

光纤复合低压绝缘电力电缆(OPLC) Optical Fiber Composite LV Power Cable (OPLC)

1 产品标准 Standard

本产品按照企业标准Q/EPRI 038 – 2011《光纤复合低压绝缘电力电缆》，相关技术要求满足企业标准的要求。

The manufacturing of OPLC adopts the standard of Q/EPRI 038 – 2011 “Technical Requirements of OPLC”, and the corresponding technical requirements can meet the standard of the enterprises.

2 适用范围 Scope of application

本产品用于工频额定电压为0.6/1kV及以下电压等级,光纤接入的智能电网和多网融合配网用电缆。

The rated power frequency voltage of the cable is 0.6/1kV or lower than this level. It is also applicable in optical fiber inserting smart grid and network integrating and so on.

3 产品特点 Features

光纤复合低压电力电缆是利用现有的低压电力电缆为主体,在边缘缝隙中成功加入光纤单元。光纤复合低压电力电缆最大的特点是融合了光纤通信与电力传输的功能,相比单一功能传输线缆而言,有4个特点。

The OPLC adopts the current LV cable as the main body, and successfully inserts the optical fiber unit in the edge gap of the cable. The most obvious characteristics of the OPLS are as following 4 points:

首先,集光纤和电力输配电缆于一身,避免二次布线,可有效降低施工、网络建设等费用。相比传统的敷设安装而言,使用光纤复合低压电缆作为智能电网用户端接入方案,节约大量的金属、管道、塑料等资源,可有效降低进入小区和用户的各项成本。

Firstly, OPLC integrates the function of both optical fiber and power cable, which can avoid the repeat wiring, and reduce the cost of construction and network setting up as well. Compared to the conventional installation type, using the OPLC as the solution of smart grid user connecting into the network can save a large amount of metal, pipes, plastic materials and so on, and effectively reduces the cost to getting into the communities and end users.

其次,适用于多种业务类型,适应性强,扩展性强,产品适应面广。使用光纤复合低压电缆,配合相应的设备和器件,可在一根传输线上实现多种业务,如IPTV、互联网接入、多媒体电话,语音通信,家庭智能电表等业务。

Secondly, the flexibility and extension of OPLC is very large. Use the OPLC coordinating with relative equipments and devices, can realize running various business at the same time in one cable, such as, IPTV, Internet connection, MMTel, speech communication, home smart wattmeter and so on.

再次,具备较强的机械性能,如抗冲击性能和良好的耐压性能,环境适应能力强。我们在研发该产品时,充分考虑到产品的使用环境的复杂性,光纤复合低压电缆按照GB/T7424中E1、E3、E4进行拉伸、压扁、冲击等试验,均符合并优于标准的要求。

Thirdly, the mechanical performance of OPLC is also very remarkable, such as shock resistance, pressurization, and environment adapting. And complicated ambient situations have been considered into the initial research and design. The performance of the OPLC in the tension, flattening, and impact test carrying out according to the GB/T7424--E1、E3、E4 are all qualified and better than the basic requirement.

最后,光单元与电力电缆长期工作温度相兼容。考虑到光纤复合低压电缆敷设之后,使用年限较长,光单元与电力电缆长期工作温度相兼容性是非常重要的一个问题。按照GB/T7424中方法F1实验,各项光学性能指标符合YD/T629要求,各项电器性能符合GB/T12706.1的标准要求。

Last but not least, since the service time of the OPLC is very long, the compatibility of the working temperature between optical unit and power unit is a very important problem. According to the F1 test per the method in GB/T7424, the optical properties reflected from the experiment are all qualified to the requirement in YD/T629, and the electrical properties are qualified to the standard in GB/T12706.1.

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4 使用特性 Operating characteristics

工频额定电压 $U_0/U(U_m)$ 为0.6/kV, 系统最高电压 U_m 为1.2kV;

Rated power frequency voltage $U_0/U(U_m)$ is 0.6/kV, and the highest system voltage U_m is 1.2kV;

聚氯乙烯电缆导体的长期允许最高工作温度为70°C, 交联聚乙烯电缆导体的长期允许最高工作温度为90°C;

The permitted max long time working temperature of PVC cable conductor is 70°C, and XLEP type is 90°C;

聚氯乙烯电缆短路时(最长持续时间不超过5s)电缆导体的最高温度不超过160°C, 交联聚乙烯电缆短路时(最长持续时间不超过5s)电缆导体的最高温度不超过250°C;

The max temperature of PVC cable conductor under short circuit (less than 5s) is less than 160°C, and the XLEP type is 250°C;

电缆敷设时环境温度应不低于0°C;

The ambient temperature should be higher than 0°C during laying the cables;

加入光纤单元, 能够将电网与电信网、广播电视网、互联网等信息的有机融合;

Plus the optical unit can effectively integrates the power grid, telecommunication network, and internet together;

5 型号说明 Model instruction

电力电缆结构特性代号 Structure character code of power cable

结构名称 Structure name	材料名称 Material name	特征代码 Character code
导体 conductor	第1、2种铜 1st and 2nd copper	省略(T)
	第5种铜 5th copper	R
	铝 Aluminium	L
绝缘 insulation	聚氯乙烯 PVC	V
	交联聚乙烯 XLEP	YJ
内护套 inner jacket	聚氯乙烯 PVC	V
	聚乙烯或低烟无卤阻燃聚烯烃 PE or LSZH	Y
	双钢带 double steel band	2
	细钢丝 fine steel wire	3
铠装 外护套 outside jacket	粗钢丝 heavy steel wire	4
	聚氯乙烯 PVC	2
	聚乙烯或低烟无卤阻燃聚烯烃 PE or LSZH	3

光单元结构特性代号 Structure character code of optical unit

结构特性代号 structure character code	代号名称 code name	适用环境 applicable environment
G1	非金属层绞全干式光单元 Non-metallic layer twist whole dry-type optical unit	室内或室外 indoor/outdoor
GT1	非金属层绞填充式光单元 Non-metallic layer twist whole filling-type optical unit	室内或室外 indoor/outdoor
G2	非金属中心管全干式光单元 Non-metallic central tube whole dry-type optical unit	室内或室外 indoor/outdoor
GT2	非金属中心管填充式光单元 Non-metallic central tube whole filling-type optical unit	室内或室外 indoor/outdoor
G3	碟形光单元 disc type optical unit	室内或室外 indoor/outdoor
G4	紧套光纤光单元 Tight buffer fiber optical unit	室内或室外 indoor/outdoor
G5	其它类型 others	室内或室外 indoor/outdoor

注: GT1、GT2不推荐应用在垂直敷设或高差较大的场合

Attention: GT1, GT2 are not recommended to be applied in the occasions like vertical laying or the height difference is very large.

电线电缆类

6 产品表示示例 Model explanation

示例A:包含24芯B1类光纤非金属层绞全干式光单元的铜芯聚氯乙烯绝缘钢带铠装聚氯乙烯护套光纤复合低压电缆,额定电压为0.6/1kV,3芯,标称截面积25mm²,表示为:

Example A: contains 24 core category B1 fiber non-metallic layer twist all dry optical unit copper core PVC insulated, steel tape armored PVC sheathed fiber composite low-voltage cables, rated voltage 0.6/1kV, 3 core, normal cross-sectional area is 25mm², expressed as:

OPLC-VV22-0.6/1 3 25+G1-24B1

示例B:包含4芯B1类光纤非金属中心管填充式光单元的铜芯聚乙烯绝缘无卤低烟阻燃 聚烯烃护套光纤复合低压电缆,额定电压为0.6/1kV,2芯,标称截面积6mm²,表示为:

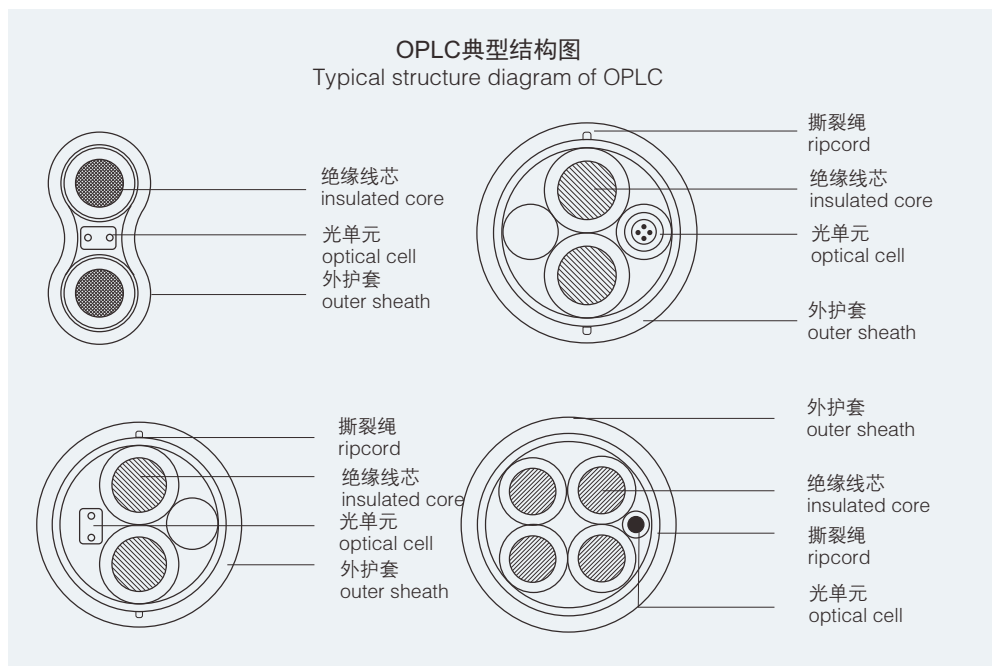
Example B: contains the four core category B1 fiber non-metallic central tube filling-type optical unit core PE insulated LSZH jacket fiber composite low voltage cable, rated voltage 0.6/1kV, 2 core, with a nominal cross-sectional area of 6mm², expressed as:

OPLC-WDZC-YY-0.6/1 2 6+ GT2-4B1

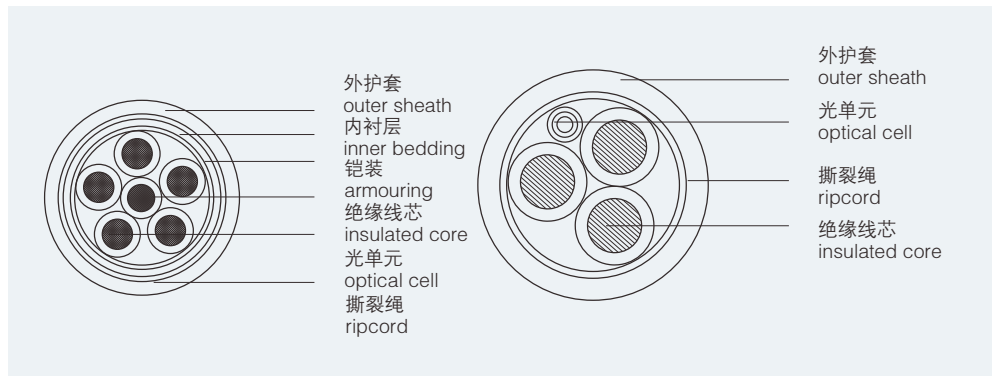
7 产品范围及结构图 Product scope and structure diagram

型号 Model	芯数 number of core	电压等级kV voltage level	标称截面mm ² cross-sectional area
OPLC-VV22-0.6/1、OPLC-VV-0.6/1、 OPLC-VLV22-0.6/1、OPLC-VLV-0.6/1	1芯、2芯、3芯、4芯、5芯 1core、2core、3core、4core、5core	0.6/1	1.5 ~ 300
OPLC-YJV22-0.6/1、OPLC-YJV-0.6/1、 OPLC-YJLV22-0.6/1、OPLC-YJLV-0.6/1	1芯、2芯、3芯、4芯、5芯 1core、2core、3core、4core、5core	0.6/1	1.5 ~ 300
OPLC-WDZC-YJY-0.6/1、 OPLC-WDZC-YJ23-0.6/1、 OPLC-WDZC-YJLY-0.6/1、 OPLC-WDZC-YJLY23-0.6/1	1芯、2芯、3芯、4芯、5芯 1core、2core、3core、4core、5core	0.6/1	1.5 ~ 300
OPLC-YJV32-0.6/1、OPLC-VV32-0.6/1、 OPLC-VLV32-0.6/1、OPLC-YJLV32-0.6/1	1芯、2芯、3芯、4芯、5芯 1core、2core、3core、4core、5core	0.6/1	1.5 ~ 300

电缆结构图 Cable structure diagram



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8 电缆敷设运行条件 Cable laying condition

• 在空气中敷设 in the air

单芯电缆平行敷设中心距离：185mm²及以下为电缆直径的2倍，240mm²及以上为90mm。

The central distance of parallel laying single-core cable: 2 times of the cable diameter when smaller than 185mm², , and 90mm when 240mm² and larger type.

周围环境温度40℃。

ambient temperature: 40℃

导电线芯最高允许温度：90℃

Max temperature of electric wire core: 90℃

不同空气温度下载流量修正系数

Correction factor of current-carrying capacity under different air temperature

导体工作温度℃ conductor working temperature	空气温度℃ air temperature								
	10	15	20	25	30	35	40	45	50
90	1.26	1.22	1.18	1.14	1.09	1.04	1.00	0.94	0.89

• 在土壤中敷设 laying in the soil

单芯电缆不接触敷设时，中心距离为电缆直径的2倍。

The central distance is twice size of the cable diameter when the single-core cable doesn't contact laying.

周围环境温度25℃。

ambient temperature: 25℃

导电线芯最高允许温度：90℃

Max temperature of electric wire core: 90℃

土壤热阻系数：1.0 k.m/W

Thermal resistivity of soil: 1.0 k.m/W

直埋深度：0.7m

Buried depth: 0.7m

不同土壤温度下载流量修正系数

Correction factor of current-carrying capacity under different soil temperature

导体工作温度℃ conductor working temperature	土壤温度℃ soil temperature					
	10	15	20	25	30	35
90	1.11	1.07	1.04	1.00	0.96	0.92

不同土壤热阻系数的载流量修正系数

Correction factor of current-carrying capacity under different thermal resistivity

电压(kV) voltage	截面(mm ²) cross-section area	土壤热阻系数(k.m/W)				
		0.8	1.0	1.2	1.5	2.0
0.6/1	≤35	1.06	1.00	0.95	0.88	0.80
	50~150	1.08	1.00	0.94	0.87	0.77
	≥185	1.09	1.00	0.93	0.85	0.76



电线电缆类

• 电缆连续负载流量

说明: 铠装电缆OPLC-VV22-0.6/1、OPLC-VLV22-0.6/1 OPLC-VY32-0.6/1、OPLC-VLY32-0.6/1、的连续负载流量分别比相应结构无铠同规格电缆的载流量小3~10A, 本手册未列出铠装电缆载流量, 请用户据此估算。



Instruction: the continuous load current-carrying capability of the armoured cable OPLC-YJV22-0.6/1, OPLC-VV22-0.6/1, OPLC-VLV22-0.6/1 OPLC-VY32-0.6/1, OPLC-VLY32-0.6/1 is 3~10A smaller than not armoured ones.

空气中敷设长期连续负荷条件下允许载流量

型号 Model	OPLC-VV-0.6/1、OPLC-VLV-0.6/1 OPLC-VY-0.6/1、OPLC-VLY-0.6/1						OPLC-VV-0.6/1、OPLC-VLV-0.6/1 OPLC-VY-0.6/1、OPLC-VLY-0.6/1			
心数 number of core	二芯		三芯、四芯、 3+1芯		五芯、4+1芯、 3+2芯		单芯			
单芯电缆排列方式										
线芯材质	铜 Cu	铝 Al	铜 Cu	铝 Al	铜 Cu	铝 Al	铜 Cu	铝 Al	铜 Cu	铝 Al
1.5	20		13	/	/	/	23	/	26	/
2.5	26	21	/	17	/	17	30	23	33	26
4	37	28	30	23	31	23	39	30	44	34
6	44	37	37	30	38	31	49	40	56	45
10	61	48	53	40	54	41	68	52	77	59
16	82	63	69	54	70	55	89	69	101	78
25	104	81	89	69	91	70	113	89	128	102
35	127	96	109	85	111	87	142	108	161	123
50	155	121	132	104	135	106	170	132	193	150
70	190	150	167	132	170	135	216	165	246	187
95	242	190	213	161	217	164	264	203	299	230
120	282	219	242	190	247	194	307	236	348	268
150	322	247	282	219	288	223	353	274	401	311
185	368	288	322	247	328	252	406	316	460	358
240			385	299	393	305	481	372	546	422
300			431	339	440	346	552	429	626	486

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土壤中敷设长期连续负荷条件下允许载流量

型号 Model	OPLC-VV-0.6/1、OPLC-VLV-0.6/1 OPLC-VY-0.6/1、OPLC-VLY-0.6/1						OPLC-VV-0.6/1、OPLC-VLV-0.6/1 OPLC-VY-0.6/1、OPLC-VLY-0.6/1			
心数 number of core	二芯		三芯、四芯、 3+1芯		五芯、4+1芯、 3+2芯		单芯			
单芯电缆排列方式										
线芯材质	铜 Cu	铝 Al	铜 Cu	铝 Al	铜 Cu	铝 Al	铜 Cu	铝 Al	铜 Cu	铝 Al
1.5	26		22		22		24		27	
2.5	34	26	29	23	30	23	31	25	35	28
4	44	35	38	30	39	31	40	32	46	36
6	56	45	47	39	48	40	50	41	57	47
10	76	59	65	50	66	51	68	52	77	60
16	100	77	84	65	86	66	86	68	98	77
25	125	100	110	84	112	85	111	86	126	98
35	155	120	130	100	133	102	131	103	149	116
50	185	145	155	120	158	122	160	123	181	140
70	230	175	195	150	199	153	197	152	223	172
95	275	210	230	185	235	189	234	180	265	205
120	310	245	260	205	265	209	267	205	302	233
150	350	275	300	230	306	235	299	234	339	265
185	395	310	335	260	341	265	340	262	386	298
240			390	300	398	306	394	308	446	349
300			435	340	340	347	447	349	507	395

9 交货长度、标志、包装 Delivery length, mark, packing

9.1 交货长度 Delivery length

9.1.1 标称截面35mm²及以下电缆，交货长度不小于300m。

As to cable smaller than 35mm², the delivery length should not shorter than 300m

9.1.2 标称截面35mm²以上电缆，交货长度不小于500m。

As to cable larger than 35mm², the delivery length should not shorter than 300m

9.1.3 长度的计量误差应不超过 0.5%。

The deviation of the length calculation should less than 0.5%

9.1.4 根据双方协议，允许以任何长度的产品交货。

According to the agreement of both two parties, allow the delivery at any length.

9.2 标志 Brand

成品电缆(电线)的表面应有制造厂名、型号、电压等级等连续标志，标志应符合GB/T 6995的规定。

The finished cable should have manufacture's name, type, voltage level and so on, and the brand should qualify to the regulation according to GB/T 6995

9.3 包装 Package

9.3.1 产品应成盘包装，成盘包装的交货盘按JB/T 8137的规定。

The product should be packed in disc, and the disc should qualify to the regulation according to JB/T 8137

9.3.2 每盘上应附有标签标明。Every disc should have the labels as followings:

- 生产厂名； manufacturer's name
- 产品型号、规格、单位为mm²； model, type, (unit mm²)
- 额定电压，单位为kV； rated voltage, unit kV
- 长度，单位为m. length, unit m
- 制造日期，年 月 日 manufacturing time
- 标准编号 standard code