0754	 0,1000 0,0601	 0,0890 0,0543	 0,0778 0,0470	 0,0605 0,0366	 0,0460 0,0280	 0,0367 0,0221	 0,0291 0,0176	 0,0247 0,0151	 0,0212 0,0129	 0,0186 0,0113	 0,0149 0,0090
Inductance between conductors	mH/km	0,4627	0,4439	0,4289	0,4209	0,4057	0,39	0,3781	0,363	0,351	0,339	0,334	0,330	0,317
Inductance between conductor and screen	mH/km	0,228	0,206	0,187	0,178	0,170	0,183	0,181	0,132	0,121	0,114	0,106	0,101	0,092
Capacitance (per phase)	uF/km	0,167	0,188	0,210	0,221	0,232	0,252	0,274	0,300	0,328	0,366	0,392	0,413	0,453

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XLPE 66 kV cable specification with lead sheath

Conductor cross-section (S)	mm²	185	240	300	350	400	500	630	800	1000	1200	1400	1600	2000
Screen cross-section	mm²	150	150	150	150	150	150	150	150	150	150	150	150	150
Insulation thickness	mm	11,5	11,0	10,5	10,5	10,5	10,5	10,5	10,5	10,5	10,5	10,5	10,5	10,5
Thickness of lead sheah	mm	2,2	2,2	2,2	2,2	2,2	2,2	2,4	2,4	2,6	2,6	2,7	2,7	2,8
Thickness of outer cover	mm	6,0	6,0	6,0	6,0	6,0	6,0	6,0	6,0	6,0	6,0	6,0	6,0	6,0
Cable diameter (D)	mm	67,6	68,9	70,2	71,8	73,4	76,4	80,0	83,9	88,5	94,1	98,2	101,4	107,6
Weight approx. Al conductor Cu conductor	kg/m	 8,6 9,7	 8,9 10,4	 9,2 11,1	 9,5 11,7	 9,9 12,4	 10,6 13,7	 11,9 15,8	 12,9 17,9	 14,6 20,8	 16,1 23,5	 17,5 26,2	 18,5 28,5	 20,9 33,4
Min. bending radius (20D)	m	1,352	1,378	1,404	1,436	1,468	1,528	1,600	1,678	1,770	1,882	1,964	2,028	2,152
Maximum pulling force Al (30 S) Cu (50 S)	kN	 5,55 9,25	 7,20 12,00	 9,00 15,00	 10,5 17,5	 12,0 20,00	 15,0 25,0	 18,9 31,5	 24,0 40,0	 30,0 50,0	 36,0 60,0	 42,0 70,0	 48,0 80,0	 60,0 100,0
DC resistance Cu conductor Al conductor	Ω/km	 0,1640 0,0991	 0,1250 0,0754	 0,1000 0,0601	 0,0890 0,0543	 0,0778 0,0470	 0,0605 0,0366	 0,0460 0,0280	 0,0367 0,0221	 0,0291 0,0176	 0,0247 0,0151	 0,0212 0,0129	 0,0186 0,0113	 0,0149 0,0090
Inductance between conductors	mH/km	0,479	0,456	0,436	0,425	0,416	0,400	0,386	0,371	0,358	0,348	0,339	0,332	0,321
Inductance between conductor and screen	mH/km	0,232	0,210	0,191	0,182	0,173	0,160	0,148	0,135	0,124	0,117	0,109	0,104	0,095
Capacitance (per phase)	uF/km	0,167	0,188	0,210	0,221	0,232	0,252	0,274	0,300	0,328	0,366	0,392	0,413	0,453

Permissible continuous current-capacity during cable laying for XLPE cables 66 kV

The load-carrying capacity of high-voltage cables can be calculated under the following laying conditions:

- cable laying in ground;
- cable laying in triangle formation;
- cable laying in flat formation, the distance between phases –cable diameter;
- cable laying depth – 1,5 m;
- soil maximum temperature +15°C;
- soil thermal resistance– 1,2 K·m/W;
- conductor temperature - +90°C;
- circuits quantity– 1;
- load factor (LF) – 0,1 и 0,8.

Table 1.1. Continious current-carrying capacity during cable laying in ground

Conductor cross-section (S), mm²			185	240	300	350	400	500	630	800	1000	1200	1400	1600	2000
Continuous current-capacity, A	Cu	LF=0,8	489	568	642	682	734	834	945	1058	1164	1365	1474	1558	1664
		LF=1,0	438	506	571	605	650	737	832	927	1016	1186	1276	1345	1430
	Al	LF=0,8	380	442	500	534	576	659	754	856	959	1093	1187	1268	1395
		LF=1,0	340	394	445	474	510	582	664	750	837	950	1028	1095	1199
Continuous current-capacity, A		LF=0,8	511	595	674	716	771	880	1001	1128	1251	1337	1423	1496	1620
	Cu	LF=1,0	456	528	597	634	682	776	883	990	1095	1168	1242	1303	1408
	Al	LF=0,8	397	462	524	560	603	692	793	903	1017	1103	1186	1259	1383
		LF=1,0	354	411	464	496	533	610	698	793	891	964	1035	1097	1202

Table 1.2. Single point earthing currents

Conductor cross-section (S), mm²			185	240	300	350	400	500	630	800	1000	1200	1400	1600	2000
Continuous current-capacity, A		LF =0,8	460	524	582	613	651	722	794	865	927	1024	1075	1113	1162
	Cu	LF =1,0	410	466	516	541	574	634	695	752	803	881	922	952	989
	Al	LF =0,8	366	420	470	499	533	599	671	743	813	892	947	991	1058
		LF =1,0	327	374	417	442	471	527	588	648	706	770	814	849	902
Continuous current-capacity, A		LF =0,8	448	501	547	570	599	649	706	752	791	840	868	891	916
		LF =1,0	396	441	479	499	523	564	612	649	681	721	743	762	781
	Cu														
	Al	LF =0,8	365	414	457	481	509	561	614	666	713	758	790	815	853
		LF =1,0	324	365	402	423	446	490	534	577	615	652	679	699	729

стр. ТП-16

Permissible continuous current-capacity during cable laying in air for XLPE cables 66 kV

The load-carrying capacity of high-voltage cables can be calculated under the following laying conditions:

- cable laying in the air;
- cable laying in triangle formation;
- cable laying in flat formation, the distance between phases –cable diameter;
- conductor temperature - +90°C;
- ambient temperature - +25°C;
- protection from solar radiation.

Table 1.3. Single point earthing currents

Conductor cross-section (S), mm²		185	240	300	350	400	500	630	800	1000	1200	1400	1600	2000
Continuous current-capacity, A	Cu	563	661	756	809	876	1009	1156	1312	1464	1741	1901	2027	2200
	Al	438	514	589	633	687	797	922	1061	1205	1391	1528	1646	1840
Continuous current-capacity, A	Cu	626	737	849	909	987	1142	1319	1511	1703	1994	2191	2350	2576
	Al	486	573	659	711	772	898	1043	1208	1382	1580	1742	1883	2120

Table 1.4. Both ends earthing currents

Conductor cross-section (S), mm²		185	240	300	350	400	500	630	800	1000	1200	1400	1600	2000
Continuous current-capacity, A	Cu	536	620	698	741	795	895	1001	1109	1209	1362	1450	1518	1612
	Al	425	494	560	599	645	737	837	944	1050	1173	1262	1335	1453
Continuous current-capacity, A	Cu	550	625	689	724	765	839	913	984	1049	1132	1182	1220	1276
	Al	448	515	575	611	650	726	805	884	959	1037	1092	1137	1207

стр. ТП-17

XLPE 110 kV cable specification

Conductor cross-section (S)	mm^2	185	240	300	350	400	500	630	800	1000	1200	1400	1600	2000
Screen cross-section	mm^2	150	150	150	150	150	150	150	150	150	150	150	150	150
Thickness of insulation	mm	16,0	16,0	16,0	16,0	15,0	15,0	15,0	15,0	15,0	15,0	15,0	15,0	15,0
Thickness of outer cover	mm	6,0	6,0	6,0	6,0	6,0	6,0	6,0	6,0	6,0	6,0	6,0	6,0	6,0
Cable diameter (D)	mm	71,7	74,0	76,5	77,9	77,5	80,5	83,7	88,6	92,8	97,8	102,6	104,9	112,9
Weight approx. Al conductor Cu conductor	kg/m	 5,5 6,6	 5,8 7,3	 6,2 8,1	 6,4 8,6	 6,5 8,9	 7,0 10,1	 7,6 11,6	 8,4 13,5	 9,3 15,7	 10,6 18,0	 11,5 20,2	 12,2 22,1	 13,8 26,2
Minimal bending radius (15·D)	m	1,071	1,110	1,148	1,169	1,163	1,208	1,256	1,329	1,392	1,469	1,539	1,574	1,694
Maximum pulling force Al (30·S) Cu (50·S)	kN	 5,55 9,25	 7,20 12,00	 9,00 15,00	 10,5 17,5	 12,0 20,00	 15,0 25,0	 18,9 31,5	 24,0 40,0	 30,0 50,0	 36,0 60,0	 42,0 70,0	 48,0 80,0	 60,0 100,0
DC resistance Al Cu	Om/ km	 0,1640 0,0991	 0,1250 0,0754	 0,1000 0,0601	 0,0890 0,0543	 0,0778 0,0470	 0,0605 0,0366	 0,0460 0,0280	 0,0367 0,0221	 0,0291 0,0176	 0,0247 0,0151	 0,0212 0,0129	 0,0186 0,0113	 0,0149 0,0090
Inductance between conductors	mH/ km	0,494	0,473	0,455	0,444	0,429	0,412	0,397	0,382	0,368	0,356	0,347	0,339	0,328
Inductance between conductors and screen	mH/ km	0,261	0,242	0,225	0,215	0,206	0,185	0,172	0,158	0,145	0,136	0,128	0,122	0,111
Capacitance (per phase)	uF/ km	0,135	0,146	0,157	0,164	0,179	0,194	0,209	0,228	0,248	0,274	0,293	0,308	0,336

стр. ТП - 18

XLPE 110 kV cable specification with lead sheath

Conductor cross-section (S)	mm²	185	240	300	350	400	500	630	800	1000	1200	1400	1600	2000
Screen cross-section	mm²	150	150	150	150	150	150	150	150	150	150	150	150	150
Thickness of insulation	mm	16,0	16,0	16,0	16,0	15,0	15,0	15,0	15,0	15,0	15,0	15,0	15,0	15,0
Thickness of lead sheah	mm	2,2	2,2	2,2	2,2	2,2	2,2	2,4	2,4	2,6	2,6	2,7	2,7	2,8
Thickness of outer cover	mm	6,0	6,0	6,0	6,0	6,0	6,0	6,0	6,0	6,0	6,0	6,0	6,0	6,0
Cable diameter (D)	mm	76,6	78,9	81,2	82,8	82,4	85,4	89,0	92,9	97,5	103,1	107,2	110,4	116,6
Weight approx. Al conductor Cu conductor	kg/m	 10,1 11,2	 10,6 12,1	 11,1 13,0	 11,5 13,7	 11,5 14,0	 12,2 15,3	 13,6 17,5	 14,7 19,7	 16,5 22,7	 18,0 25,5	 19,6 28,3	 20,7 30,6	 23,1 25,6
Minimal bending radius (20·D)	m	1,532	1,578	1,624	1,656	1,648	1,708	1,780	1,858	1,950	2,062	2,144	2,208	2,332
Maximum pulling force Al (30·S) Cu (50·S)	кN	 5,55 9,25	 7,20 12,00	 9,00 15,00	 10,5 17,5	 12,0 20,00	 15,0 25,0	 18,9 31,5	 24,0 40,0	 30,0 50,0	 36,0 60,0	 42,0 70,0	 48,0 80,0	 60,0 100,0
DC resistance Al Cu	Om/ km	 0,1640 0,0991	 0,1250 0,0754	 0,1000 0,0601	 0,0890 0,0543	 0,0778 0,0470	 0,0605 0,0366	 0,0460 0,0280	 0,0367 0,0221	 0,0291 0,0176	 0,0247 0,0151	 0,0212 0,0129	 0,0186 0,0113	 0,0149 0,0090
Inductance between conductors	mH/ km	0,504	0,483	0,465	0,454	0,439	0,422	0,407	0,391	0,378	0,366	0,356	0,349	0,337
Inductance between conductors and screen	mH/ km	0,265	0,245	0,228	0,218	0,203	0,188	0,175	0,161	0,148	0,139	0,131	0,124	0,114
Capacitance (per phase)	uF/ km	0,135	0,146	0,157	0,164	0,179	0,194	0,209	0,228	0,248	0,274	0,293	0,308	0,336

СТр. ТП-19

XLPE 132 kV cable specification

Conductor cross-section (S)	mm²	240	300	350	400	500	630	800	1000	1200	1400	1600	2000
Screen cross-section	mm²	150	150	150	150	150	150	150	150	150	150	150	150
Insulation thickness	mm	18,5	17,5	17,5	16,5	16,0	16,0	16,0	16,0	16,0	16,0	16,0	16,0
Thickness of outer cover	mm	6,0	6,0	6,0	6,0	6,0	6,0	6,0	6,0	6,0	6,0	6,0	6,0
Cable diameter (D)	mm	79,0	79,3	80,9	80,5	82,5	85,7	89,6	93,8	99,4	103,3	106,5	112,5
Weight approx. Al conductor Cu conductor	kg/m	 6,0 7,5	 6,1 8,0	 6,4 8,6	 6,4 8,9	 6,8 9,9	 7,4 11,4	 8,2 13,2	 9,0 15,3	 10,1 17,6	 10,9 19,6	 11,7 21,7	 13,3 25,7
Min. bending radius (15D)	m	1,185	1,190	1,214	1,208	1,238	1,286	1,344	1,407	1,491	1,550	1,598	1,688
Maximum pulling force Al (30 S) Cu (50 S)	kN	 7,20 12,00	 9,00 15,00	 10,5 17,5	 12,0 20,00	 15,0 25,0	 18,9 31,5	 24,0 40,0	 30,0 50,0	 36,0 60,0	 42,0 70,0	 48,0 80,0	 60,0 100,0
DC resistance Cu conductor Al conductor	Ω/km	 0,1250 0,0754	 0,1000 0,0601	 0,0890 0,0543	 0,0778 0,0470	 0,0605 0,0366	 0,0460 0,0280	 0,0367 0,0221	 0,0291 0,0176	 0,0247 0,0151	 0,0212 0,0129	 0,0186 0,0113	 0,0149 0,0090
Inductance between conductors	mH/km	0,483	0,460	0,449	0,434	0,415	0,400	0,384	0,370	0,359	0,349	0,341	0,330
Inductance between conductor and screen	mH/km	0,255	0,232	0,222	0,207	0,189	0,175	0,161	0,149	0,139	0,131	0,124	0,114
Capacitance (per phase)	uF/km	0,133	0,148	0,154	0,168	0,185	0,199	0,217	0,236	0,261	0,278	0,292	0,319

XLPE 132 kV cable specification with lead sheath

Conductor cross-section (S)	mm²	240	300	350	400	500	630	800	1000	1200	1400	1600	2000
Screen cross-section	mm²	150	150	150	150	150	150	150	150	150	150	150	150
Insulation thickness	mm	18,5	17,5	17,5	16,5	16,0	16,0	16,0	16,0	16,0	16,0	16,0	16,0
Thickness of lead sheah	mm	2,2	2,2	2,2	2,2	2,2	2,4	2,4	2,6	2,6	2,7	2,7	2,8
Thickness of outer cover	mm	6,0	6,0	6,0	6,0	6,0	6,0	6,0	6,0	6,0	6,0	6,0	6,0
Cable diameter (D)	mm	83,9	84,2	85,8	85,4	87,4	91,0	94,9	99,5	105,1	109,2	112,4	118,6
Weight approx. Al conductor Cu conductor	kg/m	 11,5 13,0	 11,7 13,5	 12,0 14,2	 12,1 14,5	 12,6 15,7	 14,0 17,9	 15,1 20,1	 16,9 23,2	 18,5 26,0	 20,0 28,8	 21,1 31,1	 23,6 36,1
Min. bending radius (20D)	m	1,678	1,684	1,716	1,708	1,748	1,820	1,898	1,990	2,102	2,184	2,248	2,378
Maximum pulling force Al (30 S) Cu (50 S)	kN	 7,20 12,00	 9,00 15,00	 10,5 17,5	 12,0 20,00	 15,0 25,0	 18,9 31,5	 24,0 40,0	 30,0 50,0	 36,0 60,0	 42,0 70,0	 48,0 80,0	 60,0 100,0
DC resistance Cu conductor Al conductor	Ω/km	 0,1250 0,0754	 0,1000 0,0601	 0,0890 0,0543	 0,0778 0,0470	 0,0605 0,0366	 0,0460 0,0280	 0,0367 0,0221	 0,0291 0,0176	 0,0247 0,0151	 0,0212 0,0129	 0,0186 0,0113	 0,0149 0,0090
Inductance between conductors	mH/km	0,495	0,472	0,461	0,446	0,427	0,412	0,396	0,382	0,370	0,360	0,352	0,340
Inductance between conductor and screen	mH/km	0,261	0,238	0,227	0,212	0,194	0,180	0,166	0,153	0,144	0,135	0,129	0,118
Capacitance (per phase)	uF/km	0,133	0,148	0,154	0,168	0,185	0,199	0,217	0,236	0,261	0,278	0,292	0,319

стр. ТП - 21

XLPE 150 kV cable specification

Conductor cross-section (S)	mm²	300	350	400	500	630	800	1000	1200	1400	1600	2000
Screen cross-section	mm²	150	150	150	150	150	150	150	150	150	150	150
Insulation thickness	mm	18,5	18,5	17,5	17,5	17,5	17,5	17,5	17,5	17,5	17,5	17,5
Thickness of outer cover	mm	6,0	6,0	6,0	6,0	6,0	6,0	6,0	6,0	6,0	6,0	6,0
Cable diameter (D)	mm	81,3	82,9	82,5	85,5	88,7	92,6	96,8	102,4	106,3	109,5	115,5
Weight approx. Al conductor Cu conductor	kg/m	 6,4 8,2	 6,6 8,8	 6,7 9,2	 7,2 10,3	 7,8 11,7	 8,6 13,5	 9,4 15,7	 10,5 18,0	 11,4 20,1	 12,2 22,1	 13,7 26,2
Min. bending radius (15D)	m	1,220	1,244	1,238	1,283	1,331	1,389	1,452	1,536	1,595	1,643	1,733
Maximum pulling force Al (30 S) Cu (50 S)	kN	 9,00 15,00	 10,5 17,5	 12,0 20,0	 15,0 25,0	 18,9 31,5	 24,0 40,0	 30,0 50,0	 36,0 60,0	 42,0 70,0	 48,0 80,0	 60,0 100
DC resistance Al conductor Cu conductor	Ω/km	 0,1000 0,0601	 0,0890 0,0543	 0,0778 0,047	 0,0605 0,0366	 0,464 0,028	 0,0367 0,0221	 0,0291 0,0176	 0,0247 0,0151	 0,0212 0,0129	 0,0186 0,0113	 0,0149 0,009
Inductance between conductors	mH/km	0,465	0,454	0,439	0,422	0,407	0,391	0,376	0,365	0,354	0,347	0,335
Inductance between conductor and screen	mH/km	0,238	0,228	0,213	0,197	0,184	0,169	0,156	0,146	0,137	0,131	0,120
Capacitance (per phase)	uF/km	0,142	0,149	0,161	0,174	0,187	0,203	0,221	0,243	0,259	0,272	0,297

XLPE 150 kV cable specification with lead sheath

Conductor cross-section (S)	mm²	300	350	400	500	630	800	1000	1200	1400	1600	2000
Screen cross-section	mm²	150	150	150	150	150	150	150	150	150	150	150
Insulation thickness	mm	18,5	18,5	17,5	17,5	17,5	17,5	17,5	17,5	17,5	17,5	17,5
Thickness of lead sheah	mm	2,2	2,2	2,2	2,2	2,4	2,4	2,6	2,6	2,7	2,7	2,8
Thickness of outer cover	mm	6,0	6,0	6,0	6,0	6,0	6,0	6,0	6,0	6,0	6,0	6,0
Cable diameter (D)	mm	86,2	87,7	87,4	90,4	94,0	97,9	102,5	108,1	112,2	115,4	121,6
Weight approx. Al conductor Cu conductor	kg/m	 12,0 13,9	 12,4 14,6	 12,4 14,9	 13,2 16,3	 14,6 18,6	 15,7 20,7	 17,6 23,8	 19,2 26,7	 20,8 29,5	 21,9 31,8	 24,4 36,9
Min. bending radius (20D)	m	1,724	1,754	1,748	1,808	1,880	1,958	2,050	2,162	2,244	2,308	2,432
Maximum pulling force Al (30 S) Cu (50 S)	kN	 9,00 15,00	 10,5 17,5	 12,0 20,0	 15,0 25,0	 18,9 31,5	 24,0 40,0	 30,0 50,0	 36,0 60,0	 42,0 70,0	 48,0 80,0	 60,0 100
DC resistance Al conductor Cu conductor	Ω/km	 0,1000 0,0601	 0,0890 0,0543	 0,0778 0,047	 0,0605 0,0366	 0,464 0,028	 0,0367 0,0221	 0,0291 0,0176	 0,0247 0,0151	 0,0212 0,0129	 0,0186 0,0113	 0,0149 0,009
Inductance between conductors	mH/km	0,477	0,465	0,450	0,433	0,418	0,402	0,388	0,375	0,365	0,358	0,345
Inductance between conductor and screen	mH/km	0,243	0,233	0,218	0,202	0,188	0,174	0,161	0,151	0,142	0,135	0,124
Capacitance (per phase)	uF/km	0,142	0,149	0,161	0,174	0,187	0,203	0,221	0,243	0,259	0,272	0,297

ВЯРНО С ОРИГИНАЛА

стр. ТП-23

Permissible continuous current-capacity during cable laying for XLPE cables 110-150 kV

The load-carrying capacity of high-voltage cables can be calculated under the following laying conditions:

- cable laying in ground;
- cable laying in triangle formation;
- cable laying in flat formation, the distance between phases –cable diameter;
- cable laying depth – 1,5 m;
- soil maximum temperature +15°C;
- soil thermal resistance– 1,2 K·m/W;
- conductor temperature - +90°C;
- circuits quantity– 1;
- load factor (LF) – 0,1 и 0,8.

Table 1.5. Continious current-carrying capacity during cable laying in ground

Conductor cross-section (S), mm²			185	240	300	350	400	500	630	800	1000	1200	1400	1600	2000
Continuous current-capacity, A	Cu	LF =0,8	490	569	644	684	736	837	949	1064	1173	1369	1479	1565	1669
		LF =1,0	438	507	572	606	652	739	835	932	1023	1189	1280	1350	1437
	Al	LF =0,8	380	442	501	535	577	661	756	859	964	1095	1189	1271	1396
		LF =1,0	341	395	445	475	511	584	665	753	841	951	1030	1097	1202
Continuous current-capacity, A	Cu	LF =0,8	510	592	671	714	769	878	1000	1128	1253	1444	1567	1661	1794
		LF =1,0	456	529	598	634	683	777	883	994	1100	1266	1371	1450	1562
	Al	LF =0,8	396	460	522	558	601	690	792	902	1017	1146	1247	1332	1478
		LF =1,0	354	411	465	496	534	611	699	794	893	1004	1091	1164	1287

Table 1.6. Single point earthing currents

Conductor cross-section (S), mm²			185	240	300	350	400	500	630	800	1000	1200	1400	1600	2000
Continuous current-capacity, A	Cu	LF =0,8	463	529	589	621	660	732	807	879	944	1038	1091	1130	1181
		LF =1,0	413	470	521	548	581	641	704	763	816	892	933	964	1001
	Al	LF =0,8	368	423	474	504	538	605	678	752	824	902	957	1003	1071
		LF =1,0	328	376	420	445	475	532	593	655	714	777	822	858	911
Continuous current-capacity, A	Cu	LF =0,8	451	505	552	576	605	656	706	752	791	840	868	891	916
		LF =1,0	398	445	485	505	529	571	612	649	681	721	743	762	781
	Al	LF =0,8	366	415	460	484	513	565	620	672	720	767	800	827	864
		LF =1,0	325	368	405	426	450	494	539	583	622	660	687	710	739

стр. ТП-24

Permissible continuous current-capacity during cable laying in air for XLPE cables 110-150 kV

The load-carrying capacity of high-voltage cables can be calculated under the following laying conditions:

- cable laying in the air;
- cable laying in triangle formation;
- cable laying in flat formation, the distance between phases–cable diameter;
- conductor temperature - +90°C;
- ambient temperature - +25°C;
- protection from solar radiation.

Table 1.7. Single point earthing currents

Conductor cross-section (S), mm²		185	240	300	350	400	500	630	800	1000	1200	1400	1600	2000
Continuous current-capacity, A	Cu	563	660	754	806	874	1006	1153	1310	1462	1729	1888	2013	2185
	Al	437	513	587	631	684	794	918	1056	1200	1380	1515	1632	1824
Continuous current-capacity, A	Cu	618	727	833	892	968	1123	1296	1483	1671	1953	2145	2300	2519
	Al	480	565	647	697	756	882	1025	1185	1356	1548	1705	1842	2072

Table 1.8. Both ends earthing currents

Conductor cross-section (S), mm²		185	240	300	350	400	500	630	800	1000	1200	1400	1600	2000
Continuous current-capacity, A	Cu	540	625	706	749	804	905	1015	1125	1229	1383	1474	1543	1639
	Al	426	497	563	603	649	741	843	952	1060	1183	1274	1348	1468
Continuous current-capacity, A	Cu	552	628	696	732	776	852	929	1004	1072	1158	1210	1249	1306
	Al	447	514	576	612	653	731	812	894	972	1053	1110	1157	1229

XLPE 220 kV cable specification

Conductor cross-section (S)	mm²	400	500	630	800	1000	1200	1400	1600	2000	2500
Screen cross-section	mm²	265	265	265	265	265	265	265	265	265	265
Insulation thickness	mm	23,0	23,0	23,0	23,0	23,0	23,0	23,0	23,0	23,0	23,0
Thickness of outer cover	mm	6,0	6,0	6,0	6,0	6,0	6,0	6,0	6,0	6,0	6,0
Cable diameter (D)	mm	94,3	97,3	100,5	105,4	109,6	114,5	119,3	121,6	127,6	134,5
Weight approx. Al conductor Cu conductor	kg/m	 9,6 12,1	 10,2 13,3	 10,9 14,9	 11,9 17,0	 12,8 19,2	 14,1 21,5	 15,1 23,8	 15,9 25,8	 17,6 30,0	 19,7 35,2
Min. bending radius (20D)	m	1,884	1,946	2,010	2,108	2,192	2,290	2,386	2,432	2,552	2,690
Maximum pulling force Al (30 S) Cu (50 S)	kN	 12,0 20,0	 15,0 25,0	 18,9 31,5	 24,0 40,0	 30,0 50,0	 36,0 60,0	 42,0 70,0	 48,0 80,0	 60,0 100,0	 75,0 125,0
DC resistance Al conductor Cu conductor	Ω/km	 0,0778 0,047	 0,0605 0,0366	 0,464 0,028	 0,0367 0,0221	 0,0291 0,0176	 0,0247 0,0151	 0,0212 0,0129	 0,0186 0,0113	 0,0149 0,009	 0,0119 0,0072
Inductance between conductors	mH/ km	0,468	0,450	0,434	0,416	0,401	0,386	0,375	0,367	0,354	0,341
Inductance between conductor and screen	mH/ km	0,246	0,230	0,214	0,199	0,184	0,171	0,161	0,154	0,142	0,130
Capacitance (per phase)	uF/km	0,138	0,148	0,158	0,171	0,184	0,199	0,211	0,221	0,240	0,261

XLPE 220 kV cable specification with lead sheath

Conductor cross-section (S)	mm²	400	500	630	800	1000	1200	1400	1600	2000	2500
Screen cross-section	mm²	265	265	265	265	265	265	265	265	265	265
Insulation thickness	mm	23,0	23,0	23,0	23,0	23,0	23,0	23,0	23,0	23,0	23,0
Thickness of lead sheah	mm	2,2	2,2	2,4	2,4	2,6	2,6	2,7	2,7	2,8	3,0
Thickness of outer cover	mm	6,0	6,0	6,0	6,0	6,0	6,0	6,0	6,0	6,0	6,0
Cable diameter (D)	mm	98,4	101,4	105,0	108,9	113,5	119,1	123,2	126,4	132,6	139,9
Weight approx. Al conductor Cu conductor	kg/m	 15,7 18,2	 16,5 19,6	 18,0 22,0	 19,2 24,2	 21,2 27,5	 22,9 30,4	 24,6 33,3	 25,8 35,7	 28,4 40,9	 32,1 47,6
Min. bending radius (20D)	m	1,968	2,028	2,100	2,178	2,270	2,382	2,464	2,528	2,652	2,798
Maximum pulling force Al (30 S) Cu (50 S)	kN	 12,0 20,0	 15,0 25,0	 18,9 31,5	 24,0 40,0	 30,0 50,0	 36,0 60,0	 42,0 70,0	 48,0 80,0	 60,0 100,0	 75,0 125,0
DC resistance Al conductor Cu conductor	Ω/km	 0,0778 0,047	 0,0605 0,0366	 0,464 0,028	 0,0367 0,0221	 0,0291 0,0176	 0,0247 0,0151	 0,0212 0,0129	 0,0186 0,0113	 0,0149 0,009	 0,0119 0,0072
Inductance between conductors	mH/ km	0,474	0,456	0,441	0,423	0,408	0,395	0,384	0,376	0,362	0,350
Inductance between conductor and screen	mH/ km	0,247	0,230	0,215	0,199	0,185	0,174	0,164	0,156	0,144	0,133
Capacitance (per phase)	uF/km	0,138	0,148	0,158	0,171	0,184	0,199	0,211	0,221	0,240	0,261

ВЯРНО С ОРИГИНАЛА

стр. ТП-27

Permissible continuous current-capacity during cable laying for XLPE cables 220 kV

The load-carrying capacity of high-voltage cables can be calculated under the following laying conditions:

- cable laying in ground;
- cable laying in triangle formation;
- cable laying in flat formation, the distance between phases –cable diameter;
- cable laying depth – 1,5 m;
- soil maximum temperature +15°C;
- soil thermal resistance– 1,2 K·m/W;
- conductor temperature - +90°C;
- circuits quantity– 1;
- load factor (LF) – 0,1 и 0,8.

Table 1.9. Continious current -carrying capacity during cable laying in ground

Conductor cross-section (S), mm²		400	500	630	800	1000	1200	1400	1600	2000	2500
Continuous current-capacity, A Cu	LF =0,8	731	832	944	1060	1169	1356	1465	1550	1658	1718
	LF =1,0	645	732	827	924	1015	1172	1261	1330	1415	1457
Al	LF =0,8	573	657	751	853	958	1084	1177	1258	1384	1488
	LF =1,0	506	577	658	744	832	937	1014	1079	1182	1263
Continuous current-capacity, A Cu	LF =0,8	759	866	986	1112	1235	1421	1542	1638	1764	1837
	LF =1,0	675	768	873	982	1087	1247	1350	1431	1536	1595
Al	LF =0,8	593	680	780	889	1002	1128	1227	1313	1453	1570
	LF =1,0	528	604	690	784	882	990	1074	1148	1266	1363

Table 1.10. Single point earthing currents

Conductor cross-section (S), mm²		400	500	630	800	1000	1200	1400	1600	2000	2500
Continuous current-capacity, A Cu	LF =0,8	647	716	787	855	914	995	1042	1077	1121	1151
	LF =1,0	566	623	681	735	782	846	882	908	940	959
Al	LF =0,8	530	595	664	735	802	871	922	963	1024	1073
	LF =1,0	464	519	577	634	689	743	783	814	861	897
Continuous current-capacity, A Cu	LF =0,8	615	670	723	772	814	866	896	918	947	967
	LF =1,0	538	583	627	666	700	741	765	782	804	819
Al	LF =0,8	517	572	629	685	736	785	820	848	889	921
	LF =1,0	454	501	548	594	635	675	703	724	757	782

Permissible continuous current-capacity during cable laying in air for XLPE cables kV

The load-carrying capacity of high-voltage cables can be calculated under the following laying conditions:

- cable laying in the air;
- cable laying in triangle formation;
- cable laying in flat formation, the distance between phases –cable diameter;
- conductor temperature - +90°C;
- ambient temperature - +25°C;
- protection from solar radiation.

Table 1.11. Single point earthing currents

Conductor cross-section (S), mm²		400	500	630	800	1000	1200	1400	1600	2000	2500
Continuous current-capacity, A	Cu	863	992	1138	1292	1443	1695	1850	1973	2141	2250
	Al	676	782	904	1039	1181	1352	1483	1596	1782	1944
Continuous current-capacity, A	Cu	942	1087	1253	1433	1613	1883	2066	2214	2423	2565
	Al	736	854	990	1144	1307	1492	1641	1773	1992	2187

Table 1.12. Both ends earthing currents

Conductor cross-section (S), mm²		400	500	630	800	1000	1200	1400	1600	2000	2500
Continuous current-capacity, A	Cu	791	891	997	1104	1203	1343	1428	1493	1581	1646
	Al	640	730	828	933	1037	1151	1236	1307	1418	1513
Continuous current-capacity, A	Cu	798	886	975	1061	1140	1237	1298	1344	1408	1460
	Al	661	746	835	927	1015	1104	1171	1224	1307	1379

Correction factors for XLPE cables 66 – 220 kV

Correction factors for different temperatures												
Temperature °C	- 5	0	5	10	15	20	25	30	35	40	45	50
in the ground	1,13	1,1	1,06	1,03	1,0	0,97	0,93	0,89	0,86	0,82	0,77	0,73
in the air	1,21	1,18	1,14	1,11	1,07	1,04	1,0	0,96	0,92	0,88	0,83	0,78

Correction factors for different thermal resistivities of soil						
Thermal resistivity of soil, K·m/W	0,8	1,0	1,2	1,5	2,0	2,5
Correction factor	1,13	1,05	1,0	0,93	0,85	0,8

Correction factors for different instalation dephts										
Cable laying depth, m	1	1,5	1,8	2,0	2,2	2,5	3,0	4,0	5,0	10,0
Correction factor	1,05	1,0	0,98	0,96	0,95	0,93	0,91	0,88	0,86	0,8

Correction factors of cable laying in pipes			
Laying conditions	Cable laid in pipes partially	Cable laid in separate pipes	Cable laid in one pipe
Correction factor	0,94	0,9	0,9

Correction factors for numbers of cables						
Distance between CL, mm	Number of parallel CL					
	2	3	4	5	6	7
500	0,86	0,76	0,72	0,68	0,65	0,63
700	0,87	0,79	0,75	0,72	0,7	0,68
900	0,89	0,81	0,78	0,75	0,73	0,72
1000	0,9	0,82	0,79	0,76	0,75	0,74
1500	0,92	0,86	0,84	0,82	0,81	0,8
2000	0,94	0,9	0,88	0,87	0,86	0,85
2500	0,95	0,92	0,9	0,89	0,89	0,88
3000	0,96	0,93	0,92	0,91	0,91	0,91
3500	0,97	0,94	0,94	0,93	0,93	0,93
4000	0,97	0,95	0,95	0,94	0,94	0,94
4500	0,98	0,96	0,96	0,95	0,95	0,95
5000	0,98	0,97	0,96	0,96	0,96	0,95
5500	0,98	0,97	0,97	0,96	0,96	0,96
6000	0,98	0,97	0,97	0,96	0,96	0,96

Example of calculating of current capacity for 66 – 220 kV cables

Cable line 110 kV

- conductor material - copper;
- conductor cross-section - 800 mm²;
- installation type – in ground;
- type of installation – close trefoil;
- laying depth – 3 m;
- number of circuits - 2;
- distance between parallel circuits -1.5 m;
- cable screens earthing –both ends;
- ambient temperature +30°C;
- load factor-1;
- thermal resistivity of native soil – 2.0 K•m/W.

According to tables, current capacity for standard cable laying conditions (cable with a copper conductor with cross-section 800 mm² with both-ends earthing and a load factor 1.0) is 816 A.

Correction factor:

Correction factor for different instalation dephts K1=0,91;
Correction factor for numbers of cables K2= 0,92;
Correction factor for different temperatures K3=0,86;
Correction factor for different thermal resistivities of soil K4=0,85.

Permissible continuous current (ACC) for the above conditions can be calculated by:

Iper.=Ist·K1·K2·K3·K4 =816·0,91·0,92·0,86·0,85≈499 A.*

* * The exact value of the permissible continuous current is determined after calculation of IEC 60287 method.

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Formulas for auxiliary calculations

1. Dynamic forces in case of short-circuit

$$F = \frac{0.2}{s} \cdot I_{max}^2 \ [N/m]$$

where I_{max} – 2.5·I_{SC} [kA];
I_{SC} – short-circuit current [kA];
s – distance between cable axes [m];
F – maximum force [N/m].

2. Electrical stresses

$$E_{max} = \frac{U_0}{r_1 \cdot \ln(\frac{r_e}{r_i})} \ [kV/mm] \qquad E_{min} = \frac{U_0}{r_e \cdot \ln(\frac{r_e}{r_i})} \ [kV/mm]$$

where: r_e – outer insulation radius [mm];
r_i – inner insulation radius [mm];
U_0 – nominal voltage[kV];
E_{max} – electrical stress at conductor screen [kV/mm];
E_{min} – electrical stress at insulation screen [kV/mm].

3. Dielectric losses

$$W = 2 \cdot \pi \cdot f \cdot U_0^2 \cdot C \cdot tan(\delta) \ [W/km]$$

where: f – frequency [Hz];
U_0 – nominal voltage [kV];
C – capacity [mkF/km];
$tan(\delta)$ – tan of dielectric losses.

4. Induction and inductive resistance

$$L = 2 \cdot \ln(\frac{k \cdot b}{r_0}) \cdot 10^{-1} \ [mGn/kg]$$

where: k=1 trefoil formation, k=1.26 flat formation;
b – distance between axes [mm];
r_0 – average radius of the conductor [mm].

$$X = \frac{2 \cdot \pi \cdot f \cdot L}{1000} \ [Ohm/km]$$

where : f – frequency [Hz];
L – inductance [mGn/km];
X – inductance resistance [Ohm/km].

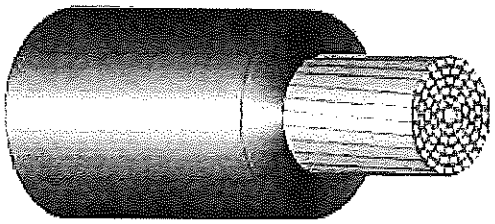
5. Maximum one-second short-circuit current

$$I_s = \frac{I_{sc}}{\sqrt{t_{sc}}} \ [\text{кА}]$$

where: I_s – maximum one-second SC current [кА];
I_{SC} – short-circuit current [кА];
t_{SC} – duration of the short-circuit current [s].

Earthing/cross-bonding cable

Earthing/cross-bonding cables are designed for transposition and screen earthing of XLPE cables. They can also be used as an additional earthing cable which is used as the connecting earthing points of cable screens when the cable line is earthed single-sided. The additional earthing cable can be used when it comes to single-sided erthing to keep down induced voltage occur in short-circuit fault.



Technical specification of earthing/cross-bonding cable

Conductor cross-section (S)	mm^2	240	400
Cable sheath thickness	mm	3,5	3,5
Cable diameter (D)	mm	25,1	30,6
Weight	kg/km	2414	3911
Min banding radius(10·D)	m	0,251	0,306
Conductor resistance against DC, at 20 °C, Cu	Om/km	0,754	0,0470

Permissible short-circuit currents for earthing/cross-bonding cables

Conductor heating temperature:

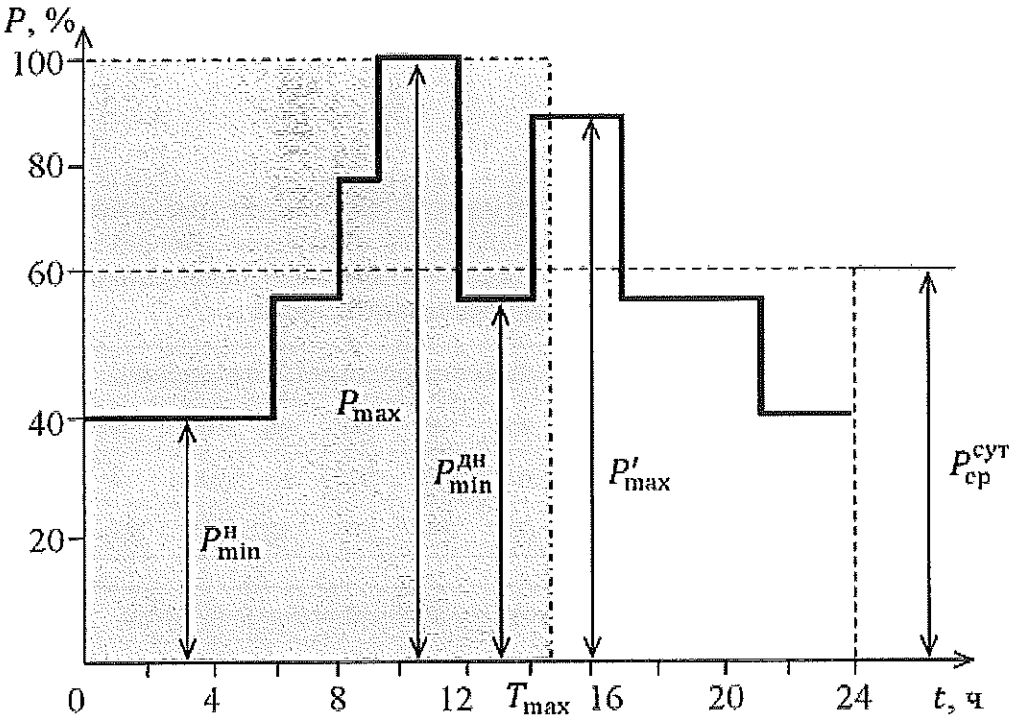
-before short-circuit 40°C
-after short-circuit 80°C

Permissible one-second SC current		
Cable cross-section, mm^2	240	400
Short circuit current, кА	35,3	58,7

Load factor

Load factor % - average energy load to the maximum peak load during a period. Most clearly, the load factor can be determined from the schedule of CL load.

Example of the CL load schedule



From the CL load schedule you can see that the load factor is equal to 0.6. The exact value of the load factor may be determined in the Regional Dispatching Office of the power system. The load factor can be calculated from the daily load schedule :

$$K_н = \frac{\sum_{i=1}^{n}(P_i \cdot t_i)}{24}$$

where: t_i – the period of i-time duration
P_i (%) – the ratio of power in the i-th time interval to the maximum power.

Short-circuit currents

Short-circuit current for all types of cables is calculated on the basis of the following conditions:

conductor temperature:

-before short-circuit 90°C
-after short-circuit 250°C

copper and alloy screen temperature:

-before short-circuit 70°C
-after short-circuit 350°C

Lead sheath temperature:

--before short-circuit 70°C
--after short-circuit 180°C

XLPE cable can be overloaded with temperatures up to 105°C. Emergency overloads do not considerably affect cable service life. The total duration of the overload mode should be no more than 100 hours per year and not more than 1000 hours for the service life. One-second long permissible short-circuit currents along the conductor and through the screen should not exceed the figures presented in the Tables.

Permissible one-cecond short-circuit current in the conductor												
Conductor cross-section, mm²	185	240	300	350	400	500	630	800	1000	1200	1600	2000
Cu conductor	26,5	34,3	42,9	50,1	57,2	71,5	90,1	114,4	14	172,8	230	288
Al conductor	17,5	22,7	28,2	33,1	37,6	47	59,2	75,2	93,1	114,3	152	190

Permissible one-cecond short-circuit current in the screen														
Copper screen cross-section, mm²	35	50	70	95	120	150	185	210	240	265	280	290	300	310
Lead sheath cross-section, mm²	249	383	551	769	968	1199	1493	1732	1963	2197	2288	2385	2458	2562
Short-circuit current, кА	6,8	9,8	13,6	17,7	22,9	28,2	34,7	40,0	45,2	50,4	52,4	54,7	56,3	58,6

Permissible one-cecond short-circuit current in the screen														
Alloy screen cross-section, mm²	35	50	70	95	120	150	185	210	240	265	280	290	300	310
Short-circuit current, кА	4,4	6,4	9,2	12,2	15,6	19,0	23,4	26,9	30,4	34,0	35,02	36,8	37,8	39,4

In the case of short-circuit, apart from the heating, the dynamic forces between cable phases have to be taken into consideration; their values can be significant. These values are important for cable clamps.

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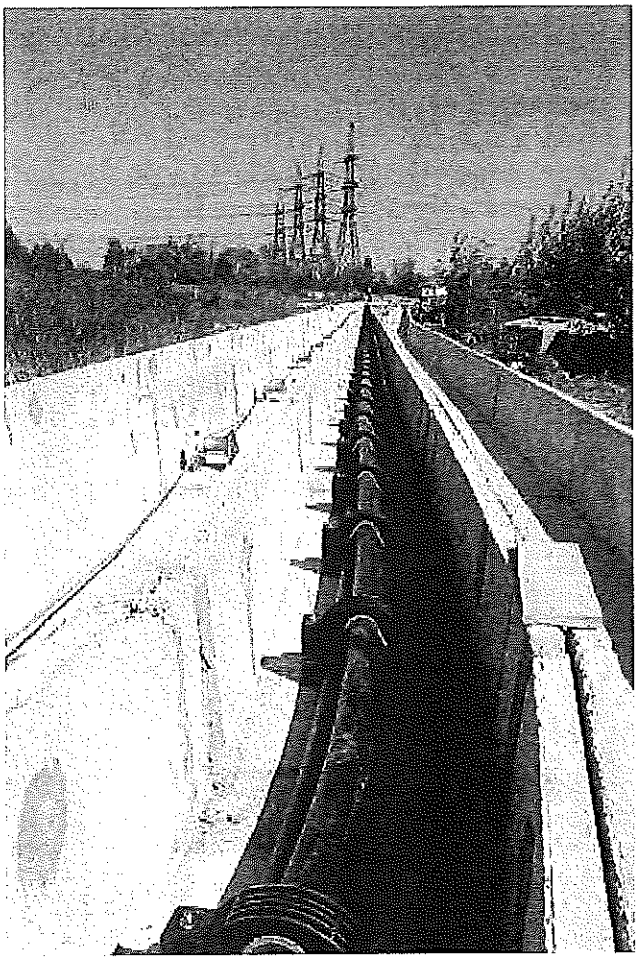
Cable laying conditions and testing after high voltage cable laying



During XLPE 66-220 kV cable laying the bending radius should be not less than 20xD, where D — outside cable diameter. When cables accessories installation is carried out with the use of a special template the preheating, minimal bending radius should be at least 15xD.

During cable laying use a cable sleeve or pulling eye, pulling force should not exceed the following figures:

F=Sx50 N/ mm² — for copper conductor,
F=Sx30 N/ mm² — for aluminum conductor

where S — conductor area of the cross-section, mm².

Ambient temperature during cable laying should not be lower than -5°C. If cable is preheated the cable laying can be carried out at the following temperatures:

-15°C – for cables with PVC-plasticate sheath;
-20°C – for cables with polyethylene sheath.

After cable line installation and commissioning, each phase of the cable and its accessories should be tested by increased AC voltage of 128 kV during one hour with frequency of 20 to 300 Hz. As agreed between manufacturing company and customer, it is permitted to conduct testing by nominal working AC voltage of 64 kV during 24 hours without load, instead of the test by increased AC voltage. The test by increased DC is feasible, but not recommended, and only as agreed between manufacturing company and customer.

Cable sheath has to be tested by DC of 10 kV, applied between a metallic screen and earthing for one minute.

During cable laying of Estralin HVC production the requirements of «Maintenance of XLPE cable laying 110-500 kV, №TD-16-01P» should be met.

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Estralin
High Voltage Cables Plant

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web-site: www.estralin.com

Information:

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Оу. ТП-37

ESTRALIN
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ВЕРНО С ОРИГИНАЛА

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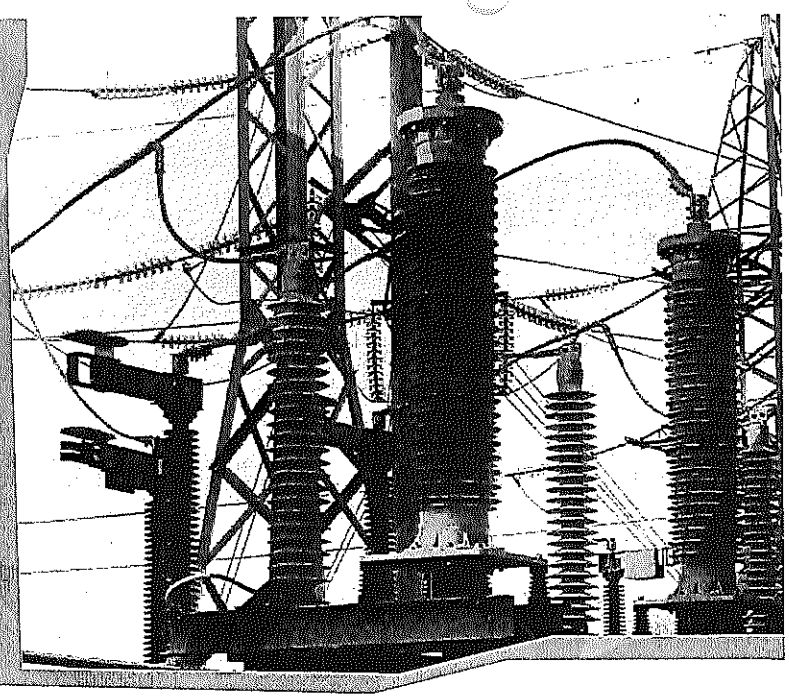
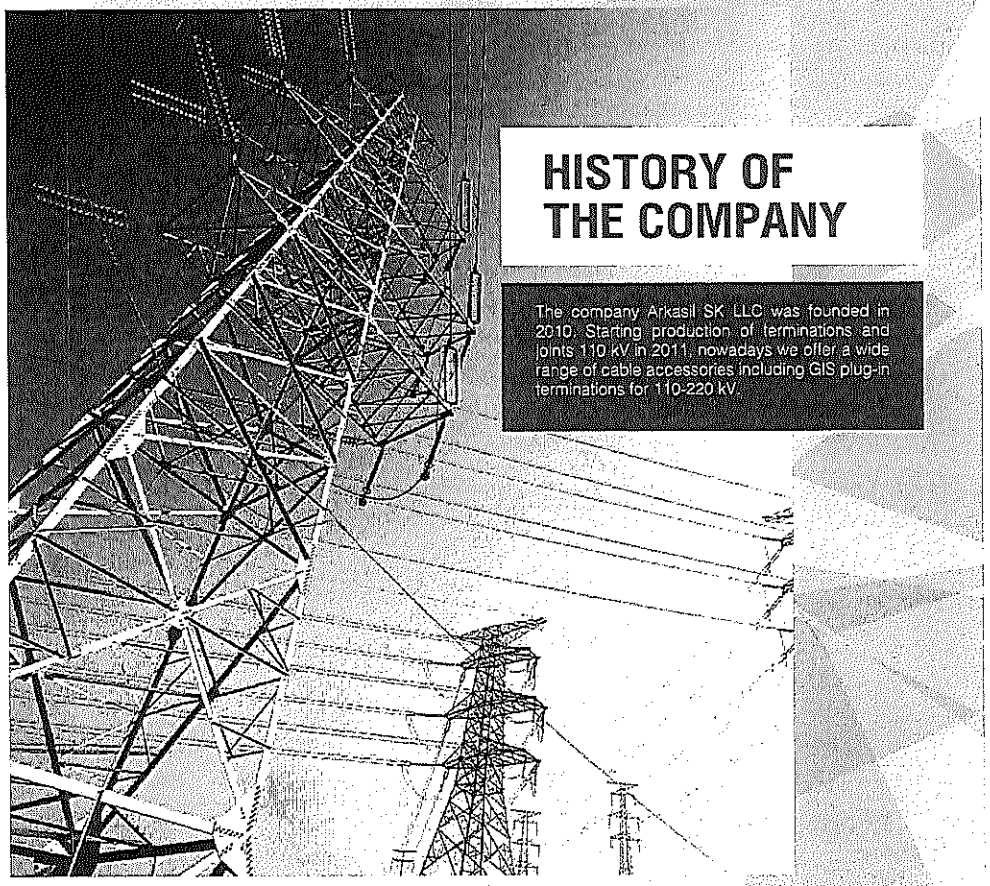


CABLE ACCESSORIES

110-220 kV

www.arkasil.com

Arkasil



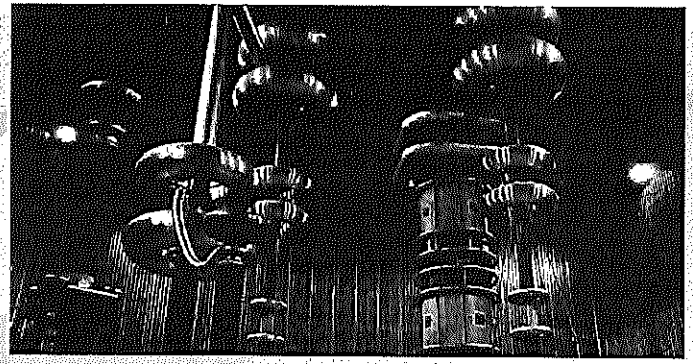
HISTORY OF THE COMPANY

The company Arkasil SK LLC was founded in 2010. Starting production of terminations and joints 110 kV in 2011, nowadays we offer a wide range of cable accessories including GIS plug-in terminations for 110-220 kV.

MAIN INFORMATION

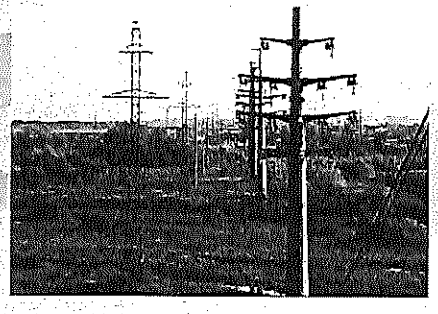
Arkasil is the first and the only Russian company offering owned-produced accessories for 110-220 kV XLPE cables. Applicable innovation design methods and more than 10-years experience of our employees in delivery, mounting and tests of HV and EHV cables and cable accessories make Arkasil the leader in the domestic market. Dynamic development of the company, optimization of technological processes and flexible pricing policy allow us to set ambitious objectives and be a serious competitor to international producers of cable accessories world-wide.

Arkasil



Aspiring to leading positions on the market of the cable accessories producers, our company pays much attention to development of new products. As a result of innovation Arkasil has launched different types of accessories for different voltage classes within 5 years.The company continuously carries out different tests of new products for approval of engineering decisions, quality of materials and production processes.

Manufacturing of high-quality products that meet modern standards, satisfying customer needs is our priority. That's why we co-operate only with the leading international and domestic producers of isolation materials and components. Quality management system is developed and implemented in the company in accordance with ISO:9001 requirements. Continuous control of material quality, production processes and complete production control during routine tests ensure our customers the compliance of the output products with the stated specification and requirements of international and local standards.



The key factor of company innovative development is the involvement of all employees. The implemented system of continuous improvements ensures the increase of the quality of output products and optimization of production processes.

Due to individual approach to the assigned tasks, flexibility in communication with the customers, strict fulfillment of contractual obligations managed to take an essential part of the Russian market . On customers' demands Arkasil develops and implements individual solution for construction of cable lines. Own design department enables us to implement the most sophisticated projects in the shortest possible time taking into account their unique features.

Together with assurance of our products quality we pay much attention to environment and energy efficiency issues. Environment management system is implemented and applied at the company in accordance with ISO 14001:2004.

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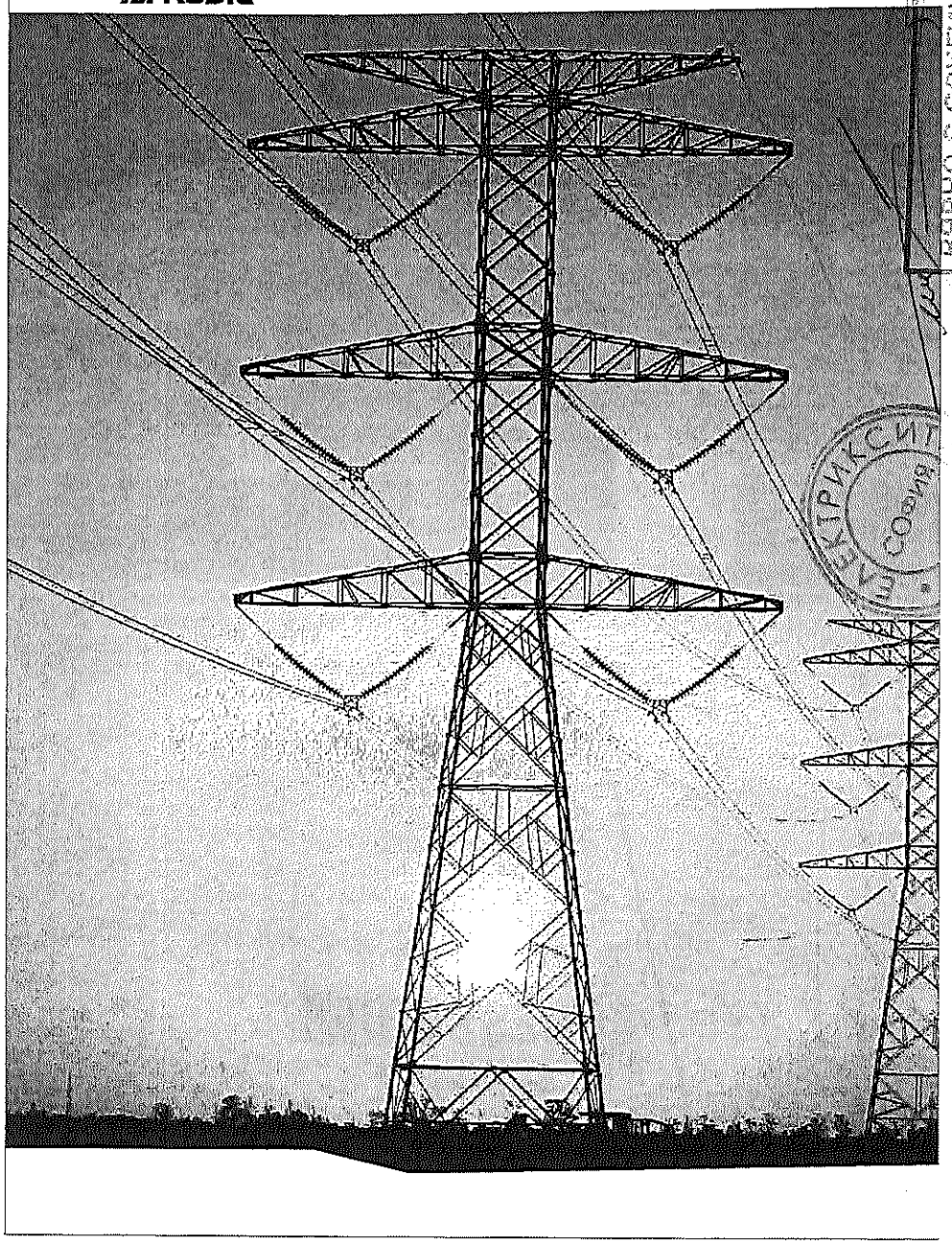

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LIST OF CONTENT

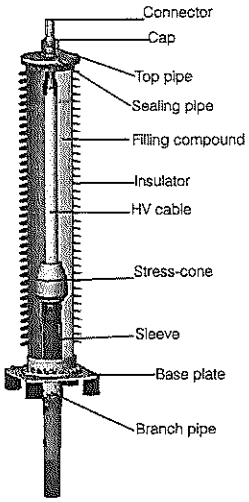
Terminations MKB 126, MKB 145, MKB 170, MKB 252

Arkasil terminations 110-220 kV with composite type insulator are used for cable lines connection with power-supply systems. Terminations are used for outdoor and indoor installation for XLPE cables 64/110, 76/132, 150/170 kV,127/220 kV (conductor cross-section 185-2500 mm²).Terminations could be produced for XLPE cable with optical fibers (OF) screen which are used for temperature monitoring.

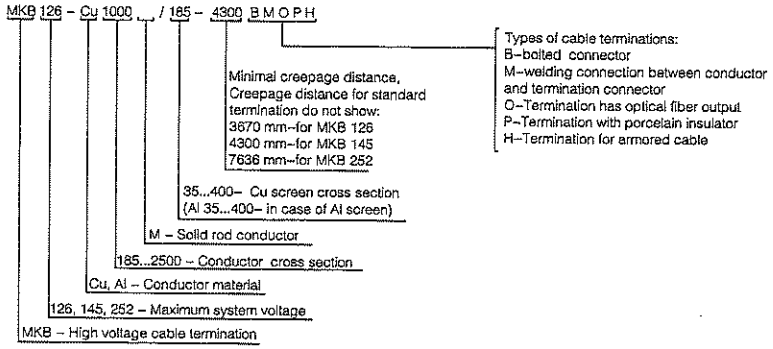
Main parts

Insulator:
- composite type porcelain insulator with glass fiber, reinforced epoxy resin tube and silicone rubber, the color of sheds - light gray;
- top and bottom flanges glued and sealed to the composite insulator.

Cable end:
- pre-molded and factory-tested silicone stress cone;
- cable end;
- base plate;
- branch pipe with flange;
- support insulators;
- seals and fixing materials;
- unpressurised synthetic oil as an insulating compound;
- optical fiber.



Labeling of high-voltage cable termination



Area of application

Type		MKB 126	MKB 145	MKB 170	MKB 252
Phase voltage	kV	64	76	87	127
Line voltage	kV	110	132	150	220
Maximum system voltage	kV	126	145	170	252
Cable conductor cross-section range	mm²	185 ÷ 2000	185÷ 2000	185÷ 2000	400÷2500
Maximum cable sheath diameter	mm	115	115	115	126
Maximum cable insulation diameter	mm	91	91	95	108

Installation options	MKB 126	MKB 145	MKB 170	MKB 252
On support	+	+	+	+
On high-voltage power transmission line	+	+	+	+
High voltage	+	+	+	+

Installation can be simplified by assembling the termination horizontally on the ground before lifting it into place.

Technical data

Electrical parameters	MKB 126	MKB 145	MKB 170	MKB 252
AC voltage withstand test	160 kV for 30 min	190 kV for 30 min	218 kV for 30 min	318 kV for 30 min
Partial discharges	<5 pC at 96 kV	<5 pC at 114 kV	<5 pC at 131 kV	<5 pC at 190 kV
Impulse voltage (10+/10- impulses)	550 kV	650 kV	750 kV	1050 kV

Climatic characteristics	MKB 126	MKB 145	MKB 170	MKB 252
Environmental condition class	U1,2	U1,2	U1,2	U1,2

Nominal operating current
Limited by cable specification

Stress cone routine tests	MKB 126	MKB 145	MKB 170	MKB 252
AC voltage withstand test	160 kV for 30 min	190 kV for 30 min	218 kV for 30 min	318 kV for 30 min
Partial discharges	<5pC at 96 kV	<5pC at 114 kV	<5 pC at 131 kV	<5pC at 190 kV

Technical parametrs		MKB 126				MKB 145				MKB 170		MKB 252	
Hollow insulator type		composit		porcelain		composit		porc.	comp.	porc.	composit		porcelain
Termination length (L)	mm	1300	1443	1622	1622	1443	1588	1622	1923	2500	2500	2624	2600	2500
Creepage distance length	mm	3670	4300	3200	4600	4300	4820	4600	6050	7820	7636	8058	7812	10000
Pollution level in accordance with IEC 60137		III	IV	III	IV	III	IV	IV	IV	IV	III	IV	III	IV
Volume of compound	l	28	32	39	39	32	38	39	42	170	200	215	170	170
Weight	kg	104	108	332	362	108	113	362	153	680	400	430	690	770
Maximum allowed force on top connector	kN	3,5	3,15	2,8	2,8	3,15	2,86	2,8	2200	5000	5	4,76	5	5

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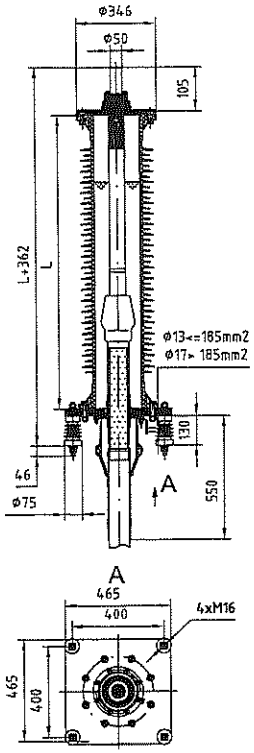
Arkasil

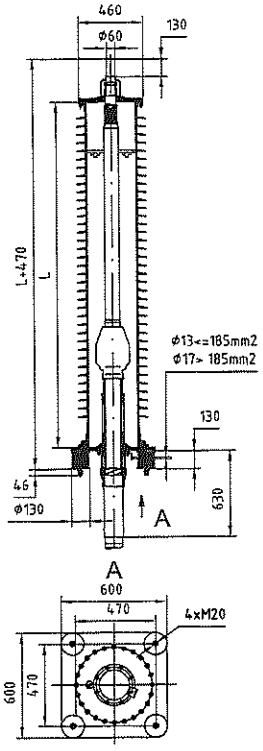
Drawings

Straight joints MCB 126, MCB 145, MCB 170, MCB 252

MKB 126 / 145 / 170



MKB 252

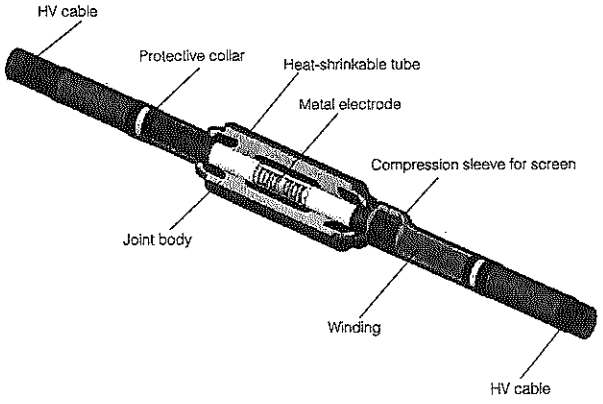


Arkasil straight joints 110-220 kV are prefabricated silicone joint, designed to connect high-voltage cables 110/132/150/220 kV with XLPE insulation (conductor cross-section 185-2500 mm²) with direct connection wire screens. Factory produced and tested silicone joint-body is the main element of joint. Joint body is made of high quality silicone rubber (LSR) and contains conductive deflectors and middle electrode for electrical stress control. Straight joints could be produced for a different connection schemes of cable screens and with different outer covering.

Main parts

- copper or components wire connector (screw connector or compression sleeve);
- pre-molded silicone insulator - joint body (with premolded field smoothing elements);
- sealing materials;
- tapes (semiconductive, conductive etc.);
- heat-shrinkable protective tubes and collars;
- coffin box;
- copper casing;
- filled coffin box or copper casing.

MCB 126 / 145 /170 /252



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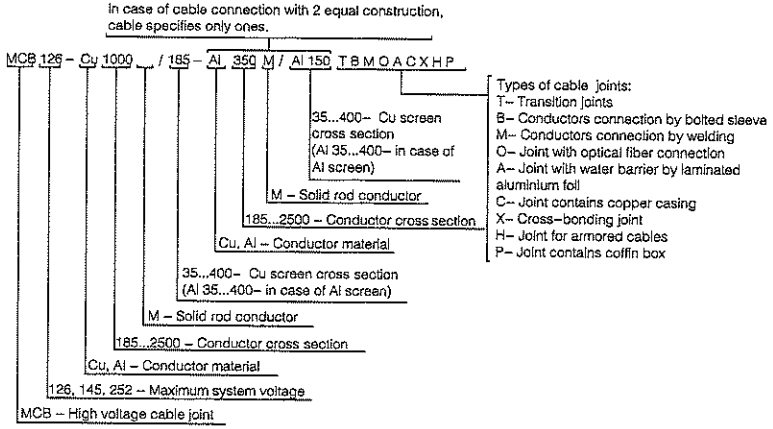
Labeling of high-voltage cable joint



Area of application

Type		MCB 126	MCB 145	MCB 170	MCB 252
Phase voltage	kV	64	76	87	127
Line voltage	kV	110	132	150	220
Maximum system voltage	kV	126	145	170	252
Cable conductor cross-section range	mm²	185 ÷ 2000	185 ÷ 2000	185 ÷ 2000	400 ÷ 2500
Maximum cable sheath diameter	mm	115	115	126	126
Maximum cable insulation diameter	mm	91	91	108	108
Rated minimal insulation thickness	mm	10,5	14	14	20

Installation options	MCB 126	MCB 145	MCB 170	MCB 252
On support	+	+	+	+
On high-voltage power transmission line	+	+	+	+
High voltage	+	+	+	+

Technical data

Electrical parameters	MCB 126	MCB 145	MCB 170	MCB 252
AC voltage withstand test	160 kV for 30 min	190 kV for 30 min	218 kV for 30 min	318 kV for 30 min
Partial discharges	<5 pC at 96 kV	<5 pC at 114 kV	<5 pC at 131 kV	<5 pC at 190 kV
Impulse voltage (10+/10- impulses)	550 kV	650 kV	750 kV	1050 kV

Current load rating	MCB 126	MCB 145	MCB 170	MCB 252
Rated operational current	limited by cable specification	limited by cable specification	limited by cable specification	limited by cable specification
Short circuit current	limited by cable specification	limited by cable specification	limited by cable specification	limited by cable specification

Stress cone routine tests	MCB 126	MCB 145	MCB 170	MCB 252
AC voltage withstand test	160 kV for 30 min	190 kV for 30 min	218 kV for 30 min	318 kV for 30 min
Partial discharges	<5pC at 96 kV	<5pC at 114 kV	<5 pC at 131 kV	<5pC at 190 kV

Climatic characteristics	MCB 126	MCB 145	MCB 170	MCB 252
Temperature	U1,2	U1,2	U1,2	U1,2

Cable sheath test voltage	MCB 126	MCB 145	MCB 170	MCB 252
AC voltage	10 kV within 1 min	10 kV within 1 min	10 kV within 1 min	10 kV within 1 min
DC voltage	20 kV within 1 min	20 kV within 1 min	20 kV within 1 min	20 kV within 1 min

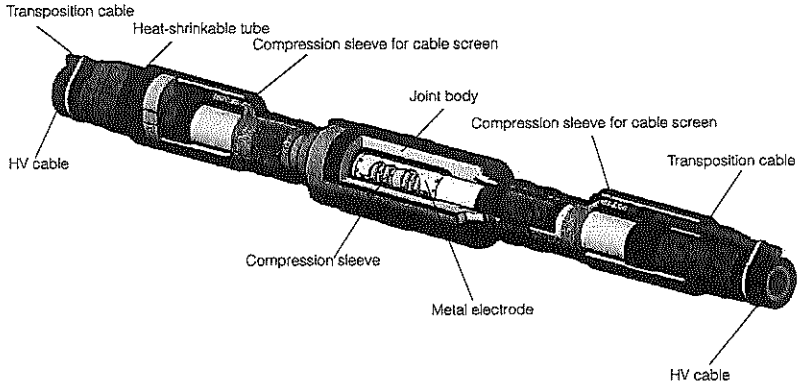
Test voltages of the cross-bonding joints	MCB 126 X	MCB 145 X	MCB 170 X	MCB 252 X
Impulse voltage (10+/10- impulses)	37,5 kV	37,5 kV	47,5 kV	47,5 kV
DC voltage	25 kV within 1 min	25 kV within 1 min	25 kV within 1 min	25 kV within 1 min

Test voltages between transposition wires	MCB 126 X	MCB 145 X	MCB 170 X	MCB 252 X
DC voltage	25 kV within 1 min	25 kV within 1 min	25 kV within 1 min	25 kV within 1 min
Impulse voltage (10+/10- impulses)	75 kV	75 kV	95 kV	95 kV

Mechanical characteristics	MCB 126 MCB 126 X	MCB 145 MCB 145X	MCB 170 MCB 170 X	MCB 252 MCB 252 X
Approximate weight, kg	35	35	80	80

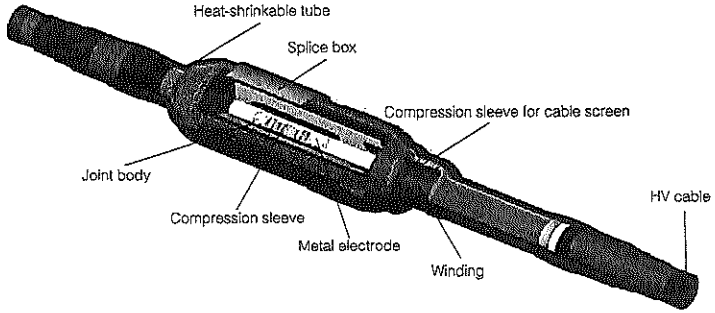
Cross-bonding joints MCB 126 X / 145 X / 170 X / 252 X

Arkasil cross-bonding joints 110-220 kV are a prefabricated silicone joint, designed to connect high-voltage cables 110/132/150/220 kV with XLPE insulation (conductor cross-section 185-2500 mm²) with integrated screen interruption. Joint body has the dielectric gap. Cable screen interruption is organized by 2 single-wire bonding cables.



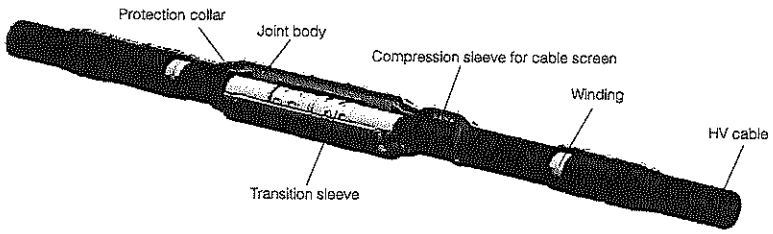
Joints with splice-box for optical fiber connection MCB 126 O / 145 O / 170 O / 252 O

Arkasil joints 110-220 kV with connector (splice-box) of optical fiber integrated in screen are a prefabricated silicone joint, designed to connect high-voltage cables 110/132/150/220 kV with XLPE insulation (conductor cross-section 185-2500 mm²). Splice-box includes all necessary components for splicing and mechanical protection.



Transition joints MCB126 T / 145 T / 170 T / 252 T

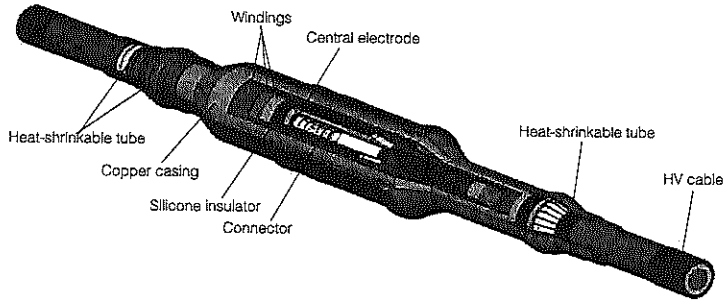
Arkasil transition joints 110-220 kV are a prefabricated silicone joints, designed to connect high-voltage cables with XLPE insulation voltage 110/132/150/220 kV (conductor cross-section 185-2500 mm²) with different constructions, different cross section of the core and screen, insulation thickneses, core material etc. Transition joint dimensions depends on cables constructions.



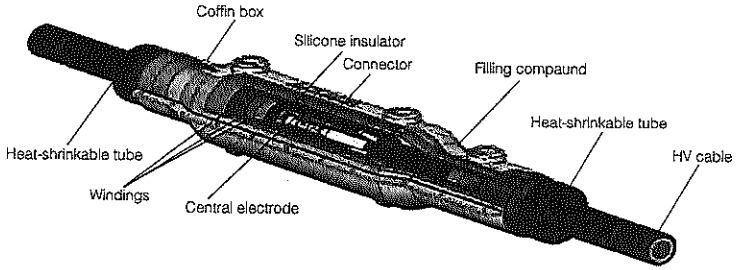
Joints with copper cases (index C) and coffin-boxes (index P) MCB 126 C,P(CP) / 145 C,P(CP) / 170 C,P(CP) / 252 C,P(CP)

Arkasil joints MCB 126/145/170/252 with copper cases (index C and coffin-boxes index P) are premolded silicone joints which are used for XLPE cables connection having different screen connection. Cases are served for joints mechanical protection.

MCB 126 C / 145 C /170 C / 252 C

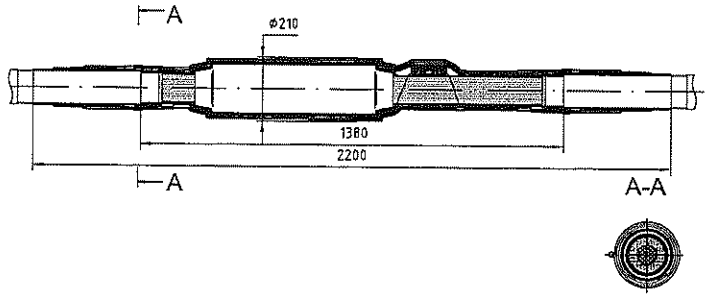


MCB 126 P / 145 P / 170 P / 252 P

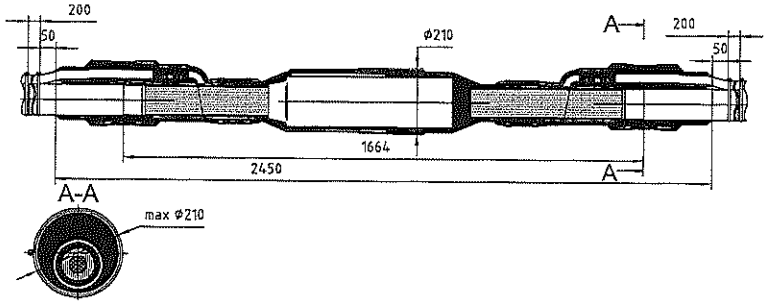


Drawings

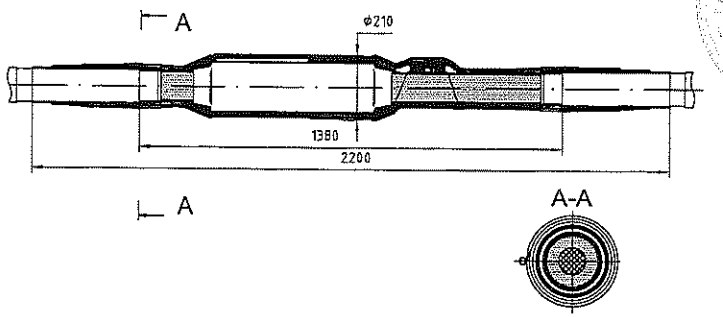
MCB 126 / 145 / 170



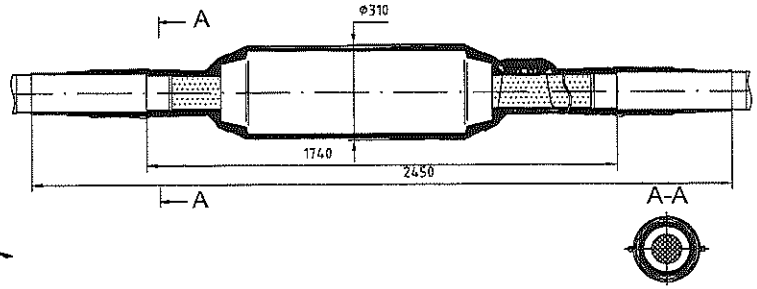
MCB 126 X /145 X /170 X



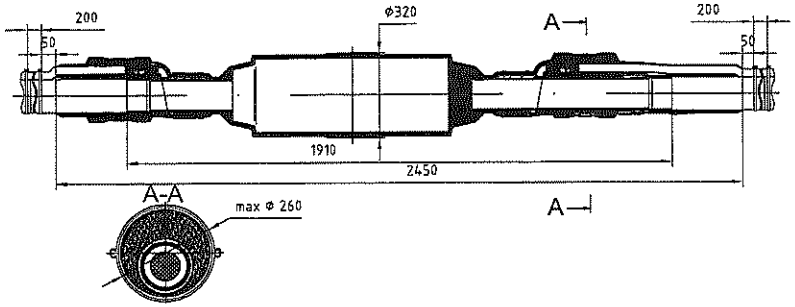
MCB 126 O / 145 O / 170 O



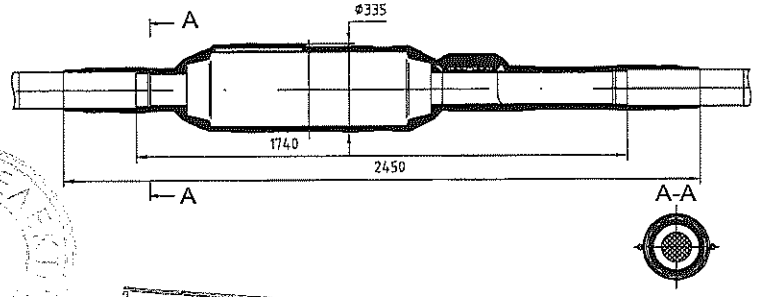
MCB 252



MCB 252 X



MCB 252 O



GIS termination labeling

Labeling of GIS termination MBB

MBB _ 126 A – Cu 1000 _ / 185 T M O K C

- Types of GIS cable terminations:
  T– "fluid–filled" type L5=757/960 mm (IEC 62271)
  M–welding connection between conductor and termination connector
  O– GIS cable termination has optical fiber output
  K–GIS cable termination has shunt jumpers
  C–GIS cable termination without cable fixing set
- 35...400– Cu screen cross section (Al 35...400– in case of Al screen)
- M – Solid rod conductor
- 185...2500 – Conductor cross section
- Cu, Al – Conductor material
- Size of bushing A/B
- 126, 145, 170, 252 – Maximum system voltage
- Put in case of separate delivery: P – insulator set / C – plug–in set
- MBB – GIS cable termination

Labeling of fluid filled GIS termination MBBM

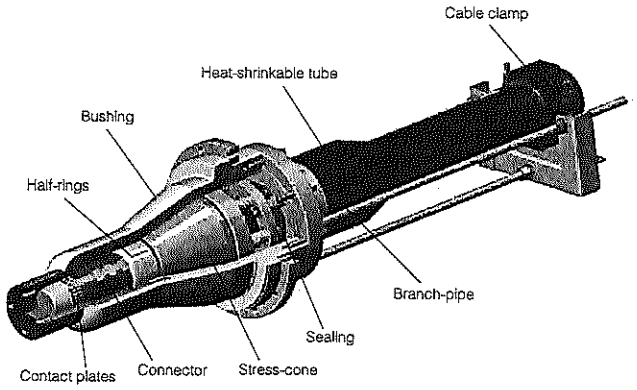
MBBM 126 – Cu 1000 _ / 185 –M O K C T X

- Types of GIS fluid filled cable terminations:
  M– welding connection between conductor and termination connector
  O– GIS fluid filled cable termination has optical fiber output
  K– GIS fluid filled cable termination has shunt jumpers
  C– GIS fluid filled cable termination without cable fixing set
  T– GIS fluid filled cable termination with vertical orientation
  X– GIS fluid filled cable termination without expansion vessel set
- 35...400– Cu screen cross section (Al 35...400– in case of Al screen)
- M – Solid rod conductor
- 185...2500 – Conductor cross section
- Cu, Al – Conductor material
- 126, 145, 170– Maximum system voltage
- MBBM – GIS fluid filled cable termination

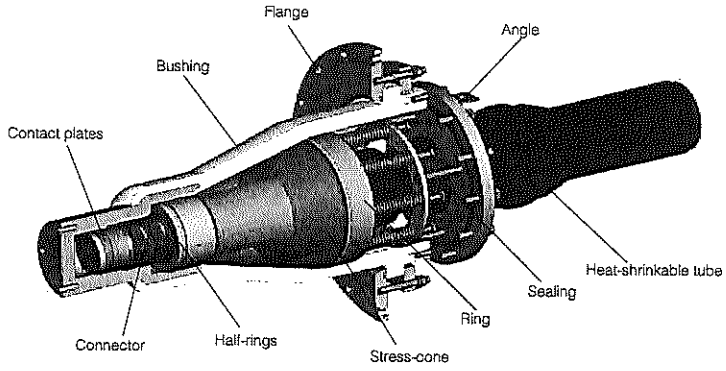
GIS terminations
MBB 126 / 145 / 170 / 252

Arkasil GIS terminations are used for cable lines connection to gas-insulated switchgear and transformers. MBB 126/145/170/252 are used for indoor installation for XLPE cables 64/110, 76/132, 87/150, 127/220 kV (conductor cross-section 185-2500 mm²). GIS terminations could be produced for XLPE cable with optical fibers in screen which are used for temperature monitoring. All types of GIS terminations made in accordance with IEC 62271-209 and could be used with switchgears for the dry type and oil filled GIS terminations. GIS termination consist of epoxy insulator and plug-in part. Due to such design cable can be disconnected from the GIS and connected again without SF6 or oil evacuation. The epoxy insulator could be delivered with GIS or with plug-in part only (epoxy insulator installed in switchgear by the manufacturer).

MBB 126 / 145 / 170



MBB 252



Area of application

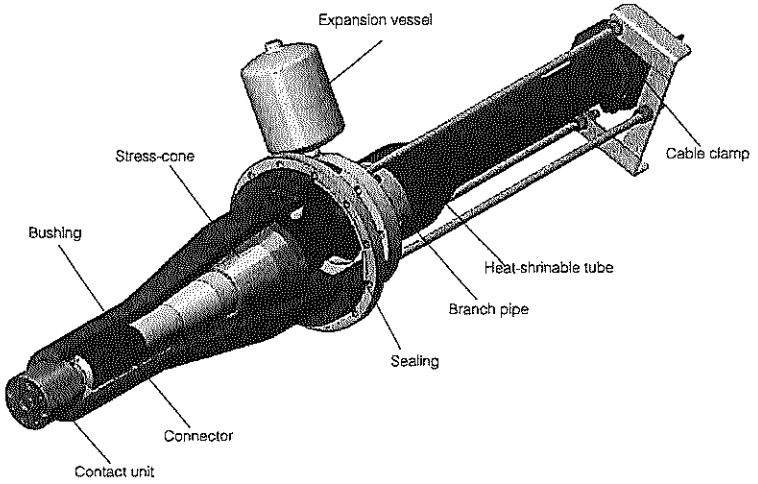
Type		MBB 126	MBB 145	MBB 170
Phase voltage	kV	126	145	170
		MBB 126 A	**MBB 145 A**	**MBB 170 A**
Maximum cable sheath diameter	mm	42÷86	42÷86	42÷86
Cable conductor cross-section range	mm²	185÷2500	185÷1600	185÷1600
Maximum cable insulation diameter	mm	115	115	115
		MBB 126 B	**MBB 145 B**	**MBB 170 B**
Maximum cable sheath	mm	55÷103	55÷103	55÷103
Diameter	mm²	400÷2500	400÷2500	400÷2500
Maximum cable insulation diameter	mm	130	130	130
Type			**MBB 252**	
Phase voltage	kV		252	
Maximum cable sheath	mm		65÷112	
Diameter	mm²		400÷2500	
Maximum cable insulation diameter	mm		130	

Technical data

Electrical parameters	MBB 126	MBB 145	MBB 170	MBB 252
Phase voltage	126 kV	145 kV	170 kV	252 kV
AC voltage withstand test	160 kV for 30 min	190 kV for 30 min	218 kV for 30 min	318 kV for 30 min
Impulse voltage (10+/10- impulses)	550 kV	650 kV	750 kV	1050 kV
Partial discharges	<5 pC at 96 kV	<5 pC at 114 kV	<5 pC at 131 kV	<5 pC at 190 kV
Climatic characteristics				
Temperature	Y1,2	Y1,2	Y1,2	Y1,2

GIS terminations
MBBM 126 / 145 / 170

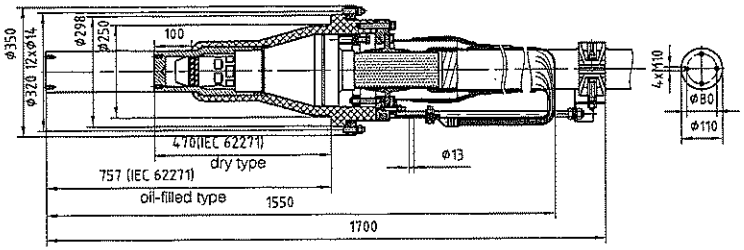
Arkasil oil-filled GIS terminations are used for cable lines connection to gas-insulated switchgear, oil-filled switchgear and transformers. GIS oil-filled terminations are used for indoor installation for XLPE cables 64/110, 76/132, 87/150, 127/220 kV (conductor cross-section 185-2500 mm²). GIS oil-filled terminations could be produced for XLPE cable with optical fibers in screen which are used for temperature monitoring. All types of GIS oil-filled terminations made in accordance with IEC 62271-209. GIS oil-filled termination consists of epoxy insulator and plug-in part.



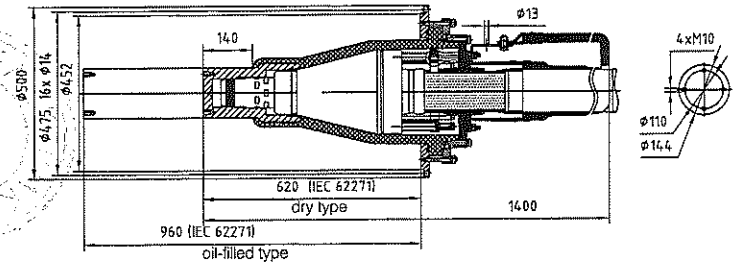
Current load rating				
Rated operational current	limited by cable specification			
Short circuit current	limited by cable specification			
Stress cone routine tests	**MBB 126**	**MBB 145**	**MBB 170**	**MBB 252**
Stress cone	126 kV	145 kV	170 kV	252 kV
AC voltage withstand test	160 kV for 30 min	190 kV for 30 min	218 kV for 30 min	318 kV for 30 min
Partial discharges	<5 pC at 96 kV	<5 pC at 114 kV	<5 pC at 131 kV	<5 pC at 190 kV

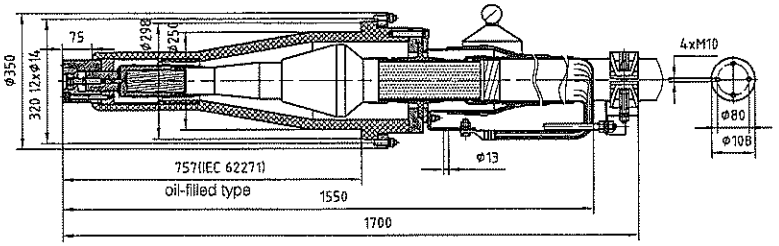
Mechanical characteristics		MBB 126/145/170 A	MBB 126/145/170 B	MBB 252
Approximate weight	kg	50	54	80
Length	mm	1400	1400	1400

MBB 126 / 145 / 170



MBB 252





Area of application

Type		MBBM 126	MBBM 145	MBBM 170
Phase voltage	kV	126	145	170
Maximum cable sheath diameter	mm	42-95	42-95	42-95
Cable conductor cross-section range	mm²	185÷2500	185÷2500	185÷2000
Maximum cable insulation diameter	mm	130	130	130

Technical data

Electrical parameters		MBBM 126	MBBM 145	MBBM 170
Phase voltage	kV	126	145	170
AC voltage withstand test	kV	160 kV for 30 min	190 kV for 30 min	218 kV for 30 min
Impulse voltage (10+/10- impulses)	kV	550	650	750
Partial discharges	kV	<5 pC at 96 kV	<5 pC at 114 kV	<5 pC at 131 kV

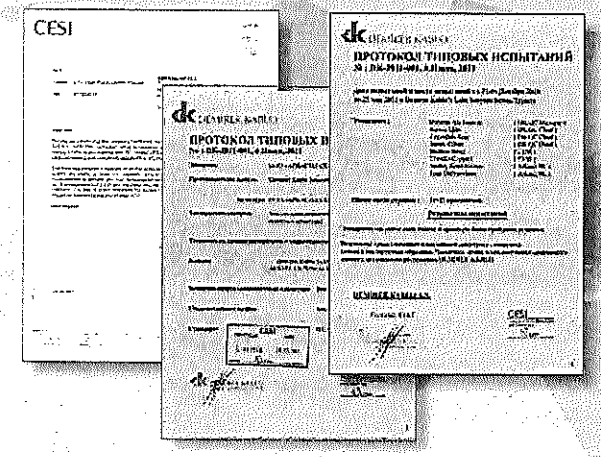
Climatic characteristics	MBBM 126	MBBM 145	MBBM 170
Environmental condition class	U1,2	U1,2	U1,2

Current load rating	
Rated operational current	limited by cable specification
Short circuit current	limited by cable specification

Stress cone routine tests	MBBM 126	MBBM 145	MBBM 170
Phase voltage	126 kV	145 kV	170 kV
AC voltage withstand test	160 kV for 30 min	190 kV for 30 min	218 kV for 30 min
Partial discharges	<5 pC at 96 kV	<5 pC at 114 kV	<5 pC at 131 kV

Mechanical characteristics		MBBM 126	MBBM 145	MBBM 170
Approximate weight	kg	80	80	80
Length	mm	1550	1550	1550

TYPE TESTS OF CABLE SYSTEM 110 kV

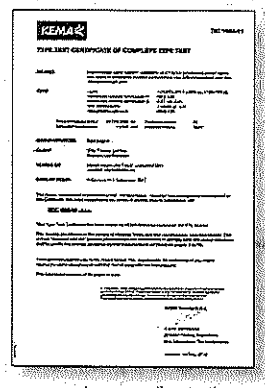


ВЯРНО С ОРИГИНАЛА

CESI, Italy

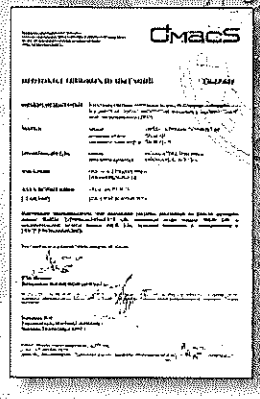
- heating cycle voltage test;
- partial discharge test at ambient temperature;
- partial discharge test at high temperature;
- tan measurement;
- lightning impulse voltage test followed by power frequency voltage test;
- examination of the cable system;
- test of outer protection of joint.

KEMA, The Neatherlands



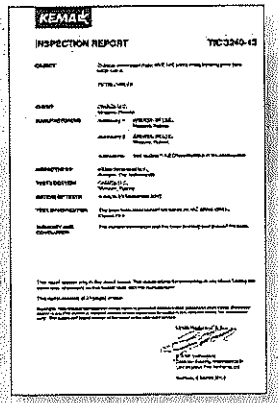
Tests were made according to the program of the harmonized European standard HD 632 S2, part 1, analogue of IEC 60840 edition 3 (2004), in the test laboratory of KEMA (Netherlands).

OMACS, Russia

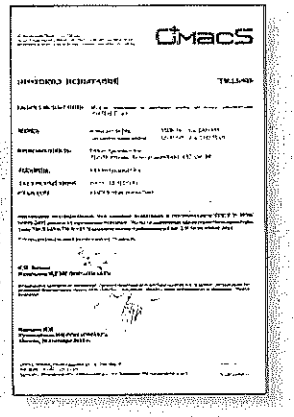


Type tests according to IEC 60840.

TYPE TESTS OF CABLE SYSTEM 132 kV


KEMA
INSPECTION REPORT

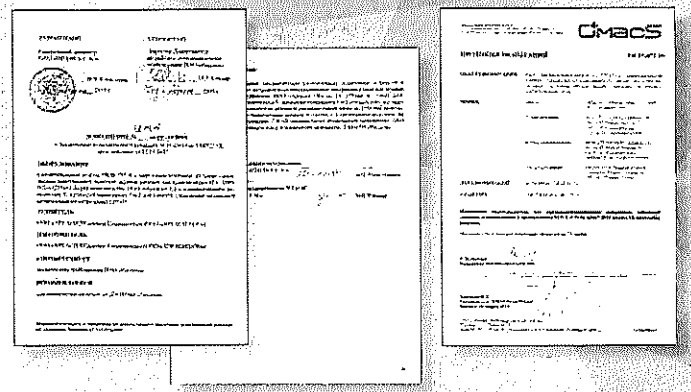
KEMA,
The Netherlands


OMACS

OMACS,
Russia

Tests were made on cable with 14 mm insulation thickness.

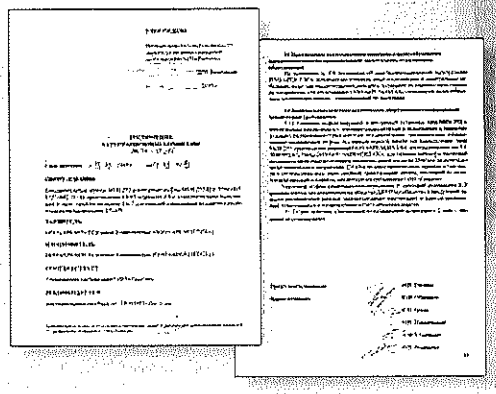
TYPE TESTS OF CABLE SYSTEM 220 kV


OMACS

OMACS,
Russia

Tests were made under CESI supervision.

PREQUALIFICATION TESTS OF CABLE SYSTEM 220 kV

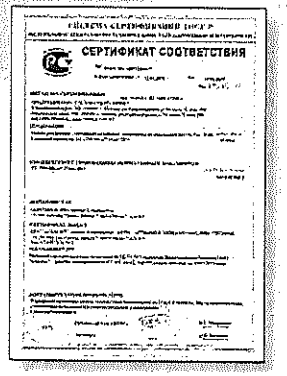


The electrical test of High-voltage cable system consisting of a 220 kV single-core power cable, four outdoor terminations, four cross-bonding joints and four GIS terminations is in process.

CERTIFICATES

TY 3599-001-65235642-2011

ARKASIL SK LLC production complies with the requirements of regulatory documents.



HEAT-SHRINKABLE COMPONENTS

Heat shrinkable cable end caps

Heat Shrinkable cable End Caps are used to seal the ends of all types of Cables protect from ingress of water/ moisture. The caps are manufactured from high quality cross linked polyolefin material. Compatible with most commonly used Cable Jackets i.e. XLPE, PVC, PILC or Rubber Sheathed Cable. Hot Melt adhesive lining provides seal from irregular cable sheaths. Excellent resistance to weathering, moisture, contamination and adverse environmental conditions.

Area of application

- valved end caps available for pressurized application for telecom cables;
- special relief valved end caps available for degassing application in High Voltage Power cables;
- high voltage (non tracking) end caps available for sealing live parts;
- conductive end caps are available with;
- conductive mastic.

Technical specification

Type		Standard
Physical		
Tensile Strength	12 H/mm² (Mpa)	ASTM D638
Ultimate Elongation	350%	ASTM D638
Density	1,05 ± 0,2 g/cm³	ASTM D792
Hardness	45 ± 10 Shore D	ASTM D2240
Water Absorption	0,2 % (max)	ASTM D570

Type		Standard
Low Temperature Flexibility		
(-40°C for 4 hrs.)	No Cracking	ASTM D2671
Heat Shock (250°C for 30 min.)	No cracking or flowing	ESI 09-11
Shrink Temperature	125°C	IEC 216
Temperature range	-40°C to +110°C	IEC 216

Thermal		
Accelerated Ageing	(120°C for 500 h)	ASTM D2671
Tensile Strength	11 H/mm² (Mpa)	ASTM D638
Ultimate Elongation	300 %	ASTM D638

Electrical		
Dielectric Strength	12 kB/mm	ASTM D149
Volume Resistivity	$1 \cdot 10^{14}$ Ohm·cm	ASTM D257
Dielectric Constant (E)	5 (max)	ASTM D150

Code	D min (mm)	D max (mm)	T±10 (mm)	Length (min)	Cable diameter
ASEC 001S	6	2.0	2.0	25	2-4
ASEC 001	12	4.0	2.3	38	4-8
ASEC 001L	12	4.0	2.3	58	4-8
ASEC 001A	14	4.0	2.3	58	4-11
ASEC 101	20	7.5	2.3	55	8-16
ASEC 101 L	20	7.5	2.5	75	8-16
ASEC 101 A*	25	8.0	2.3	75	8-20
ASEC 102	30	11	2.5	75	12-26
ASEC 102 A	35	11	2.5	75	12-30
ASEC 201*	40	15	3.3	90	16-35
ASEC 201 L	40	15	3.3	120	16-35
ASEC 201 AL	45	15	3.3	120	16-40
ASEC 301*	55	25	3.8	122	25-47
ASEC 301 L	55	25	3.8	170	25-47
ASEC 301 AL	63	25	3.8	170	25-55
ASEC 401*	75	35	3.8	140	35-68
ASEC 401 L	75	35	4.0	180	35-68
ASEC 501 S	85	45	4.0	160	45-80
ASEC 501*	100	45	4.0	160	45-90
ASEC 501 L	100	45	4.0	200	45-90
ASEC 501 AL	120	45	4.0	200	45-110
ASEC 601*	130	60	4.6	160	64-120
ASEC 701*	154	60	4.6	165	70-145
ASEC 801	230	120	5.5	220	140-200
ASEC 901	310	120	5.5	220	140-280
ASEC 1001	400	200	6.0	220	230-380

* Widely applied

HEAT-SHRINKABLE TUBES

Heat-shrinkable tubes ASMW and ASHW are medium wall and heavy wall black tubes. ASMW tubes are used for environmental protection of cable termination and insulating the connectors for straight through joints/ splice. ASHW tubes are used for mechanical protection and outer sealing of underground straight through cable joints/splice.

Technical specification

- these tubes are manufactured from high quality cross inked polyolefin material;
- optional hot melt adhesive lining for complete environmental protection and insulation;
- excellent resistance to weathering, UV rays, chemical and solvents;
- maximum cut length available up to 1500 mm;
- custom dimensions, thickness, length & colors available on request;
- conform to IEC standard.

Heat-shrinkable tubes	45/13 (250 mm)
Heat-shrinkable tubes	52/13 (1000 mm)
Heat-shrinkable tubes	130/35 (1000 mm)
Heat-shrinkable tubes	160/50 (900 mm)
Heat-shrinkable tubes	180/50 (1000 mm)
Heat-shrinkable tubes	200/55 (1300 mm)
Heat-shrinkable tubes	227/77 (1300 mm)
Heat-shrinkable tubes	300/90 (1200 mm)
Heat-shrinkable tubes	350/110 (1500 mm)

Type		Standard
Physical		
Tensile Strength	12 H/mm² (Mpa)	ASTM D638
Ultimate Elongation	350%	ASTM D638
Longitudinal Change	-10% (max)	ASTM D2671
Density	1,15 ± 0,2 g/cm³	ASTM D792
Hardness	45 ± 10 Shore D	ASTM D2240
Water Absorption	0,5 % (max)	ASTM D570
Thermal		
Accelerated Ageing	(120°C for 500 h)	ASTM D2671
Tensile Strength	11 H/mm² (Mpa)	ASTM D 638
Ultimate Elongation	300 %	ASTM D 638
Low temperature Flexibility (-40oC for 4 h.)	No Cracking	ASTM D2671
Heat Shock (250oC for 30 min.)	No Cracking or flowing	ESI 09-11
Shrink Temperature	125°C	IEC 216
Temperature range	-40°C to + 110°C	IEC 216
Electrical		
Dielectric Strength	12 кВ/mm	ASTM D 149
Volume Resistivity	$1 \cdot 10^{14}$ Ohm·cm	ASTM D257
Dielectric Constant (E)	5 (max)	ASTM D150

HEAT-SHRINKABLE COLLAR

Heat-shrinkable collar is a polyolefin tube with metal zipper that can be mounted on installed cable without cutting.

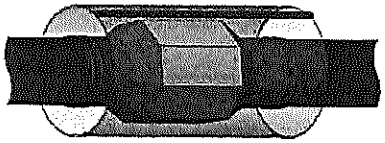
Technical specification

- hot melt adhesive provides complete environmental sealing and insulation;
- high resistance to UV rays, chemicals, corrosion, fungus, etc.;
- temperature sensitive paint changes color when heat shrinking process is complete;
- maximum length available up to 1500 mm.

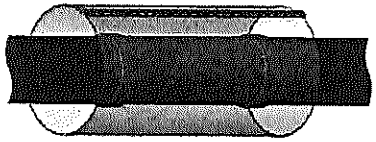
Heat-shrinkable collar	198/55 (2200 mm)
Heat-shrinkable collar	198/55 (2450 mm)

Type		Standard
Physical characteristics		
Tensile Strength	17 H/mm² (Mpa)	ASTM D638
Ultimate Elongation	300%	ASTM D638
Longitudinal Change	-10% (max)	ASTM D2671
Water Absorption	0,2 % (max)	ASTM D570

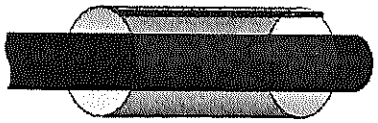
For the protection of Cable joint



For Cable Repairs



For corrosion protection of Oil, Water & Gas pipeline



Thermal characteristics		
Accelerated Ageing	(120°C for 500 h)	ASTM D2671
Tensile Strength	15 H/mm² (Mpa)	ASTM D 638
Ultimate Elongation	220 % (min.)	ASTM D 638

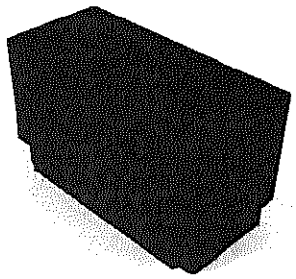
Thermomarker color change		
150°C for 30 min.	No change	Visual
250°C for 5 min.	Color change	Visual

Electrical		
Dielectric Strength	12 kB/mm (min.)	ASTM D149

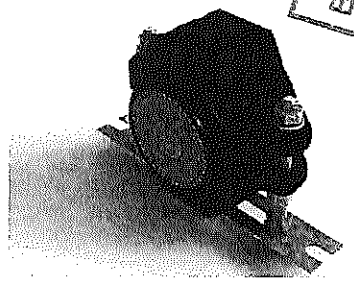
FIXING FOR HIGH-VOLTAGE CABLES

BKK3 and BKK cable clamps provide reliable fixing of high voltage cables and even at high short-circuit currents.

Cable clamps BKK3



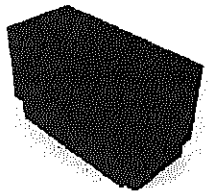
Cable clamps BKK



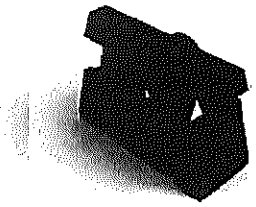
FIXING FOR MIDDLE VOLTAGE CABLES

YKK3 and YKK-60 universal cable clamps as well as PKK cable clamps are designed for fixing of all types of middle voltage cables.

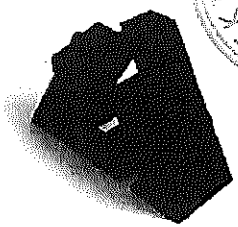
Cable clamps RKK



Cable clamps YKK3

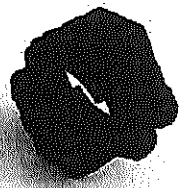


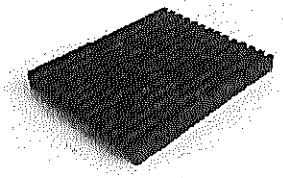
Cable clamps YKK-60 and YKK2-60



SILICONE GASKET HEAT RESISTANT PST-80

Laying PST-80 is used when laying the cable in the vertical sections to increase coefficient of friction and prevent Gasket of the cable. Gaskets are made of organosilicone cal rubber (silicone). Gasket design is made for careful gasket and cable fixing.

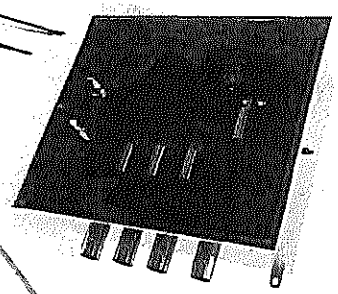




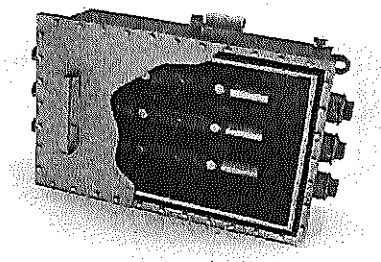
EARTHING AND CROSS-BONDING BOXES

Earthing and cross-bonding boxes are used for cross-connection of six single - core wires and for grounding of 150-500 kV cable screens.

Earthing boxes

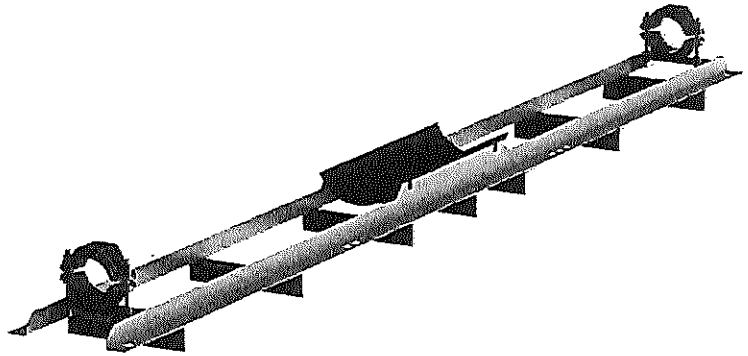


Cross-bonding boxes



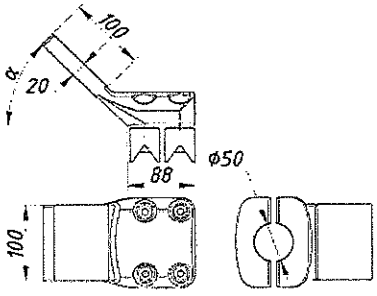
SUPPORT ASSEMBLY

Support assembly is designed for installation of joints.
Support assembly consists of steel corners with supporting stand for installation of joints.

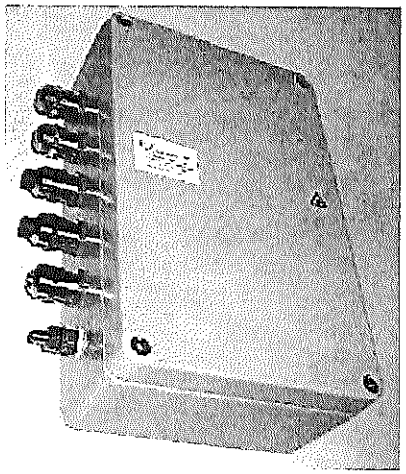


CABLE CONNECTOR

For connection of termination to cable lines it is necessary to use cable connectors. Arkasil SK delivers aluminum, bronze and bimetallic cable connectors.

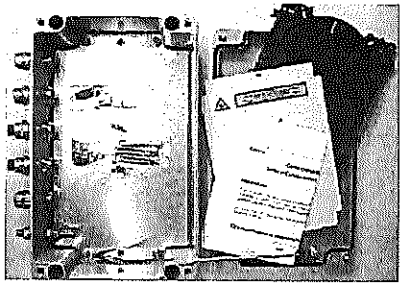


TERMINATIONS SPLICE BOX

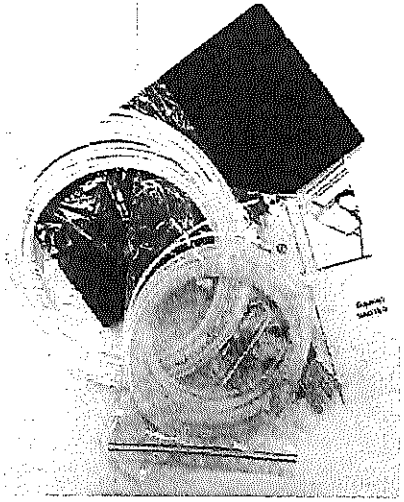


It is applied for connection of fiber-optical modules installed in the high-voltage optical fiber.

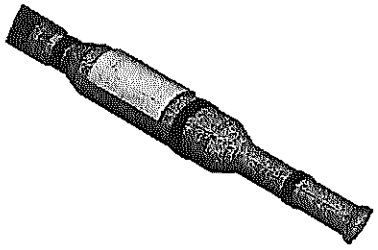
Splice box is a high voltage metal tray, safety class IP66, with 4 inputs for optical fiber modules, 2,5 - 5,5 mm² in diameter. It protects the connection point and is applied to store the fiber stock necessary for repair or preventive works.



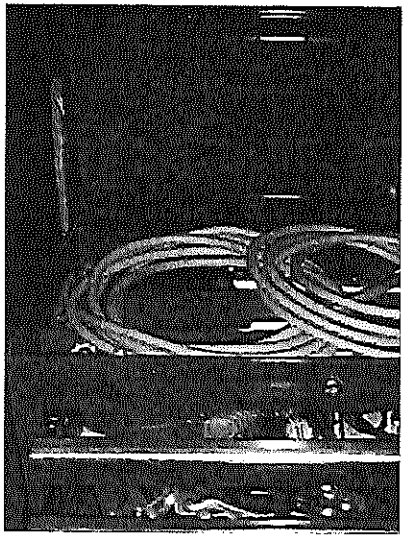
JOINTS SPLICE BOX



It is applied for connection of fiber-optical modules installed in the high-voltage optical fiber. A joint splice box is a high voltage rubber base with slots and channels for the optical fibers, it provides connection of the modules, protects the connection point. It is fixed during the joint installation. The supply complete set includes all necessary accessories for the optical modules welding.

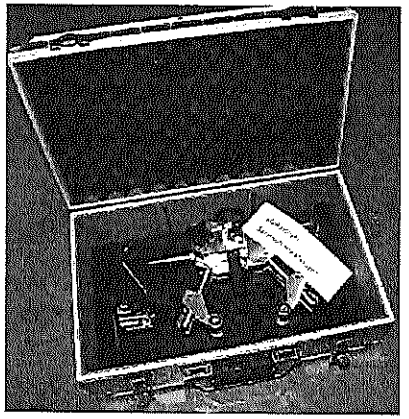


TOOLS FOR ARKASIL SK CABLE ACCESSORIES INSTALLATION



Installation Tool Kits 1010 Kit

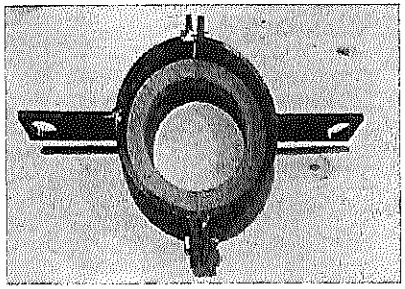
The installation tools including all necessary items for the high-voltage cable and cable accessories high voltage and installation.



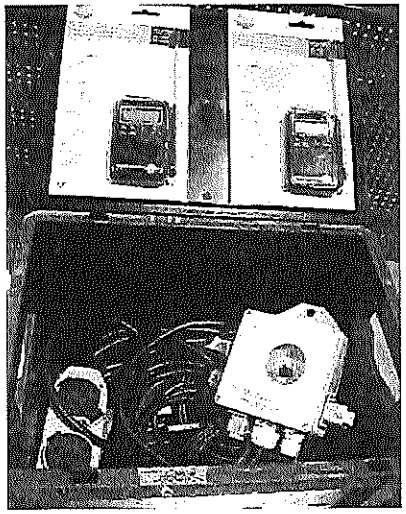
Tools for cutting and preparation cable MAS 130

MAS 130 is a cable knife Combined mechanical device for the removal of conductive and insulating layer cables with XLPE insulated polyethylene. Diameter range 18-130 insulation mm. A feature of the tool is the MAS 130 no need for silicone howling lubrication during operation.

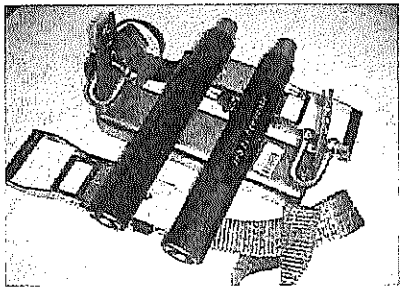
1000 kg Belt Winch
For pulling the silicone insulator on the cable.



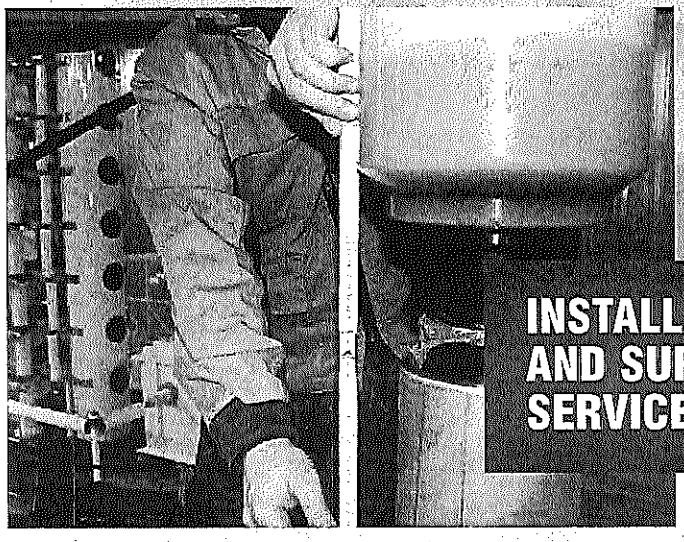
Cable heating kit 1080 kit
This instrument is used for cable heating.



Winch-to-cable fixing device
The device is fixed on the cable, and has terminals for fixing the winches.



SUPERVISION SERVICE



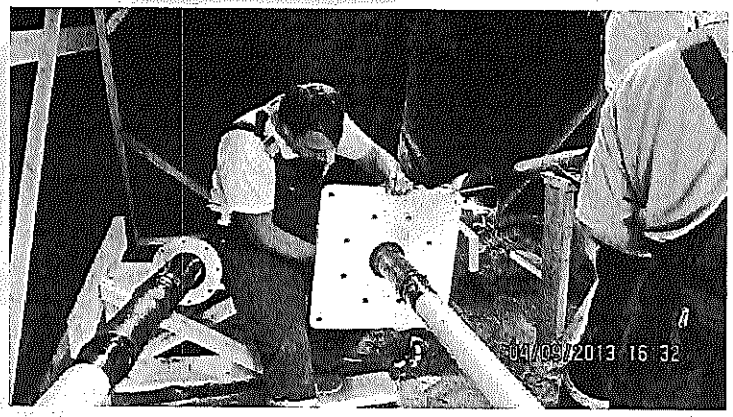
INSTALLATION AND SUPERVISION SERVICE

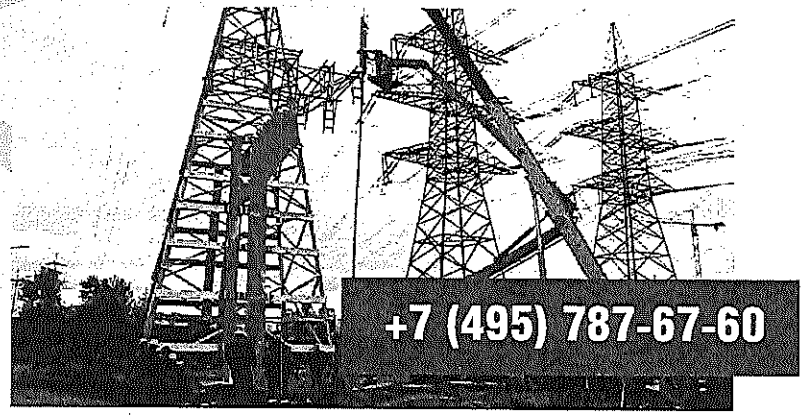
- technical and technological global supervision;
- installation quality control by specialists having ARKASIL SK certificates;
- providing documentation on the installed Arkasil SK cable accessories;
- the Arkasil SK cable accessories related consultations;
- "Installation Supervision" in the construction standards is not defined yet. Therefore, when making an agreement, it is necessary to be governed by the normative documents, including "The Regulations For Installation/ Supervision", governing the basis for granting consulting services and the contractual relations, in general.

Arkasil

INSTALLATION SERVICE

- installation of the Arkasil SK cable accessories by the specialists certified by Arkasil SK for these works;
- guarantee documentation on the installed Arkasil SK cable accessories;
- the Arkasil SK cable accessories related consultations.





FOR MORE INFORMATION

Arkasil

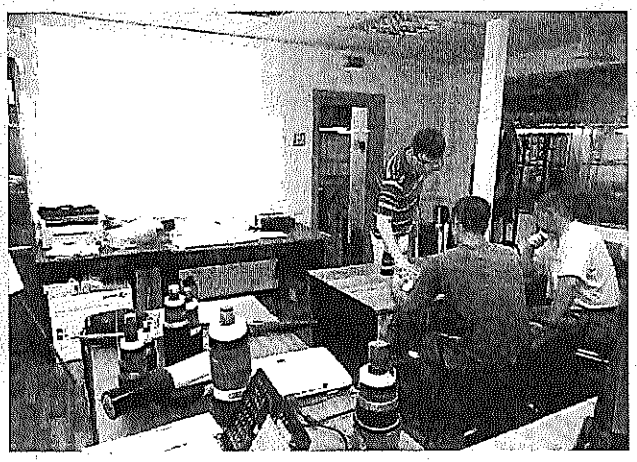
SPECIALISTS TRAINING OF ASSEMBLY COMPANIES

Training takes place at the training center, located in the industrial base of Arkasil SK. Also, in order to optimize the training company Arkasil SK provides it on the jointers site service for the training of production facilities and training installers.

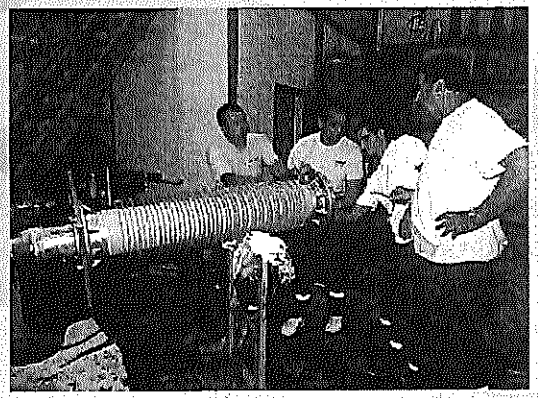
THE TRAINING SHALL INCLUDE

- theory training;
- practical training;
- tests;
- sample preparation for certification;
- granting certificates.

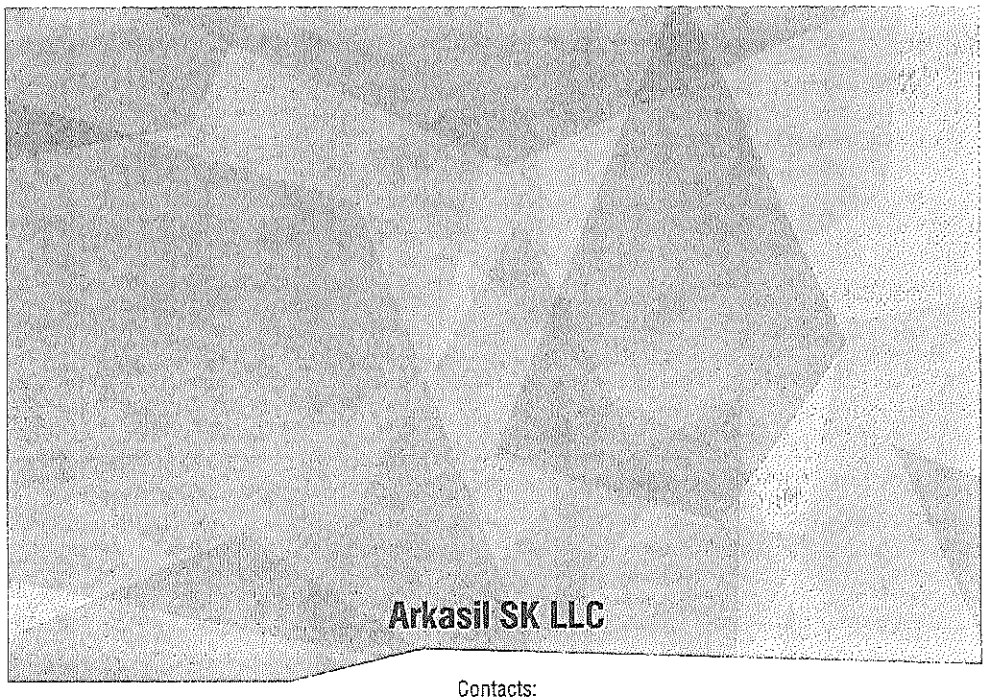
During the theoretical part of the training specialists communicate general information about cables. The theoretical part includes information about XLPE cables, cable accessories 110-220 kV of different types, technological processes of terminations and joints installation, workplace preparation, safety measures, technical documentation preparation. The practical part includes the technological process using cable samples and installation tools, practicing terminations and joints installation work. The quality of technological operations on the cable sample is estimated in the accompanying of an experienced jointer attestat-training-insulating sheet.



On the exam checked the quality of theoretical material and process of terminations and joints installation on the stand. Affter the interview and the practical experience the staff get the certificate in accordance with Regulation of qualified Arkasil SK cable accessories 110-220 kV installation training.

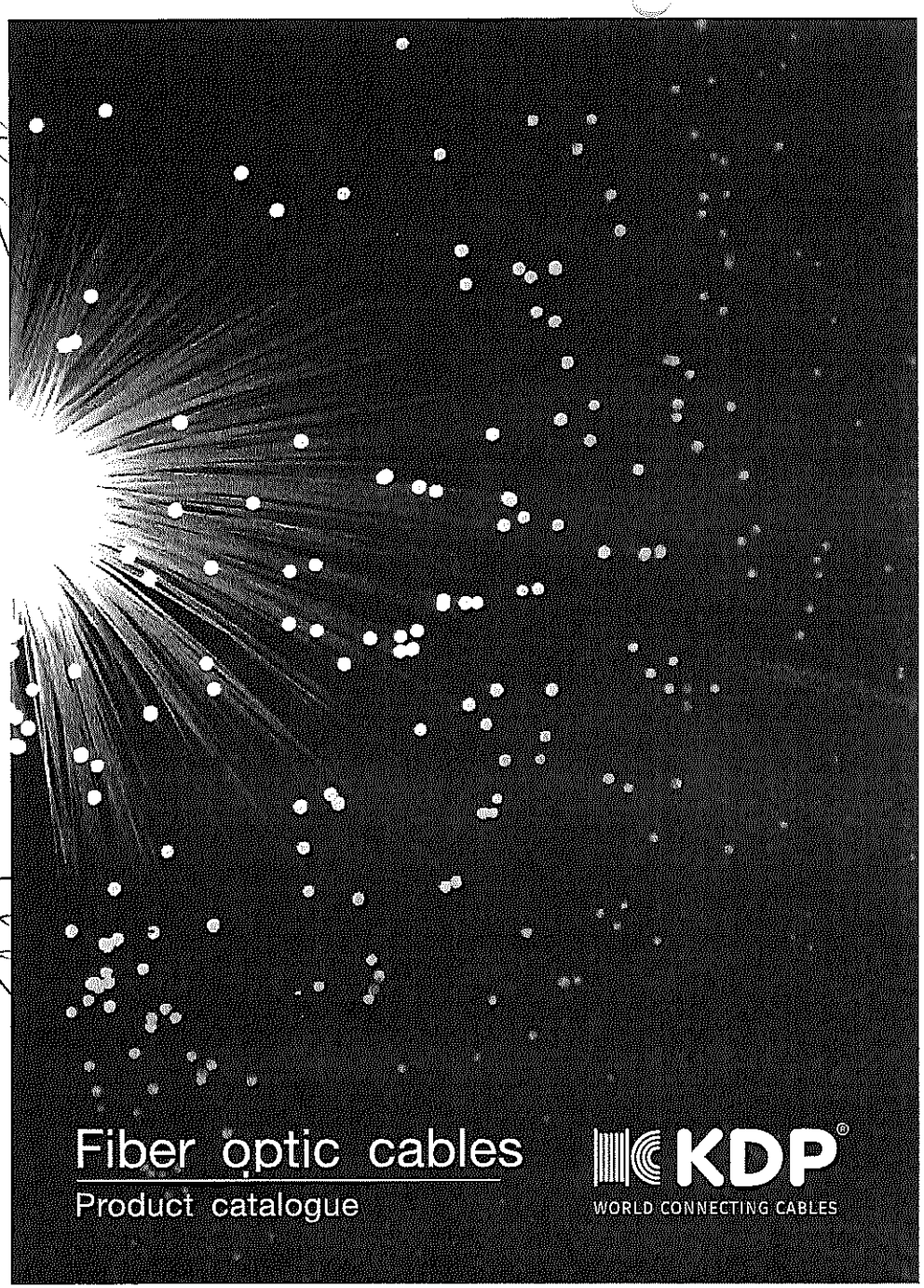


As the result of the examination the jointers from other companies get the permission to carry out the installation of Arkasil SK cable accessories.



Contacts:

111250, Russia, Moscow, Proezd Zavoda Serp i Molot 6, bld.1
Tel./Fax: +7 495 787-67-60
E-mail: info@arkasil.com
web-site: www.arkasil.com



Fiber optic cables

Product catalogue

KDP®
WORLD CONNECTING CABLES

Dear Customers,

since 1930 we have been supplying the cables which help you to solve your problems through communication. For forward, please, find a new comprehensive catalogue containing the heart-pricked line of our company.

We tried not only to include the standard sections that you probably know very well, but some innovations and brand new products as well. Despite the catalogue is considered as a complete presentation of our production, not all variants can be published and included.

For some special products, please, contact our Sales Department that will provide you with any information requested. Let us advise you of the fact that all cable parameters in this catalogue are for information only.

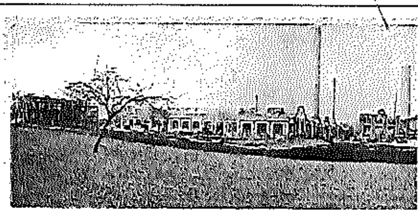
All rights reserved.

Heiko Mönkwitz
Head of Commercial Department – Member of board

Summary

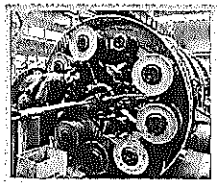
Index

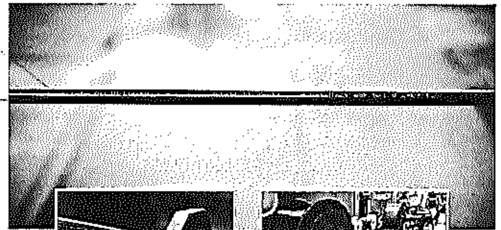
History and present of
KABELOVNA Děčín Podmokly

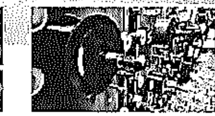


KSP was founded in [illegible] 1910 as a branch of the Bergmann cable plant in Berlin, the original name of the company being [illegible] Podmokly.

From the very outset the plant manufactured all types of power and telecommunications cables [illegible] as well as rubber-insulated conductors [illegible] with accessories. Company activity at that time [illegible] involving electrical equipment and its installation.







The cable factory came [illegible] to the hands of Anglo-Prague [illegible] after the First World War [illegible] the company [illegible] business. The production [illegible] then merged in 1932 [illegible]. However the production programme of the cable factory did not change too radically.

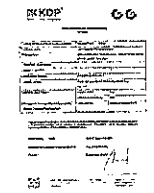
The company was nationalised after 1945. [illegible] KABLO Kladno [illegible]. The main emphasis [illegible] manufacture of communications cables and in [illegible] KABLO Děčín became the monopoly producer of cables for [illegible]. The company [illegible] after 1990 became independent again and returned to its traditional name of KABELOVNA Děčín Podmokly, a.s. SIEMENS AG then entered the company in 1992. The result of mutual cooperation [illegible] of production technology, the expansion of the range produced and the strengthening of KABELOVNA Děčín Podmokly in [illegible] market.

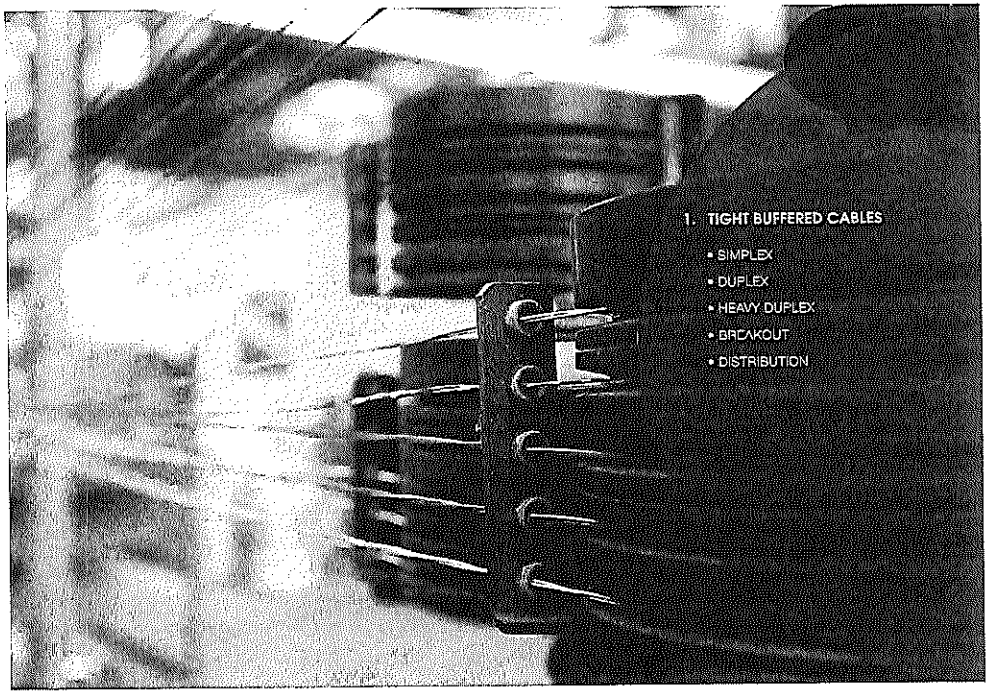
SIEMENS sold its share in KABELOVNA to American [illegible] in July 2000, before this company [illegible] American company CDT (Cable Design Technology) in December 2001. CDT then merged with American company BELDEN in 2004, the newly-founded company taking on the name of Belden CDT Inc. 2007 the cable works [illegible] the company [illegible] and KSP Assembly, s.r.o.

History

4. 9. 1909	Foundation of [illegible] company "Kabelwerk Hagmeyer, Kolben & Co." with branch in Vienna
27. 6. 1911	Launch of Production – 100 employees. Production of power and communication cables, cable sets and accessories, rubber wires and insulation tubes including accessories.
05/1919	The company was acquired by „Ringhoffen bei Prag" and renamed KAVÁ, Praha, s. p. Creation of textile communication cables production
05/1930	The company completely burnt down. Production restored at the end of year 1930
05/1945	The company came under national control of 100% s. r. composition. Then it was nationalized and became a part of national company KABLO Pisárky. Production of power and communication cables with lead sealing, rubber and textile wires and cord wires.
1. 1. 1950	Establishment of national company KABLO Brno.
1960	Production of power communication cables
1961	KABLO Brno became a monopoly producer of communication cables for local networks.
1962–1964	Construction of new hall in connection with production of communication cables
1965	Termination of power cables production.
1968	Initiation of data cables production
31. 12. 1990	Privatization, majority interest of Swedish steel company The agreement name KABLOVNA DEZA Pisárky, a. s. was used
1992	Company starts working jointly with NKT A/S
1994	Initiation of cable assemblies production
1995	ISO 9001 certification confirmed
1996	Initiation of twisted pairs cables production
1998	Czech Republic Quality Award
1998	ISO 14001 certification confirmed
2000	Establishment of subsidiary company KDP Kabeltechnik Wien, GmbH
2000	Cable network construction in Hungary from the DEBF CV
2001	CCT Tele-Haught became a majority owner of the company
2002	Complete renewal of coax cable assortment
2003	Release of data cable production
2004	Merge with Polish company Telcon CCT s.r. was established
2007	Wires Group becomes a new owner of KABELOVNA
2010	KABELOVNA DEZA Pisárky, s.r.o. commences EMEA Agreements.
2015	New portfolio of cable manufacturing
1. 1. 2016	KABELOVNA DEZA Pisárky, s.r.o. later become a member of PPTH Gomez

Certificates and CPR





SIMPLEX

Specification: 16×1, 17×1, 11×1, 12×1, 14×1, 13×1, 18×1, 19×1, 13×1, 2026, Z174,

Description of materials:
1. FR-I SZH buffered optical fiber, 2. Waterblocking aramid yarn, 3. FR-I SZH outer jacket,

Temperature range	
Installation	0 to +50 °C
Operation	-15 to +70 °C
Storage	5 to +50 °C

Design code	Fiber No.	Cable outer diameter [mm]	Net weight [kg/km]	Max. load (installation) [N]	Crush resistance [N/100 cm]
16×1	16	9.9	104	1500	500
17×1	17	9.9	104	1500	500
11×1	11	9.9	104	1500	500
12×1	12	9.9	104	1500	500
14×1	14	9.9	104	1500	500
13×1	13	9.9	104	1500	500
18×1	18	9.9	104	1500	500
19×1	19	9.9	104	1500	500
13×1	13	9.9	104	1500	500
2026	26	9.9	104	1500	500
Z174	24	9.9	104	1500	500

DUPLEX

Specification: 20×1, 21×1, 22×1, 24×1, 28×1, 23×1, Z176

Description of materials:
1. FR-I SZH buffered optical fibers, 2. Waterblocking aramid yarn, 3. FR-I SZH outer jacket,

Temperature range	
Installation	0 to +50 °C
Operation	-15 to +70 °C
Storage	5 to +50 °C

Design code	Cable outer diameter [mm]	Net weight [kg/km]	Max. load (installation) [N]	Crush resistance [N/100 cm]
20×1	12.5 × 24	96	2000	1000
21×1	13.5 × 26	73	2000	1000
22×1	12.5 × 25	99	2000	1000
24×1	14 × 27	114	2000	1000
28×1	15 × 29	114	2000	1000
23×1	14 × 27	114	2000	1000
Z176	15.5 × 28	144	2000	1000

HEAVY DUPLEX

Specification: 32×1, 34×1, 38×1, Z178, Z205, Z270

Description of materials:
1. FR-I SZH buffered optical fibers, 2. Waterblocking aramid yarn, 3. FR-I SZH inner jacket, 4. Rip-Cord, 5. HH-LSoH outer jacket, UV stable

Temperature range	32×1, 34×1, 38×1, Z178	Z205, Z270
Installation	0 to +50 °C	-15 to +50 °C
Operation	0 to +70 °C	-15 to +70 °C
Storage	-5 to +70 °C	-15 to +70 °C

Design code	Cable outer diameter [mm]	Net weight [kg/km]	Max. load (installation) [N]	Crush resistance [N/100 cm]
32×1	20 × 36	173	3000	1500
34×1	20 × 36	173	3000	1500
38×1	22 × 39	213	3000	1500
Z178	24 × 42	264	3000	1500
Z205	26 × 50	403	3000	1500
Z270	32 × 56	504	3000	1500

BREAKOUT STANDARD

Specification: 41×1, 42×1, 44×1, 40×1

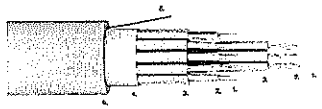
Description of materials:
1. Central FRP strength member, 2. PE sealing for central FRP strength member where necessary, 3. HH-LSoH buffered optical fibers, 4. Waterblocking aramid yarn, 5. Bamplex cable, 6. Water-swellable tape, 7. Rip-Cord, 8. FR-I SZH outer jacket, UV stable

Temperature range	41×1, 42×1	42×1, 44×1
Installation	-5 to +50 °C	-5 to +50 °C
Operation	-15 to +70 °C	-15 to +70 °C
Storage	-25 to +70 °C	-25 to +70 °C

Design code	Max. fiber count	Simplex diameter [mm]	Cable outer diameter [mm]	Net weight [kg/km]	Max. load (installation) [N]	Crush resistance [N/100 cm]
41×1	36	18	17	320	2200	2000
42×1	24	26	19	540	4000	1,500
44×1	24	24	16	370	1500	1,500
40×1	24	28	19.7	600	2500	1,500

BREAKOUT NO CSM

Specification: BN-1



Description of materials:

1. FR-I 6291 buffered optical fibres, 2. Water-blocking aramid yarn, 3. Ripcord cable, 4. Water-swellable tape, 5. Rip-Cord, 6. FR-LSZH outer jacket, UV stable

Temperature range	
Installation	-5 to +50 °C
Operation	-20 to +70 °C
Storage	-20 to +70 °C

Design code	Max. fiber count	Cable outer diameter (mm)	Cable outer diameter (mm)	Net weight (kg/km)	Max. load (installation) (N)	Crush resistance (N/10 cm)
4Dx4	48	4.9	10.7	124.0	1,920	1,200

BREAKOUT IMPROVED

Specification: 4Dx8, 4Mx8

Description of materials:

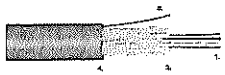
1. Central FRP strength member, 2. PP cording for central FRP strength member (when required), 3. FR-LSZH buffered optical fibers, 4. Water-blocking aramid yarn, 5. Strength cable, 6. Water-blocking Eglass yarn, 7. Rip-Cord, 8. FR-LSZH outer jacket, UV stable

Temperature range	4Dx8	4Mx8
Installation	-5 to +50 °C	-5 to +50 °C
Operation	-20 to +70 °C	-20 to +70 °C
Storage	-20 to +70 °C	-20 to +70 °C

Design code	Max. fiber count	Ring tube diameter (mm)	Cable outer diameter (mm)	Net weight (kg/km)	Max. load (installation) (N)	Crush resistance (N/10 cm)
4Dx8	24	2.8	9.0	94.0	1,440	1,200
4Mx8	48	2.8	10.1	108.0	1,920	1,200

DISTRIBUTION STANDARD

Specification: BE-1



Description of materials:

1. FR-I 6291 buffered optical fibers, 2. Water-blocking E-glass yarn, 3. Rip-Cord, 4. FR-LSZH outer jacket, UV stable

Temperature range	
Installation	-5 to +50 °C
Operation	-20 to +70 °C
Storage	-20 to +70 °C

Design code	Fiber count	Cable outer diameter (mm)	Net weight (kg/km)	Max. load (installation) (N)	Crush resistance (N/10 cm)
BE-1	4	9.5	82.0	960	2,000
BE-1	6	9.6	85.0	1,000	2,000
BE-1	8	9.7	88.0	1,040	2,000
BE-1	12	9.8	91.5	1,080	2,000
BE-1	16	9.9	95.0	1,120	2,000
BE-1	24	10.4	102.0	1,200	2,000

DISTRIBUTION STANDARD

Specification: BN-1

Description of materials:

1. FR-I 6291 buffered optical fibers, 2. Water-blocking aramid yarn, 3. Rip-Cord, 4. FR-LSZH outer jacket, UV stable

Temperature range	
Installation	-5 to +50 °C
Operation	-20 to +70 °C
Storage	-20 to +70 °C

Design code	Fiber count	Cable outer diameter (mm)	Net weight (kg/km)	Max. load (installation) (N)	Crush resistance (N/10 cm)
BN-1	4	7.6	60.0	800	1,000
BN-1	6	8.1	70.0	960	1,000
BN-1	8	8.6	80.0	1,040	2,000
BN-1	12	9.4	95.0	1,200	2,000
BN-1	16	9.9	104.0	1,360	2,000
BN-1	24	10.5	120.0	1,520	2,000
BN-1	36	11.5	150.0	1,840	2,000

DISTRIBUTION IMPROVED

Specification: BBx0

Description of materials:

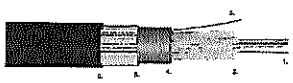
1. FR-I 80H buffered optical fiber, 2. Waterblocking E-glass yarn, 3. Rip-Cord, 4. FR-I 80H inner jacket, 5. Waterblocking E-glass yarn 6. HI-LSOH outer jacket, UV stable.

Temperature range	
Installation	0 to +50 °C
Operation	-20 to +60 °C
Storage	-20 to +60 °C

Design code	Fiber count	Cable outer diameter (mm)	Net weight (kg/km)	Max. load (installation) (N)	Crush resistance (N/10 cm)
BBx0	2	8.4	84.0	2,500	2,500
BBx0	4	8.6	90.5	2,500	2,500
BBx0	6	8.7	100.6	2,500	2,500
BBx0	8	10.1	118.0	2,500	2,500
BBx0	12	11.1	132.6	2,500	2,500
BBx0	16	12.5	164.0	2,500	2,500
BBx0	24	14.1	204.0	2,500	2,500

DISTRIBUTION SWA

Specification: BAx0, BAx5



Description of materials:

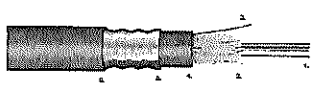
1. FR-I 80H buffered optical cable, 2. Waterblocking aramid yarn, 3. Rip-Cord, 4. FR-I 80H inner jacket, 5. Steel Wire Armour (SWA), 6. HI-LSOH or PE outer jacket, UV stable.

Temperature range	
Installation	0 to +50 °C
Operation	-20 to +60 °C
Storage	-20 to +70 °C

Design code	Fiber count	Cable outer diameter (mm)	Net weight (kg/km)	Max. load (installation) (N)	Crush resistance (N/10 cm)
BAx0	2	10.2	160.0	4,000	2,000
BAx0	4	11.7	180.0	4,000	2,000
BAx0	12	13.7	217.0	4,000	2,000
BAx0	24	16.8	297.0	7,000	2,000
BAx5	2	10.2	160.0	4,000	2,000
BAx5	4	11.7	180.0	4,000	2,000
BAx5	12	13.7	217.0	4,000	2,000
BAx5	24	16.8	297.0	7,000	2,000

DISTRIBUTION CST

Specification: BBx0, BAx1



Description of materials:

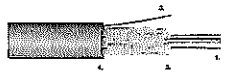
1. FR-I 80H buffered optical fiber, 2. Waterblocking E-glass yarn, 3. Rip-Cord, 4. FR-I 80H inner jacket, 5. Corrugated steel tape, 6. HI-LSOH or PE outer jacket, UV stable.

Temperature range	
Installation	0 to +50 °C
Operation	-20 to +60 °C
Storage	-20 to +70 °C

Design code	Fiber count	Cable outer diameter (mm)	Net weight (kg/km)	Max. load (installation) (N)	Crush resistance (N/10 cm)
BBx0	2	9.5	105.0	800	2,500
BBx0	4	11.0	130.0	1,600	2,500
BBx0	12	12.5	191.0	1,600	2,500
BBx0	24	15.5	260.0	1,600	2,500
BBx1	2	11.5	131.0	800	2,500
BBx1	4	13.0	164.0	1,600	2,500
BBx1	12	15.5	191.0	1,600	2,500
BBx1	24	18.5	260.0	1,600	2,500

DISTRIBUTION ACRYLATE BUFFER

Specification: BA1

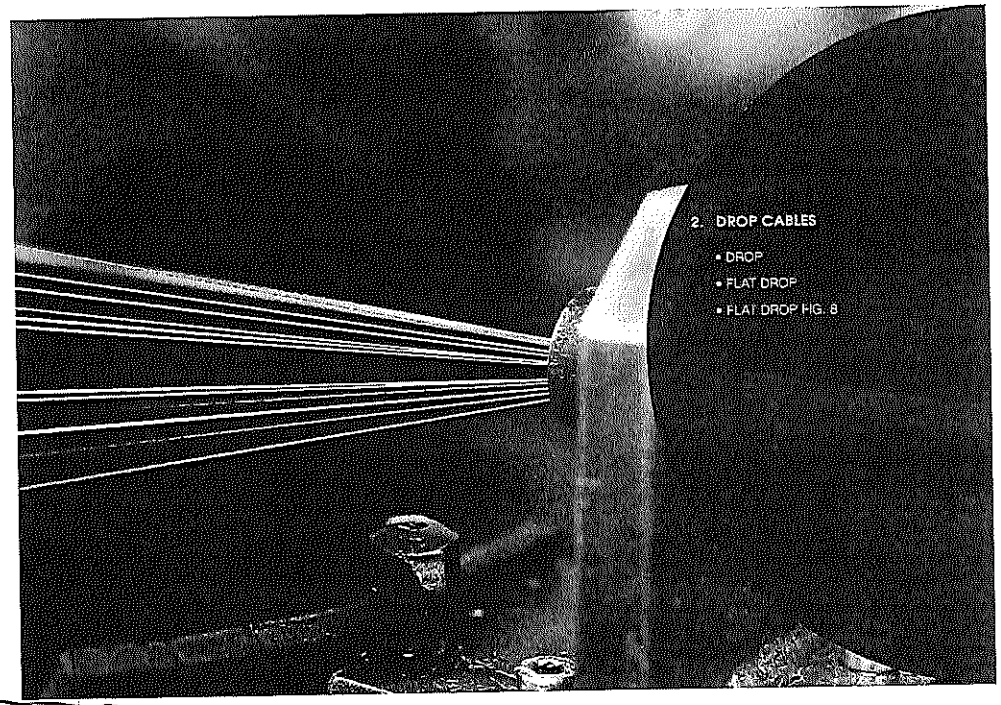


Description of materials:

1. Acrylate buffered optical fiber, 2. Waterblocking E-glass yarn, 3. Rip-Cord
4. HI-LSOH outer jacket, UV stable.

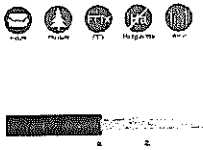
Temperature range	
Installation	-10 to +50 °C
Operation	-40 to +70 °C
Storage	-40 to +70 °C

Design code	Fiber count	Cable outer diameter (mm)	Net weight (kg/km)	Max. load (installation) (N)	Crush resistance (N/10 cm)
BA1	2	4.8	30.0	600	2,500
BA1	4	5.1	31.0	700	2,500
BA1	12	5.8	32.0	900	2,500
BA1	24	6.9	39.0	1,200	2,500
BA1	36	8.1	50.0	1,200	2,500
BA1	72	9.4	78.0	1,400	2,500
BA1	96	11.6	120.0	1,400	2,500
BA1	24	8.5	64.0	1,200	2,500



DROP

Specification: 7A01, Z236, Z237



Description of materials:

1. Central fibres 2. Aramid yarn, 3. FR-HFFR outer jacket, UV stable

Temperature range	
Installation	-20/+70°C
Operation	-20/+70°C
Storage	-20/+70°C

Design code	Fibre count	Cable outer diameter [mm]	Net weight [kg/km]	Max. load [short/long] [N]	Crush resistance [N/10 cm]
7A01	1+2	3.0	10.5	750	1,000
7A02	4+2	3.4	12.0	750	1,000
7A04	4	3.2	11.5	600	1,000
7A08	8	3.6	13.5	600	1,000
Z236	1+2	3.0	10.5	750	1,000
Z237	2	3.0	11.0	1,000	1,000
Z237	4	3.4	11.2	1,000	1,000
Z237	8	3.2	12.6	1,000	1,000
Z237	2	3.0	11.0	1,000	1,000

FLAT DROP

Specification: Z041, Z042

Description of materials:

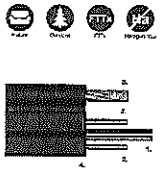
1. Central fibres. 2. Fixed wire in FRP. 3. FR-HFFR outer jacket, UV stable

Temperature range	
Installation	-5/+50°C
Operation	-20/+70°C
Storage	-20/+70°C

Design code	Fibre count	Cable outer dimension [mm]	Net weight [kg/km]	Max. load [short/long] [N]	Crush resistance [N/10 cm]
Z041	2	2 x 3.0	15	300	1,000
Z042	2	2 x 3.0	16	300	1,000

FLAT DROP FIG. 8

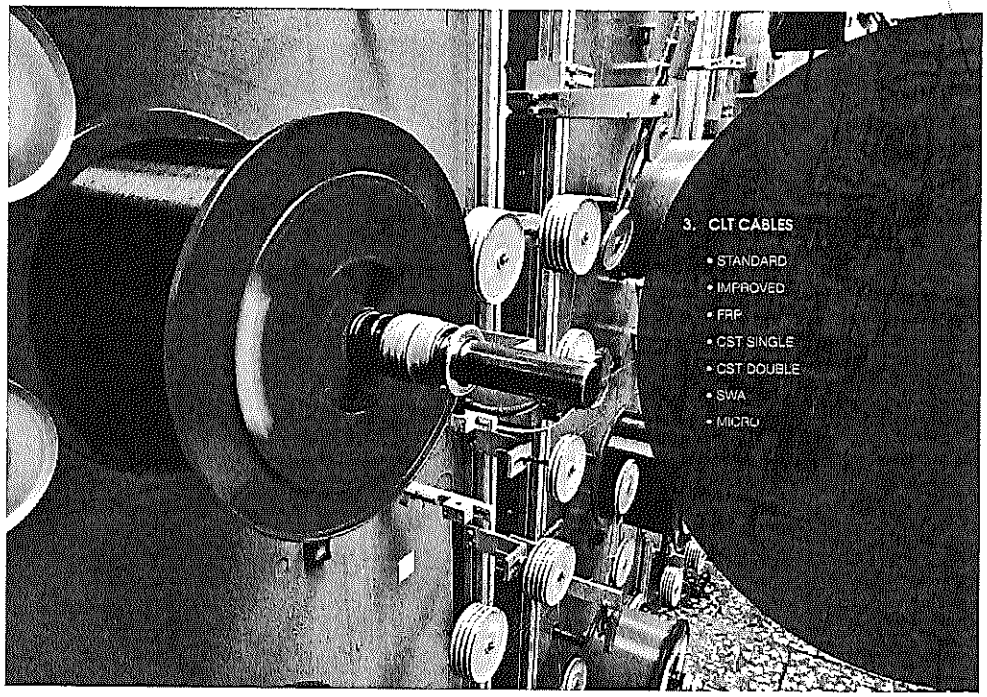
Specification: 2048, 2048



Description of materials:

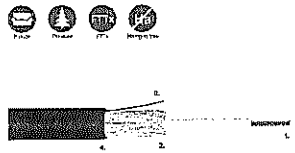
1. Optimal fibres, 2. Fibre yarn or FRP, 3. Fibre yarn (minimum of 1.0 mm), 4. PH-LSZH outer jacket, UV stable.

Design code	Fiber count	Cable outer diameter [mm]	Unit weight [kg/km]	Max. load (short-term) [N]	Crush resistance [N/10 cm]
2048	2	4 x 5.5	30.0	1200	4 000
2048	4	4 x 5.5	34.0	1800	4 000



CLT STANDARD

Specification: AE00, BE00, AE02, BE02



Description of materials:

1. Gel filled PBT loose tube with optical fibers. 2. Water-blocking E-glass yarn. 3. Rip-Cord. 4. HH-LSZH or PE outer jacket, UV stable.

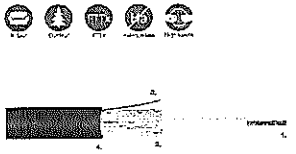
Temperature range	
Installation	-10 to +50 °C
Operation	-20 to +70 °C
Storage	-20 to +70 °C

Design code	Max fiber count	Loose tube diameter [mm]	Cable size	Net weight [kg/km]	Max load (installation) [N]	Crush resistance [N/10 cm]
AE00	12	2.5	6.4	27.0	1,100	2,000
BE00	24	3.0	8.6	51.0	2,100	2,000
AE02	12	2.5	7.4	40.0	1,100	2,000
BE02	24	3.0	7.4	48.0	1,100	2,000

02

CLT IMPROVED

Specification: AR00, BR00, AR02, BR02



Description of materials:

1. Gel filled PBT loose tube with optical fibers. 2. Water-blocking E-glass yarn. 3. Rip-Cord. 4. FR-LSZH or PE outer jacket, UV stable.

Temperature range	
Installation	-10 to +50 °C
Operation	-20 to +70 °C
Storage	-20 to +70 °C

Design code	Max fiber count	Loose tube diameter [mm]	Cable size	Net weight [kg/km]	Max load (installation) [N]	Crush resistance [N/10 cm]
AR00	12	2.5	8.5	62.0	2,100	2,000
BR00	24	3.0	11.0	110.0	3,300	2,000
AR02	12	2.5	9.6	100.0	2,100	2,000
BR02	24	3.0	9.7	99.0	2,100	2,000

03

CLT FRP

Specification: BF00, BF02

Description of materials:

1. Gel filled PBT loose tube with optical fibers. 2. FRP tensile strength member. 3. Water-blocking E-glass yarn. 4. Rip-Cord. 5. HH-LSZH or PE outer jacket, UV stable.

Temperature range	
Installation	-10 to +50 °C
Operation	-20 to +70 °C
Storage	-20 to +70 °C

Design code	Max fiber count	Loose tube diameter [mm]	Cable size	Net weight [kg/km]	Max. load (installation) [N]	Crush resistance [N/10 cm]
[illegible]	12	2.5	7.4	61.0	2,100	2,000
BF02	24	3.0	7.4	60.0	2,100	2,000

04

CLT CST

Specification: BH00, BH02, Z140, Z140

Description of materials:

1. Gel filled PBT loose tube with optical fibers. 2. Water-blocking E-glass yarn. 3. Rip-Cord. 4. Corrugated steel tape. 5. HH-LSZH or PE outer jacket, UV stable.

Temperature range	
Installation	-10 to +50 °C
Operation	-20 to +70 °C
Storage	-20 to +70 °C

Design code	Max fiber count	Loose tube diameter [mm]	Cable size	Net weight [kg/km]	Max load (installation) [N]	Crush resistance [N/10 cm]
[illegible]	24	3.0	9.6	89.0	1,100	10,000
BH02	24	3.0	10.1	100.0	2,100	10,000
Z140	24	3.0	7.2	70.0	1,100	10,000
Z140	24	3.0	7.2	67.0	1,100	10,000

05

CLT CST

Specification: xcee

Description of materials:

1. Gel filled PBT loose tube with optical fibers, 2. Rip-Cord, 3. Corrugated Steel tape, 4. Steel Wire, 5. HL outer jacket, UV stable

Temperature range	
Installation	-5°C to +50°C
Operation	-20°C to +50°C
Storage	-5°C to +50°C

Design code	Max fiber count	Cable size	Net weight [kg/km]	Max. load (+ 4 cable) [N]	Crush resistance [N/cm]
3088	24	9.5	95.0	2,000	300

CLT FRP DOUBLE JACKET

Specification: xb17

Description of materials:

1. Gel filled PBT loose tube with optical fibers, 2. Waterblocking Rayleen yarn, 3. FR-LSZH inner jacket, 4. Rip-Cord, 5. Waterblocking E-Glass yarn, 6. FRP rods, 7. PE outer jacket, UV stable

Temperature range	
Installation	-5°C to +50°C
Operation	-30°C to +60°C
Storage	-5°C to +70°C

Design code	Max fiber count	Cable size	Net weight kg/km	Max. load (installation) [kN]	Crush resistance [N/cm]
3817	12	9.7	100	1	300

CLT DROP

Specification: xcte

Description of materials:

1. Gel filled PBT loose tube with optical fibers, 2. FRP rods, 3. PE outer jacket, UV stable

Temperature range	
Installation	-5°C to +50°C
Operation	-20°C to +50°C
Storage	-5°C to +70°C

Design code	Max fiber count	Cable size	Net weight [kg/km]	Max load (installation) [N]
3898	12	7.5	55.3	600

CLT CST DOUBLE JACKET

Specification: bin, bif2, bif2

Description of materials:

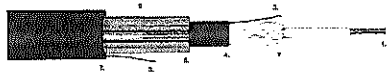
1. Gel filled PBT loose tube with optical fibers, 2. Waterblocking Rayleen yarn, 3. Rip-Cord, 4. HH-LSZH or HL outer jacket, 5. Corrugated steel tape, 6. FR-LSZH or HL outer jacket, UV stable

Temperature range	
Installation	-5°C to +50°C
Operation	-30°C to +60°C
Storage	-5°C to +70°C

Design code	Max fiber count	Loose tube diameter [mm]	Cable size	Net weight [g/km]	Max. load (installation) [N]	Crush resistance [N/10 cm]
bif1	24	3.0	10.5	140.0	1,121	4,200
bif2	24	3.0	10.5	133.0	1,120	4,200
bif4	24	3.0	10.5	131.0	1,121	4,200

CLT SWA

Specification: BWP1, BWP2, BWP1, BWP2



Description of materials:

1. Oil filled PBT loose tube with optical fibers, 2. Water-blocking Figlass yarn, 3. Pip-Cord,
4. HI-LIGHT or HI inner jacket, 5. Steel Wire Armour (SWA), 6. Water-swellable tape,
7. FR-LSZH or PE outer jacket, UV stable.

Temperature range

Installation	0 to +50 °C
Operation	-20 to +70 °C
Storage	-20 to +70 °C

Design code	Max fiber count	Loose tube diameter [mm]	Cable size	Net weight [kg/km]	Max load (installation) [N]	Crush resistance [N/10 cm]
BWP1	48	3.0	9.4	114.0	4,000	1,500
BWP2	24	3.0	12.7	178.0	8,000	4,000
BWP1	96	3.0	9.4	114.0	4,000	1,500
BWP2	24	3.0	12.7	178.0	8,000	4,000

CLT MICRO

Specification: Z048, Z096, Z144, Z288

Description of materials:

1. Optical fibre, 2. Gel filled PBT loose tube, 3. Low Flexible Polymer.

Temperature range

Installation	-15 to +50 °C
Operation	-20 to +70 °C
Storage	-20 to +70 °C

Design code	Max fiber count	Loose tube diameter [mm]	Cable size	Net weight [kg/km]	Max load (installation) [N]	Crush resistance [N/10 cm]
Z048	48	2.0	9.4	90	2,000	1,000
Z096	96	2.4	9.4	90	2,000	1,000
Z144	144	2.4	9.4	90	2,000	1,000
Z288	288	2.4	9.4	90	2,000	1,000

CLT MICRO

Specification: AL048, Z096, Z288

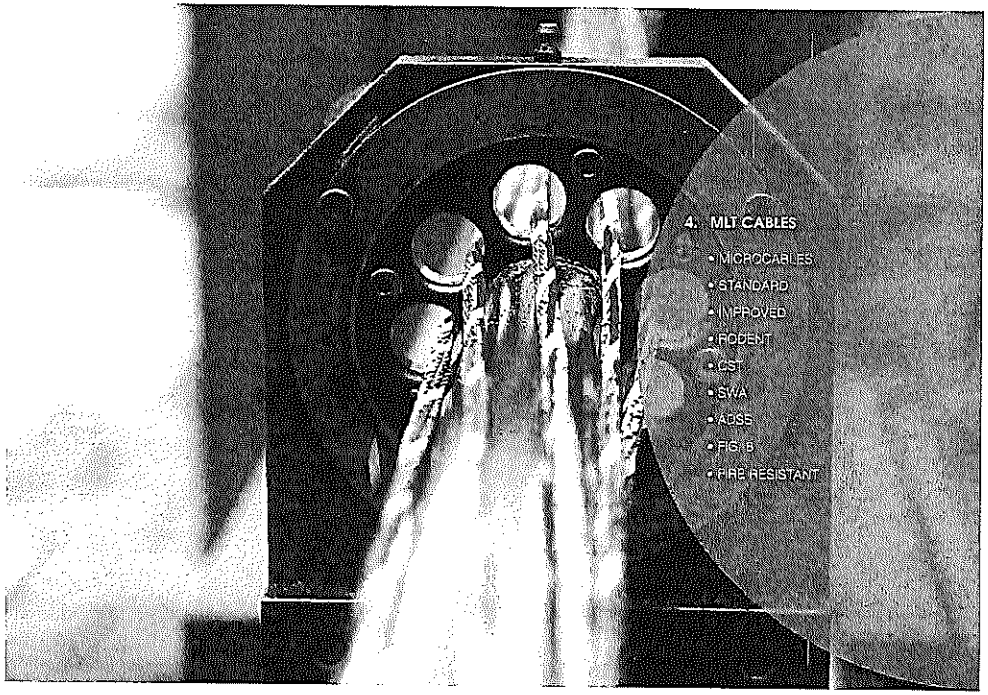
Description of materials:

1. Oil filled PBT loose tube with optical fibers, 2. Water-blocking aramid yarn, 3. Pip-Cord,
4. HI outer jacket, UV stable.

Temperature range

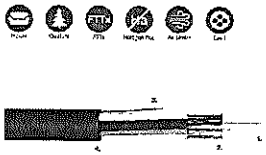
Installation	-15 to +50 °C
Operation	-20 to +70 °C
Storage	-20 to +70 °C

Design code	Max fiber count	Loose tube diameter [mm]	Cable size	Net weight [kg/km]	Max load (installation) [N]	Crush resistance [N/10 cm]
AL048	48	2.0	9.4	90	2,000	1,000
Z096	96	2.4	9.4	90	2,000	1,000
Z288	288	2.4	9.4	90	2,000	1,000



MICROCABLES

Specification: ZG10, TM08, TM02, GM01, GM02, WM08, WM02, Z202, Z108



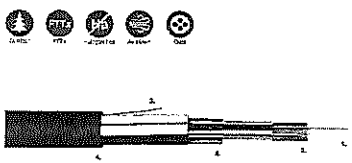
Description of materials:
1. FRP dielectric central strength member, 2. Gel filled PBT loose tube with optical fibers,
3. Rip-Cord, 4. FR-LSZH or PE outer jacket, UV stable.

Temperature range:	
Installation	-10 to +50°C
Operation	-30 to +70°C
Storage	-40 to +80°C

Design code	Max. fiber count	Loose tube diameter/ mm	Cable size	Net weight [kg/km]	Max. Load Installation [N]	Crush resistance [N/100 mm]
ZG10	10	1.5	4.2	20.0	300	1,000
TM08	12	1.5	5.8	32.0	700	1,500
TM02	24	1.5	6.8	41.0	700	1,500
GM01	60	2.5	9.0	90.0	1,400	1,500
GM02	24	1.5	7.3	48.0	1,400	1,500
WM08	144	1.5	9.6	68.0	1,500	1,500
WM02	144	1.5	9.6	84.0	1,500	1,500
Z202	144	1.5	7.1	48.0	700	1,500
Z108	144	1.5	7.1	51.0	700	1,500

MICROCABLES

Specification: Z048



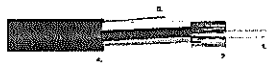
Description of materials:
1. FRP dielectric central strength member, 2. Gel filled PBT loose tube with optical fibers,
3. Rip-Cord, 4. PE outer jacket, UV stable.

Temperature range:	
Installation	-10 to +50°C
Operation	-30 to +70°C
Storage	-40 to +80°C

Design code	Max. fiber count	Loose tube diameter/ [mm]	Cable size	Net weight [kg/km]	Max. Load installation [N]	Crush resistance [N/100 mm]
Z048	48	2.5	10.2	87	1,100	1,200

MICROCABLES

Specification: UM01, UM02, OM01, OM02, PM01, PM02, RM01, RM02, VM01, VM02



Description of materials:

1. FRP dielectric central strength member. 2. Gel filled PBT loose tube with optical fibers.
3. Rip-Cord. 4. FR-LSZH or PE outer jacket, UV stable.

Temperature range	
Installation	-15 to +60 °C
Operation	-40 to +70 °C
Storage	-40 to +70 °C

Design code	Max. fiber count	Jacket Ø (nominal) [mm]	Cable Ø	Net weight [kg/km]	Max. load (installation) [N]	Crush resistance [N/10 cm]
UM01	8	1.7	7.2	48.0	1,500	1,000
UM02	12	1.7	7.2	53.0	900	1,000
OM01	24	1.7	7.2	52.0	1,500	1,000
OM02	72	1.7	7.2	51.0	900	1,000
PM01	96	1.7	7.2	52.0	1,500	1,000
PM02	96	1.7	9.4	84.5	2,400	1,000
RM01	144	1.7	9.4	81.5	2,400	1,000
RM02	144	1.7	10.0	120.0	2,400	1,000
VM01	216	1.7	10.5	85	900	1,000
VM02	288	1.7	12.5	115	900	1,000

MICROCABLES

Specification: SM01, SM02, KM01, DM02, SM02, KM02

Description of materials:

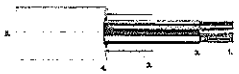
1. FRP dielectric central strength member. 2. Gel filled PBT loose tube with optical fibers.
3. Rip-Cord. 4. FR-LSZH or PE outer jacket, UV stable.

Temperature range	
Installation	-15 to +60 °C
Operation	-30 to +70 °C
Storage	-40 to +70 °C

Design code	Max. fiber count	Jacket Ø (nominal) [mm]	Cable Ø	Net weight [kg/km]	Max. load (installation) [N]	Crush resistance [N/10 cm]
SM01	144	3.5	9.5	87	2,000	1,000
SM02	288	3.5	9.5	93.0	1,500	1,000
KM01	144	3.5	9.5	87.0	2,000	1,000
DM02	144	3.5	9.5	87.0	2,000	1,000
SM02	288	3.5	11.1	114.0	1,500	1,000
KM02	144	3.5	11.1	114.0	1,500	1,000

RISER MICROCABLES

Specification: XD09



Description of materials:

1. Optical fibers. 2. Gel filled micro tubes. 3. FTP core. 4. FR LSZH outer jacket.
5. Linen sheet piece for opening of the cable.

Temperature range	
Installation	-15 to +60 °C
Operation	-30 to +70 °C
Storage	-40 to +70 °C

Design code	Max. fiber count	Cable Ø	Net weight [kg/km]	Max. load (short term) [N]	Crush resistance [N/cm]
XD09	24	10.5	84.0	n/a	n/a

TIGHT-BUFFERED RISER CABLE

Specification: XD10

Description of materials:

1. Optical fibers. 2. Tight buffer. 3. FRP rods. 4. FR-LSZH outer jacket.
5. Linen sheet piece for opening of the cable.

Temperature range	
Installation	-15 to +60 °C
Operation	-30 to +70 °C
Storage	-40 to +70 °C

Design code	Max. fiber count	Cable Ø	Net weight [kg/km]	Max. load (installation) [N]	Crush resistance [N/cm]
XD10	24	10.5	81.0	600	n/a

TIGHT-BUFFERED RISER CABLE

Specification: XD07

Description of materials:

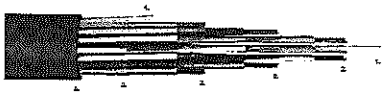
1. Optical fibre, 2. Gel filled micro tubes, 3. Water swellable Tape, 4. Waterblocking aramid yarn, 5. Rip-Cord, 6. FRP rods, 7. PE outer Jacket, UV stable.

Temperature range	
Installation	-20 to +60 °C
Operation	-30 to +70 °C
Storage	-30 to +70 °C

Design code	Max fiber count	Cable size	Net weight [kg/km]	Max load (installation) [N]	Crush resistance [N/10 cm]
XD07	12	7.7	59.0	1,200	300
XD07	18	9.4	88.4	1,200	300
XD07	72	12.2	155.0	1,200	300
XD07	96	13.8	192.2	1,200	300
XD07	144	16.0	263.1	1,200	300

MLT STANDARD

Specification: Z002, Z004



Description of materials:

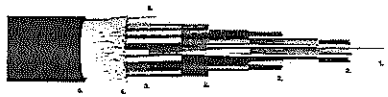
1. FRP dielectric central strength member, 2. Gel filled PBT loose tube with optical fibres, 3. Water-swellable tape, 4. Rip-Cord, 5. FR-LSZH or PE outer jacket, UV stable.

Temperature range	
Installation	-15 to +55 °C
Operation	-20 to +70 °C
Storage	-40 to +70 °C

Design code	Max fiber count	Loose tube diameter [mm]	Cable size	Net weight [kg/km]	Max load (installation) [N]	Crush resistance [N/10 cm]
Z002	48	1.7	9.5	84.0	700	1,000
Z004	96	1.7	12.0	119.0	700	1,000

MLT STANDARD

Specification: Z017, Z018, Z540, Z550



Description of materials:

1. FRP dielectric central strength member, 2. Gel filled PBT loose tube with optical fibres, 3. Water-swellable tape, 4. Waterblocking E-glass yarn, 5. Rip-Cord, 6. FR-LSZH or PE outer jacket, UV stable.

Temperature range	
Installation	-15 to +55 °C
Operation	-20 to +70 °C
Storage	-40 to +70 °C

Design code	Max fiber count	Loose tube diameter [mm]	Cable size	Net weight [kg/km]	Max load (installation) [N]	Crush resistance [N/10 cm]
Z017	144	2.5	16.2	204.0	2,500	2,000
Z018	288	3.0	21.3	327.0	4,000	2,000
Z540	864	2.5	28.7	704.0	4,000	2,000
Z550	432	2.5	28.7	407.0	4,000	2,000

MLT STANDARD

Specification: UE01, UE02, CE01, CE02, PE01, PE02, RE01, RE02, VE01, VE02

Description of materials:

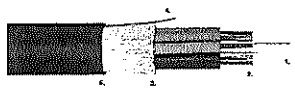
1. FRP dielectric central strength member, 2. Gel filled PBT loose tube with optical fibre, 3. Water-blocked E-glass yarn, 4. Rip-Cord, 5. FR-LSZH or PE outer jacket, UV stable.

Temperature range	
Installation	-15 to +60 °C
Operation	-40 to +70 °C
Storage	-40 to +70 °C

Design code	Max fiber count	Loose tube diameter [mm]	Cable size	Net weight [kg/km]	Max load (installation) [N]	Crush resistance [N/10 cm]
UE01	12	1.7	7.0	57.0	1,300	2,000
UE02	24	1.7	7.0	57.0	1,300	2,000
CE01	72	1.7	9.7	85.0	2,500	2,000
CE02	96	1.7	9.7	85.0	2,500	2,000
PE01	24	1.7	9.5	87.0	1,300	2,000
PE02	48	1.7	9.5	87.0	1,300	2,000
RE01	144	1.7	11.0	125.0	2,500	2,000
RE02	144	1.7	11.0	125.0	2,500	2,000
VE01	216	1.7	13.0	173.0	2,500	2,000
VE02	216	1.7	13.0	173.0	2,500	2,000

MLT STANDARD

Specification: LE01, LE02, FE01, FE02, GE01, GE02, HE01, HE02



Description of materials:

1. FRP dielectric central strength member. 2. Gel filled PBT loose tube with optical fibers.
3. Waterswelling E-glass yarn. 4. Ripcord. 5. FR-LSZH or PE outer jacket, UV stable.

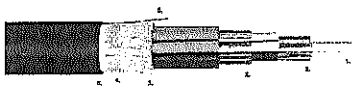
Temperature range

Installation	-15°C - +50°C
Operation	-40°C - +70°C
Storage	-40°C - +70°C

Design code	Max. fiber count	Loose tube diameter (mm)	Cable size	Net weight (kg/km)	Max. load (installation) (N)	Crush resistance (N/10 cm)
LE01	48	2.0	9.0	79.0	1,400	2,000
LE02	48	2.0	9.0	82.0	1,400	2,000
FE01	72	2.0	10.5	95.0	1,400	2,000
FE02	72	2.0	10.5	110.5	2,400	2,000
GE01	96	2.0	11.0	102.5	2,400	2,000
GE02	96	2.0	11.0	145.0	2,400	2,000
HE01	144	2.5	12.0	145.0	4,500	3,000
HE02	144	2.5	13.0	210.0	4,500	3,000

MLT STANDARD

Specification: LE00, LE02



Description of materials:

1. FRP dielectric central strength member. 2. Gel filled PBT loose tube with optical fibers.
3. Waterblocking E-glass yarn. 4. Water-swellable tape. 5. Rip-Cord. 6. HF-LSZH or PE outer jacket, UV stable.

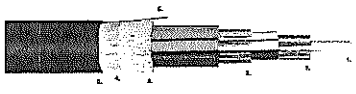
Temperature range

Installation	0°C (+32°F)
Operation	-40°C (-40°F)
Storage	-40°C (-40°F)

Design code	Max. fiber count	Loose tube diameter (mm)	Cable size	Net weight (kg/km)	Max. load (installation) (N)	Crush resistance (N/10 cm)
LE00	24	2.0	9.0	84.0	1,400	2,000
LE02	48	2.5	11.0	145.0	2,400	2,000

MLT STANDARD

Specification: ZE00, ZE02



Description of materials:

1. FRP dielectric central strength member. 2. Gel filled PBT loose tube with optical fibers.
3. Waterblocking E-glass yarn. 4. Water-swellable tape. 5. Rip-Cord. 6. HF-LSZH or PE outer jacket, UV stable.

Temperature range

Installation	-0°C +50°C
Operation	-40°C +70°C
Storage	-40°C +70°C

Design code	Max. fiber count	Loose tube diameter (mm)	Cable size	Net weight (kg/km)	Max. load (installation) (N)	Crush resistance (N/10 cm)
ZE00	24	2.0	10.0	104.0	1,400	2,000
ZE02	48	2.0	10.0	104.0	2,400	2,000

MLT STANDARD

Specification: ME00, ME02

Description of materials:

1. FRP dielectric central strength member. 2. Gel filled PBT loose tube with optical fibers.
3. Water-swellable tape. 4. Waterblocking E-glass yarn. 5. Rip-Cord. 6. HF-LSZH or PE outer jacket. UV stable.

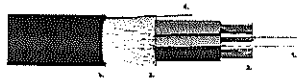
Temperature range

Installation	0°C (+32°F)
Operation	-40°C (-40°F)
Storage	-40°C (-40°F)

Design code	Max. fiber count	Loose tube diameter (mm)	Cable size	Net weight (kg/km)	Max. load (installation) (N)	Crush resistance (N/10 cm)
ME00	4.0	2.5	8.0	104.0	2,400	2,000
ME02	4.0	2.5	10.0	104.0	2,400	2,000

MLT STANDARD

Specification: YE01, YE02



Description of materials:

1. FRP dielectric central strength member. 2. Gel filled PBT loose tube with optical fibers.
3. Waterblocking E-glass yarn. 4. Rip-Cord. 5. FR-LSZH or PE outer jacket, UV stable

Temperature range	
Installation	-15 to +50 °C
Operation	-40 to +70 °C
Storage	-40 to +70 °C

Design code	Max. fiber count	Loose tube diameter (mm)	Cable size	Net weight (kg/km)	Max. load (installation) (N)	Crush resistance (N/10 cm)
YE01	288	2.5	17.0	240.0	6 400	1 200
YE02	288	2.5	17.0	250.0	6 400	1 200

MLT STANDARD

Specification: DE01, SE01, KE01, DE02, SE02, KE02

Description of materials:

1. FRP dielectric central strength member. 2. Gel filled PBT loose tube with optical fibers.
3. Water swellable tape. 4. Water blocking E-glass yarn. 5. Rip-Cord. 6. FR-LSZH or PE outer jacket, UV stable

Temperature range	
Installation	-15 to +50 °C
Operation	-40 to +70 °C
Storage	-40 to +70 °C

Design code	Max. fiber count	Loose tube diameter (mm)	Cable size	Net weight (kg/km)	Max. load (installation) (N)	Crush resistance (N/10 cm)
DE01	144	2.5	13.7	165.0	2 400	1 000
SE01	288	2.5	17.0	240.0	6 400	1 200
KE01	432	2.5	19.1	320.0	9 600	1 500
DE02	144	2.5	13.7	165.0	2 400	1 000
SE02	288	2.5	17.0	240.0	6 400	1 200
KE02	432	2.5	19.1	320.0	9 600	1 500

MLT IMPROVED

Specification: GR01, GR02, FR01, FR02, RR01, RR02, VR01, VR02

Description of materials:

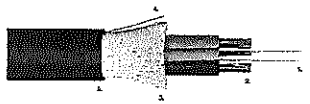
1. FRP dielectric central strength member. 2. Gel filled PBT loose tube with optical fibers.
3. Waterblocking E-glass yarn. 4. Rip-Cord. 5. FR-LSZH or PE outer jacket, UV stable.

Temperature range	
Installation	-15 to +50 °C
Operation	-40 to +70 °C
Storage	-40 to +70 °C

Design code	Max. fiber count	Loose tube diameter (mm)	Cable size	Net weight (kg/km)	Max. load (installation) (N)	Crush resistance (N/10 cm)
GR01	72	1.7	12.4	140.0	4 800	2 000
GR02	72	1.7	12.4	140.0	4 800	2 000
FR01	96	1.7	13.0	170.0	6 400	2 000
FR02	96	1.7	13.0	170.0	6 400	2 000
RR01	144	1.7	13.6	200.0	10 000	2 000
RR02	144	1.7	13.6	200.0	10 000	2 000
VR01	216	1.7	17.5	330.0	14 400	2 000
VR02	216	1.7	17.5	340.0	14 400	2 000

MLT IMPROVED

Specification: LR01, LR02, FR01, FR02, GR01, GR02, HR01, HR02



Description of materials:

1. FRP dielectric central strength member. 2. Gel filled PBT loose tube with optical fibers.
3. Waterblocking E-glass yarn. 4. Rip-Cord. 5. FR-LSZH or PE outer jacket, UV stable.

Temperature range	
Installation	-15 to +50 °C
Operation	-40 to +70 °C
Storage	-40 to +70 °C

Design code	Max. fiber count	Loose tube diameter (mm)	Cable size	Net weight (kg/km)	Max. load (installation) (N)	Crush resistance (N/10 cm)
LR01	48	2.0	12.4	140.0	3 600	2 000
LR02	48	2.0	12.4	140.0	3 600	2 000
FR01	72	2.0	13.0	170.0	4 800	2 000
FR02	72	2.1	13.0	180.0	4 800	2 000
GR01	96	2.0	13.6	200.0	7 200	2 000
GR02	96	2.0	13.6	200.0	7 200	2 000
HR01	144	2.0	14.3	260.0	10 800	2 000
HR02	144	2.0	14.3	270.0	10 800	2 000

MLT IMPROVED

Specification: MP00, MP02

Description of materials:

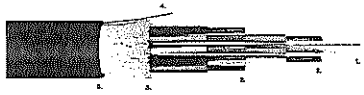
1. FRP dielectric central strength member. 2. Gel filled PBT loose tube with optical fibers.
3. Water-blocking F-glass yarn. 4. Rip-Cord. 5. FR-LSZH or PE outer jacket, UV stable.

Temperature range	
Installation	-15 to +50°C
Operation	-30 to +70°C
Storage	-40 to +70°C

Design code	Max. fiber count	Loose tube diameter [mm]	Cable dia.	Net weight [kg/km]	Max. load (installation) N	Crush resistance (LTD) daN/100 mm
MP00	432	2.5	16.5	329.0	2,700	2,700
MP02	540	2.9	22.5	359.0	4,500	2,500

MLT IMPROVED

Specification: PR01, PR02



Description of materials:

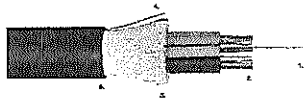
1. FRP dielectric central strength member. 2. Gel filled PBT loose tube with optical fibers.
3. Water-blocking F-glass yarn. 4. Rip-Cord. 5. FR-LSZH or PE outer jacket, UV stable.

Temperature range	
Installation	0 to +50°C
Operation	-30 to +70°C
Storage	-40 to +70°C

Design code	Max. fiber count	Loose tube diameter [mm]	Cable dia.	Net weight [kg/km]	Max. load (installation) N	Crush resistance N/100 mm
PR01	216	2.5	17.1	291.0	4,725	2,475
PR02	216	2.5	19.4	298.0	6,480	2,250

MLT IMPROVED

Specification: YP01, YP02



Description of materials:

1. FRP dielectric central strength member. 2. Gel filled PBT loose tube with optical fibers.
3. Water-blocking F-glass yarn. 4. Rip-Cord. 5. FR-LSZH or PE outer jacket, UV stable.

Temperature range	
Installation	-15 to +50°C
Operation	-30 to +70°C
Storage	-40 to +70°C

Design code	Max. fiber count	Loose tube diameter [mm]	Cable dia.	Net weight [kg/km]	Max. load (installation) N	Crush resistance N/100 mm
YP01	432	2.5	17.1	342.0	11,970	5,220
YP02	360	2.5	17.1	347.0	13,500	3,420

MLT CST

Specification: CH01, CH02, PH01, PH02, RH01, RH02

Description of materials:

1. FRP dielectric central strength member. 2. Gel filled PBT loose tube with optical fibers.
3. Water-swellable yarn. 4. Wire-blocking F-glass yarn. 5. Rip-Cord. 6. Corrugated steel tape.
7. HHLSOH or PE outer jacket, UV stable

Temperature range	
Installation	-15 to +50°C
Operation	-40 to +70°C
Storage	-40 to +70°C

Design code	Max. fiber count	Loose tube diameter [mm]	Cable dia.	Net weight [kg/km]	Max. load (installation) N	Crush resistance [N/(100 mm)]
CH01	72	1.7	12.0	174.0	7,560	3,420
CH02	72	1.7	14.0	191.0	7,560	3,420
PH01	144	1.7	13.1	194.0	5,400	3,420
PH02	96	1.7	11.1	152.0	5,400	3,420
RH01	144	1.7	14.1	196.0	5,400	3,420
RH02	144	1.7	14.1	214.0	5,400	3,420

MLT CST

Specification: LH01, LH02, FH01, FH02, GH01, GH02, HH01, HH02

Description of materials:

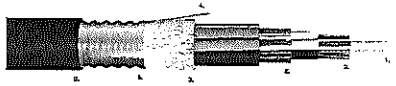
1. FRP dielectric central strength member. 2. Gel filled PBT loose tube with optical fibers.
3. Water-swellable tape. 4. Veiled aramid FRP yarn. 5. Rip-Cord. 6. Corrugated steel tape.
7. FR-LSZH or PE outer jacket. UV stable.

Temperature range	
Installation	-15 to +50°C
Operation	-40 to +70°C
Storage	-40 to +70°C

Design code	Max. fiber count	Loose tube diameter (nom)	Cable size	Net weight (kg/km)	Max. load (installation) (N)	Crush resistance (N/10 cm)
LH01	18	2.0	11.0	125.0	1,200	10,000
LH02	36	2.7	13.5	195.0	1,200	10,000
FH01	72	2.7	13.5	190.0	2,400	10,000
FH02	72	2.7	13.5	190.0	2,400	10,000
GH01	48	2.7	13.5	190.0	2,400	10,000
GH02	96	2.7	13.5	190.0	2,400	10,000
HH01	144	2.7	16.5	250.0	4,000	10,000
HH02	144	2.7	16.5	250.0	4,000	10,000

MLT CST

Specification: VH01, VH02



Description of materials:

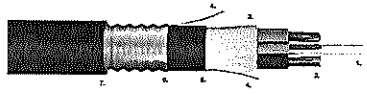
1. FRP dielectric central strength member. 2. Gel filled PBT loose tube with optical fibers.
3. Water-swellable FRP yarn. 4. Rip-Cord. 5. Corrugated steel tape. 6. FR-LSZH or PE outer jacket. UV stable.

Temperature range	
Installation	-15 to +50°C
Operation	-40 to +70°C
Storage	-40 to +70°C

Design code	Max. fiber count	Loose tube diameter (nom)	Cable size	Net weight (kg/km)	Max. load (installation) (N)	Crush resistance (N/10 cm)
VH01	216	1.7	14.5	209.0	4,000	10,000
VH02	288	1.7	14.5	209.0	4,000	10,000

MLT CST DOUBLE JACKET

Specification: LDP1, LDP2, LDP3, FDP1, FDP2, FDP3



Description of materials:

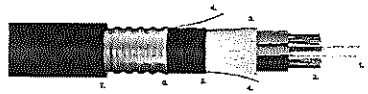
1. FRP dielectric central strength member. 2. Gel filled PBT loose tube with optical fibers.
3. Water-swellable FRP yarn. 4. Rip-Cord. 5. FR-LSZH or PE inner jacket.
6. Corrugated steel tape. 7. FR-LSZH or PE outer jacket. UV stable.

Temperature range	
Installation	-15 to +50°C
Operation	-40 to +70°C
Storage	-40 to +70°C

Design code	Max. fiber count	Loose tube diameter (nom)	Cable size	Net weight (kg/km)	Max. load (installation) (N)	Crush resistance (N/10 cm)
LDP1	48	2.0	15.5	262.0	1,200	10,000
LDP2	96	2.0	19.5	410.0	1,500	10,000
LDP3	72	2.0	19.0	390.0	1,800	10,000
FDP1	72	2.0	17.5	340.0	2,000	10,000
FDP2	72	2.0	19.5	390.0	2,000	10,000
FDP3	72	2.0	19.5	390.0	2,000	10,000

MLT CST DOUBLE JACKET

Specification: GDP1, GDP2, HDP1, HDP2



Description of materials:

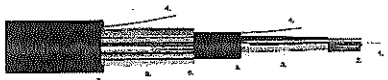
1. FRP dielectric central strength member. 2. Gel filled PBT loose tube with optical fibers.
3. Water-swellable E-glass yarn. 4. Rip-Cord. 5. FR-LSZH or PE inner jacket.
6. Corrugated steel tape. 7. FR-LSZH or PE outer jacket. UV stable.

Temperature range	
Installation	-15 to +50°C
Operation	-40 to +70°C
Storage	0 to +70°C

Design code	Max. fiber count	Loose tube diameter (nom)	Cable size	Net weight (kg/km)	Max. load (installation) (N)	Crush resistance (N/10 cm)
GDP1	72	2.0	16.0	312.0	4,000	10,000
GDP2	96	2.0	16.5	348.0	4,000	10,000
HDP1	144	2.0	19.5	522.0	4,000	10,000
HDP2	144	2.0	19.5	504.0	4,000	10,000

MLT SWA

Specification: LWP, LWP2, PWP, PWP2, GWP, GWP2, LWP, LWP2



Description of materials:

1. FRP dielectric central strength member, 2. Gel filled PBT loose tube tube with optical fibers.
3. Water-swellable yarn, 4. Rip-Cord, 5. FRP (S2) or PP inner jacket, 6. Steel Wire Armour (SWA).
7. HHLS/LSZH or PE outer jacket, UV stable.

Temperature range:	
Installation	-15 to +50 °C
Operation	-40 to +70 °C
Storage	-40 to +70 °C

Design code	Max. fiber count	Loose tube diameter [nominal mm]	Cable size	Net weight [kg/km]	Max. load (s-stabilized) [N]	Crush resistance [N/10 cm]
LWP	12	2.0	12.2	280.0	1100	450.0
LWP2	48	2.0	16.9	397.0	1100	450.0
PWP	72	2.0	18.7	394.5	1100	450.0
PWP2	96	2.0	19.7	484.5	1100	450.0
GWP	96	2.0	19.0	426.0	1100	450.0
GWP2	144	2.0	19.0	426.0	1100	450.0
HWP	144	2.0	19.5	518.7	1100	450.0
HWP2	144	2.0	19.5	518.0	1100	450.0

ADSS

Specification: ASU, Z100, Z104

Description of materials:

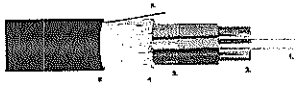
1. Gel filled PBT loose tube with optical fibers. 2. FRP central strength member.
3. Rip-Cord. 4. PE outer jacket, UV stable.

Temperature range:	
Installation	-15 to +50 °C
Operation	-40 to +70 °C
Storage	-40 to +70 °C

Design code	Max. fiber count	Loose tube material [mm]	Cable size	Net weight [kg/km]	Max. load (installation) [N]	Crush resistance [N/10 cm]
ASU	12	1.5	4.9 x 7.5	57.0	1100	450.0
Z100	24	1.7	9.1 x 12.5	204.0	1200	450.0
Z104	48	1.7	10.5 x 14	270	2400	900.0

ADSS

Specification: N2D, N4D, N2R, N4R



Description of materials:

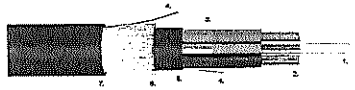
1. FRP dielectric central strength member, 2. Gel filled PBT loose tube with optical fibers.
3. Water-swellable tape, 4. Water-blocking aramid yarn, 5. Rip-Cord, 6. PE outer jacket, UV stable

Temperature range:	
Installation	-15 to +50 °C
Operation	-40 to +70 °C
Storage	-40 to +70 °C

Design code	Max. fiber count	Loose tube diameter [nominal mm]	Cable size	Net weight [kg/km]	Max. load (s-stabilized) [N]	Crush resistance [N/10 cm]
N2D	12	2.5	10.2	139	2400	900.0
N4D	72	2.5	11.6	180.0	2400	900.0
N2R	96	2.5	12.0	180.0	2400	900.0
N4R	144	2.5	14.0	240.0	2400	900.0

ADSS

Specification: N2H, N4H, N5H, N6H



Description of materials:

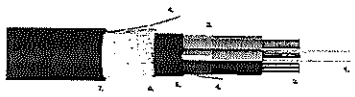
1. FRP dielectric central strength member, 2. Gel filled PBT loose tube with optical fibers.
3. Water-swellable tape, 4. Rip-Cord, 5. HDPE inner jacket, 6. Water-blocking aramid yarn.
7. PE outer jacket, UV stable.

Temperature range:	
Installation	-15 to +50 °C
Operation	-40 to +70 °C
Storage	-40 to +70 °C

Design code	Max. fiber count	Loose tube diameter [mm]	Cable size	Net weight [kg/km]	Min. load (installation) [N]	Crush resistance [N/10 cm]
N2H	48	2.5	12.2	170.0	600.0	240.0
N4H	72	2.5	12.5	170.0	600.0	240.0
N5H	96	2.5	13.3	170.0	1200	240.0
N6H	144	2.5	15.4	204.0	1200	240.0

ADSS

Specification: N42I, N52I, N62I



Description of materials:

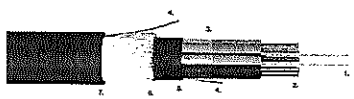
1. FRP dielectric central strength member, 2. Gel filled PBT loose tube with optical fibers, 3. Water-swellable tape, 4. Rip-Cord, 5. PE inner jacket, 6. Water-blocking aramid yarn, 7. PE outer jacket, UV stable

Temperature range	
Installation	-10 to +50°C
Operation	-40 to +70°C
Storage	-40 to +70°C

Design code	Max. fiber count	Loose tube diameter [mm]	Cable size	Net weight [kg/km]	Max. load (installation) [N]	Crush resistance [N/100 mm]
N42I	72	2.5	14.0	187.0	10 000	3 000
N52I	96	2.5	17	221.0	10 000	3 000
N62I	144	2.5	20.5	292.0	10 000	3 000

ADSS

Specification: N4RI, N5RI, N5RI, N7RI, N7SI, N8SI



Description of materials:

1. FRP dielectric central strength member, 2. Gel filled PBT loose tube with optical fibers, 3. Water-swellable tape, 4. Rip-Cord, 5. PE inner jacket, 6. Water-blocking aramid yarn, 7. PE outer jacket, UV stable.

Temperature range	
Installation	-10 to +50°C
Operation	-40 to +70°C
Storage	-40 to +70°C

Design code	Max. fiber count	Loose tube diameter [mm]	Cable size	Net weight [kg/km]	Max. load (installation) [N]	Crush resistance [N/100 mm]
N4RI	72	2.5	12.0	202.0	10 000	3 000
N5RI	96	2.5	13.5	241.0	10 000	3 000
N7RI	144	2.5	16.5	301.0	10 000	3 000

FIG.8

Specification: A802, A802, Z107

Description of materials:

1. Gel filled PBT loose tube with optical fibers. 2. Rip-Cord. 3. FR-LSZH or PE outer jacket, UV stable. 4. Metal wire strength.

Temperature range	
Installation	-10 to +50°C
Operation	-30 to +70°C
Storage	-30 to +70°C

Design code	Max. fiber count	Loose tube diameter [mm]	Cable size	Net weight [kg/km]	Max. load (installation) [N]	Crush resistance [N/100 mm]
A802	12	2.5	6.5 x 11.5	110	1 000	1 000
A802	24	2.5	6.5 x 11.5	120	1 000	1 000
Z107	24	2.5	6.5 x 10.5	110	1 000	2 000

FIG.8

Specification: L82A, F82A, G82A, H82A

Description of materials:

1. FRP dielectric central strength member. 2. Gel fibre PBT loose tube with optical fibers. 3. Water-blocking F-glass yarn. 4. Water-swellable tape. 5. Aluminium tape. 6. Rip-Cord. 7. PE outer jacket, UV stable. 8. Shell with marker jet.

Temperature range	
Installation	-10 to +50°C
Operation	-40 to +70°C
Storage	-30 to +70°C

Design code	Max. fiber count	Loose tube diameter [mm]	Cable size	Net weight [kg/km]	Max. load (installation) [N]	Crush resistance [N/100 mm]
L82A	48	2.5	11.1 x 20.7	182.0	5 000	2 000
F82A	72	2.5	11.1 x 20.7	192.0	5 000	2 000
G82A	96	2.5	12.1 x 21.7	212.0	5 000	2 000
H82A	144	2.5	12.1 x 21.7	216.0	5 000	2 000

FIRE RESISTANT – FSC 90 min.

Specification: OLT – 2269; MLT – 2268, 2269, 2269

Description of materials:

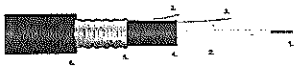
1. FRP dielectric central strength member. 2. Oil filled PBT loose tube with optical fibers.
3. Water-blocking E-glass yarn. 4. Water-swellable tape. 5. Rip-Cord. 6. Corrugated steel tape.
7. HHUSCH outer jacket, UV stable.

Temperature range	2269	2268, 2269, 2269
Installation	-5°C to +50°C	-5°C to +50°C
Operation	-40°C to +70°C	-40°C to +70°C
Storage	-30°C to +70°C	-40°C to +70°C

Design code	Max. fiber count	Loose tube diameter (nom.)	Cable dia.	Net weight (kg/km)	Max. load (installation) (daN)	Crush resistance (daN/5 cm)
2269	24	2.2	19.5	1500	1400	1000
2268	72	2.2	19.5	1740	1700	1000
2269	96	2.2	19.5	1820	1800	1000
2269	144	2.2	19.5	2020	1900	1000

FIRE RESISTANT – FSC 180 min.

Specification: OLT – 2261; 2265 – distribution cable; MLT – 2262, 2263, 2264

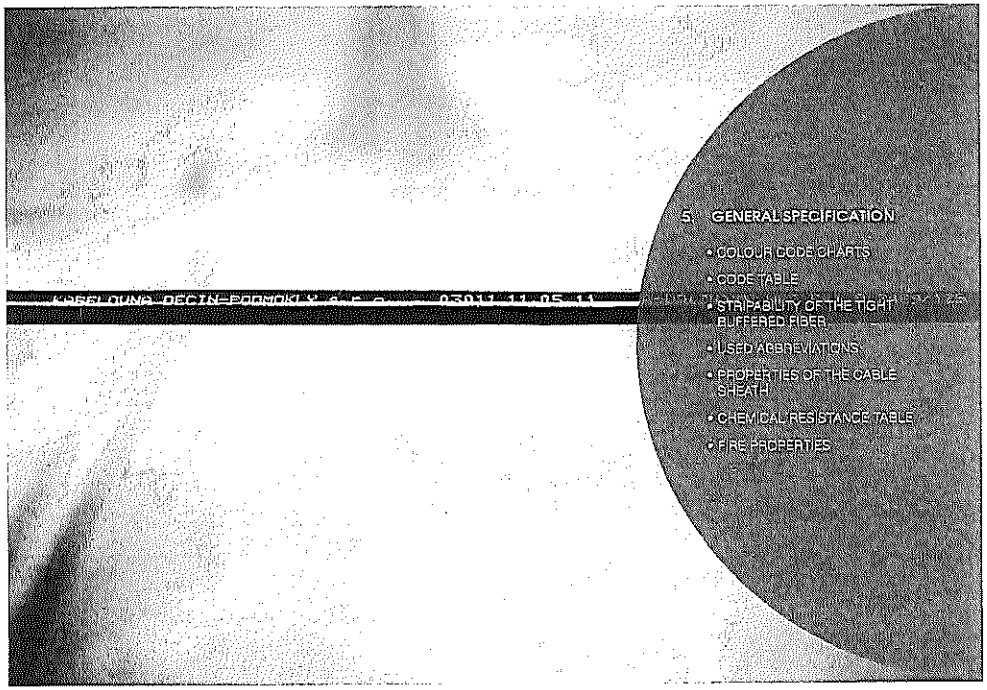


Description of materials:

1. Oil filled PBT loose tube with optical fibers. 2. Water-blocking E-glass yarn. 3. Rip-Cord.
4. FR-HFFR inner jacket, UV stable. 5. Corrugated steel tape. 6. FR-HFFR outer jacket, UV stable

Temperature range	2261	2264	2262, 2263, 2264
Installation	-5°C to +50°C	-5°C to +50°C	-5°C to +50°C
Operation	-40°C to +70°C	-40°C to +70°C	-40°C to +70°C
Storage	-40°C to +70°C	-30°C to +70°C	-40°C to +70°C

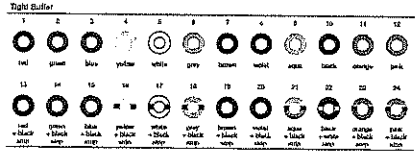
Design code	Max. fiber count	Loose tube diameter (nom.)	Cable dia.	Net weight (kg/km)	Max. load (installation) (kN)	Crush resistance (daN/5 cm)
2261	24	2.2	12.5	270	2.500	1000
2265	96	2.2	12.5	300	3.000	1000
2262	72	2.2	14.5	360	5.000	1000
2263	96	2.2	14.5	390	5.000	1000
2264	144	2.2	14.5	390	5.000	1000



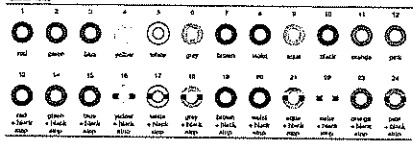
Colour Code Charts

IEC 60304 (Standard)

Tight Buffer



Looser Tube



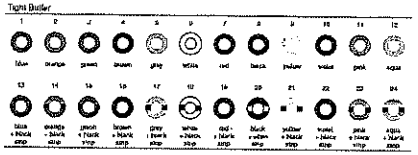
Multi Loose Tube – Tubes Colour Code

Note: Different colour sequences available on request

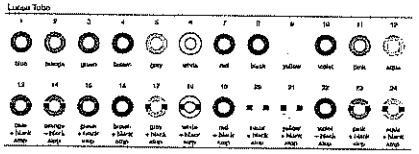
Colour Code Charts

TIA/EIA 598

Tight Buffer



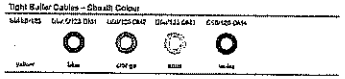
Looser Tube



Loose Tube Cables – Sheath Colour

All Colours

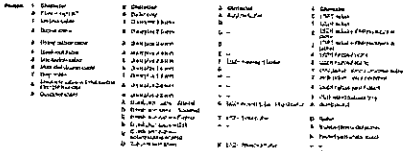
Tight Buffer Cables – Sheath Colour



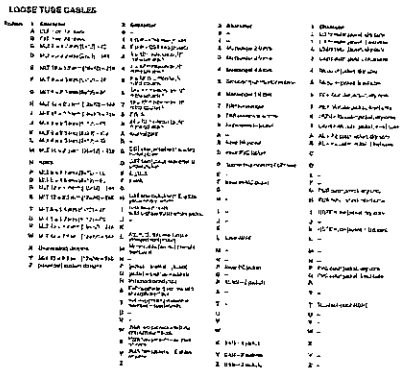
Note: Different sheath colours available on request.

Code table

TIGHT BUFFER CABLES



LOOSE TUBE CABLES



Stripability of the Tight Buffered Fiber

TIGHT (CODE T)	strippability up to 14 cm
FREE (CODE F)	strippability more than 100 cm

Used Abbreviations

LSZH	LOW SMOKE, ZERO HALOGEN
LSOH	LOW SMOKE, ZERO HALOGEN
LSHF	LOW SMOKE, HALOGEN FREE
HFFR	HALOGEN FREE, FLAME RETARDANT
FRNC	FIRE RETARDANT, NON-CORRODING
FR-LSZH	FIRE RETARDANT – LOW SMOKE, ZERO HALOGEN

Properties of the Cable Sheath

	LDPE	HDPE	PA	FR-LSZH	PUR
Flexibility	Medium	Low	Low	High	Very High
Water Resistance	High	High	Medium	Medium	Medium
Abrasion Resistance	High	High	High	Low	High
UV Radiation Resistance	High	High	Low	High	High
Brittleness at Low Temperature	Medium	Medium	Low	Medium	Very Low

Chemical Resistance Table (@ 20 °C)

	LDPE	HDPE	PA	FR-LSOH	PUR
Acids, Dilute or Weak	E	E	F	N	G
Acids, Strong or Concentrated	E	E	N	N	F
Alcohols, Aliphatic	E	E	G	G	F
Aldehydes	G	G	F	F	G
Bases	E	E	F	G	N
Esters	G	G	E	F	N
Hydrocarbons, Aliphatic	F	G	C	F	C
Hydrocarbons, Aromatic	F	G	E	N	N
Hydrocarbons, Halogenated	N	F	G	N	N
Ketones	G	G	F	N	N
Oxidizing Agents, Strong	F	F	N	N	N
Salts	E	E	E	G	E
Crude Oil	N	N	G	F	F
Kerosene	F	F	E	N	F
Mineral Oil	G	G	E	N	F

Note: Test acids per 'Oxidizing Agents, strong'.

E — 30 days of constant exposure causes no damage. Plastic may tolerate for years

G — Little or no damage after 30 days of constant exposure to the reagent.

F — Some effect after 7 days of constant exposure to the reagent. The effect may be crazing, cracking, loss of strength or discolouration, depending on the plastic.

N — Not recommended. Immediate damage may occur. Depending on the plastic, the effect may be severe crazing, cracking, loss of strength, dissolution deformation discolouration or permeation loss.

Note: The table must be considered as an indication

Fire properties

		METHOD	COMMENTS
Fire properties – Flammability	pass	EN 60332-3-22 (cat. A) EN 50399-2-2	- 40 min exposure to flame - length of the burned sample max. 2.5 m
Fire properties – Acid gases	pass	EN 50754-1 EN 50754-2	- min. pH 4.3 - max. 10 µS/mm
Fire properties – Smoke density	pass	EN 61034-1 EN 61034-2	min. 60 %

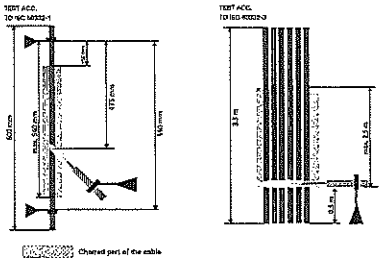
Note: Valid for all FR-LSOH sheaths.

Fire Properties

FLAME-RETARDANT

The cable must meet the requirements of the test specified in IEC standard 60332-1 or IEC 60332-1.
The cable does not propagate fire and is self-extinguishing.

Notice: You can not presume that if the cable passes the test according 60332-1, a bundle of such cables passing a test 60332-3



Charred part of the cable

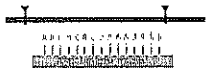
Cable Diameter	Burning Time
≤ 25 mm	60 sec
> 25 mm ≤ 50 mm	120 sec

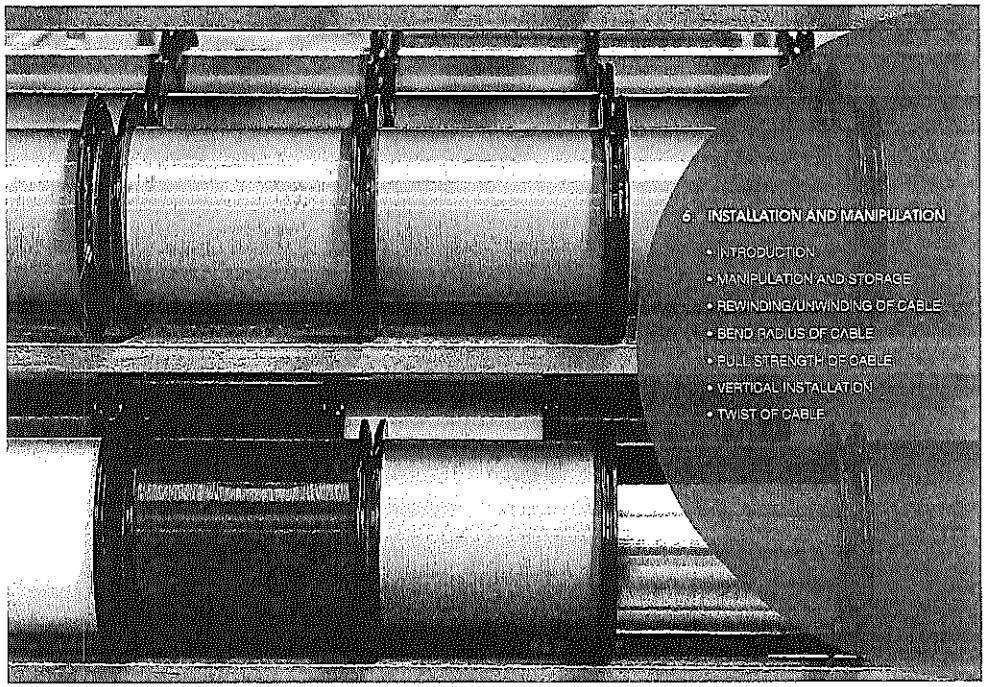
Category	Amount of Burning Material	Burning Time
A*	7.0 l/m	40 min
B	3.5 l/m	40 min
C	1.5 l/m	20 min
D	0.5 l/m	20 min

* XDP Cables

FIRE-RESISTANT

The cable must meet the requirements test specified in standard IEC 60331-11 and 25. The cable must be functional a minimum of 90 minutes at direct fire.





6. INSTALLATION AND MANIPULATION

- INTRODUCTION
- MANIPULATION AND STORAGE
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- PULL STRENGTH OF CABLE
- VERTICAL INSTALLATION
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Introduction

It is very easy to damage optical cables if manipulation with them is incorrect or if important installation procedures are not followed.

The precautions listed below should be taken into consideration when installing and manipulating with optical cables. Violating any of the basic rules can result in worsening of the cable's transfer characteristics or it can permanently damage it and shorten its lifetime. The handbook can also serve as a guideline for solving problem not only related to the installation of new cable but also for possible problems of cables, which have already been installed.

There is an assumption that the customer has general knowledge about the design of optical cables and the terminology related to it. If necessary, please contact KDP.

Symbols Used:

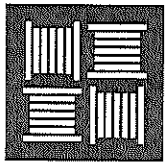
RECOMMENDED

NOT RECOMMENDED

Manipulation and Storage

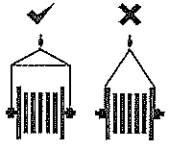
The drums with the cables cannot be thrown from any heights! The drums with optical cables have to always stand on the edges of the head, secured with a wedge to prevent movement. The only time when it is not necessary to secure the drums with a wedge is when the drums are mutually secured between each other by standing them crosswise. /Pic. 1

It is possible to store HEAVYDUPLEX, SIMPLEX, DUPLEX type cables and cable with cables up to 4mm in diameter by laying them on the head. However, the cable has to be secured by shrink wrap to prevent the loosening of individual cable coils.



Pic. 1

Cables intended for internal use can only be stored in closed areas without humidity. Cables for internal and outdoor use can be stored in outdoor conditions. However, the cable ends have to be waterproof. However, if the cable is on a plywood spool, it has to be stored in such a manner so as to prevent the effects of water on the spool.



Pic. 2

When manipulating with the drums using a crane, a spacer rod has to be placed between the load bearing ropes, so that the ropes do not exert pressure on the cable through the side drums. /Pic. 2

When lifting the drums using a forklift, the drums can only be gripped from the sides and only when the ends of the forklift are long enough for the head of the drum to be positioned on it with a safe overhang. /Pic. 3

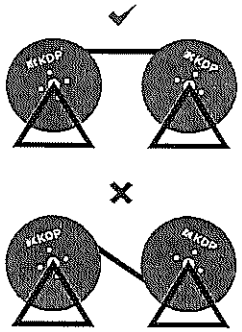
Pic. 3

It is only possible to roll the drums short distances and only on a hard and flat surface.

Rewinding/Unwinding of Cable

The rewinding and unwinding of cables is only possible at temperatures above 0 °C. If for any reason, it is necessary to unwind the cable in a lower temperature, the cable has to be left at a minimum temperature of 20 °C for at least 24 hours beforehand. For rewinding the cable, the winding (twisting) direction of the cable has to be maintained, unwinding cannot form an "8" shape. /Pic. 4

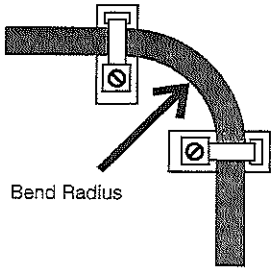
When unwinding the cable, it is necessary to maintain continuous pull without variation. Unwinding without pull can then lead to the loosening of individual rods and to the considerable mutual strike pull, possibly to the intermediate, sharp kegging of the cable, resulting in the damaging of the optical fibers.



Pic. 4

Bend Radius of Cable

This value is defined by the cable manufacturer and exceeding this value can cause invisible fiber damage, which does not have to be evident immediately following installation, but later on. Therefore, it is important to follow the minimum bend diameter not only during installation but also for a cable, which has already been installed.



Pic. 5

Pull Strength of Cable

Unless stated otherwise, all optical cables manufactured at KDP are designed for conditions under which there is not pull stress exerted during operations, or only such a pull that the fiber in the cable is not stressed (such an option is stated in the cable specification). If the stressing of cables takes place in operations, we recommend consulting such solution with KDP prior to cable installation.

The maximum pull-distance is for the purpose of cable installation and this value should never be exceeded! It is not force that shapes the cable in here, but the limit which guarantees that the fibers will not be damaged.

For checking purposes, upon installation, it is strongly recommended to place a mid-cable and a pull cable measuring pull for the consecutive monitoring of the current cable pull, if necessary, also record a value of the cases of installation, which then significantly aid in resolving consequent problems following installation. In order to decrease resistance when dragging, it is suitable to use a lubricant. Prior to use, verify that it is compatible with the material of the cable coating.

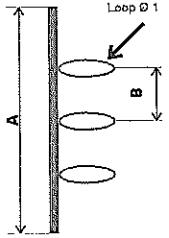
Vertical Installation

A gel, resistant to dripping up to 70 °C for a period of 24 hours, is used in optical KDP cables. This gel is also resistant and maintains its characteristics for the entire lifetime of the cable. Therefore, it is possible to install optical cables with independent secondary protection, a gel-filled tube, vertically, either as a connection with one central tube as well as multi-tube cables. This does not apply for multi-tubes, where the inner cable tube (the space between the individual tubes) is filled with gel. We do not recommend installing such cables vertically.

Conditions for the bend radius of the pull strength and other parameters are the same as for any common terrestrial installation. The procedure applies for installation outdoors as well as indoors, sewage systems, etc.

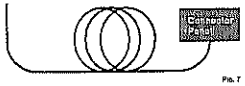
The vertical placement of cables has to be fastened by clamps, to prevent sliding. The maximum distance between individual clamps has to be such, where the weight of the cables between the clamps exceeds the pull strength and does not strain the fibers in the cable. Horizontal loops will form an vertically running cable as a relief element and protection against the possible movement of the cable in case of vibration or the load bearing construction, against fixed mounting in the lower part of the cable. The distance of the loop depends on the inner diameter of the tubes in the cable. /Pic. 6

If the cable in the lower part directly enters into the connector panel, it should enter by 3 loops. The purpose of this is to compare the change in the lengths of cables given the change in temperatures. This is from the lower part of the panel /Pic. 7



A	500 m	200 m
B	20 m	20 m

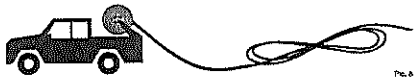
Pic. 6



Pic. 7

Twist of Cable

Avoid twisting the cable during installation because the can cause stress to the fiber. If you install a cable longer than 20 m and you are pulling it through a narrower section (for example, a playground), unwind the cable beforehand. Place cables freely in a figure eight on the floor /Pic. 8/. Placing cables in a loop prevents twisting. The diameter of the loop should be 2–4 m, depending on the rigidity of the cable. The length of the figure eight is 8–10 m.



Pic. 8

It is recommended to place for example, cardboard panel between individual rolls. Pic. 9

Pic. 9

Prior to taking the cable from the figure eight, lift it by 180°, with the aid of other individuals, so that the beginning of the cable is facing upward /Pic. 10

After putting it through, do not wind it back up into the drum, but place it back in a figure eight for further laying.

Pic. 10

Notes

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Phone: +420 412 706 111 | **E-mail:** sales@kabelovna.cz
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Стр. ТП - 85

Multi Loose Tube Cable

ID: **LE02**

KABELOVNA Děčín Podmokly s.r.o.
Ústecká 840/33, 405 33 Děčín 5
Czech Republic
DIČ CZ26759993
tel.: +420 412 706 222
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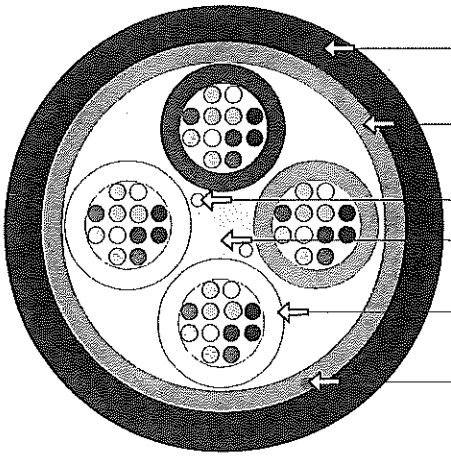
6.5.2016 ver.8

J/A-DQ(BN)H 4×2,3 max. 48F

This cable is is suitable for indoor or outdoor use. The cable has standard level of rodent protection.



- Black FR-LSZH outer jacket, UV stable
  (Other colours available on request)
- Water blocking E-glass
- Water blocking yarn
- FRP dielectric central strenght member (OD 1,0 mm)
- Gel filled loose tube with optical fibres
- Rip cord

Order example

2100 m J/A-DQ(BN)H 48E9/125 G.657.A1 jacket coulour BLK, cable specification LE02

Fibre colour coding

According to IEC 60304

1 Red	7 Brown
2 Green	8 Violet
3 Blue	9 Turquoise
4 Yellow	10 Black
5 White	11 Orange
6 Grey	12 Pink

Other fibre colour sequences available on request

Tube colour coding

1 Red
2 Green
3-4 White

In the case of lower number of fibres some tubes are replaced by uncoloured fillers
Other tubes colour sequences available on request

Fibre Type

Singie mode fiber 9/125
Multi mode fiber 50/125
Multi mode fiber 62,5/125

See the Fibre Specification sheet

Sheat Marking

Print colour	White
Print method	INK-Jet
Print legend	manufacturer's name, job number, type of cable, length marking @ 1 m intervals

Other print legends available on request

Packaging	Standard put-up length	Drum size
Plywood	2100 m ±5 %, other lengths on request	1000×640×600
Plywood	4100 m ±5 %, other lengths on request	1200×640×600

стр. ТП-86

Multi Loose Tube Cable

ID: **LE02**

KDP®
KABELOVNA Děčín Podmokly s.r.o.
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tel.: +420 412 706 222
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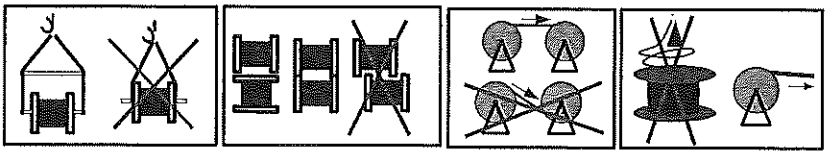
6.5.2016 ver.8

J/A-DQ(BN)H 4×2,3 max. 48F

Mechanical and Environmental properties

Test		Value	Unit	Method
Cable outer diameter		8,9 ±0,4	mm	EN 60811-1-1
Cable weight		86	kg/km	
Outer jacket thickness		1,5	mm	
Loose tube diameter		2,3	mm	
Max. tensile strength		1400	N	EN 60974-1-2-E1
Crush resistance test		2000	N	EN 60974-1-2-E3
Impact resistance test		3	Number of. impact	EN 60974-1-2-E4
Min. bend radius (no load) Min. bend radius (load)		15 20	×OD ×OD	EN 60974-1-2-E11a EN60974-1-2-E11b
Moisture resistance test		pass		EN 60794-1-22-F5
Temperature range	Installation Operation Storage	-15 to +50°C -40 to +70°C -40 to +70°C		EN 60794-1-22-F1
Fire properties – Flammability		pass		EN60332-3-22 (cat.A) ČSN EN 50266-2-2
Fire properties – Acid gases		pass		EN 50267 EN 50267-2-2 EN 50267-2-3
Fire properties – Smoke density		pass		EN 61034-1 EN 61034-2

Cable life time - minimum 30 years



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