

LSZH Fire Resistant Cables

0.6/1kV Single-Core

Mica Tape, XLPE Insulated, Unarmoured & Armoured, LSZH Sheathed Cable

Description: CU/MT/XLPE/LSZH-AT-UV or CU/MT/XLPE/LSZH/AWA/LSZH-AT-UV

Model Code: MXL-AT-UV or MXLAL-AT-UV



Application :	This cable is designed for areas where the integrity of the electrical circuit is critical in maintaining power supply. Applications include emergency lightings, control and power circuits, power stations, fire alarm systems, underground tunnels, sewage treatment plants, and high-rise buildings.
Voltage rating :	0.6/1kV
Construction :	Plain annealed copper (IEC 60228 Class 2), mica tape fire barrier, XLPE compound insulated, unarmoured or aluminium wires armoured, anti-termite and UV resistant LSZH compound sheathed cable
Insulation colour :	Natural
Sheath colour :	Orange (Other colour upon request)
Specification :	IEC 60502-1, SS 299, BS 6387, IEC 60331, IEC 60332-1-2, IEC 60332-3, IEC 60754, IEC 61034-2
Operating temperature :	90°C

Conductor			Insulation	Unarmoured Cable			Armoured Cable		
Nominal Area	No./Diam. of Strand	Approx. Diam.	Thickness	Part No.	Approx. Overall Diam.	Approx. Weight	Part No.	Approx. Overall Diam.	Approx. Weight
(mm ²)	(no./mm)	(mm)	(mm)		(mm)	(kg/km)		(mm)	(kg/km)
1.5	7/0.53	1.59	0.7	07018813	6.7	61	-	-	-
2.5	7/0.67	2.01	0.7	08018813	7.1	75	-	-	-
4	7/0.85	2.55	0.7	09018813	7.8	94	-	-	-
6	7/1.04	3.12	0.7	10018813	8.5	122	-	-	-
10	7/1.35	4.05	0.7	11018813	9.6	170	-	-	-
16	7/1.70	5.10	0.7	12018813	10.6	235	-	-	-
25 (cs)	7/2.14	6.20	0.9	13018813	12.3	343	-	-	-
35 (cs)	19/1.53	7.30	0.9	14018813	13.7	455	14018870	20.2	705
50 (cs)	19/1.78	8.20	1.0	15018813	15.1	590	15018870	21.4	816
70 (cs)	19/2.14	10.00	1.1	16018813	16.6	820	16018870	23.5	1047
95 (cs)	19/2.52	11.80	1.1	17018813	19.0	1075	17018870	25.3	1353
120 (cs)	37/2.03	13.00	1.2	18018813	20.5	1350	18018870	27.4	1689
150 (cs)	37/2.25	14.40	1.4	19018813	22.7	1640	19018870	29.3	2010
185 (cs)	37/2.52	16.20	1.6	20018813	25.1	2040	20018870	31.5	2440
240 (cs)	61/2.25	18.80	1.7	21018813	28.1	2650	21018870	34.5	3060
300 (cs)	61/2.52	21.20	1.8	22018813	30.9	3260	22018870	37.1	3690
400 (cs)	61/2.85	24.30	2.0	23018813	34.8	4130	23018870	42.3	4780
500 (cs)	61/3.20	27.40	2.2	24018813	38.7	5200	24018870	46.0	5970
630	127/2.52	32.76	2.4	25018813	44.9	6600	25018870	52.2	7530
800	127/2.85	37.05	2.6	26018813	50.0	8300	26018870	58.6	9680
1000	127/3.20	41.60	2.8	27018813	55.1	10458	27018870	64.4	11980

Current rating and voltage drop

For Unarmoured Cable, please refer to Table 8 & 9 (Page 54)

For Armoured Cable, please refer to Table 10 & 11 (Page 55)

(cs) : Circular Compact Stranded Conductor

TESTS

Flame Propagation Tests (IEC 60332, BS EN 60332)

Tests on Electric Cables under Fire Conditions

Part 1 : Tests on a single vertical insulated wire or cable
Part 3 : Tests on bunched wires and cables under fire condition

Flame retardant cables prevent flame propagation during a fire emergency. Our cable's protective material includes additives such as aluminium hydroxide or magnesium hydroxide. When the protective materials comes into contact with fire, the by-product from the endothermic reaction is gaseous water which will help envelop the flame, and thereby exclude oxygen from the fire.



In this reaction, the decomposition products are non-toxic and the mineral phases MgO and Al₂O₃ are alkaline, reducing the likelihood of acidic, corrosive gases exiting the plastic. This ensures higher levels of safety.

This test is also conducted on both a single cable as well as bunched vertical cables. This is because flame propagation along a vertical bunch of cables depends on other factors such as the volume of combustible material exposed and cables' geometrical configuration, which differ across single and bunched cables.

The IEC 60332-3 specifies methods for assessing flame retardance of bunched cables comprising of varying densities of combustible material.

IEC 60332-3	Total volume of non-metallic material in the bunched cables on a vertical ladder	Duration exposed to flame
	(litres)	(mins)
IEC 60332-3-22 (Cat. A)	7	40
IEC 60332-3-23 (Cat. B)	3.5	40
IEC 60332-3-24 (Cat. C)	1.5	20

Passing criteria: After the burning has ceased, the charred portion should not exceed a height of 2.5 meters.

Acid Gas Emission Tests (IEC 60754, BS EN 60754)

Test on Gases Evolved During Combustion of Materials from Cables

When fire comes into contact with polyvinyl chloride (PVC) or chlorine-containing material, hydrogen chloride gas (HCl) is released. The HCl gas could cause irritation to the eyes, mouth, throat, nose, and lungs. At Keystone Cable, all our fire resistant and flame retardant cables use Low Smoke Zero Halogen (LSZH) compounds to prevent the formation of HCl gases from the burning of cables.

The standards determine the degree of acidity of gases evolved during the combustion of cable materials by measuring pH and conductivity.

Passing Criteria: The weighted pH value is not less than 4.3 when related to 1 litre of water, and the weighted value of conductivity is not more than 10µS/mm when related to 1 litre of water.

Smoke Emission Tests (IEC 61034, BS EN 61034)

Measurement of Smoke Density of Electric Cables Burning under Defined Conditions

The "3-meter cube test" measures the amount of smoke generated by cables in the event of a fire. The cables are placed in a 3m³ enclosure. A beam of light is transmitted from one window of the chamber to the opposite window. The cables are subjected to fire in the chamber, and the light transmission is recorded.

Passing Criteria: A minimum light transmission value of 60%.

Fire Resistant Tests (SS 299, BS 6387, IEC 60331)

Specification for Performance Requirements for Cables Required to Maintain Circuit Integrity under Fire Conditions

During fire evacuations, it is important for critical electrical installations including fire alarms, smoke detectors, sprinklers, emergency lightings, and exit lights to function optimally. At Keystone Cable, we conduct these stringent tests by simulating the environment for our fire resistant cables to ensure that they pass the safety requirements and will perform during such emergencies. The protocol letter assigned to the cable reflects the level of testing the cable has gone through and passed.

SS 299:2021, BS 6387:2013 are recognised as the stringent fire resistant test standards for power cables.

Resistance to Fire Alone (SS 299:2021, BS 6387:2013)

Protocol C	Cables are subjected to fire at 950°C for 3 hours
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Resistance to Fire with Water (SS 299:2021, BS 6387:2013)

Protocol W	Cables are subjected to fire at 650°C for 15 minutes, then at 650°C with water spray for another 15 minutes.
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Resistance to Fire with Mechanical Shock (SS 299:2021, BS 6387:2013)

Protocol Z	Cables are subjected to fire at 950°C for 15 minutes with mechanical shock applied every 30s.
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IEC 60331-21 is commonly used as a basic fire resistant test standard.

Resistance to Fire Alone (IEC 60331-21 for common test)

	Cables are subjected to fire at 750°C for 90 minutes
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SS 299:2021 does not specify the essential construction standard and test requirement for small power, instrument, and control cables of less than 0.6/1kV. Based on market's requirement, SS 299-1:1998 will be used for these cables to test circuit integrity accordingly.

Resistance to Fire Alone (SS 299 Part 1:1998)

Category A	Cables are subjected to fire at 650°C for 3 hours
Category B	Cables are subjected to fire at 750°C for 3 hours
Category C	Cables are subjected to fire at 950°C for 3 hours

Resistance to Fire with Water (SS 299 Part 1:1998)

Category W	Cables are subjected to fire at 650°C for 15 minutes, then at 650°C with water spray for another 15 minutes.
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Resistance to Fire with Mechanical Shock (SS 299 Part 1:1998)

Category X	Cables are subjected to fire at 650°C for 15 minutes with mechanical shock applied every 30s.
Category Y	Cables are subjected to fire at 750°C for 15 minutes with mechanical shock applied every 30s.
Category Z	Cables are subjected to fire at 950°C for 15 minutes with mechanical shock applied every 30s.

Passing criteria: No short circuit during the respective testing period.

LSZH Fire Resistant Cables

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Conductor			Insulation	Unarmoured Cable			Armoured Cable		
Nominal Area	No./Diam. of Strand	Approx. Diam.	Thickness	Part No.	Approx. Overall Diam.	Approx. Weight	Part No.	Approx. Overall Diam.	Approx. Weight
(mm ²)	(no./mm)	(mm)	(mm)		(mm)	(kg/km)		(mm)	(kg/km)
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4	7/0.85	2.55	0.7	09018813	7.8	94	-	-	-
6	7/1.04	3.12	0.7	10018813	8.5	122	-	-	-
10	7/1.35	4.05	0.7	11018813	9.6	170	-	-	-
16	7/1.70	5.10	0.7	12018813	10.6	235	-	-	-
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Current rating and voltage drop

For Unarmoured Cable, please refer to Table 8 & 9 (Page 54)

For Armoured Cable, please refer to Table 10 & 11 (Page 55)

(cs) : Circular Compact Stranded Conductor

Current Rating and Voltage Drop

XLPE (or LSZH) Insulated Cables
Single-Core, Unarmoured



tel (65) 6367 0107 fax (65) 6365 2963
www.keystone-cable.com

Single-Core Cables with XLPE (or LSZH) Insulation, with or without PVC (or LSZH) Outersheath 450/750V or 0.6/1kV

Table 8 : Current-Carrying Capacities (Amp)
[CU/LSZH, CU/XLPE/PVC, CU/XLPE/LSZH, CU/MT/LSZH or CU/MT/XLPE/LSZH Cables]

Conductor Operating Temperature : 90°C
Ambient Temperature : 30°C

BS EN 50525-3-41 (BS 7211)
BS 8592
IEC 60502-1

Conductor Cross-sectional Area	Reference Method 4 (enclosed in conduit in thermally insulating wall etc)		Reference Method 3 (enclosed in conduit on a wall or in trunking etc)		Reference Method 1 (clipped direct)		Reference Method 11 (on a perforated cable tray, horizontal or vertical)		Reference Method 12 (in free air)		
	2 cables, 1-phase a.c. or d.c.		3 or 4 cables, 3-phase a.c.		2 cables, 1-phase a.c. or d.c. flat and touching		3 or 4 cables, 3-phase a.c. flat and touching or trefoil		Horizontal flat spaced	Vertical flat spaced	Trefoil
	2 cables, 1-phase a.c. or d.c.	3 or 4 cables, 3-phase a.c.	2 cables, 1-phase a.c. or d.c.	3 or 4 cables, 3-phase a.c.	2 cables, 1-phase a.c. or d.c. flat and touching	3 or 4 cables, 3-phase a.c. flat and touching or trefoil	2 cables, 1-phase a.c. or d.c. flat and touching	3 or 4 cables, 3-phase a.c. flat and touching or trefoil	2 cables, 1-phase a.c. or d.c. or 3 cables 3-phase a.c.	2 cables, 1-phase a.c. or d.c. or 3 cables 3-phase a.c.	3 cables trefoil, 3-phase a.c.
1	2	3	4	5	6	7	8	9	10	11	12
mm ²	A	A	A	A	A	A	A	A	A	A	A
1.5	18	17	22	19	25	23	-	-	-	-	-
2.5	24	23	30	26	34	31	-	-	-	-	-
4	33	30	40	35	46	41	-	-	-	-	-
6	43	39	51	45	59	54	-	-	-	-	-
10	58	53	71	63	81	74	-	-	-	-	-
16	76	70	95	85	109	99	-	-	-	-	-
25	100	91	126	111	143	130	158	140	183	163	138
35	124	111	156	138	176	161	195	176	226	203	171
50	149	135	189	168	228	209	239	215	274	246	209
70	189	170	240	214	293	268	308	279	351	318	270
95	228	205	290	259	355	326	375	341	426	389	330
120	263	235	336	299	413	379	436	398	495	453	385
150	300	270	375	328	476	436	505	461	570	524	445
185	341	306	426	370	545	500	579	530	651	600	511
240	400	358	500	433	644	590	686	630	769	711	606
300	459	410	573	493	743	681	794	730	886	824	701
400	-	-	683	584	868	793	915	849	1065	994	820
500	-	-	783	666	990	904	1044	973	1228	1150	936
630	-	-	900	764	1130	1033	1191	1115	1423	1338	1069
800	-	-	-	-	1288	1179	1358	1275	1581	1485	1214
1000	-	-	-	-	1443	1323	1520	1436	1775	1671	1349

Note : For rating factors of ambient temperature other than 30°C, please refer to Table 23 (Page 62)

Table 9 : Voltage Drop (Per Amp Per Meter)
[CU/LSZH, CU/XLPE/PVC, CU/XLPE/LSZH, CU/MT/LSZH or CU/MT/XLPE/LSZH Cables]

Conductor Operating Temperature : 90°C

BS EN 50525-3-41 (BS 7211)
BS 8592
IEC 60502-1

Conductor Cross-sectional Area	2 cables, d.c.	2 cables, 1-phase a.c.						3 or 4 cables, 3-phase a.c.								
		Reference Methods 3 and 4 (enclosed in conduit etc, in or on a wall)			Reference Methods 1 and 11 (clipped direct or on trays touching)			Reference Methods 3 and 4 (enclosed in conduit etc, in or on a wall)			Reference Methods 1, 11 and 12 (trefoil)			Reference Methods 1 and 11 (flat and touching)		
		3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
mm ²	mV/A/m	mV/A/m	mV/A/m	mV/A/m	mV/A/m	mV/A/m	mV/A/m	mV/A/m	mV/A/m	mV/A/m	mV/A/m	mV/A/m	mV/A/m	mV/A/m	mV/A/m	mV/A/m
1.5	31	31	27	27	27	27	27	27	27	27	27	27	27	27	27	27
2.5	19	19	16	16	16	16	16	16	16	16	16	16	16	16	16	16
4	12	12	10	10	10	10	10	10	10	10	10	10	10	10	10	10
6	7.9	7.9	6.8	6.8	6.8	6.8	6.8	6.8	6.8	6.8	6.8	6.8	6.8	6.8	6.8	6.8
10	4.7	4.7	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
16	2.9	2.9	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5
		r	x	z	r	x	z	r	x	z	r	x	z	r	x	z
25	1.85	1.85	0.31	1.90	1.85	0.190	1.85	1.60	0.27	1.65	1.60	0.165	1.60	1.60	0.190	1.60
35	1.35	1.35	0.29	1.35	1.35	0.180	1.35	1.15	0.25	1.15	1.15	0.155	1.15	1.15	0.180	1.15
50	0.99	1.00	0.29	1.05	0.99	0.180	1.00	0.87	0.25	0.90	0.86	0.155	0.87	0.86	0.180	0.87
70	0.68	0.70	0.28	0.75	0.68	0.175	0.71	0.60	0.24	0.65	0.59	0.150	0.61	0.59	0.175	0.62
95	0.49	0.51	0.27	0.58	0.49	0.170	0.52	0.44	0.23	0.50	0.43	0.145	0.45	0.43	0.170	0.46
120	0.39	0.41	0.26	0.48	0.39	0.165	0.43	0.35	0.23	0.42	0.34	0.140	0.37	0.34	0.165	0.38
150	0.32	0.33	0.26	0.43	0.32	0.165	0.36	0.29	0.23	0.37	0.28	0.140	0.31	0.28	0.165	0.32
185	0.25	0.27	0.26	0.37	0.26	0.165	0.30	0.23	0.23	0.32	0.22	0.140	0.26	0.22	0.165	0.28
240	0.190	0.21	0.26	0.33	0.20	0.160	0.25	0.185	0.22	0.29	0.170	0.140	0.22	0.170	0.165	0.24
300	0.155	0.175	0.25	0.31	0.160	0.160	0.22	0.150	0.22	0.27	0.140	0.140	0.195	0.135	0.160	0.21
400	0.12	0.140	0.25	0.29	0.130	0.155	0.20	0.125	0.22	0.25	0.110	0.135	0.175	0.110	0.160	0.195
500	0.093	0.120	0.25	0.28	0.105	0.155	0.185	0.100	0.22	0.24	0.090	0.135	0.160	0.088	0.160	0.180
630	0.072	0.100	0.25	0.27	0.086	0.155	0.175	0.088	0.21	0.23	0.074	0.135	0.150	0.071	0.160	0.170
800	0.056	-	-	-	0.072	0.150	0.175	-	-	-	0.062	0.130	0.145	0.059	0.155	0.165
1000	0.045	-	-	-	0.063	0.150	0.165	-	-	-	0.055	0.130	0.140	0.050	0.155	0.165

Note : r = resistive component; x = reactive component; z = impedance value

Current Rating and Voltage Drop

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Single-Core, Armoured



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www.keystone-cable.com

Single-Core Cables with XLPE or LSZH Insulation, Armoured, PVC or LSZH Outersheath 0.6/1kV

Table 10 : Current-Carrying Capacities (Amp)
[CU/XLPE/PVC/AWA/PVC, CU/XLPE/LSZH/AWA/LSZH, CU/MT/XLPE/LSZH/AWA/LSZH Cables]

Conductor Operating Temperature : 90°C

Ambient Temperature : 30°C

Ground Temperature : 15°C

Depth of Laying : 0.5m

Soil Thermal Resistivity : 1.2 k•m/W

BS 6724

IEC 60502-1

Conductor Cross-sectional Area	Reference Method 1 (clipped direct)		Reference Method 11 (on a perforated cable tray)		Reference Method 12 (in free air)	In single-way ducts		Laid direct in ground	
	2 cables, 1-phase a.c. or d.c. flat and touching	3 or 4 cables, 3-phase a.c. flat and touching	2 cables, 1-phase a.c. or d.c. flat and touching	3 or 4 cables, 3-phase a.c. flat and touching	3 cables, 3-phase a.c. trefoil touching	2 cables, 1-phase a.c. or d.c. ducts touching	3 cables, 3-phase a.c. trefoil touching	2 cables, 1-phase a.c. or d.c. touching	3 cables, 3-phase a.c. trefoil touching
1	2	3	4	5	6	7	8	9	10
mm ²	A	A	A	A	A	A	A	A	A
50	237	220	253	232	222	255	235	275	235
70	303	277	322	293	285	310	280	340	290
95	367	333	389	352	346	365	330	405	345
120	425	383	449	405	402	410	370	460	389
150	488	437	516	462	463	445	405	510	435
185	557	496	587	524	529	485	440	580	490
240	656	579	689	612	625	550	500	670	560
300	755	662	792	700	720	610	550	750	630
400	853	717	899	767	815	640	580	830	700
500	962	791	1016	851	918	690	620	910	770
630	1082	861	1146	935	1027	750	670	1000	840
800	1170	904	1246	987	1119	828	735	1117	931
1000	1261	961	1345	1055	1214	919	811	1254	1038

Note : For rating factors of ambient temperature other than 30°C, please refer to Table 23 (Page 62)
For rating factors of ground temperature other than 15°C, please refer to Table 24 (Page 62)

Table 11 : Voltage Drop (Per Amp Per Meter)
[CU/XLPE/PVC/AWA/PVC, CU/XLPE/LSZH/AWA/LSZH, CU/MT/XLPE/LSZH/AWA/LSZH Cables]

Conductor Operating Temperature : 90°C

BS 6724

IEC 60502-1

Conductor Cross- sectional Area	2 cables, d.c.	2 cables, 1-phase a.c.			3 or 4 cables, 3-phase a.c.						2 cables, 1-phase a.c.		3 or 4 cables, 3-phase a.c. touching	
		Reference Method 1 & 11 (touching)			Reference Method 1, 11 & 12 (trefoil touching)			Reference Method 1 & 11 (flat touching)			In ducts	In ground	In ducts	In ground
		mV/A/m			mV/A/m			mV/A/m			mV/A/m	mV/A/m	mV/A/m	mV/A/m
1	2	3			4			5			6	7	8	9
mm²	mV/A/m	r	x	z	r	x	z	r	x	z	mV/A/m	mV/A/m	mV/A/m	mV/A/m
50	0.98	0.99	0.21	1.00	0.86	0.180	0.87	0.84	0.25	0.88	1.10	0.99	0.93	0.86
70	0.67	0.68	0.200	0.71	0.59	0.170	0.62	0.60	0.25	0.65	0.80	0.70	0.70	0.61
95	0.49	0.51	0.195	0.55	0.44	0.170	0.47	0.46	0.24	0.52	0.65	0.53	0.56	0.46
120	0.39	0.41	0.190	0.45	0.35	0.165	0.39	0.38	0.24	0.44	0.55	0.43	0.48	0.37
150	0.31	0.33	0.185	0.38	0.29	0.160	0.33	0.31	0.23	0.39	0.50	0.37	0.43	0.32
185	0.25	0.27	0.185	0.33	0.23	0.160	0.28	0.26	0.23	0.34	0.45	0.31	0.39	0.27
240	0.195	0.21	0.180	0.28	0.180	0.155	0.24	0.21	0.22	0.30	0.40	0.26	0.35	0.23
300	0.155	0.170	0.175	0.25	0.145	0.150	0.21	0.170	0.22	0.28	0.37	0.24	0.32	0.21
400	0.115	0.145	0.170	0.22	0.125	0.150	0.195	0.160	0.21	0.27	0.35	0.21	0.30	0.19
500	0.093	0.125	0.170	0.21	0.105	0.145	0.180	0.145	0.20	0.25	0.33	0.20	0.28	0.18
630	0.073	0.105	0.165	0.195	0.092	0.145	0.170	0.135	0.195	0.24	0.30	0.19	0.26	0.17
800	0.056	0.090	0.160	0.190	0.086	0.140	0.165	0.130	0.180	0.23	0.28	0.18	0.24	0.16
1000	0.045	0.092	0.155	0.180	0.080	0.135	0.155	0.125	0.170	0.21	0.26	0.17	0.22	0.15

Note : r = resistive component; x = reactive component; z = impedance value

Table 23 : Correction Factor for Ambient Air Temperature Other Than 30°C to be Applied to the Current-Carrying Capacities for Cables in Free Air

Ambient Temperature (°C)	Insulation				
	PVC (70°C)	XLPE (90°C)	HT-PVC (90°C)	Rubber (85°C)	Rubber (60°C)
10	1.22	1.15	-	-	-
15	1.17	1.12	-	-	-
20	1.12	1.08	-	-	-
25	1.06	1.04	1.03	1.02	-
30	1.00	1.00	1.00	1.00	1.00
35	0.94	0.96	0.97	0.95	0.91
40	0.87	0.91	0.94	0.90	0.82
45	0.79	0.87	0.91	0.85	0.71
50	0.71	0.82	0.87	0.80	0.58
55	0.61	0.76	0.84	0.74	0.41
60	0.50	0.71	0.80	0.67	-
65	0.35	0.65	0.76	0.60	-
70	-	0.58	0.71	0.52	-
75	-	0.50	0.61	0.43	-
80	-	0.41	0.50	0.30	-
85	-	0.29	0.35	-	-

Table 24 : Correction Factor for Ambient Ground Temperature Other Than 15°C to be Applied to the Current-Carrying Capacities for Cables in Ducts or in Ground

Ground Temperature (°C)	Insulation	
	PVC (70°C)	XLPE (90°C)
10	1.04	1.03
15	1.00	1.00
20	0.95	0.97
25	0.90	0.93
30	0.85	0.89
35	0.80	0.86
40	0.74	0.82
45	0.67	0.77
50	0.60	0.73
55	-	0.68
60	-	0.63
65	-	0.58