



LOW VOLTAGE CABLES

PVC & XLPE Insulated / 0.6/1 kV & 450/750 V



About Our LV Cables

Low voltage power and control cables are used for electricity supply in low voltage installation systems. They are usually employed in various indoor and outdoor applications in power plants, industrial and infrastructure projects, and in the distribution of electricity to various residential and commercial loads.

Universal Metals (Pvt.) Ltd manufactures an extensive range of low voltage power and control cables to meet the requirements of diverse industrial, commercial and residential applications. Our cables are designed and tested to comply with the latest editions of IEC and BS standards, ensuring reliable performance across all installation conditions.

Product Range

This catalogue covers the following product ranges:

- Bare Stranded SDC Conductors
- PVC Insulated Indoor Wires (450/750 V)
- Single-core PVC Power Cables
- Multi-core PVC Power Cables
- Single-core XLPE Power Cables
- Multi-core XLPE Power Cables
- PVC & XLPE Armoured Cables
- PVC & XLPE Control Cables
- BS 7889 / BS 5467 Cables

Cable Marking

The external surface of all cables covered by this catalogue will be legibly marked with the below elements, at intervals not exceeding one metre:

- Manufacturer's identification: "UMPL"
- Number of cores and nominal area of conductors (e.g. $4 \times 50 \text{ mm}^2$)
- Voltage designation (e.g. 0.6/1.0 kV)
- Short cable description (e.g. Cu/XLPE/SWA/PVC)
- Year of manufacture
- Continuous length marking every metre

Production & Delivery Tolerances

Weights and dimensions data are approximate and subject to manufacturing tolerance. The standard delivery length tolerance is $\pm 5\%$. However, customized tolerances can be provided by agreement between U MPL and the purchaser.

Voltage Designation

Cables are designated by the voltages U_0 , U and U_m , expressed in the form $U_0/U (U_m)$:

Symbol	Description
U_0	The rated power frequency voltage between conductor and earth or metallic screen for which the cable is designed.
U	The rated power frequency voltage between conductors for which the cable is designed.
U_m	The maximum value of the "highest system voltage" for which the equipment may be used.

The products specified in this catalogue are intended to be used for the supply of electrical energy up to a rated voltage of 0.6/1 (1.2) kV, within a nominal power frequency range of 49 Hz to 61 Hz.

All cable designs, constructions, materials and tests are covered by the following IEC and BS publications.

IEC Standards

Standard	Description
IEC 60502	Power cables with extruded insulation and their accessories for rated voltages from 1 kV ($U_m = 1.2$ kV) up to 30 kV ($U_m = 36$ kV).
IEC 60227	Polyvinyl chloride insulated cables of rated voltages up to and including 450/750 V.
IEC 60228	Conductors of insulated cables.
IEC 60811	Electric and optical fibre cables: Test methods for non-metallic materials.
IEC 60287	Electric cables: Calculation of the current rating.
IEC 60332	Tests on electric and optical fibre cables under fire conditions.

BS Standards

Standard	Description
BS 7889	Electric cables: Thermosetting insulated, non-armoured cables with a voltage of 600/1000 V, for fixed installations.
BS 5467	Electric cables: Thermosetting insulated, armoured cables for voltages of 600/1000 V and 1900/3300 V.
BS 7655	Specification for insulating and sheathing materials for cables.
BS EN 50525	Electric cables: Low voltage energy cables of rated voltages up to and including 450/750 V.
BS EN 60228	Conductors of insulated cables.
BS EN 60811	Electric and optical fibre cables: Test methods for non-metallic materials.
BS EN 60332	Tests on electric and optical fibre cables under fire conditions.

Standard structure for PVC and XLPE insulated low voltage power and control cables rated 0.6/1.0 kV.

1. Conductor

The conductor transmits the current with the lowest possible losses. The conductor shall consist of copper (plain or tin coated) or aluminium, complying with IEC 60228 or BS EN 60228 standards.

Property	Unit	Copper	Aluminium
Density	g/cm ³	8.89	2.703
Resistivity	$\Omega \cdot \text{mm}^2/\text{m}$	0.017241	0.028264
Tensile Strength	N/mm ²	200 to 300	70 to 90

2. Insulation

A material having good dielectric properties, used to isolate cable conductors from their surroundings:

- PVC (Polyvinyl Chloride): rated 70 °C, meeting PVC/A requirements to IEC 60502-1
- XLPE (Cross-linked Polyethylene): rated 90 °C, meeting IEC 60502-1 or GP8 to BS 7655-1.3

3. Bedding

The bedding (inner covering) consists of an extruded layer of Polyvinyl Chloride (PVC) applied under any supplementary metallic elements to protect the laid-up cores against humidity and mechanical loads.

4. Metallic Armour

Provides mechanical protection in applications where there is a risk of mechanical damage:

- Round wire armour (AWA/SWA): Single layer applied helically; recommended for horizontal mechanical stresses (e.g. high-rise building installations)
- Double tape armour (ATA/STA): Two tapes applied helically in two layers; recommended for vertical mechanical stresses (e.g. underground / direct burial installations)

5. Outer Sheath (Jacket)

An extruded layer of Polyvinyl Chloride (PVC) providing protection against abrasion, scoring, impact and sidewall bearing pressures. Jackets are normally black with UV-resistant PVC formulation.

Standard colour codes for conductor identification. Alternative colours available on request.

Colour Codes

Function	Standard Colour Code	Harmonized (HD 308 S2)	Harmonized (IEC 60445)
Phase, single-phase (L)	Red	Brown	Black
Neutral (N)	Black	Blue	Blue
Phase 1, three-phase (L1)	Red	Brown	Black
Phase 2, three-phase (L2)	Yellow	Black	Brown
Phase 3, three-phase (L3)	Blue	Grey	Grey
Protective conductor (PE)	Green/Yellow	Green/Yellow	Green/Yellow

Core Assembly

The cores of multi-core cables are laid up with a right-hand or right-and-left-hand alternating direction of lay. For control cables, the direction of lay alternates for each successive layer.

Standard core counts and their colour identification:

Cable Type	Core Colours (Standard)
Two-core	Red, Black
Three-core	Red, Yellow, Blue
Four-core	Red, Yellow, Blue, Black
Five-core	Red, Yellow, Blue, Black, Green/Yellow

General Criteria for Cable Selection

It is of vital importance that the type of cable ordered is suitable for its intended use. The following factors should be taken into account when selecting a suitable cable:

- Maximum operating voltage
- System frequency
- Insulation level
- Length of line
- Voltage drop
- Load characteristics
- Mode of installation
- Chemical and physical properties of soil
- National legislation and regulations
- Specific requirements to be met

Information to Provide with Enquiry or Order

- a.** Required design standard
- b.** Length of cable required and individual drum lengths
- c.** Voltage designation
- d.** Number of cores
- e.** Size of conductor
- f.** Conductor material (copper or aluminium)
- g.** Type of conductor (stranded or solid, circular or shaped)
- h.** Exposure to aggressive environments (water, oil or acid)
- i.** Type of armour, if required (wire armour or tape armour)
- j.** Other special conditions or specific requirements

Applications

Bare stranded soft-drawn (annealed) copper conductor is suitable for uninsulated hook up, jumpers and grounding conductors in electrical construction, where high conductivity and flexibility are required.

Conductor Characteristics

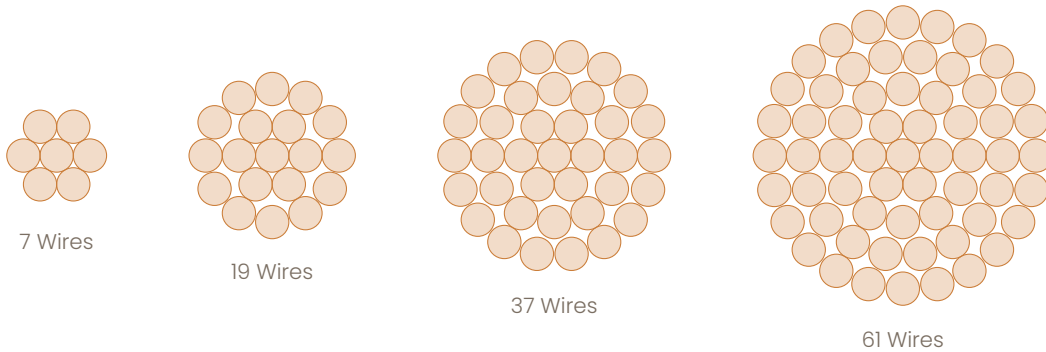
Highest conductivity per unit area of all common commercial metals. Excellent corrosion resistance. Flexible; easily worked and formed into place. Good fatigue-resistance; not subject to breaks due to nicks or cuts when terminating.

Applicable Standards

Bare stranded soft-drawn copper conductors are designed and tested to meet or exceed the requirements of IEC 60228 / BS EN 60228 standards. Alternative designs can also be supplied to meet customer-specified requirements.

Conductor Construction

Bare stranded soft-drawn (annealed) copper conductor is a concentric-lay-stranded conductor consisting of annealed copper wires available in both single layer and multi-layer constructions up to 61 wires.



Technical Data

Reference Standards: IEC 60228 / BS EN 60228

Nominal Area (mm ²)	Construction No. × (mm)	Overall Dia. (mm)	Weight (kg/km)	DC Resistance at 20 °C (Ω/km)
1.5	7 × 0.52	1.56	13.5	12.1000
2.5	7 × 0.67	2.01	22.4	7.4100
4	7 × 0.85	2.55	36.0	4.6100
6	7 × 1.04	3.12	54.0	3.0800
10	7 × 1.34	4.02	87.0	1.8300
16	7 × 1.68	5.04	138.0	1.1500
25	7 × 2.14	6.42	220.0	0.7270
35	7 × 2.52	7.56	305.0	0.5240
50	19 × 1.80	8.90	413.0	0.3870
70	19 × 2.14	10.70	601.0	0.2680
95	19 × 2.52	12.50	832.0	0.1930
120	37 × 2.03	14.21	1050.0	0.1530
150	37 × 2.25	15.75	1290.0	0.1240
185	37 × 2.52	17.50	1615.0	0.0991
240	61 × 2.25	20.25	2120.0	0.0754
300	61 × 2.52	22.50	2660.0	0.0601
400	61 × 2.92	26.10	3420.0	0.0470
500	61 × 3.25	29.00	4460.0	0.0366

Applications

Suitable for fixed and protected installations in metallic, non-metallic or embedded conduits, ducts or trunks or similar closed systems. Can be used in/on lighting fittings, switch and control devices, control panels, inside appliances and similar applications.

Cable Construction

- **Conductor:** Plain annealed solid (Class 1), stranded (Class 2) or flexible (Class 5) circular copper conductor
- **Insulation:** Extruded layer of Polyvinyl Chloride (PVC) compound
- **Core Identification:** Standard colours; other colours available on request

Applicable Standards

Designed and tested to meet or exceed the requirements of IEC 60227-3 and BS EN 50525-2-31 standards. Alternative designs available to meet customer-specified requirements.

Cable Characteristics

Property	Value	Standard
Max. operating temperature	70 °C	-
Max. short circuit temperature	160 °C	-
Flame propagation	Pass	IEC 60332-1-2
Oil resistance	Fair	ASTM D 1047
Minimum bending radius	15 ×	-

Solid copper conductors (Class 1 to IEC 60228). Current ratings at ambient air temperature of 40 °C.

Solid Conductors

Area (mm ²)	DC Res. 20 °C (Ω/km)	AC Res. 70 °C (Ω/km)	2L (a) A	2L (b) A	Dia. (mm)	Weight (kg/km)
1.5	12.1000	14.4777	13	15	2.8	25
2.5	7.4100	8.8661	17	21	3.4	35
4	4.6100	5.5159	23	28	3.9	50
6	3.0800	3.6853	30	36	4.4	70
10	1.8300	2.1897	40	50	5.6	115

Current rating columns: (a) = 2 loaded conductors, enclosed in conduit in thermally insulating wall; (b) = 2 loaded conductors, clipped direct.

Stranded Conductors

Stranded copper conductors (Class 2 to IEC 60228). 2L = two loaded; 3L = three loaded conductors.

Area mm ²	DC Res. Ω/km	AC Res. Ω/km	2L (a)	2L (b)	3L (c)	3L (d)	3L (e)	3L (f)	3L (g)	Dia. mm	Wt. kg/km
1.5	12.100	14.478	13	15	-	-	-	-	-	3.0	25
2.5	7.410	8.866	17	21	-	-	-	-	-	3.6	35
4	4.610	5.516	23	28	-	-	-	-	-	4.2	55
6	3.080	3.685	30	36	-	-	-	-	-	4.7	70
10	1.830	2.190	40	50	-	-	-	-	-	5.7	110
16	1.150	1.376	53	66	-	-	-	-	-	6.7	170
25	0.727	0.870	70	88	114	96	127	99	113	8.3	260
35	0.524	0.628	86	109	141	119	157	124	141	9.3	350
50	0.387	0.464	103	131	170	145	190	151	171	10.9	475
70	0.268	0.322	131	167	218	188	244	196	221	12.5	675
95	0.193	0.233	158	202	264	230	297	239	270	14.5	925
120	0.153	0.186	183	234	306	268	344	279	315	15.8	1160
150	0.124	0.151	209	-	353	310	397	323	364	17.7	1425
185	0.0991	0.122	237	-	403	356	453	371	417	19.8	1785
240	0.0754	0.0952	279	-	475	422	535	441	495	22.5	2335
300	0.0601	0.0780	319	-	547	488	617	510	573	25.3	2905
400	0.0471	0.0638	-	-	656	570	741	599	691	28.3	3745
500	0.0366	0.0531	-	-	755	651	854	686	800	32.1	4830
630	0.0283	0.0450	-	-	874	743	990	787	930	35.7	6105

Current rating (A) at 40 °C ambient: (a) Enclosed in conduit, insulating wall; (b) Clipped direct; (c) 3L enclosed conduit, insulating wall; (d) 3L conduit on wall; (e) 3L clipped direct; (f) 3L perforated tray; (g) 3L free in air.

Flexible copper conductors (Class 5 to IEC 60228). Current ratings at ambient air temperature of 40 °C.

Flexible Conductors

Area mm ²	DC Res. Ω/km	AC Res. Ω/km	2L (a)	2L (b)	3L (c)	3L (d)	3L (e)	3L (f)	3L (g)	Dia. mm	Wt. kg/km
1.5	13.300	15.914	13	15	-	-	-	-	-	3.0	25
2.5	7.980	9.548	17	21	-	-	-	-	-	3.7	35
4	4.950	5.923	23	28	-	-	-	-	-	4.1	50
6	3.300	3.949	30	36	-	-	-	-	-	4.6	70
10	1.910	2.286	40	50	-	-	-	-	-	6.0	120
16	1.210	1.448	53	66	-	-	-	-	-	7.6	185
25	0.780	0.934	70	88	114	96	127	99	113	9.5	285
35	0.554	0.664	86	109	141	119	157	124	141	11.0	385
50	0.386	0.463	103	131	170	145	190	151	171	12.6	550
70	0.272	0.327	131	167	218	188	244	196	221	14.6	740
95	0.206	0.248	158	202	264	230	297	239	270	17.0	1000
120	0.161	0.195	183	234	306	268	344	279	315	18.9	1255
150	0.129	0.158	209	-	353	310	397	323	364	21.2	1565
185	0.106	0.131	237	-	403	356	453	371	417	23.4	1915
240	0.0801	0.101	279	-	475	422	535	441	495	26.9	2515

Current rating (A) at 40 °C ambient: (a) Enclosed in conduit, insulating wall; (b) Clipped direct; (c) 3L enclosed conduit, insulating wall; (d) 3L conduit on wall; (e) 3L clipped direct; (f) 3L perforated tray; (g) 3L free in air. Derating factors from Annex C apply for different laying conditions.

Applications

These cables are intended for fixed installations, indoors and outdoors, in low voltage electricity systems. They are normally used for the distribution of electrical energy in urban networks, power or switching stations, industrial plants, as well as in switchgears, in applications where there is no risk of mechanical damage.

Cable Construction

- **Conductor:** Plain annealed stranded circular or circular compacted copper or aluminium conductor (Class 2 to IEC 60228)
- **Insulation:** Extruded layer of Polyvinyl Chloride (PVC) – Type PVC/A to IEC 60502-1
- **Outer Jacket:** Extruded layer of PVC – Type ST1 to IEC 60502-1

Cable Characteristics

Property	Value	Standard
Max. operating temperature	70 °C	-
Max. short circuit temperature	160 °C	-
Flame propagation	Pass	IEC 60332-1-2
Oil resistance	Fair	ASTM D 1047
UV Resistant	Yes	-
Minimum bending radius	15 ×	-

Single-core, PVC insulated, PVC sheathed, unarmoured with copper conductor.

Area mm ²	DC Res. Ω/km	AC Res. Ω/km	Gnd (a) A	Gnd (b) A	Duct (c) A	Duct (d) A	Air (e) A	Air (f) A	Air (g) A	Dia. mm	Wt. kg/km
1.5	12.100	14.478	22	22	16	18	17	17	23	6.0	55
2.5	7.410	8.866	29	29	21	24	23	23	30	6.4	70
4	4.610	5.516	37	37	28	31	30	31	40	7.4	100
6	3.080	3.685	46	46	34	39	38	39	50	7.9	125
10	1.830	2.190	61	61	46	51	52	53	68	8.5	160
16	1.150	1.376	79	79	60	66	69	70	90	9.5	225
25	0.727	0.870	101	101	78	86	92	94	119	11.1	330
35	0.524	0.627	121	121	94	104	113	116	147	12.1	425
50	0.387	0.464	143	143	114	124	138	142	178	13.7	560
70	0.268	0.322	175	175	141	152	175	180	225	15.3	770
95	0.193	0.232	209	209	172	185	216	223	276	17.5	1045
120	0.153	0.185	236	237	197	211	251	258	320	18.8	1285
150	0.124	0.151	265	266	224	238	289	298	367	20.9	1580
185	0.0991	0.122	300	300	256	272	335	345	423	23.2	1970
240	0.0754	0.0942	346	346	300	318	398	410	502	26.1	2555
300	0.0601	0.0769	389	389	341	362	460	474	581	29.1	3165
400	0.0470	0.0625	437	437	389	409	532	548	674	32.3	4050
500	0.0366	0.0515	490	490	442	473	614	632	785	36.3	5190
630	0.0283	0.0433	544	548	496	537	700	722	910	40.1	6520
800	0.0221	0.0374	596	596	549	600	787	812	1042	44.0	8310
1000	0.0176	0.0333	652	655	608	680	909	941	1229	52.8	10465

Laying conditions: Ambient air 40 °C, ground 35 °C, soil resistivity 1.5 K·m/W, depth 0.5 m. (a)(b) Buried direct; (c)(d) In buried ducts; (e)(f)(g) In free air. Apply derating factors from Annex C for different conditions.

Single-core, PVC insulated, PVC sheathed, unarmoured with aluminium conductor.

Area mm ²	DC Res. Ω/km	AC Res. Ω/km	Gnd (a) A	Gnd (b) A	Duct (c) A	Duct (d) A	Air (e) A	Air (f) A	Air (g) A	Dia. mm	Wt. kg/km
10	3.080	3.701	48	49	36	41	41	42	54	8.5	100
16	1.910	2.295	61	61	46	51	53	55	70	9.5	130
25	1.200	1.442	78	78	61	67	71	73	93	11.1	180
35	0.868	1.043	94	94	73	80	88	90	114	12.1	215
50	0.641	0.771	111	111	88	96	107	110	138	13.7	275
70	0.443	0.533	136	136	110	118	136	140	174	15.3	350
95	0.320	0.385	162	163	133	143	168	173	214	17.5	470
120	0.253	0.305	184	185	153	164	195	201	249	18.8	555
150	0.206	0.249	206	207	174	185	225	232	285	20.9	680
185	0.164	0.199	235	234	200	212	262	270	329	23.2	845
240	0.125	0.153	272	272	235	248	313	322	392	26.1	1075
300	0.100	0.123	307	307	270	283	363	375	454	29.1	1330
400	0.0778	0.0975	350	350	311	327	426	439	531	32.3	1665
500	0.0605	0.0779	398	399	359	378	499	514	625	36.3	2095
630	0.0469	0.0630	451	451	411	435	580	598	733	40.1	2595
800	0.0367	0.0524	503	503	464	494	665	686	852	44.1	3220
1000	0.0291	0.0450	561	563	523	569	782	809	1022	52.8	4080

Laying conditions: Ambient air 40 °C, ground 35 °C, soil resistivity 1.5 K·m/W, depth 0.5 m. (a)(b) Buried direct; (c)(d) In buried ducts; (e)(f)(g) In free air. Apply derating factors from Annex C for different conditions.

Applications

These cables are intended for fixed installations, indoors and outdoors, in low voltage electricity systems. Normally used for the distribution of electrical energy in urban networks, power or switching stations, industrial plants, as well as in switchgears, in applications where there is no risk of mechanical damage.

Cable Construction

- **Conductor:** Plain annealed stranded circular (rm) or sector shaped (sm) copper conductor (Class 2 to IEC 60228)
- **Insulation:** Extruded layer of Polyvinyl Chloride (PVC) – Type PVC/A to IEC 60502-1
- **Core Identification:** 2C: Red, Black | 3C: Red, Yellow, Blue | 4C: Red, Yellow, Blue, Black
- **Assembly:** Cores assembled together with PVC filling
- **Outer Jacket:** Extruded layer of PVC – Type ST1 to IEC 60502-1 (double PVC sheathed)

Cable Characteristics

Property	Value	Standard
Max. operating temperature	70 °C	-
Max. short circuit temperature	160 °C	-
Flame propagation	Pass	IEC 60332-1-2
Oil resistance	Fair	ASTM D 1047
UV Resistant	Yes	-
Minimum bending radius	15 ×	-

Multi-core, PVC insulated, double PVC sheathed, unarmoured with copper conductor.

Two Core Cables

Area mm ²	Type	DC Res. Ω/km	AC Res. Ω/km	Ground A	Ducts A	Air A	Dia. mm	Weight kg/km
1.5	rm	12.1000	14.4777	27	19	21	11.9	200
2.5	rm	7.4100	8.8661	36	24	28	12.8	245
4	rm	4.6100	5.5159	47	32	38	14.7	330
6	rm	3.0800	3.6853	58	40	48	15.8	405
10	rm	1.8300	2.1898	76	53	65	17.0	500
16	rm	1.1500	1.3763	98	70	86	19.0	675
25	rm	0.7270	0.8703	127	92	116	22.1	960
35	rm	0.5240	0.6276	152	111	142	24.2	1220

Three Core Cables

Area mm ²	Type	DC Res. Ω/km	AC Res. Ω/km	Ground A	Ducts A	Air A	Dia. mm	Weight kg/km
1.5	rm	12.1000	14.4777	23	15	18	12.4	230
2.5	rm	7.4100	8.8661	29	20	23	13.4	280
4	rm	4.6100	5.5159	38	26	32	15.4	390
6	rm	3.0800	3.6853	48	33	40	16.7	480
10	rm	1.8300	2.1898	63	43	55	18.4	580
16	rm	1.1500	1.3763	81	57	72	20.6	790
25	rm	0.7270	0.8703	105	75	98	23.6	1120
35	sm	0.5240	0.6276	117	85	107	23.2	1360
50	sm	0.3870	0.4639	139	103	131	26.6	1785
70	sm	0.2680	0.3220	170	128	166	30.3	2485
95	sm	0.1930	0.2328	204	156	204	34.5	3345
120	sm	0.1530	0.1856	231	178	235	36.4	4090

Laying conditions: Ambient air 40 °C, ground 35 °C, soil resistivity 1.5 K·m/W, depth 0.5 m. Type: rm = round stranded; sm = sector shaped.

Multi-core, PVC insulated, double PVC sheathed, unarmoured with copper conductor.

Four Core Cables

Area mm ²	Type	DC Res. Ω/km	AC Res. Ω/km	Ground A	Ducts A	Air A	Dia. mm	Weight kg/km
1.5	rm	12.1000	14.4777	23	15	18	13.3	265
2.5	rm	7.4100	8.8661	29	20	23	14.3	330
4	rm	4.6100	5.5159	38	26	32	16.6	465
6	rm	3.0800	3.6853	48	33	40	18.0	585
10	rm	1.8300	2.1898	63	43	55	19.9	725
16	rm	1.1500	1.3763	81	57	72	22.3	985
25	rm	0.7270	0.8703	105	75	98	26.1	1430
35	sm	0.5240	0.6276	117	85	107	26.5	1765
50	sm	0.3870	0.4639	139	103	131	31.1	2375
70	sm	0.2680	0.3220	170	128	166	34.9	3250
95	sm	0.1930	0.2328	204	156	204	38.6	4375
120	sm	0.1530	0.1856	231	178	235	42.6	5445
150	sm	0.1240	0.1514	259	203	270	47.1	6660
185	sm	0.0991	0.1224	292	232	311	52.5	8310
240	sm	0.0754	0.0952	338	272	370	58.8	10705
300	sm	0.0601	0.0780	381	310	426	64.9	13320
400	sm	0.0470	0.0638	431	357	495	73.9	17050
500	sm	0.0366	0.0531	484	405	568	81.4	21815

Laying conditions: Ambient air 40 °C, ground 35 °C, soil resistivity 1.5 K·m/W, depth 0.5 m. Type: rm = round stranded; sm = sector shaped.

Four core cables with reduced neutral. PVC insulated, double PVC sheathed, unarmoured with copper conductor.

Four Core Cables with Reduced Neutral

Main + N (mm ²)	DC Res. 20 °C Main / N (Ω/km)	AC Res. 70 °C Main / N (Ω/km)	Ground A	Ducts A	Air A	Dia. mm	Weight kg/km
25+16	0.727 / 1.150	0.870 / 1.376	105	75	98	25.1	1335
35+16	0.524 / 1.150	0.628 / 1.376	117	85	107	26.5	1610
50+25	0.387 / 0.727	0.464 / 0.870	139	103	131	30.7	2155
70+35	0.268 / 0.524	0.322 / 0.628	170	128	166	33.3	2945
95+50	0.193 / 0.387	0.233 / 0.464	204	156	204	37.1	3935
120+70	0.153 / 0.268	0.186 / 0.322	231	178	235	40.9	4965
150+70	0.124 / 0.268	0.151 / 0.322	259	203	270	44.7	5905
185+95	0.0991 / 0.193	0.122 / 0.233	292	232	311	49.6	7390
240+120	0.0754 / 0.153	0.0952 / 0.186	338	272	370	56.0	9510
300+150	0.0601 / 0.124	0.0780 / 0.151	381	310	426	61.8	11800
400+185	0.0470 / 0.0991	0.0638 / 0.122	431	357	495	69.9	14980
500+240	0.0366 / 0.0754	0.0531 / 0.0952	484	405	568	77.3	18155

Laying conditions: Ambient air 40 °C, ground 35 °C, soil resistivity 1.5 K·m/W, depth 0.5 m. Main cores are sector shaped (sm); neutral cores are round stranded (rm) up to 16 mm², sector shaped above.

Applications

These cables are intended for fixed installations, indoors and outdoors, in low voltage electricity systems. Normally used for the distribution of electrical energy in urban networks, power or switching stations, industrial plants, as well as in switchgears, in applications where there is a risk of mechanical damage.

Cable Construction

- **Conductor:** Plain annealed stranded circular (rm) or sector shaped (sm) copper conductor (Class 2 to IEC 60228)
- **Insulation:** Extruded layer of Cross-linked Polyethylene (XLPE) to IEC 60502-1
- **Core Identification:** 2C: Red, Black | 3C: Red, Yellow, Blue | 4C: Red, Yellow, Blue, Black
- **Assembly:** Cores assembled together with PVC filling
- **Outer Jacket:** Extruded layer of PVC – Type ST2 to IEC 60502-1 (double PVC sheathed)

Cable Characteristics

Property	Value	Standard
Max. operating temperature	90 °C	-
Max. short circuit temperature	250 °C	-
Flame propagation	Pass	IEC 60332-1-2
Oil resistance	Fair	ASTM D 1047
UV Resistant	Yes	-
Minimum bending radius	15 ×	-

Multi-core, XLPE insulated, double PVC sheathed, unarmoured with copper conductor.

Two Core Cables

Area mm ²	Type	DC Res. Ω/km	AC Res. Ω/km	Ground A	Ducts A	Air A	Dia. mm	Weight kg/km
1.5	rm	12.1000	15.4287	33	22	28	11.5	185
2.5	rm	7.4100	9.4485	43	29	36	12.4	225
4	rm	4.6100	5.8783	56	38	48	13.5	280
6	rm	3.0800	3.9274	69	48	61	14.6	345
10	rm	1.8300	2.3336	91	63	82	15.8	440
16	rm	1.1500	1.4667	118	83	110	17.8	605
25	rm	0.7270	0.9275	153	110	149	20.9	875
35	rm	0.5240	0.6688	183	133	183	23.0	1120

Three Core Cables

Area mm ²	Type	DC Res. Ω/km	AC Res. Ω/km	Ground A	Ducts A	Air A	Dia. mm	Weight kg/km
1.5	rm	12.1000	15.4287	27	18	23	12.0	205
2.5	rm	7.4100	9.4485	35	24	30	13.0	255
4	rm	4.6100	5.8783	46	31	40	14.1	325
6	rm	3.0800	3.9274	57	39	51	15.4	410
10	rm	1.8300	2.3336	75	53	70	17.1	520
16	rm	1.1500	1.4667	97	69	93	19.3	720
25	rm	0.7270	0.9275	126	92	126	22.6	1035
35	sm	0.5240	0.6688	144	105	141	22.0	1265
50	sm	0.3870	0.4944	171	127	173	25.0	1650
70	sm	0.2680	0.3431	209	159	220	28.9	2330
95	sm	0.1930	0.2481	251	193	271	32.3	3115
120	sm	0.1530	0.1976	286	223	317	35.6	3875

Laying conditions: Ambient air 40 °C, ground 35 °C, soil resistivity 1.5 K·m/W, depth 0.5 m. Type: rm = round stranded; sm = sector shaped.

Multi-core, XLPE insulated, double PVC sheathed, unarmoured with copper conductor.

Four Core Cables

Area mm ²	Type	DC Res. Ω/km	AC Res. Ω/km	Ground A	Ducts A	Air A	Dia. mm	Weight kg/km
1.5	rm	12.1000	15.4287	27	18	23	12.8	235
2.5	rm	7.4100	9.4485	35	24	30	13.9	300
4	rm	4.6100	5.8783	46	31	40	15.2	385
6	rm	3.0800	3.9274	57	39	51	16.5	495
10	rm	1.8300	2.3336	75	53	70	18.4	650
16	rm	1.1500	1.4667	97	69	93	20.9	900
25	rm	0.7270	0.9275	126	92	126	24.6	1315
35	sm	0.5240	0.6688	144	105	141	25.0	1640
50	sm	0.3870	0.4944	171	127	173	28.7	2160
70	sm	0.2680	0.3431	209	159	220	33.2	3045
95	sm	0.1930	0.2481	251	193	271	35.9	4065
120	sm	0.1530	0.1976	286	223	317	40.4	5130
150	sm	0.1240	0.1612	319	252	360	44.9	6290
185	sm	0.0991	0.1302	361	288	416	49.9	7815
240	sm	0.0754	0.1012	417	339	495	56.1	10125
300	sm	0.0601	0.0829	470	386	570	61.7	12595
400	sm	0.0470	0.0676	533	444	665	70.7	16170
500	sm	0.0366	0.0561	598	505	764	78.2	20775

Laying conditions: Ambient air 40 °C, ground 35 °C, soil resistivity 1.5 K·m/W, depth 0.5 m. Type: rm = round stranded; sm = sector shaped.

Four core cables with reduced neutral. XLPE insulated, double PVC sheathed, unarmoured with copper conductor.

Four Core Cables with Reduced Neutral

Main + N (mm ²)	DC Res. 20 °C Main / N (Ω/km)	AC Res. 70 °C Main / N (Ω/km)	Ground A	Ducts A	Air A	Dia. mm	Weight kg/km
25+16	0.727 / 1.150	0.928 / 1.467	126	92	126	23.7	1230
35+16	0.524 / 1.150	0.669 / 1.467	144	105	141	25.0	1485
50+25	0.387 / 0.727	0.494 / 0.928	171	127	173	28.5	1960
70+35	0.268 / 0.524	0.343 / 0.669	209	159	220	31.6	2735
95+50	0.193 / 0.387	0.248 / 0.494	251	193	271	35.4	3645
120+70	0.153 / 0.268	0.198 / 0.343	286	223	317	38.3	4605
150+70	0.124 / 0.268	0.161 / 0.343	319	252	360	42.5	5545
185+95	0.0991 / 0.193	0.130 / 0.248	361	288	416	47.4	6950
240+120	0.0754 / 0.153	0.101 / 0.198	417	339	495	53.3	8965
300+150	0.0601 / 0.124	0.083 / 0.161	470	386	570	58.6	11110
400+185	0.0470 / 0.0991	0.068 / 0.130	533	444	665	66.3	14055
500+240	0.0366 / 0.0754	0.056 / 0.101	598	505	764	74.1	17695

Laying conditions: Ambient air 40 °C, ground 35 °C, soil resistivity 1.5 K.m/W, depth 0.5 m. Main cores sector shaped (sm); neutral round stranded (rm) up to 16 mm², sector shaped above.

Applications

These cables are intended for fixed installations, indoors and outdoors, in low voltage electricity systems. Normally used for the distribution of electrical energy in urban networks, power or switching stations, industrial plants, as well as in switchgears, in applications where there is no risk of mechanical damage.

Cable Construction

- **Conductor:** Stranded circular (rm) or sector shaped (sm) copper or aluminium conductor (Class 2 to IEC 60228)
- **Insulation:** Extruded layer of Polyvinyl Chloride (PVC) – Type PVC/A to IEC 60502-1
- **Core Identification:** 2C: Red, Black | 3C: Red, Yellow, Blue | 4C: Red, Yellow, Blue, Black
- **Assembly:** Cores assembled together with non-hygroscopic filler if needed
- **Outer Jacket:** Extruded layer of PVC – Type ST1 to IEC 60502-1 (single sheath)

Cable Characteristics

Property	Value	Standard
Max. operating temperature	70 °C	-
Max. short circuit temperature	160 °C	-
Flame propagation	Pass	IEC 60332-1-2
Oil resistance	Fair	ASTM D 1047
UV Resistant	Yes	-
Minimum bending radius	12 ×	-

Available with copper (Cu) or aluminium (Al) conductors. Data tables follow for each conductor material.

Multi-core, PVC insulated and PVC sheathed (single), unarmoured with copper conductor.

Two Core Cables

Area mm ²	Type	DC Res. Ω/km	AC Res. Ω/km	Ground A	Ducts A	Air A	Dia. mm	Weight kg/km
1.5	rm	12.1000	14.4777	27	19	21	9.9	145
2.5	rm	7.4100	8.8661	36	24	28	10.8	185
4	rm	4.6100	5.5159	47	32	38	12.7	260
6	rm	3.0800	3.6853	58	40	48	13.8	330
10	rm	1.8300	2.1898	76	53	65	15.0	420
16	rm	1.1500	1.3763	98	70	86	17.0	580
25	rm	0.7270	0.8703	127	92	116	20.1	855
35	rm	0.5240	0.6276	152	111	142	22.2	1100

Three Core Cables

Area mm ²	Type	DC Res. Ω/km	AC Res. Ω/km	Ground A	Ducts A	Air A	Dia. mm	Weight kg/km
1.5	rm	12.1000	14.4777	23	15	18	10.4	170
2.5	rm	7.4100	8.8661	29	20	23	11.4	220
4	rm	4.6100	5.5159	38	26	32	13.4	315
6	rm	3.0800	3.6853	48	33	40	14.7	400
10	rm	1.8300	2.1898	63	43	55	16.4	500
16	rm	1.1500	1.3763	81	57	72	18.6	720
25	rm	0.7270	0.8703	105	75	98	21.9	1020
35	sm	0.5240	0.6276	117	85	107	21.2	1310
50	sm	0.3870	0.4639	139	103	131	24.6	1715
70	sm	0.2680	0.3220	170	128	166	27.7	2355
95	sm	0.1930	0.2328	204	156	204	32.1	3205
120	sm	0.1530	0.1856	231	178	235	34.0	3940

Laying conditions: Ambient air 40 °C, ground 35 °C, soil resistivity 1.5 K·m/W, depth 0.5 m. Type: rm = round stranded; sm = sector shaped.

Multi-core, PVC insulated and PVC sheathed (single), unarmoured with copper conductor.

Four Core Cables

Area mm ²	Type	DC Res. Ω/km	AC Res. Ω/km	Ground A	Ducts A	Air A	Dia. mm	Weight kg/km
1.5	rm	12.1000	14.4777	23	15	18	11.3	205
2.5	rm	7.4100	8.8661	29	20	23	12.3	265
4	rm	4.6100	5.5159	38	26	32	14.6	385
6	rm	3.0800	3.6853	48	33	40	16.0	500
10	rm	1.8300	2.1898	63	43	55	17.9	670
16	rm	1.1500	1.3763	81	57	72	20.3	920
25	rm	0.7270	0.8703	105	75	98	24.1	1295
35	sm	0.5240	0.6276	117	85	107	24.5	1665
50	sm	0.3870	0.4639	139	103	131	28.7	2220
70	sm	0.2680	0.3220	170	128	166	32.3	3055
95	sm	0.1930	0.2328	204	156	204	36.2	4200
120	sm	0.1530	0.1856	231	178	235	39.6	5185
150	sm	0.1240	0.1514	259	203	270	44.3	6390
185	sm	0.0991	0.1224	292	232	311	49.1	7905
240	sm	0.0754	0.0952	338	272	370	55.6	10280
300	sm	0.0601	0.0780	381	310	426	61.7	12840
400	sm	0.0470	0.0638	431	357	495	70.3	16455
500	sm	0.0366	0.0531	484	405	568	77.8	21170

Laying conditions: Ambient air 40 °C, ground 35 °C, soil resistivity 1.5 K·m/W, depth 0.5 m. Type: rm = round stranded; sm = sector shaped.

Four core cables with reduced neutral. PVC insulated and PVC sheathed (single), unarmoured with copper conductor.

Four Core Cables with Reduced Neutral

Main + N (mm ²)	DC Res. 20 °C Main / N (Ω/km)	AC Res. 70 °C Main / N (Ω/km)	Ground A	Ducts A	Air A	Dia. mm	Weight kg/km
25+16	0.727 / 1.150	0.870 / 1.376	105	75	98	23.1	1215
35+16	0.524 / 1.150	0.628 / 1.376	117	85	107	24.5	1480
50+25	0.387 / 0.727	0.464 / 0.870	139	103	131	28.7	2005
70+35	0.268 / 0.524	0.322 / 0.628	170	128	166	32.3	2745
95+50	0.193 / 0.387	0.233 / 0.464	204	156	204	36.2	3700
120+70	0.153 / 0.268	0.186 / 0.322	231	178	235	39.6	4665
150+70	0.124 / 0.268	0.151 / 0.322	259	203	270	44.3	5605
185+95	0.0991 / 0.193	0.122 / 0.233	292	232	311	49.1	7035
240+120	0.0754 / 0.153	0.095 / 0.186	338	272	370	55.6	9045
300+150	0.0601 / 0.124	0.078 / 0.151	381	310	426	61.7	11290
400+185	0.0470 / 0.0991	0.064 / 0.122	431	357	495	70.3	14375
500+240	0.0366 / 0.0754	0.053 / 0.095	484	405	568	77.8	18415

Laying conditions: Ambient air 40 °C, ground 35 °C, soil resistivity 1.5 K.m/W, depth 0.5 m. Main cores sector shaped (sm); neutral round stranded (rm) up to 16 mm², sector shaped above.

Multi-core, PVC insulated and PVC sheathed (single), unarmoured with aluminium conductor.

Two Core Cables

Area mm ²	Type	DC Res. Ω/km	AC Res. Ω/km	Ground A	Ducts A	Air A	Dia. mm	Weight kg/km
10	rm	3.0800	3.7007	59	41	50	15.0	300
16	rm	1.9100	2.2950	76	54	66	17.0	390
25	rm	1.2000	1.4421	99	71	90	19.6	535
35	rm	0.8680	1.0433	118	86	110	22.2	680

Three Core Cables

Area mm ²	Type	DC Res. Ω/km	AC Res. Ω/km	Ground A	Ducts A	Air A	Dia. mm	Weight kg/km
10	rm	3.0800	3.7007	48	33	42	16.4	320
16	rm	1.9100	2.2950	63	44	56	18.6	430
25	rm	1.2000	1.4421	81	58	76	21.3	555
35	sm	0.8680	1.0433	90	66	83	21.2	670
50	sm	0.6410	0.7707	108	80	102	24.6	1715
70	sm	0.4430	0.5331	132	99	129	27.7	2355
95	sm	0.3200	0.3856	158	121	159	32.1	3205
120	sm	0.2530	0.3055	180	138	183	34.0	3940

Laying conditions: Ambient air 40 °C, ground 35 °C, soil resistivity 1.5 K-m/W, depth 0.5 m. Type: rm = round stranded; sm = sector shaped.

Multi-core, PVC insulated and PVC sheathed (single), unarmoured with aluminium conductor.

Four Core Cables

Area mm ²	Type	DC Res. Ω/km	AC Res. Ω/km	Ground A	Ducts A	Air A	Dia. mm	Weight kg/km
10	rm	3.0800	3.7007	48	33	42	17.9	435
16	rm	1.9100	2.2950	63	44	56	20.3	535
25	rm	1.2000	1.4421	81	58	76	23.4	675
35	sm	0.8680	1.0433	90	66	83	24.5	815
50	sm	0.6410	0.7707	108	80	102	28.7	1075
70	sm	0.4430	0.5331	132	99	129	32.3	1380
95	sm	0.3200	0.3856	158	121	159	36.2	1890
120	sm	0.2530	0.3055	180	138	183	39.6	2270
150	sm	0.2060	0.2494	202	158	210	44.3	2785
185	sm	0.1640	0.1994	229	181	243	49.1	3395
240	sm	0.1250	0.1533	265	214	290	55.6	4390
300	sm	0.1000	0.1240	300	244	336	61.7	5375
400	sm	0.0778	0.0984	344	285	396	70.3	6900
500	sm	0.0605	0.0789	392	328	460	77.8	8640

Four Core Cables with Reduced Neutral

Main + N (mm ²)	DC Res. 20 °C Main / N (Ω/km)	AC Res. 70 °C Main / N (Ω/km)	Ground A	Ducts A	Air A	Dia. mm	Weight kg/km
50+25	0.641 / 1.200	0.771 / 1.442	108	80	102	28.7	995
70+35	0.443 / 0.868	0.533 / 1.043	132	99	129	30.9	1275
95+50	0.320 / 0.641	0.386 / 0.771	158	121	159	34.5	1680
120+70	0.253 / 0.443	0.306 / 0.533	180	138	183	37.9	2060
150+70	0.206 / 0.443	0.249 / 0.533	202	158	210	41.9	2485
185+95	0.164 / 0.320	0.199 / 0.386	229	181	243	46.6	3070
240+120	0.125 / 0.253	0.153 / 0.306	265	214	290	52.6	3900
300+150	0.100 / 0.206	0.124 / 0.249	300	244	336	58.4	4790
400+185	0.0778 / 0.164	0.098 / 0.199	344	285	396	66.3	6085
500+240	0.0605 / 0.125	0.079 / 0.153	392	328	460	73.5	7545

Laying conditions: Ambient air 40 °C, ground 35 °C, soil resistivity 1.5 K·m/W, depth 0.5 m.

Applications

These cables are intended for fixed installations, indoors and outdoors, in low voltage electricity systems. Normally used for the distribution of electrical energy in urban networks, power or switching stations, industrial plants, as well as in switchgears, in applications where there is a risk of mechanical damage.

Cable Construction

- **Conductor:** Stranded circular or circular compacted copper or aluminium conductor (Class 2 to IEC 60228)
- **Insulation:** Extruded layer of PVC – Type PVC/A to IEC 60502-1
- **Bedding:** Extruded layer of PVC – Type ST1 to IEC 60502-1
- **Armouring:** Single layer of round non-magnetic (aluminium) wires (AWA)
- **Outer Jacket:** Extruded layer of PVC – Type ST1 to IEC 60502-1

Cable Characteristics

Property	Value	Standard
Max. operating temperature	70 °C	-
Max. short circuit temperature	160 °C	-
Flame propagation	Pass	IEC 60332-1-2
Oil resistance	Fair	ASTM D 1047
Mechanical impact	Very Good	-
UV Resistant	Yes	-
Minimum bending radius	12 ×	-

Single-core, PVC insulated, aluminium wire armoured, PVC sheathed with copper conductor.

Area mm ²	DC Res. Ω/km	AC Res. Ω/km	Gnd (a) A	Gnd (b) A	Duct (c) A	Duct (d) A	Air (e) A	Air (f) A	Air (g) A	Dia. mm	Wt. kg/km
6	3.080	3.685	48	48	40	44	45	46	56	13.6	280
10	1.830	2.190	63	63	53	58	60	62	75	14.2	330
16	1.150	1.376	81	81	68	74	79	81	99	15.2	410
25	0.727	0.870	104	104	87	95	104	106	129	16.8	540
35	0.524	0.627	124	123	104	113	127	129	156	18.0	665
50	0.387	0.464	146	145	123	132	153	155	185	19.6	825
70	0.268	0.321	177	176	151	161	190	193	229	21.4	1065
95	0.193	0.232	209	208	181	189	232	233	272	23.4	1370
120	0.153	0.184	236	233	205	212	266	265	307	24.9	1640
150	0.124	0.150	263	259	229	234	302	299	340	26.8	1960
185	0.0991	0.121	293	287	258	258	345	337	379	29.1	2380
240	0.0754	0.093	333	324	296	287	402	386	425	32.0	3010
300	0.0601	0.076	363	349	325	303	452	422	454	35.8	3755
400	0.0470	0.061	397	380	360	326	508	464	493	39.4	4740
500	0.0366	0.050	432	410	395	348	568	507	535	43.4	5965
630	0.0283	0.042	465	438	429	368	627	547	574	47.4	7395
800	0.0221	0.035	477	452	444	382	664	572	613	52.7	9480
1000	0.0176	0.031	503	476	475	408	729	623	678	61.5	11840

Laying conditions: Ambient air 40 °C, ground 35 °C, soil resistivity 1.5 K·m/W, depth 0.5 m. (a)(b) Buried direct; (c)(d) In buried ducts; (e)(f)(g) In free air.

Single-core, PVC insulated, aluminium wire armoured, PVC sheathed with aluminium conductor.

Area mm ²	DC Res. Ω/km	AC Res. Ω/km	Gnd (a) A	Gnd (b) A	Duct (c) A	Duct (d) A	Air (e) A	Air (f) A	Air (g) A	Dia. mm	Wt. kg/km
10	3.080	3.701	50	50	42	46	48	49	60	14.2	270
16	1.910	2.295	63	63	52	58	61	63	77	15.2	315
25	1.200	1.442	81	81	68	74	81	83	101	16.8	390
35	0.868	1.043	96	96	81	88	99	101	122	18.0	455
50	0.641	0.770	113	113	96	104	119	121	146	19.6	540
70	0.443	0.533	138	138	118	126	149	151	181	21.4	650
95	0.320	0.385	164	163	141	150	181	184	217	23.4	790
120	0.253	0.305	185	184	161	169	209	211	247	24.9	910
150	0.206	0.249	207	205	181	188	238	238	277	26.8	1060
185	0.164	0.198	233	230	205	210	273	272	312	29.1	1255
240	0.125	0.152	267	262	237	239	321	316	357	32.0	1535
300	0.100	0.123	296	288	265	258	367	353	390	35.8	1920
400	0.0778	0.097	330	320	299	283	420	397	432	39.4	2355
500	0.0605	0.077	367	353	335	309	479	444	478	43.4	2870
630	0.0469	0.062	403	385	372	334	541	490	523	47.4	3470
800	0.0367	0.051	426	408	397	353	589	525	569	52.8	4390
1000	0.0291	0.043	458	438	432	383	660	581	637	61.5	5455

Laying conditions: Ambient air 40 °C, ground 35 °C, soil resistivity 1.5 K·m/W, depth 0.5 m. (a)(b) Buried direct; (c)(d) In buried ducts; (e)(f)(g) In free air.

Applications

These cables are intended for fixed installations, indoors and outdoors, in low voltage electricity systems. Normally used for the distribution of electrical energy in urban networks, power or switching stations, industrial plants, as well as in switchgears, in applications where there is a risk of mechanical damage.

Cable Construction

- **Conductor:** Plain annealed stranded circular (rm) or sector shaped (sm) copper conductor (Class 2 to IEC 60228)
- **Insulation:** Extruded layer of PVC – Type PVC/A to IEC 60502-1
- **Core Identification:** 2C: Red, Black | 3C: Red, Yellow, Blue | 4C: Red, Yellow, Blue, Black
- **Assembly:** Cores assembled together with non-hygroscopic filler if needed
- **Bedding:** Extruded layer of PVC – Type ST1 to IEC 60502-1
- **Armouring:** Double layers of galvanized steel tapes (STA)
- **Outer Jacket:** Extruded layer of PVC – Type ST1 to IEC 60502-1

Cable Characteristics

Property	Value	Standard
Max. operating temperature	70 °C	-
Max. short circuit temperature	160 °C	-
Flame propagation	Pass	IEC 60332-1-2
Oil resistance	Fair	ASTM D 1047
Mechanical impact	Very Good	-
UV Resistant	Yes	-
Minimum bending radius	12 ×	-

Multi-core, PVC insulated, steel tape armoured (STA), PVC sheathed with copper conductor.

Two Core Cables

Area mm ²	Type	DC Res. Ω/km	AC Res. Ω/km	Ground A	Ducts A	Air A	Dia. mm	Weight kg/km
6	rm	3.0800	3.6853	56	41	49	16.6	495
10	rm	1.8300	2.1898	74	54	65	17.8	600
16	rm	1.1500	1.3763	95	71	86	19.8	785
25	rm	0.7270	0.8703	123	93	115	22.9	1095
35	rm	0.5240	0.6276	147	112	140	25.0	1365

Three Core Cables

Area mm ²	Type	DC Res. Ω/km	AC Res. Ω/km	Ground A	Ducts A	Air A	Dia. mm	Weight kg/km
6	rm	3.0800	3.6853	46	33	41	17.5	575
10	rm	1.8300	2.1898	61	44	55	19.2	685
16	rm	1.1500	1.3763	79	58	72	21.4	910
25	rm	0.7270	0.8703	102	75	97	24.7	1265
35	sm	0.5240	0.6276	114	86	106	24.0	1500
50	sm	0.3870	0.4639	135	103	130	27.6	1960
70	sm	0.2680	0.3220	165	128	162	31.1	2665
95	sm	0.1930	0.2328	199	157	202	36.7	3900
120	sm	0.1530	0.1856	225	178	231	38.6	4675

Laying conditions: Ambient air 40 °C, ground 35 °C, soil resistivity 1.5 K·m/W, depth 0.5 m. rm = round stranded, sm = sector shaped.

Multi-core, PVC insulated, steel tape armoured (STA), PVC sheathed with copper conductor.

Four Core Cables

Area mm ²	Type	DC Res. Ω/km	AC Res. Ω/km	Ground A	Ducts A	Air A	Dia. mm	Weight kg/km
4	rm	4.6100	5.5159	37	27	32	17.4	560
6	rm	3.0800	3.6853	46	33	41	18.8	690
10	rm	1.8300	2.1898	61	44	55	20.7	840
16	rm	1.1500	1.3763	79	58	72	23.1	1115
25	rm	0.7270	0.8703	102	75	97	26.9	1590
35	sm	0.5240	0.6276	114	86	106	27.3	1925
50	sm	0.3870	0.4639	135	103	130	32.1	2580
70	sm	0.2680	0.3220	165	128	162	36.9	3790
95	sm	0.1930	0.2328	199	157	202	40.8	5000
120	sm	0.1530	0.1856	225	178	231	44.6	6105
150	sm	0.1240	0.1514	252	203	264	49.3	7420
185	sm	0.0991	0.1224	284	231	303	54.5	9130
240	sm	0.0754	0.0952	327	270	356	61.0	11655
300	sm	0.0601	0.0780	366	305	407	67.1	14370
400	sm	0.0470	0.0638	414	350	471	76.1	18245
500	sm	0.0366	0.0531	462	394	535	85.0	23960

Laying conditions: Ambient air 40 °C, ground 35 °C, soil resistivity 1.5 K·m/W, depth 0.5 m. rm = round stranded, sm = sector shaped.

Four core cables with reduced neutral. PVC insulated, steel tape armoured (STA), PVC sheathed with copper conductor.

Four Core Cables with Reduced Neutral

Main + N (mm ²)	DC Res. 20 °C Main / N (Ω/km)	AC Res. 70 °C Main / N (Ω/km)	Ground A	Ducts A	Air A	Dia. mm	Weight kg/km
25+16	0.727 / 1.150	0.870 / 1.376	102	75	97	25.9	1485
35+16	0.524 / 1.150	0.628 / 1.376	114	86	106	27.3	1770
50+25	0.387 / 0.727	0.464 / 0.870	135	103	130	31.5	2340
70+35	0.268 / 0.524	0.322 / 0.628	165	128	162	34.1	3110
95+50	0.193 / 0.387	0.233 / 0.464	199	157	202	39.1	4475
120+70	0.153 / 0.268	0.186 / 0.322	225	178	231	42.9	5565
150+70	0.124 / 0.268	0.151 / 0.322	252	203	264	46.9	6565
185+95	0.0991 / 0.193	0.122 / 0.233	284	231	303	51.6	8100
240+120	0.0754 / 0.153	0.095 / 0.186	327	270	356	58.0	10295
300+150	0.0601 / 0.124	0.078 / 0.151	366	305	407	63.8	12680
400+185	0.0470 / 0.0991	0.064 / 0.122	414	350	471	72.1	16075
500+240	0.0366 / 0.0754	0.053 / 0.095	462	394	535	80.7	21085

Laying conditions: Ambient air 40 °C, ground 35 °C, soil resistivity 1.5 K.m/W, depth 0.5 m. Main cores sector shaped (sm); neutral round stranded (rm) up to 16 mm², sector shaped above.

Multi-core, PVC insulated, steel tape armoured (STA), PVC sheathed with aluminium conductor.

Two Core Cables

Area mm ²	Type	DC Res. Ω/km	AC Res. Ω/km	Ground A	Ducts A	Air A	Dia. mm	Weight kg/km
10	rm	3.0800	3.7007	57	42	50	17.8	480
16	rm	1.9100	2.2950	74	55	67	19.8	590
25	rm	1.2000	1.4421	96	72	89	22.4	765
35	rm	0.8680	1.0433	114	87	109	25.0	945

Three Core Cables

Area mm ²	Type	DC Res. Ω/km	AC Res. Ω/km	Ground A	Ducts A	Air A	Dia. mm	Weight kg/km
10	rm	3.0800	3.7007	47	34	42	19.2	505
16	rm	1.9100	2.2950	61	45	56	21.4	625
25	rm	1.2000	1.4421	79	59	75	24.1	795
35	sm	0.8680	1.0433	88	66	82	24.0	865
50	sm	0.6410	0.7707	105	80	101	27.6	1100
70	sm	0.4430	0.5331	128	100	126	31.1	1410
95	sm	0.3200	0.3856	155	122	157	36.7	2165
120	sm	0.2530	0.3055	175	139	180	38.6	2490

Laying conditions: Ambient air 40 °C, ground 35 °C, soil resistivity 1.5 K-m/W, depth 0.5 m. rm = round stranded, sm = sector shaped.

Multi-core, PVC insulated, steel tape armoured (STA), PVC sheathed with aluminium conductor.

Four Core Cables

Area mm ²	Type	DC Res. Ω/km	AC Res. Ω/km	Ground A	Ducts A	Air A	Dia. mm	Weight kg/km
10	rm	3.0800	3.7007	47	34	42	20.7	605
16	rm	1.9100	2.2950	61	45	56	23.1	735
25	rm	1.2000	1.4421	79	59	75	26.2	960
35	sm	0.8680	1.0433	88	66	82	27.3	1080
50	sm	0.6410	0.7707	105	80	101	32.1	1435
70	sm	0.4430	0.5331	128	100	126	36.9	2115
95	sm	0.3200	0.3856	155	122	157	40.8	2685
120	sm	0.2530	0.3055	175	139	180	44.6	3190
150	sm	0.2060	0.2494	196	158	206	49.3	3820
185	sm	0.1640	0.1994	222	181	237	54.5	4615
240	sm	0.1250	0.1533	257	212	281	61.0	5770
300	sm	0.1000	0.1240	290	242	323	67.1	6905
400	sm	0.0778	0.0984	333	281	378	76.1	8695
500	sm	0.0605	0.0789	377	322	436	85.0	11430

Laying conditions: Ambient air 40 °C, ground 35 °C, soil resistivity 1.5 K·m/W, depth 0.5 m. rm = round stranded, sm = sector shaped.

Four core cables with reduced neutral. PVC insulated, steel tape armoured (STA), PVC sheathed with aluminium conductor.

Four Core Cables with Reduced Neutral

Main + N (mm ²)	DC Res. 20 °C Main / N (Ω/km)	AC Res. 70 °C Main / N (Ω/km)	Ground A	Ducts A	Air A	Dia. mm	Weight kg/km
50+25	0.641 / 1.200	0.771 / 1.442	105	80	101	31.5	1330
70+35	0.443 / 0.868	0.533 / 1.043	128	100	126	34.1	1640
95+50	0.320 / 0.641	0.386 / 0.771	155	122	157	39.1	2455
120+70	0.253 / 0.443	0.306 / 0.533	175	139	180	42.9	2960
150+70	0.206 / 0.443	0.249 / 0.533	196	158	206	46.9	3445
185+95	0.164 / 0.320	0.199 / 0.386	222	181	237	51.6	4140
240+120	0.125 / 0.253	0.153 / 0.306	257	212	281	58.0	5150
300+150	0.100 / 0.206	0.124 / 0.249	290	242	323	63.8	6185
400+185	0.0778 / 0.164	0.098 / 0.199	333	281	378	72.1	7790
500+240	0.0605 / 0.125	0.079 / 0.153	377	322	436	80.7	10220

Laying conditions: Ambient air 40 °C, ground 35 °C, soil resistivity 1.5 K·m/W, depth 0.5 m. Main cores sector shaped (sm); neutral round stranded (rm) up to 25 mm², sector shaped above.

Applications

These cables are intended for fixed installations, indoors and outdoors, in low voltage electricity systems. Normally used for the distribution of electrical energy in urban networks, power or switching stations, industrial plants, as well as in switchgears, in applications where there is a risk of mechanical damage.

Cable Construction

- **Conductor:** Plain annealed stranded circular (rm) or sector shaped (sm) copper conductor, or stranded aluminium conductor (Class 2 to IEC 60228)
- **Insulation:** Extruded layer of PVC – Type PVC/A to IEC 60502-1
- **Core Identification:** 2C: Red, Black | 3C: Red, Yellow, Blue | 4C: Red, Yellow, Blue, Black
- **Assembly:** Cores assembled together with non-hygroscopic filler if needed
- **Bedding:** Extruded layer of PVC – Type ST1 to IEC 60502-1
- **Armouring:** Single layer of round galvanized steel wires (SWA)
- **Outer Jacket:** Extruded layer of PVC – Type ST1 to IEC 60502-1

Cable Characteristics

Property	Value	Standard
Max. operating temperature	70 °C	-
Max. short circuit temperature	160 °C	-
Flame propagation	Pass	IEC 60332-1-2
Oil resistance	Fair	ASTM D 1047
Mechanical impact	Very Good	-
UV Resistant	Yes	-
Minimum bending radius	12 ×	-

Multi-core, PVC insulated, steel wire armoured (SWA), PVC sheathed with copper conductor.

Two Core Cables

Area mm ²	Type	DC Res. Ω/km	AC Res. Ω/km	Ground A	Ducts A	Air A	Dia. mm	Weight kg/km
1.5	rm	12.1000	14.4777	27	20	23	13.5	365
2.5	rm	7.4100	8.8661	35	25	30	14.4	420
4	rm	4.6100	5.5159	46	34	40	16.3	535
6	rm	3.0800	3.6853	57	42	51	18.3	750
10	rm	1.8300	2.1898	75	56	68	19.5	870
16	rm	1.1500	1.3763	97	72	89	21.5	1095
25	rm	0.7270	0.8703	125	95	120	25.3	1605
35	rm	0.5240	0.6276	149	115	146	27.4	1910

Three Core Cables

Area mm ²	Type	DC Res. Ω/km	AC Res. Ω/km	Ground A	Ducts A	Air A	Dia. mm	Weight kg/km
1.5	rm	12.1000	14.4777	22	16	19	14.0	400
2.5	rm	7.4100	8.8661	29	21	25	15.0	470
4	rm	4.6100	5.5159	38	27	34	17.9	725
6	rm	3.0800	3.6853	47	34	42	19.2	840
10	rm	1.8300	2.1898	62	45	57	20.9	980
16	rm	1.1500	1.3763	80	59	75	23.1	1240
25	rm	0.7270	0.8703	104	78	101	27.1	1815
35	sm	0.5240	0.6276	115	88	110	26.4	2020
50	sm	0.3870	0.4639	137	106	134	30.2	2595
70	sm	0.2680	0.3220	167	131	168	34.5	3605
95	sm	0.1930	0.2328	200	159	205	38.7	4630
120	sm	0.1530	0.1856	226	180	235	40.6	5435

Laying conditions: Ambient air 40 °C, ground 35 °C, soil resistivity 1.5 K·m/W, depth 0.5 m. rm = round stranded, sm = sector shaped.

Multi-core, PVC insulated, steel wire armoured (SWA), PVC sheathed with copper conductor.

Four Core Cables

Area mm ²	Type	DC Res. Ω/km	AC Res. Ω/km	Ground A	Ducts A	Air A	Dia. mm	Weight kg/km
1.5	rm	12.1000	14.4777	22	16	19	14.9	450
2.5	rm	7.4100	8.8661	29	21	25	15.9	530
4	rm	4.6100	5.5159	38	27	34	19.1	820
6	rm	3.0800	3.6853	47	34	42	20.5	970
10	rm	1.8300	2.1898	62	45	57	22.4	1165
16	rm	1.1500	1.3763	80	59	75	25.5	1630
25	rm	0.7270	0.8703	104	78	101	29.3	2190
35	sm	0.5240	0.6276	115	88	110	29.9	2545
50	sm	0.3870	0.4639	137	106	134	35.5	3540
70	sm	0.2680	0.3220	167	131	168	39.1	4535
95	sm	0.1930	0.2328	200	159	205	44.0	6220
120	sm	0.1530	0.1856	226	180	235	47.8	7440
150	sm	0.1240	0.1514	252	205	268	52.5	8855
185	sm	0.0991	0.1224	283	232	306	57.9	10765
240	sm	0.0754	0.0952	325	269	358	64.2	13470
300	sm	0.0601	0.0780	362	303	406	70.3	16340
400	sm	0.0470	0.0638	402	342	465	80.6	21420
500	sm	0.0366	0.0531	442	379	521	88.3	26650

Laying conditions: Ambient air 40 °C, ground 35 °C, soil resistivity 1.5 K·m/W, depth 0.5 m. rm = round stranded, sm = sector shaped.

Four core cables with reduced neutral. PVC insulated, steel wire armoured (SWA), PVC sheathed with copper conductor.

Four Core Cables with Reduced Neutral

Main + N (mm ²)	DC Res. 20 °C Main / N (Ω/km)	AC Res. 70 °C Main / N (Ω/km)	Ground A	Ducts A	Air A	Dia. mm	Weight kg/km
25+16	0.727 / 1.150	0.870 / 1.376	104	78	101	28.3	2065
35+16	0.524 / 1.150	0.628 / 1.376	115	88	110	29.9	2385
50+25	0.387 / 0.727	0.464 / 0.870	137	106	134	35.5	3300
70+35	0.268 / 0.524	0.322 / 0.628	167	131	168	39.1	4135
95+50	0.193 / 0.387	0.233 / 0.464	200	159	205	44.0	5270
120+70	0.153 / 0.268	0.186 / 0.322	226	180	235	47.8	6860
150+70	0.124 / 0.268	0.151 / 0.322	252	205	268	52.5	7945
185+95	0.0991 / 0.193	0.122 / 0.233	283	232	306	57.9	9625
240+120	0.0754 / 0.153	0.095 / 0.186	325	269	358	64.2	12020
300+150	0.0601 / 0.124	0.078 / 0.151	362	303	406	70.3	14575
400+185	0.0470 / 0.0991	0.064 / 0.122	402	342	465	80.6	19105
500+240	0.0366 / 0.0754	0.053 / 0.095	442	379	521	88.3	23670

Laying conditions: Ambient air 40 °C, ground 35 °C, soil resistivity 1.5 K.m/W, depth 0.5 m. Main cores sector shaped (sm); neutral round stranded (rm) up to 16 mm², sector shaped above.

Multi-core, PVC insulated, steel wire armoured (SWA), PVC sheathed with aluminium conductor.

Two Core Cables

Area mm ²	Type	DC Res. Ω/km	AC Res. Ω/km	Ground A	Ducts A	Air A	Dia. mm	Weight kg/km
10	rm	3.0800	3.7007	58	43	52	19.5	750
16	rm	1.9100	2.2950	75	56	69	21.5	900
25	rm	1.2000	1.4421	97	74	93	24.8	1265
35	rm	0.8680	1.0433	116	89	113	27.4	1490

Three Core Cables

Area mm ²	Type	DC Res. Ω/km	AC Res. Ω/km	Ground A	Ducts A	Air A	Dia. mm	Weight kg/km
10	rm	3.0800	3.7007	48	35	44	20.9	800
16	rm	1.9100	2.2950	62	46	58	23.1	955
25	rm	1.2000	1.4421	81	60	78	26.5	1335
35	sm	0.8680	1.0433	89	68	85	26.4	1385
50	sm	0.6410	0.7707	106	82	104	30.2	1735
70	sm	0.4430	0.5331	130	102	130	34.5	2350
95	sm	0.3200	0.3856	156	124	160	38.7	2900
120	sm	0.2530	0.3055	176	141	183	40.6	3250

Laying conditions: Ambient air 40 °C, ground 35 °C, soil resistivity 1.5 K-m/W, depth 0.5 m. rm = round stranded, sm = sector shaped.

Multi-core, PVC insulated, steel wire armoured (SWA), PVC sheathed with aluminium conductor.

Four Core Cables

Area mm ²	Type	DC Res. Ω/km	AC Res. Ω/km	Ground A	Ducts A	Air A	Dia. mm	Weight kg/km
10	rm	3.0800	3.7007	48	35	44	22.4	930
16	rm	1.9100	2.2950	62	46	58	25.5	1245
25	rm	1.2000	1.4421	81	60	78	28.6	1535
35	sm	0.8680	1.0433	89	68	85	29.9	1695
50	sm	0.6410	0.7707	106	82	104	35.5	2395
70	sm	0.4430	0.5331	130	102	130	39.1	2860
95	sm	0.3200	0.3856	156	124	160	44.0	3905
120	sm	0.2530	0.3055	176	141	183	47.8	4525
150	sm	0.2060	0.2494	197	160	210	52.5	5255
185	sm	0.1640	0.1994	223	183	241	57.9	6255
240	sm	0.1250	0.1533	257	214	283	64.2	7580
300	sm	0.1000	0.1240	289	242	324	70.3	8885
400	sm	0.0778	0.0984	327	278	378	80.6	11870
500	sm	0.0605	0.0789	367	315	431	88.3	14120

Laying conditions: Ambient air 40 °C, ground 35 °C, soil resistivity 1.5 K·m/W, depth 0.5 m. rm = round stranded, sm = sector shaped.

Four core cables with reduced neutral. PVC insulated, steel wire armoured (SWA), PVC sheathed with aluminium conductor.

Four Core Cables with Reduced Neutral

Main + N (mm ²)	DC Res. 20 °C Main / N (Ω/km)	AC Res. 70 °C Main / N (Ω/km)	Ground A	Ducts A	Air A	Dia. mm	Weight kg/km
50+25	0.641 / 1.200	0.771 / 1.442	106	82	104	34.9	2290
70+35	0.443 / 0.868	0.533 / 1.043	130	102	130	37.5	2665
95+50	0.320 / 0.641	0.386 / 0.771	156	124	160	41.3	3250
120+70	0.253 / 0.443	0.306 / 0.533	176	141	183	46.3	4255
150+70	0.206 / 0.443	0.249 / 0.533	197	160	210	50.1	4825
185+95	0.164 / 0.320	0.199 / 0.386	223	183	241	54.8	5660
240+120	0.125 / 0.253	0.153 / 0.306	257	214	283	61.2	6875
300+150	0.100 / 0.206	0.124 / 0.249	289	242	324	67.0	8075
400+185	0.0778 / 0.164	0.098 / 0.199	327	278	378	76.6	10815
500+240	0.0605 / 0.125	0.079 / 0.153	367	315	431	84.0	12800

Laying conditions: Ambient air 40 °C, ground 35 °C, soil resistivity 1.5 K·m/W, depth 0.5 m. Main cores sector shaped (sm); neutral round stranded (rm) up to 25 mm², sector shaped above.

Applications

These cables are intended for fixed installations, indoors and outdoors, in low voltage electricity systems. Normally used for the distribution of electrical energy in urban networks, power or switching stations, industrial plants, as well as in switchgears. The XLPE insulation provides higher continuous operating temperature (90 °C) compared to PVC insulated cables, allowing greater current carrying capacity.

Cable Construction

- **Conductor:** Plain annealed stranded circular or circular compacted copper conductor, or stranded aluminium conductor (Class 2 to IEC 60228)
- **Insulation:** Extruded layer of Cross-linked Polyethylene (XLPE) to IEC 60502-1
- **Core Identification:** Red (other colours available on request per HD 308 S2 or IEC 60445)
- **Outer Jacket:** Extruded layer of PVC – Type ST2 to IEC 60502-1

Cable Characteristics

Property	Value	Standard
Max. operating temperature	90 °C	-
Max. short circuit temperature	250 °C	-
Flame propagation	Pass	IEC 60332-1-2
Oil resistance	Fair	ASTM D 1047
Mechanical impact	Fair	-
UV Resistant	Yes	-
Minimum bending radius	15 ×	-

Single-core, XLPE insulated, PVC sheathed with copper conductor. Current ratings for various installation methods.

Single Core Cables – Copper Conductor

Area mm ²	DC Res. Ω/km	AC Res. Ω/km	Gnd (a) A	Gnd (b) A	Duct (c) A	Duct (d) A	Air (e) A	Air (f) A	Air (g) A	Dia. mm	Wt. kg/km
1.5	12.100	15.429	27	28	20	23	23	23	31	5.8	50
2.5	7.410	9.449	36	36	26	30	30	31	40	6.2	65
4	4.610	5.878	46	46	34	38	40	41	53	6.8	85
6	3.080	3.927	57	57	42	48	50	52	68	7.3	105
10	1.830	2.334	75	75	56	63	68	70	91	7.9	140
16	1.150	1.467	97	97	73	82	91	93	121	8.9	205
25	0.727	0.927	124	124	96	106	122	125	161	10.5	300
35	0.524	0.669	149	149	117	128	150	154	198	11.5	395
50	0.387	0.494	175	176	140	153	183	189	240	12.9	520
70	0.268	0.343	214	215	174	188	233	240	304	14.7	725
95	0.193	0.248	257	256	212	227	288	297	374	16.5	980
120	0.153	0.197	291	292	243	260	335	346	434	18.0	1220
150	0.124	0.161	327	327	277	295	388	400	499	20.1	1500
185	0.0991	0.129	369	369	316	336	450	464	577	22.2	1860
240	0.0754	0.100	425	426	371	393	536	553	688	24.9	2415
300	0.0601	0.082	479	473	422	447	620	641	797	27.7	2990
400	0.0470	0.066	539	540	482	512	720	743	928	30.9	3845
500	0.0366	0.055	604	606	549	587	834	862	1084	34.9	4950
630	0.0283	0.045	674	673	619	668	955	986	1257	39.3	6295
800	0.0221	0.039	739	741	688	750	1078	1116	1440	43.6	8090
1000	0.0176	0.035	807	808	766	841	1234	1276	1674	52.2	10150

Installation methods: (a) Buried direct, trefoil; (b) Buried direct, flat; (c) In ducts, trefoil; (d) In ducts, flat; (e) Free air, trefoil; (f) Free air, flat touching; (g) Free air, flat spaced.

Laying conditions: Ambient air 40 °C, ground 35 °C, soil resistivity 1.5 K·m/W, depth 0.5 m.

Single-core, XLPE insulated, PVC sheathed with aluminium conductor. Current ratings for various installation methods.

Single Core Cables – Aluminium Conductor

Area mm ²	DC Res. Ω/km	AC Res. Ω/km	Gnd (a) A	Gnd (b) A	Duct (c) A	Duct (d) A	Air (e) A	Air (f) A	Air (g) A	Dia. mm	Wt. kg/km
10	3.080	3.949	60	60	45	50	54	55	72	7.9	85
16	1.910	2.449	75	75	57	63	70	72	94	8.9	105
25	1.200	1.539	96	96	75	83	94	97	125	10.5	150
35	0.868	1.113	116	116	90	99	116	120	153	11.5	185
50	0.641	0.822	136	136	109	118	142	146	186	12.9	230
70	0.443	0.569	166	167	135	146	181	186	236	14.7	310
95	0.320	0.411	199	199	164	176	224	230	290	16.5	400
120	0.253	0.326	226	227	189	202	261	269	337	18.0	490
150	0.206	0.266	254	254	215	229	301	311	387	20.1	600
185	0.164	0.212	288	288	247	261	351	362	449	22.2	735
240	0.125	0.163	333	335	291	307	421	434	536	24.9	935
300	0.100	0.131	378	378	333	350	489	505	622	27.7	1155
400	0.0778	0.104	430	431	385	404	575	594	730	30.9	1465
500	0.0605	0.083	490	492	445	468	676	699	861	34.9	1850
630	0.0469	0.067	557	556	511	539	789	815	1008	39.3	2370
800	0.0367	0.055	622	623	579	614	907	938	1171	43.7	2995
1000	0.0291	0.047	692	693	657	702	1058	1094	1386	52.2	3765

Installation methods: (a) Buried direct, trefoil; (b) Buried direct, flat; (c) In ducts, trefoil; (d) In ducts, flat; (e) Free air, trefoil; (f) Free air, flat touching; (g) Free air, flat spaced.

Laying conditions: Ambient air 40 °C, ground 35 °C, soil resistivity 1.5 K.m/W, depth 0.5 m.

Applications

These cables are intended for fixed installations, indoors and outdoors, in low voltage electricity systems. Normally used for the distribution of electrical energy in urban networks, power or switching stations, industrial plants, as well as in switchgears, in applications where there is no risk of mechanical damage.

Cable Construction

- **Conductor:** Plain annealed stranded circular (rm) or sector shaped (sm) copper conductor, or stranded aluminium conductor (Class 2 to IEC 60228)
- **Insulation:** Extruded layer of Cross-linked Polyethylene (XLPE) to IEC 60502-1
- **Core Identification:** 2C: Red, Black | 3C: Red, Yellow, Blue | 4C: Red, Yellow, Blue, Black
- **Assembly:** Cores assembled together with non-hygroscopic filler if needed
- **Outer Jacket:** Extruded layer of PVC – Type ST2 to IEC 60502-1

Cable Characteristics

Property	Value	Standard
Max. operating temperature	90 °C	-
Max. short circuit temperature	250 °C	-
Flame propagation	Pass	IEC 60332-1-2
Oil resistance	Fair	ASTM D 1047
Mechanical impact	Fair	-
UV Resistant	Yes	-
Minimum bending radius	12 ×	-

Multi-core, XLPE insulated, PVC sheathed, unarmoured with copper conductor.

Two Core Cables

Area mm ²	Type	DC Res. Ω/km	AC Res. Ω/km	Ground A	Ducts A	Air A	Dia. mm	Weight kg/km
1.5	rm	12.1000	15.4287	33	22	28	9.5	130
2.5	rm	7.4100	9.4485	43	29	36	10.4	165
4	rm	4.6100	5.8783	56	38	48	11.5	215
6	rm	3.0800	3.9274	69	48	61	12.6	275
10	rm	1.8300	2.3336	91	63	82	13.8	365
16	rm	1.1500	1.4667	118	83	110	15.8	520
25	rm	0.7270	0.9275	153	110	149	18.9	775
35	rm	0.5240	0.6688	183	133	183	21.0	1010

Three Core Cables

Area mm ²	Type	DC Res. Ω/km	AC Res. Ω/km	Ground A	Ducts A	Air A	Dia. mm	Weight kg/km
1.5	rm	12.1000	15.4287	27	18	23	10.1	150
2.5	rm	7.4100	9.4485	35	24	30	11.0	195
4	rm	4.6100	5.8783	46	31	40	12.1	260
6	rm	3.0800	3.9274	57	39	51	13.4	340
10	rm	1.8300	2.3336	75	53	70	15.1	445
16	rm	1.1500	1.4667	97	69	93	17.3	660
25	rm	0.7270	0.9275	126	92	126	20.6	940
35	sm	0.5240	0.6688	144	105	141	20.0	1210
50	sm	0.3870	0.4944	171	127	173	23.0	1580
70	sm	0.2680	0.3431	209	159	220	26.5	2210
95	sm	0.1930	0.2481	251	193	271	29.9	2970
120	sm	0.1530	0.1976	286	223	317	33.2	3710

Laying conditions: Ambient air 40 °C, ground 35 °C, soil resistivity 1.5 K·m/W, depth 0.5 m. AC resistance at 90 °C (XLPE rated). rm = round stranded, sm = sector shaped.

Multi-core, XLPE insulated, PVC sheathed, unarmoured with copper conductor.

Four Core Cables

Area mm ²	Type	DC Res. Ω/km	AC Res. Ω/km	Ground A	Ducts A	Air A	Dia. mm	Weight kg/km
1.5	rm	12.1000	15.4287	27	18	23	10.8	175
2.5	rm	7.4100	9.4485	35	24	30	11.9	235
4	rm	4.6100	5.8783	46	31	40	13.2	315
6	rm	3.0800	3.9274	57	39	51	14.5	420
10	rm	1.8300	2.3336	75	53	70	16.4	600
16	rm	1.1500	1.4667	97	69	93	18.9	840
25	rm	0.7270	0.9275	126	92	126	22.6	1190
35	sm	0.5240	0.6688	144	105	141	23.0	1535
50	sm	0.3870	0.4944	171	127	173	26.5	2020
70	sm	0.2680	0.3431	209	159	220	30.8	2865
95	sm	0.1930	0.2481	251	193	271	33.5	3890
120	sm	0.1530	0.1976	286	223	317	37.6	4890
150	sm	0.1240	0.1612	319	252	360	42.1	6010
185	sm	0.0991	0.1302	361	288	416	47.1	7475
240	sm	0.0754	0.1012	417	339	495	52.9	9685
300	sm	0.0601	0.0829	470	386	570	58.5	12100
400	sm	0.0470	0.0676	533	444	665	67.1	15550
500	sm	0.0366	0.0561	598	505	764	74.6	20100

Laying conditions: Ambient air 40 °C, ground 35 °C, soil resistivity 1.5 K·m/W, depth 0.5 m. AC resistance at 90 °C (XLPE rated). rm = round stranded, sm = sector shaped.

Four core cables with reduced neutral. XLPE insulated, PVC sheathed, unarmoured with copper conductor.

Four Core Cables with Reduced Neutral

Main + N (mm ²)	DC Res. 20 °C Main / N (Ω/km)	AC Res. 90 °C Main / N (Ω/km)	Ground A	Ducts A	Air A	Dia. mm	Weight kg/km
25+16	0.727 / 1.150	0.928 / 1.467	126	92	126	21.7	1115
35+16	0.524 / 1.150	0.669 / 1.467	144	105	141	23.0	1365
50+25	0.387 / 0.727	0.494 / 0.928	171	127	173	26.5	1825
70+35	0.268 / 0.524	0.343 / 0.669	209	159	220	29.2	2545
95+50	0.193 / 0.387	0.248 / 0.494	251	193	271	33.0	3440
120+70	0.153 / 0.268	0.198 / 0.343	286	223	317	35.9	4380
150+70	0.124 / 0.268	0.161 / 0.343	319	252	360	39.7	5260
185+95	0.0991 / 0.193	0.130 / 0.248	361	288	416	44.6	6630
240+120	0.0754 / 0.153	0.101 / 0.198	417	339	495	49.9	8525
300+150	0.0601 / 0.124	0.083 / 0.161	470	386	570	55.2	10630
400+185	0.0470 / 0.0991	0.068 / 0.130	533	444	665	63.1	13545
500+240	0.0366 / 0.0754	0.056 / 0.101	598	505	764	70.3	17465

Laying conditions: Ambient air 40 °C, ground 35 °C, soil resistivity 1.5 K.m/W, depth 0.5 m. Main cores sector shaped (sm); neutral round stranded (rm) up to 16 mm², sector shaped above.

Multi-core, XLPE insulated, PVC sheathed, unarmoured with aluminium conductor.

Two Core Cables

Area mm ²	Type	DC Res. Ω/km	AC Res. Ω/km	Ground A	Ducts A	Air A	Dia. mm	Weight kg/km
10	rm	3.0800	3.9490	70	49	63	13.8	250
16	rm	1.9100	2.4490	91	64	85	15.8	325
25	rm	1.2000	1.5388	118	85	116	18.4	455
35	rm	0.8680	1.1133	142	103	142	21.0	590

Three Core Cables

Area mm ²	Type	DC Res. Ω/km	AC Res. Ω/km	Ground A	Ducts A	Air A	Dia. mm	Weight kg/km
10	rm	3.0800	3.9490	58	41	53	15.1	265
16	rm	1.9100	2.4490	75	54	72	17.3	370
25	rm	1.2000	1.5388	98	71	98	20.0	475
35	sm	0.8680	1.1133	111	82	109	20.0	575
50	sm	0.6410	0.8224	133	99	134	23.0	720
70	sm	0.4430	0.5688	163	123	171	26.5	955
95	sm	0.3200	0.4115	195	150	210	29.9	1235
120	sm	0.2530	0.3259	222	173	246	33.2	1525

Laying conditions: Ambient air 40 °C, ground 35 °C, soil resistivity 1.5 K·m/W, depth 0.5 m. AC resistance at 90 °C (XLPE rated). rm = round stranded, sm = sector shaped.

Multi-core, XLPE insulated, PVC sheathed, unarmoured with aluminium conductor.

Four Core Cables

Area mm ²	Type	DC Res. Ω/km	AC Res. Ω/km	Ground A	Ducts A	Air A	Dia. mm	Weight kg/km
10	rm	3.0800	3.9490	58	41	53	16.4	365
16	rm	1.9100	2.4490	75	54	72	18.9	455
25	rm	1.2000	1.5388	98	71	98	22.0	575
35	sm	0.8680	1.1133	111	82	109	23.0	685
50	sm	0.6410	0.8224	133	99	134	26.5	880
70	sm	0.4430	0.5688	163	123	171	30.8	1190
95	sm	0.3200	0.4115	195	150	210	33.5	1580
120	sm	0.2530	0.3259	222	173	246	37.6	1970
150	sm	0.2060	0.2660	248	196	280	42.1	2410
185	sm	0.1640	0.2126	282	225	325	47.1	2960
240	sm	0.1250	0.1634	327	265	388	52.9	3795
300	sm	0.1000	0.1321	370	304	449	58.5	4635
400	sm	0.0778	0.1047	424	354	530	67.1	6000
500	sm	0.0605	0.0838	484	408	618	74.6	7570

Laying conditions: Ambient air 40 °C, ground 35 °C, soil resistivity 1.5 K·m/W, depth 0.5 m. AC resistance at 90 °C (XLPE rated). rm = round stranded, sm = sector shaped.

Four core cables with reduced neutral. XLPE insulated, PVC sheathed, unarmoured with aluminium conductor.

Four Core Cables with Reduced Neutral

Main + N (mm ²)	DC Res. 20 °C Main / N (Ω/km)	AC Res. 90 °C Main / N (Ω/km)	Ground A	Ducts A	Air A	Dia. mm	Weight kg/km
50+25	0.641 / 1.200	0.822 / 1.539	133	99	134	26.5	815
70+35	0.443 / 0.868	0.569 / 1.113	163	123	171	29.2	1080
95+50	0.320 / 0.641	0.412 / 0.822	195	150	210	33.0	1420
120+70	0.253 / 0.443	0.326 / 0.569	222	173	246	35.9	1775
150+70	0.206 / 0.443	0.266 / 0.569	248	196	280	39.7	2140
185+95	0.164 / 0.320	0.213 / 0.412	282	225	325	44.6	2670
240+120	0.125 / 0.253	0.163 / 0.326	327	265	388	49.9	3380
300+150	0.100 / 0.206	0.132 / 0.266	370	304	449	55.2	4130
400+185	0.0778 / 0.164	0.105 / 0.213	424	354	530	63.1	5255
500+240	0.0605 / 0.125	0.084 / 0.163	484	408	618	70.3	6600

Laying conditions: Ambient air 40 °C, ground 35 °C, soil resistivity 1.5 K·m/W, depth 0.5 m. Main cores sector shaped (sm); neutral round stranded (rm) up to 25 mm², sector shaped above.

Applications

These cables are intended for fixed installations, indoors and outdoors, in low voltage electricity systems. Normally used for the distribution of electrical energy in urban networks, power or switching stations, industrial plants, as well as in switchgears, in applications where there is a risk of mechanical damage. Aluminium wire armouring provides non-magnetic protection ideal for single-core applications.

Cable Construction

- **Conductor:** Plain annealed stranded circular or circular compacted copper conductor, or stranded aluminium conductor (Class 2 to IEC 60228)
- **Insulation:** Extruded layer of Cross-linked Polyethylene (XLPE) to IEC 60502-1
- **Core Identification:** Red (other colours available on request)
- **Bedding:** Extruded layer of PVC – Type ST2 to IEC 60502-1
- **Armouring:** Single layer of round non-magnetic (aluminium) wires (AWA)
- **Outer Jacket:** Extruded layer of PVC – Type ST2 to IEC 60502-1

Cable Characteristics

Property	Value	Standard
Max. operating temperature	90 °C	-
Max. short circuit temperature	250 °C	-
Flame propagation	Pass	IEC 60332-1-2
Oil resistance	Fair	ASTM D 1047
Mechanical impact	Very Good	-
UV Resistant	Yes	-
Minimum bending radius	12 ×	-

Single-core, XLPE insulated, aluminium wire armoured (AWA), PVC sheathed with copper conductor.

Single Core Cables – Copper Conductor

Area mm ²	DC Res. Ω/km	AC Res. Ω/km	Gnd (a) A	Gnd (b) A	Duct (c) A	Duct (d) A	Air (e) A	Air (f) A	Air (g) A	Dia. mm	Wt. kg/km
6	3.080	3.927	59	59	49	54	60	61	75	13.0	255
10	1.830	2.334	78	78	65	71	80	82	100	13.6	300
16	1.150	1.467	99	99	83	91	105	107	132	14.6	380
25	0.727	0.927	127	127	107	117	138	141	172	16.2	500
35	0.524	0.669	151	151	128	139	168	171	208	17.2	615
50	0.387	0.494	178	178	152	163	202	206	249	18.8	765
70	0.268	0.342	217	215	189	198	253	257	307	20.6	1000
95	0.193	0.247	257	255	223	234	308	310	366	22.4	1285
120	0.153	0.196	290	287	253	263	354	354	413	24.1	1560
150	0.124	0.160	323	318	284	291	403	400	461	26.0	1860
185	0.0991	0.129	361	354	320	322	461	453	512	28.3	2270
240	0.0754	0.099	411	401	367	360	539	521	579	31.0	2870
300	0.0601	0.081	456	440	410	391	612	583	637	33.6	3475
400	0.0470	0.065	494	472	450	410	685	628	672	38.2	4535
500	0.0366	0.053	539	511	497	439	770	691	729	42.2	5715
630	0.0283	0.044	582	547	541	465	854	749	783	46.4	7130
800	0.0221	0.037	599	565	564	481	908	781	829	52.3	9240
1000	0.0176	0.032	629	595	601	513	996	849	915	61.1	11550

Installation methods: (a) Buried direct, trefoil; (b) Buried direct, flat; (c) In ducts, trefoil; (d) In ducts, flat; (e) Free air, trefoil; (f) Free air, flat touching; (g) Free air, flat spaced.

Laying conditions: Ambient air 40 °C, ground 35 °C, soil resistivity 1.5 K.m/W, depth 0.5 m.

Single-core, XLPE insulated, aluminium wire armoured (AWA), PVC sheathed with aluminium conductor.

Single Core Cables – Aluminium Conductor

Area mm ²	DC Res. Ω/km	AC Res. Ω/km	Gnd (a) A	Gnd (b) A	Duct (c) A	Duct (d) A	Air (e) A	Air (f) A	Air (g) A	Dia. mm	Wt. kg/km
10	3.080	3.949	62	62	51	57	63	65	80	13.6	240
16	1.910	2.449	77	77	65	71	81	83	102	14.6	285
25	1.200	1.539	99	99	83	91	107	110	134	16.2	350
35	0.868	1.113	118	118	100	108	130	133	163	17.2	405
50	0.641	0.822	139	139	118	128	157	161	195	18.8	480
70	0.443	0.568	169	169	145	156	197	201	242	20.6	585
95	0.320	0.411	201	200	174	185	240	244	292	22.4	705
120	0.253	0.325	228	226	198	209	278	281	332	24.1	830
150	0.206	0.265	254	252	223	232	317	319	373	26.0	965
185	0.164	0.212	286	282	253	260	365	364	421	28.3	1150
240	0.125	0.162	328	323	293	297	430	425	483	31.0	1390
300	0.100	0.131	368	359	330	328	492	481	539	33.6	1640
400	0.0778	0.103	408	395	372	354	564	536	587	38.2	2150
500	0.0605	0.082	455	437	418	387	647	602	650	42.2	2620
630	0.0469	0.065	501	478	466	421	733	668	711	46.4	3205
800	0.0367	0.053	531	507	500	443	802	714	767	52.4	4150
1000	0.0291	0.045	570	545	545	480	898	789	858	61.1	5165

Installation methods: (a) Buried direct, trefoil; (b) Buried direct, flat; (c) In ducts, trefoil; (d) In ducts, flat; (e) Free air, trefoil; (f) Free air, flat touching; (g) Free air, flat spaced.

Laying conditions: Ambient air 40 °C, ground 35 °C, soil resistivity 1.5 K.m/W, depth 0.5 m.

Applications

These cables are intended for fixed installations, indoors and outdoors, in low voltage electricity systems. Normally used for the distribution of electrical energy in urban networks, power or switching stations, industrial plants, as well as in switchgears, in applications where there is a risk of mechanical damage.

Cable Construction

- **Conductor:** Plain annealed stranded circular (rm) or sector shaped (sm) copper conductor, or stranded aluminium conductor (Class 2 to IEC 60228)
- **Insulation:** Extruded layer of Cross-linked Polyethylene (XLPE) to IEC 60502-1
- **Core Identification:** 2C: Red, Black | 3C: Red, Yellow, Blue | 4C: Red, Yellow, Blue, Black
- **Assembly:** Cores assembled together with non-hygroscopic filler if needed
- **Bedding:** Extruded layer of PVC – Type ST2 to IEC 60502-1
- **Armouring:** Double layers of galvanized steel tapes (STA)
- **Outer Jacket:** Extruded layer of PVC – Type ST2 to IEC 60502-1

Cable Characteristics

Property	Value	Standard
Max. operating temperature	90 °C	-
Max. short circuit temperature	250 °C	-
Flame propagation	Pass	IEC 60332-1-2
Oil resistance	Fair	ASTM D 1047
Mechanical impact	Very Good	-
UV Resistant	Yes	-
Minimum bending radius	12 ×	-

Multi-core, XLPE insulated, steel tape armoured (STA), PVC sheathed with copper conductor.

Two Core Cables

Area mm ²	Type	DC Res. Ω/km	AC Res. Ω/km	Ground A	Ducts A	Air A	Dia. mm	Weight kg/km
6	rm	3.0800	3.9274	67	49	62	15.4	430
10	rm	1.8300	2.3336	89	65	83	16.6	530
16	rm	1.1500	1.4667	114	84	110	18.6	705
25	rm	0.7270	0.9275	148	111	148	21.7	1000
35	rm	0.5240	0.6688	177	134	180	23.8	1260

Three Core Cables

Area mm ²	Type	DC Res. Ω/km	AC Res. Ω/km	Ground A	Ducts A	Air A	Dia. mm	Weight kg/km
6	rm	3.0800	3.9274	55	40	52	16.2	500
10	rm	1.8300	2.3336	74	54	70	17.9	615
16	rm	1.1500	1.4667	95	70	93	20.1	835
25	rm	0.7270	0.9275	123	92	124	23.4	1170
35	sm	0.5240	0.6688	140	106	140	22.8	1390
50	sm	0.3870	0.4944	166	128	171	25.8	1790
70	sm	0.2680	0.3431	203	159	215	29.7	2495
95	sm	0.1930	0.2481	243	193	263	33.3	3310
120	sm	0.1530	0.1976	278	224	310	37.8	4430

Laying conditions: Ambient air 40 °C, ground 35 °C, soil resistivity 1.5 K·m/W, depth 0.5 m. AC resistance at 90 °C (XLPE rated). rm = round stranded, sm = sector shaped.

Multi-core, XLPE insulated, steel tape armoured (STA), PVC sheathed with copper conductor.

Four Core Cables

Area mm ²	Type	DC Res. Ω/km	AC Res. Ω/km	Ground A	Ducts A	Air A	Dia. mm	Weight kg/km
4	rm	4.6100	5.8783	45	32	41	16.0	480
6	rm	3.0800	3.9274	55	40	52	17.3	590
10	rm	1.8300	2.3336	74	54	70	19.2	755
16	rm	1.1500	1.4667	95	70	93	21.7	1020
25	rm	0.7270	0.9275	123	92	124	25.4	1465
35	sm	0.5240	0.6688	140	106	140	25.8	1780
50	sm	0.3870	0.4944	166	128	171	29.5	2320
70	sm	0.2680	0.3431	203	159	215	34.0	3235
95	sm	0.1930	0.2481	243	193	263	38.1	4630
120	sm	0.1530	0.1976	278	224	310	42.6	5760
150	sm	0.1240	0.1612	310	252	349	47.1	6990
185	sm	0.0991	0.1302	349	287	402	52.1	8590
240	sm	0.0754	0.1012	402	335	473	58.3	10995
300	sm	0.0601	0.0829	452	380	541	63.9	13550
400	sm	0.0470	0.0676	511	435	627	72.9	17260
500	sm	0.0366	0.0561	570	491	713	81.8	22775

Laying conditions: Ambient air 40 °C, ground 35 °C, soil resistivity 1.5 K·m/W, depth 0.5 m. AC resistance at 90 °C (XLPE rated).

Four core cables with reduced neutral. XLPE insulated, steel tape armoured (STA), PVC sheathed with copper conductor.

Four Core Cables with Reduced Neutral

Main + N (mm ²)	DC Res. 20 °C Main / N (Ω/km)	AC Res. 90 °C Main / N (Ω/km)	Ground A	Ducts A	Air A	Dia. mm	Weight kg/km
25+16	0.727 / 1.150	0.928 / 1.467	123	92	124	24.5	1370
35+16	0.524 / 1.150	0.669 / 1.467	140	106	140	25.8	1635
50+25	0.387 / 0.727	0.494 / 0.928	166	128	171	29.3	2135
70+35	0.268 / 0.524	0.343 / 0.669	203	159	215	32.6	2905
95+50	0.193 / 0.387	0.248 / 0.494	243	193	263	37.4	4160
120+70	0.153 / 0.268	0.198 / 0.343	278	224	310	40.5	5185
150+70	0.124 / 0.268	0.161 / 0.343	310	252	349	44.7	6165
185+95	0.0991 / 0.193	0.130 / 0.248	349	287	402	49.6	7650
240+120	0.0754 / 0.153	0.101 / 0.198	402	335	473	55.5	9735
300+150	0.0601 / 0.124	0.083 / 0.161	452	380	541	60.6	11940
400+185	0.0470 / 0.0991	0.068 / 0.130	511	435	627	68.5	15100
500+240	0.0366 / 0.0754	0.056 / 0.101	570	491	713	76.1	19270

Laying conditions: Ambient air 40 °C, ground 35 °C, soil resistivity 1.5 K.m/W, depth 0.5 m. Main cores sector shaped (sm); neutral round stranded (rm) up to 16 mm², sector shaped above.

Multi-core, XLPE insulated, steel tape armoured (STA), PVC sheathed with aluminium conductor.

Two Core Cables

Area mm ²	Type	DC Res. Ω/km	AC Res. Ω/km	Ground A	Ducts A	Air A	Dia. mm	Weight kg/km
10	rm	3.0800	3.9490	68	50	64	16.6	410
16	rm	1.9100	2.4490	89	65	85	18.6	515
25	rm	1.2000	1.5388	115	86	115	21.2	675
35	rm	0.8680	1.1133	138	104	140	23.8	840

Three Core Cables

Area mm ²	Type	DC Res. Ω/km	AC Res. Ω/km	Ground A	Ducts A	Air A	Dia. mm	Weight kg/km
10	rm	3.0800	3.9490	57	41	54	17.9	440
16	rm	1.9100	2.4490	73	54	72	20.1	545
25	rm	1.2000	1.5388	95	72	97	22.8	700
35	sm	0.8680	1.1133	108	82	108	22.8	750
50	sm	0.6410	0.8224	129	99	132	25.8	930
70	sm	0.4430	0.5688	158	124	167	29.7	1235
95	sm	0.3200	0.4115	189	150	204	33.3	1575
120	sm	0.2530	0.3259	217	174	241	37.8	2245

Laying conditions: Ambient air 40 °C, ground 35 °C, soil resistivity 1.5 K·m/W, depth 0.5 m. AC resistance at 90 °C (XLPE rated). rm = round stranded, sm = sector shaped.

Multi-core, XLPE insulated, steel tape armoured (STA), PVC sheathed with aluminium conductor.

Four Core Cables

Area mm ²	Type	DC Res. Ω/km	AC Res. Ω/km	Ground A	Ducts A	Air A	Dia. mm	Weight kg/km
10	rm	3.0800	3.9490	57	41	54	19.2	515
16	rm	1.9100	2.4490	73	54	72	21.7	640
25	rm	1.2000	1.5388	95	72	97	24.8	845
35	sm	0.8680	1.1133	108	82	108	25.8	930
50	sm	0.6410	0.8224	129	99	132	29.5	1180
70	sm	0.4430	0.5688	158	124	167	34.0	1560
95	sm	0.3200	0.4115	189	150	204	38.1	2315
120	sm	0.2530	0.3259	217	174	241	42.6	2845
150	sm	0.2060	0.2660	241	196	272	47.1	3390
185	sm	0.1640	0.2126	274	255	314	52.1	4075
240	sm	0.1250	0.1634	317	264	372	58.3	5105
300	sm	0.1000	0.1321	357	301	428	63.9	6085
400	sm	0.0778	0.1047	410	349	503	72.9	7705
500	sm	0.0605	0.0838	464	400	580	81.8	10245

Four Core Cables with Reduced Neutral

Main + N (mm ²)	DC Res. 20 °C Main / N (Ω/km)	AC Res. 90 °C Main / N (Ω/km)	Ground A	Ducts A	Air A	Dia. mm	Weight kg/km
50+25	0.641 / 1.200	0.822 / 1.539	129	99	132	29.3	1125
70+35	0.443 / 0.868	0.569 / 1.113	158	124	167	32.6	1435
95+50	0.320 / 0.641	0.412 / 0.822	189	150	204	37.4	2140
120+70	0.253 / 0.443	0.326 / 0.569	217	174	241	40.5	2580
150+70	0.206 / 0.443	0.266 / 0.569	241	196	272	44.7	3045
185+95	0.164 / 0.320	0.213 / 0.412	274	255	314	49.6	3690
240+120	0.125 / 0.253	0.163 / 0.326	317	264	372	55.5	4590
300+150	0.100 / 0.206	0.132 / 0.266	357	301	428	60.6	5445
400+185	0.0778 / 0.164	0.105 / 0.213	410	349	503	68.5	6805
500+240	0.0605 / 0.125	0.084 / 0.163	464	400	580	76.1	8405

Laying conditions: Ambient air 40 °C, ground 35 °C, soil resistivity 1.5 K.m/W, depth 0.5 m.

Applications

These cables are intended for fixed installations, indoors and outdoors, in low voltage electricity systems. Normally used for the distribution of electrical energy in urban networks, power or switching stations, industrial plants, as well as in switchgears, in applications where there is a risk of mechanical damage.

Cable Construction

- **Conductor:** Plain annealed stranded circular (rm) or sector shaped (sm) copper conductor, or stranded aluminium conductor (Class 2 to IEC 60228)
- **Insulation:** Extruded layer of Cross-linked Polyethylene (XLPE) to IEC 60502-1
- **Core Identification:** 2C: Red, Black | 3C: Red, Yellow, Blue | 4C: Red, Yellow, Blue, Black
- **Assembly:** Cores assembled together with non-hygroscopic filler if needed
- **Bedding:** Extruded layer of PVC – Type ST2 to IEC 60502-1
- **Armouring:** Single layer of round galvanized steel wires (SWA)
- **Outer Jacket:** Extruded layer of PVC – Type ST2 to IEC 60502-1

Cable Characteristics

Property	Value	Standard
Max. operating temperature	90 °C	-
Max. short circuit temperature	250 °C	-
Flame propagation	Pass	IEC 60332-1-2
Oil resistance	Fair	ASTM D 1047
Mechanical impact	Very Good	-
UV Resistant	Yes	-
Minimum bending radius	12 ×	-

Multi-core, XLPE insulated, steel wire armoured (SWA), PVC sheathed with copper conductor.

Two Core Cables

Area mm ²	Type	DC Res. Ω/km	AC Res. Ω/km	Ground A	Ducts A	Air A	Dia. mm	Weight kg/km
1.5	rm	12.1000	15.4287	33	24	29	13.1	340
2.5	rm	7.4100	9.4485	42	31	38	14.0	395
4	rm	4.6100	5.8783	55	40	51	15.1	465
6	rm	3.0800	3.9274	68	50	64	16.2	550
10	rm	1.8300	2.3336	90	67	87	18.3	775
16	rm	1.1500	1.4667	116	87	114	20.3	990
25	rm	0.7270	0.9275	151	114	154	24.1	1465
35	rm	0.5240	0.6688	180	138	188	26.2	1780

Three Core Cables

Area mm ²	Type	DC Res. Ω/km	AC Res. Ω/km	Ground A	Ducts A	Air A	Dia. mm	Weight kg/km
1.5	rm	12.1000	15.4287	27	19	24	13.6	365
2.5	rm	7.4100	9.4485	35	25	32	14.6	435
4	rm	4.6100	5.8783	45	33	42	15.7	520
6	rm	3.0800	3.9274	56	41	53	17.0	630
10	rm	1.8300	2.3336	75	56	73	19.6	885
16	rm	1.1500	1.4667	96	72	96	21.8	1140
25	rm	0.7270	0.9275	125	95	130	25.8	1675
35	sm	0.5240	0.6688	142	109	145	25.2	1880
50	sm	0.3870	0.4944	169	132	177	28.4	2385
70	sm	0.2680	0.3431	206	163	222	33.1	3385
95	sm	0.1930	0.2481	246	197	271	36.7	4320
120	sm	0.1530	0.1976	279	226	314	40.0	5190

Laying conditions: Ambient air 40 °C, ground 35 °C, soil resistivity 1.5 K·m/W, depth 0.5 m. AC resistance at 90 °C (XLPE rated).

Multi-core, XLPE insulated, steel wire armoured (SWA), PVC sheathed with copper conductor.

Four Core Cables

Area mm ²	Type	DC Res. Ω/km	AC Res. Ω/km	Ground A	Ducts A	Air A	Dia. mm	Weight kg/km
1.5	rm	12.1000	15.4287	27	19	24	14.4	410
2.5	rm	7.4100	9.4485	35	25	32	15.5	490
4	rm	4.6100	5.8783	45	33	42	16.8	600
6	rm	3.0800	3.9274	56	41	53	19.0	855
10	rm	1.8300	2.3336	75	56	73	20.9	1045
16	rm	1.1500	1.4667	96	72	96	24.1	1490
25	rm	0.7270	0.9275	125	95	130	27.8	2025
35	sm	0.5240	0.6688	142	109	145	28.4	2370
50	sm	0.3870	0.4944	169	132	177	32.1	3000
70	sm	0.2680	0.3431	206	163	222	37.6	4285
95	sm	0.1930	0.2481	246	197	271	40.3	5410
120	sm	0.1530	0.1976	279	226	314	45.8	7000
150	sm	0.1240	0.1612	311	255	356	50.3	8370
185	sm	0.0991	0.1302	349	290	407	55.3	10110
240	sm	0.0754	0.1012	400	336	470	61.5	12720
300	sm	0.0601	0.0829	446	378	541	67.1	15450
400	sm	0.0470	0.0676	499	427	620	77.4	20280
500	sm	0.0366	0.0561	546	474	695	85.1	25405

Laying conditions: Ambient air 40 °C, ground 35 °C, soil resistivity 1.5 K·m/W, depth 0.5 m. AC resistance at 90 °C (XLPE rated).

Four core cables with reduced neutral. XLPE insulated, steel wire armoured (SWA), PVC sheathed with copper conductor.

Four Core Cables with Reduced Neutral

Main + N (mm ²)	DC Res. 20 °C Main / N (Ω/km)	AC Res. 90 °C Main / N (Ω/km)	Ground A	Ducts A	Air A	Dia. mm	Weight kg/km
25+16	0.727 / 1.150	0.928 / 1.467	125	95	130	26.9	1905
35+16	0.524 / 1.150	0.669 / 1.467	142	109	145	28.2	2210
50+25	0.387 / 0.727	0.494 / 0.928	169	132	177	31.9	2810
70+35	0.268 / 0.524	0.343 / 0.669	206	163	222	36.0	3890
95+50	0.193 / 0.387	0.248 / 0.494	246	197	271	39.6	4925
120+70	0.153 / 0.268	0.198 / 0.343	279	226	314	42.7	6015
150+70	0.124 / 0.268	0.161 / 0.343	311	255	356	47.9	7495
185+95	0.0991 / 0.193	0.130 / 0.248	349	290	407	52.8	9120
240+120	0.0754 / 0.153	0.101 / 0.198	400	336	470	58.7	11375
300+150	0.0601 / 0.124	0.083 / 0.161	446	378	541	63.8	13755
400+185	0.0470 / 0.0991	0.068 / 0.130	499	427	620	73.0	17975
500+240	0.0366 / 0.0754	0.056 / 0.101	546	474	695	80.8	22485

Laying conditions: Ambient air 40 °C, ground 35 °C, soil resistivity 1.5 K.m/W, depth 0.5 m. Main cores sector shaped (sm); neutral round stranded (rm) up to 16 mm², sector shaped above.

Multi-core, XLPE insulated, steel wire armoured (SWA), PVC sheathed with aluminium conductor.

Two Core Cables

Area mm ²	Type	DC Res. Ω/km	AC Res. Ω/km	Ground A	Ducts A	Air A	Dia. mm	Weight kg/km
10	rm	3.0800	3.9490	69	51	67	18.3	660
16	rm	1.9100	2.4490	90	67	88	20.3	800
25	rm	1.2000	1.5388	117	89	120	23.6	1130
35	rm	0.8680	1.1133	140	107	146	26.2	1360

Three Core Cables

Area mm ²	Type	DC Res. Ω/km	AC Res. Ω/km	Ground A	Ducts A	Air A	Dia. mm	Weight kg/km
10	rm	3.0800	3.9490	57	43	56	19.6	705
16	rm	1.9100	2.4490	74	56	74	21.8	855
25	rm	1.2000	1.5388	97	74	101	25.2	1195
35	sm	0.8680	1.1133	110	85	113	25.2	1245
50	sm	0.6410	0.8224	131	102	137	28.4	1525
70	sm	0.4430	0.5688	160	127	173	33.1	2125
95	sm	0.3200	0.4115	191	153	211	36.7	2585
120	sm	0.2530	0.3259	218	176	245	40.0	3005

Laying conditions: Ambient air 40 °C, ground 35 °C, soil resistivity 1.5 K-m/W, depth 0.5 m. AC resistance at 90 °C (XLPE rated).

Multi-core, XLPE insulated, steel wire armoured (SWA), PVC sheathed with aluminium conductor.

Four Core Cables

Area mm ²	Type	DC Res. Ω/km	AC Res. Ω/km	Ground A	Ducts A	Air A	Dia. mm	Weight kg/km
10	rm	3.0800	3.9490	57	43	56	20.9	810
16	rm	1.9100	2.4490	74	56	74	24.1	1105
25	rm	1.2000	1.5388	97	74	101	27.2	1395
35	sm	0.8680	1.1133	110	85	113	28.4	1525
50	sm	0.6410	0.8224	131	102	137	32.1	1855
70	sm	0.4430	0.5688	160	127	173	37.6	2605
95	sm	0.3200	0.4115	191	153	211	40.3	3100
120	sm	0.2530	0.3259	218	176	245	45.8	4085
150	sm	0.2060	0.2660	243	199	278	50.3	4770
185	sm	0.1640	0.2126	274	228	320	55.3	5600
240	sm	0.1250	0.1634	317	265	376	61.5	6835
300	sm	0.1000	0.1321	356	301	430	67.1	7985
400	sm	0.0778	0.1047	404	346	501	77.4	10730
500	sm	0.0605	0.0838	452	393	574	85.1	12875

Four Core Cables with Reduced Neutral

Main + N (mm ²)	DC Res. 20 °C Main / N (Ω/km)	AC Res. 90 °C Main / N (Ω/km)	Ground A	Ducts A	Air A	Dia. mm	Weight kg/km
50+25	0.641 / 1.200	0.822 / 1.539	131	102	137	31.9	1800
70+35	0.443 / 0.868	0.569 / 1.113	160	127	173	36.0	2420
95+50	0.320 / 0.641	0.412 / 0.822	191	153	211	39.6	2905
120+70	0.253 / 0.443	0.326 / 0.569	218	176	245	42.7	3410
150+70	0.206 / 0.443	0.266 / 0.569	243	199	278	47.9	4375
185+95	0.164 / 0.320	0.213 / 0.412	274	228	320	52.8	5160
240+120	0.125 / 0.253	0.163 / 0.326	317	265	376	58.7	6230
300+150	0.100 / 0.206	0.132 / 0.266	356	301	430	63.8	7255
400+185	0.0778 / 0.164	0.105 / 0.213	404	346	501	73.0	9685
500+240	0.0605 / 0.125	0.084 / 0.163	452	393	574	80.8	11615

Laying conditions: Ambient air 40 °C, ground 35 °C, soil resistivity 1.5 K·m/W, depth 0.5 m.

Applications

These cables are intended for fixed installations, indoors and outdoors, in low voltage control systems. Normally used for connecting signaling and control units in industry, in railways, in traffic signals, in power or switching stations, as well as in switchgears, in applications where there is no risk of mechanical damage.

Cable Construction

- **Conductor:** Plain annealed stranded circular copper conductor (Class 2 to IEC 60228)
- **Insulation:** Extruded layer of PVC – Type PVC/A to IEC 60502-1
- **Core Identification:** Black with printed numbers (ICEA/NEMA-E.3.4 Method 4)
- **Assembly:** Cores assembled together with non-hygroscopic filler if needed
- **Outer Jacket:** Extruded layer of PVC – Type ST1 to IEC 60502-1

Cable Characteristics

Property	Value	Standard
Max. operating temperature	70 °C	-
Max. short circuit temperature	160 °C	-
Flame propagation	Pass	IEC 60332-1-2
Oil resistance	Fair	ASTM D 1047
Mechanical impact	Fair	-
UV Resistant	Yes	-
Minimum bending radius	12 ×	-

Control cables, PVC insulated, PVC sheathed, unarmoured with copper conductor. DC Res.: 12.100 Ω /km, AC Res.: 14.478 Ω /km.

1.5 mm² Conductor – 2 to 48 Cores

Cores × mm ²	Ground A	Ducts A	Air A	Dia. mm	Weight kg/km
2 × 1.5	27	19	21	9.9	145
3 × 1.5	23	15	18	10.4	170
4 × 1.5	23	15	18	11.3	205
5 × 1.5	17	12	14	12.6	220
7 × 1.5	15	10	12	13.7	275
10 × 1.5	13	9	11	16.9	375
12 × 1.5	12	8	10	17.4	425
14 × 1.5	11	8	10	18.2	480
16 × 1.5	11	8	10	19.4	545
19 × 1.5	10	7	9	20.4	620
24 × 1.5	9	7	9	23.6	765
30 × 1.5	8	6	8	24.9	920
37 × 1.5	7	6	7	27.1	1105
40 × 1.5	7	5	7	28.2	1195
48 × 1.5	7	5	7	31.0	1410

Laying conditions: Ambient air 40 °C, ground 35 °C, soil resistivity 1.5 K·m/W, depth 0.5 m.

Control cables, PVC insulated, PVC sheathed, unarmoured with copper conductor.

2.5 mm² Conductor - DC Res.: 7.410 Ω /km, AC Res.: 8.866 Ω /km

Cores × mm ²	Ground A	Ducts A	Air A	Dia. mm	Weight kg/km
2 × 2.5	36	24	28	10.8	185
3 × 2.5	29	20	23	11.4	220
4 × 2.5	29	20	23	12.3	265
5 × 2.5	22	15	18	13.9	290
7 × 2.5	19	13	16	14.9	360
10 × 2.5	17	12	15	18.5	495
12 × 2.5	16	11	14	19.1	570
14 × 2.5	15	10	13	20.0	645
16 × 2.5	14	10	13	21.3	735
19 × 2.5	13	9	12	22.4	840
24 × 2.5	12	9	11	26.0	1045
30 × 2.5	11	8	10	27.5	1260
37 × 2.5	10	7	10	29.9	1525
40 × 2.5	9	7	10	31.3	1660
48 × 2.5	9	7	9	34.5	1975

4.0 mm² Conductor - DC Res.: 4.610 Ω /km, AC Res.: 5.516 Ω /km

Cores × mm ²	Ground A	Ducts A	Air A	Dia. mm	Weight kg/km
2 × 4.0	47	32	38	12.7	260
3 × 4.0	38	26	32	13.4	315
4 × 4.0	38	26	32	14.6	385
5 × 4.0	29	21	25	16.4	420
7 × 4.0	25	18	22	17.9	535
10 × 4.0	22	16	20	22.5	740
12 × 4.0	20	15	19	23.2	860
14 × 4.0	19	14	18	24.4	980
16 × 4.0	18	13	17	26.0	1120
19 × 4.0	17	12	16	27.4	1285
24 × 4.0	15	12	16	32.2	1620
30 × 4.0	14	11	14	34.3	1990
37 × 4.0	13	10	13	37.5	2430
40 × 4.0	12	9	13	39.0	2620
48 × 4.0	11	9	13	43.0	3115

Laying conditions: Ambient air 40 °C, ground 35 °C, soil resistivity 1.5 K.m/W, depth 0.5 m.

Applications

These cables are intended for fixed installations, indoors and outdoors, in low voltage control systems. Normally used for connecting signaling and control units in industry, in railways, in traffic signals, in power or switching stations, as well as in switchgears, in applications where there is no risk of mechanical damage. The copper tape shield provides electromagnetic interference (EMI) protection.

Cable Construction

- **Conductor:** Plain annealed stranded circular copper conductor (Class 2 to IEC 60228)
- **Insulation:** Extruded layer of PVC – Type PVC/A to IEC 60502-1
- **Core Identification:** Black with printed numbers (ICEA/NEMA-E.3.4 Method 4)
- **Assembly:** Cores assembled together with non-hygroscopic filler if needed
- **Bedding:** Extruded layer of PVC – Type ST1 to IEC 60502-1
- **Shielding:** Single copper tape applied helically with suitable overlap
- **Outer Jacket:** Extruded layer of PVC – Type ST1 to IEC 60502-1

Cable Characteristics

Property	Value	Standard
Max. operating temperature	70 °C	-
Max. short circuit temperature	160 °C	-
Flame propagation	Pass	IEC 60332-1-2
Oil resistance	Fair	ASTM D 1047
Mechanical impact	Fair	-
UV Resistant	Yes	-
Minimum bending radius	12 ×	-

Control cables, PVC insulated, copper tape shielded, PVC sheathed with copper conductor. DC Res.: 12.100 Ω /km, AC Res.: 14.478 Ω /km.

1.5 mm² Conductor – 2 to 48 Cores

Cores × mm ²	Ground A	Ducts A	Air A	Dia. mm	Weight kg/km
2 × 1.5	27	19	22	12.2	225
3 × 1.5	22	15	18	12.8	255
4 × 1.5	22	15	18	13.6	290
5 × 1.5	16	12	14	15.0	315
7 × 1.5	14	10	12	16.0	380
10 × 1.5	13	9	11	19.2	500
12 × 1.5	12	9	10	19.7	555
14 × 1.5	11	8	10	20.5	615
16 × 1.5	10	8	9	21.7	690
19 × 1.5	10	7	9	22.7	770
24 × 1.5	9	7	8	25.9	940
30 × 1.5	8	6	8	27.2	1105
37 × 1.5	7	5	7	29.4	1305
40 × 1.5	7	5	7	30.5	1405
48 × 1.5	7	5	7	33.3	1645

Laying conditions: Ambient air 40 °C, ground 35 °C, soil resistivity 1.5 K·m/W, depth 0.5 m.

Control cables, PVC insulated, copper tape shielded, PVC sheathed with copper conductor.

2.5 mm² Conductor – DC Res.: 7.410 Ω/km, AC Res.: 8.866 Ω/km

Cores × mm ²	Ground A	Ducts A	Air A	Dia. mm	Weight kg/km
2 × 2.5	35	25	29	13.1	270
3 × 2.5	29	20	24	13.7	310
4 × 2.5	29	20	24	14.7	360
5 × 2.5	21	16	18	16.1	385
7 × 2.5	19	14	16	17.2	475
10 × 2.5	16	12	15	20.8	635
12 × 2.5	15	11	14	21.4	715
14 × 2.5	14	10	13	22.3	795
16 × 2.5	13	10	13	23.6	895
19 × 2.5	12	9	12	24.7	1005
24 × 2.5	11	9	11	28.3	1245
30 × 2.5	10	8	10	29.8	1465
37 × 2.5	9	7	10	32.4	1765
40 × 2.5	9	7	9	33.6	1895
48 × 2.5	8	7	9	37.2	2265

4.0 mm² Conductor – DC Res.: 4.610 Ω/km, AC Res.: 5.516 Ω/km

Cores × mm ²	Ground A	Ducts A	Air A	Dia. mm	Weight kg/km
2 × 4.0	45	33	39	15.0	360
3 × 4.0	37	27	32	15.8	420
4 × 4.0	37	27	32	16.9	500
5 × 4.0	28	21	25	18.8	535
7 × 4.0	24	18	22	20.2	670
10 × 4.0	21	16	20	24.8	910
12 × 4.0	20	15	19	25.5	1035
14 × 4.0	19	14	18	26.7	1165
16 × 4.0	18	13	17	28.3	1315
19 × 4.0	16	12	16	29.7	1490
24 × 4.0	15	12	15	34.9	1895
30 × 4.0	13	11	14	37.0	2280
37 × 4.0	12	10	13	39.5	2695
40 × 4.0	12	9	13	41.7	2950
48 × 4.0	11	9	12	45.9	3500

Laying conditions: Ambient air 40 °C, ground 35 °C, soil resistivity 1.5 K.m/W, depth 0.5 m.

Applications

These cables are intended for fixed installations, indoors and outdoors, in low voltage control systems. Normally used for connecting signaling and control units in industry, in railways, in traffic signals, in power or switching stations, as well as in switchgears, in applications where there is a risk of mechanical damage.

Cable Construction

- **Conductor:** Plain annealed stranded circular copper conductor (Class 2 to IEC 60228)
- **Insulation:** Extruded layer of PVC – Type PVC/A to IEC 60502-1
- **Core Identification:** Black with printed numbers (ICEA/NEMA-E.3.4 Method 4)
- **Assembly:** Cores assembled together with non-hygroscopic filler if needed
- **Bedding:** Extruded layer of PVC – Type ST1 to IEC 60502-1
- **Armouring:** Single layer of round galvanized steel wires
- **Outer Jacket:** Extruded layer of PVC – Type ST1 to IEC 60502-1

Cable Characteristics

Property	Value	Standard
Max. operating temperature	70 °C	-
Max. short circuit temperature	160 °C	-
Flame propagation	Pass	IEC 60332-1-2
Oil resistance	Fair	ASTM D 1047
Mechanical impact	Very Good	-
UV Resistant	Yes	-
Minimum bending radius	12 ×	-

Control cables, PVC insulated, steel wire armoured, PVC sheathed with copper conductor. DC Res.: 12.100 Ω /km, AC Res.: 14.478 Ω /km.

1.5 mm² Conductor – 2 to 48 Cores

Cores × mm ²	Ground A	Ducts A	Air A	Dia. mm	Weight kg/km
2 × 1.5	27	20	23	13.5	365
3 × 1.5	22	16	19	14.0	400
4 × 1.5	22	16	19	14.9	450
5 × 1.5	17	12	14	16.2	495
7 × 1.5	15	11	13	17.3	575
10 × 1.5	13	10	12	21.9	870
12 × 1.5	12	9	11	22.4	945
14 × 1.5	11	8	10	23.2	1015
16 × 1.5	10	8	10	24.4	1115
19 × 1.5	10	7	9	26.1	1365
24 × 1.5	9	7	9	29.3	1630
30 × 1.5	8	6	8	30.6	1820
37 × 1.5	7	6	7	33.0	2105
40 × 1.5	7	6	7	34.1	2235
48 × 1.5	7	5	7	37.2	2830

Laying conditions: Ambient air 40 °C, ground 35 °C, soil resistivity 1.5 K·m/W, depth 0.5 m.

Control cables, PVC insulated, steel wire armoured, PVC sheathed with copper conductor.

2.5 mm² Conductor – DC Res.: 7.410 Ω/km, AC Res.: 8.866 Ω/km

Cores × mm ²	Ground A	Ducts A	Air A	Dia. mm	Weight kg/km
2 × 2.5	35	25	30	14.4	420
3 × 2.5	29	21	25	15.0	470
4 × 2.5	29	21	25	15.9	530
5 × 2.5	22	16	19	17.5	590
7 × 2.5	19	14	17	19.9	805
10 × 2.5	17	12	15	23.5	1045
12 × 2.5	15	12	14	24.1	1130
14 × 2.5	14	11	14	25.7	1375
16 × 2.5	14	10	13	27.0	1520
19 × 2.5	13	10	12	28.1	1665
24 × 2.5	12	9	12	31.9	2005
30 × 2.5	10	8	11	33.4	2280
37 × 2.5	10	7	10	36.0	2645
40 × 2.5	9	7	10	37.5	3110
48 × 2.5	9	7	9	41.1	3585

4.0 mm² Conductor – DC Res.: 4.610 Ω/km, AC Res.: 5.516 Ω/km

Cores × mm ²	Ground A	Ducts A	Air A	Dia. mm	Weight kg/km
2 × 4.0	46	34	40	16.3	535
3 × 4.0	38	27	34	17.9	725
4 × 4.0	38	27	34	19.1	820
5 × 4.0	28	21	26	20.9	905
7 × 4.0	25	19	23	22.9	1070
10 × 4.0	22	17	21	28.2	1570
12 × 4.0	20	15	20	28.9	1705
14 × 4.0	19	14	19	30.1	1870
16 × 4.0	18	14	18	31.7	2065
19 × 4.0	17	13	17	33.3	2290
24 × 4.0	15	12	16	39.0	3155
30 × 4.0	14	11	14	40.9	3600
37 × 4.0	12	10	13	43.4	4100
40 × 4.0	12	10	13	45.8	4450
48 × 4.0	11	9	12	50.0	5475

Laying conditions: Ambient air 40 °C, ground 35 °C, soil resistivity 1.5 K.m/W, depth 0.5 m.

Applications

These cables are intended for fixed installations, indoors and outdoors, in low voltage control systems. Normally used for connecting signaling and control units in industry, in railways, in traffic signals, in power or switching stations, as well as in switchgears, in applications where there is no risk of mechanical damage.

Cable Construction

- **Conductor:** Plain annealed stranded circular copper conductor (Class 2 to IEC 60228)
- **Insulation:** Extruded layer of cross-linked polyethylene (XLPE) to IEC 60502-1
- **Core Identification:** Black with printed numbers (ICEA/NEMA-E.3.4 Method 4)
- **Assembly:** Cores assembled together with non-hygroscopic filler if needed
- **Outer Jacket:** Extruded layer of PVC – Type ST2 to IEC 60502-1

Cable Characteristics

Property	Value	Standard
Max. operating temperature	90 °C	-
Max. short circuit temperature	250 °C	-
Flame propagation	Pass	IEC 60332-1-2
Oil resistance	Fair	ASTM D 1047
Mechanical impact	Fair	-
UV Resistant	Yes	-
Minimum bending radius	12 ×	-

Control cables, XLPE insulated, PVC sheathed, unarmoured with copper conductor. DC Res.: 12.100 Ω /km, AC Res.: 15.429 Ω /km.

1.5 mm² Conductor – 2 to 48 Cores

Cores × mm ²	Ground A	Ducts A	Air A	Dia. mm	Weight kg/km
2 × 1.5	33	22	28	9.5	130
3 × 1.5	27	18	23	10.1	150
4 × 1.5	27	18	23	10.8	175
5 × 1.5	21	15	18	12.1	190
7 × 1.5	18	13	16	13.1	235
10 × 1.5	16	11	15	16.1	320
12 × 1.5	15	10	14	16.6	360
14 × 1.5	14	10	13	17.4	405
16 × 1.5	13	9	12	18.5	460
19 × 1.5	12	9	12	19.4	520
24 × 1.5	11	8	11	22.4	640
30 × 1.5	10	7	10	23.7	765
37 × 1.5	9	7	9	25.7	920
40 × 1.5	9	7	9	26.7	990
48 × 1.5	8	6	9	29.2	1155

Laying conditions: Ambient air 40 °C, ground 35 °C, soil resistivity 1.5 K·m/W, depth 0.5 m. AC resistance at 90 °C (XLPE rated).

Control cables, XLPE insulated, PVC sheathed, unarmoured with copper conductor.

2.5 mm² Conductor – DC Res.: 7.410 Ω/km, AC Res.: 9.449 Ω/km

Cores × mm ²	Ground A	Ducts A	Air A	Dia. mm	Weight kg/km
2 × 2.5	43	29	36	10.4	165
3 × 2.5	35	24	30	11.0	195
4 × 2.5	35	24	30	11.9	235
5 × 2.5	27	19	24	13.3	255
7 × 2.5	24	17	21	14.3	315
10 × 2.5	21	15	20	17.7	435
12 × 2.5	19	14	18	18.2	505
14 × 2.5	18	13	17	19.1	560
16 × 2.5	17	12	17	20.4	640
19 × 2.5	16	11	16	21.4	725
24 × 2.5	14	11	15	24.8	900
30 × 2.5	13	10	14	26.2	1085
37 × 2.5	12	9	13	28.5	1310
40 × 2.5	11	9	12	29.6	1415
48 × 2.5	11	8	12	32.6	1680

4.0 mm² Conductor – DC Res.: 4.610 Ω/km, AC Res.: 5.878 Ω/km

Cores × mm ²	Ground A	Ducts A	Air A	Dia. mm	Weight kg/km
2 × 4.0	56	38	48	11.5	215
3 × 4.0	46	31	40	12.1	260
4 × 4.0	46	31	40	13.2	315
5 × 4.0	35	25	32	14.8	345
7 × 4.0	31	22	28	16.1	440
10 × 4.0	27	20	26	20.1	610
12 × 4.0	25	18	24	20.7	705
14 × 4.0	23	17	23	21.8	800
16 × 4.0	22	16	22	23.2	915
19 × 4.0	20	15	21	24.4	1050
24 × 4.0	18	14	20	28.4	1305
30 × 4.0	17	13	18	30.1	1590
37 × 4.0	15	12	17	32.9	1940
40 × 4.0	15	11	17	34.2	2095
48 × 4.0	14	11	16	37.9	2510

Laying conditions: Ambient air 40 °C, ground 35 °C, soil resistivity 1.5 K.m/W, depth 0.5 m. AC resistance at 90 °C (XLPE rated).

Applications

These cables are intended for fixed installations, indoors and outdoors, in low voltage control systems. Normally used for connecting signaling and control units in industry, in railways, in traffic signals, in power or switching stations, as well as in switchgears, in applications where there is no risk of mechanical damage. The copper tape shield provides electromagnetic interference (EMI) protection.

Cable Construction

- **Conductor:** Plain annealed stranded circular copper conductor (Class 2 to IEC 60228)
- **Insulation:** Extruded layer of cross-linked polyethylene (XLPE) to IEC 60502-1
- **Core Identification:** Black with printed numbers (ICEA/NEMA-E.3.4 Method 4)
- **Assembly:** Cores assembled together with non-hygroscopic filler if needed
- **Bedding:** Extruded layer of PVC – Type ST2 to IEC 60502-1
- **Shielding:** Single copper tape applied helically with suitable overlap
- **Outer Jacket:** Extruded layer of PVC – Type ST2 to IEC 60502-1

Cable Characteristics

Property	Value	Standard
Max. operating temperature	90 °C	-
Max. short circuit temperature	250 °C	-
Flame propagation	Pass	IEC 60332-1-2
Oil resistance	Fair	ASTM D 1047
Mechanical impact	Fair	-
UV Resistant	Yes	-
Minimum bending radius	12 ×	-

Control cables, XLPE insulated, copper tape shielded, PVC sheathed with copper conductor. DC Res.: 12.100 Ω /km, AC Res.: 15.429 Ω /km.

1.5 mm² Conductor – 2 to 48 Cores

Cores × mm ²	Ground A	Ducts A	Air A	Dia. mm	Weight kg/km
2 × 1.5	32	23	28	11.8	210
3 × 1.5	27	19	24	12.3	230
4 × 1.5	27	19	24	13.1	265
5 × 1.5	20	15	18	14.5	285
7 × 1.5	18	13	16	15.4	335
10 × 1.5	15	11	15	18.4	440
12 × 1.5	14	11	14	18.9	485
14 × 1.5	13	10	13	19.7	545
16 × 1.5	13	9	12	20.8	600
19 × 1.5	12	9	12	21.7	665
24 × 1.5	11	8	11	24.7	810
30 × 1.5	10	7	10	26.0	945
37 × 1.5	9	7	9	28.0	1110
40 × 1.5	9	7	9	29.0	1190
48 × 1.5	8	6	9	31.5	1375

Laying conditions: Ambient air 40 °C, ground 35 °C, soil resistivity 1.5 K·m/W, depth 0.5 m. AC resistance at 90 °C (XLPE rated).

Control cables, XLPE insulated, copper tape shielded, PVC sheathed with copper conductor.

2.5 mm² Conductor – DC Res.: 7.410 Ω/km, AC Res.: 9.449 Ω/km

Cores × mm ²	Ground A	Ducts A	Air A	Dia. mm	Weight kg/km
2 × 2.5	42	30	37	12.7	250
3 × 2.5	35	25	31	13.3	285
4 × 2.5	35	25	31	14.2	330
5 × 2.5	26	20	24	15.6	350
7 × 2.5	23	17	21	16.6	425
10 × 2.5	20	15	19	20.0	565
12 × 2.5	18	14	18	20.5	640
14 × 2.5	17	13	17	21.4	705
16 × 2.5	16	12	16	22.7	790
19 × 2.5	15	11	15	23.7	885
24 × 2.5	14	11	14	27.1	1090
30 × 2.5	13	10	13	28.5	1280
37 × 2.5	11	9	12	30.8	1525
40 × 2.5	11	9	12	32.1	1650
48 × 2.5	10	8	11	35.5	1975

4.0 mm² Conductor – DC Res.: 4.610 Ω/km, AC Res.: 5.878 Ω/km

Cores × mm ²	Ground A	Ducts A	Air A	Dia. mm	Weight kg/km
2 × 4.0	54	39	49	13.8	310
3 × 4.0	45	32	41	14.5	355
4 × 4.0	45	32	41	15.5	420
5 × 4.0	34	26	32	16.7	450
7 × 4.0	30	22	28	18.4	565
10 × 4.0	26	20	26	22.4	760
12 × 4.0	24	18	24	23.0	858
14 × 4.0	22	17	23	24.1	965
16 × 4.0	21	16	22	25.5	1090
19 × 4.0	20	15	20	26.7	1230
24 × 4.0	18	14	19	30.7	1520
30 × 4.0	16	13	18	32.6	1830
37 × 4.0	15	12	16	35.1	2205
40 × 4.0	14	11	16	37.1	2405
48 × 4.0	13	11	15	40.6	2830

Laying conditions: Ambient air 40 °C, ground 35 °C, soil resistivity 1.5 K.m/W, depth 0.5 m. AC resistance at 90 °C (XLPE rated).

Applications

These cables are intended for fixed installations, indoors and outdoors, in low voltage control systems. Normally used for connecting signaling and control units in industry, in railways, in traffic signals, in power or switching stations, as well as in switchgears, in applications where there is a risk of mechanical damage.

Cable Construction

- **Conductor:** Plain annealed stranded circular copper conductor (Class 2 to IEC 60228)
- **Insulation:** Extruded layer of cross-linked polyethylene (XLPE) to IEC 60502-1
- **Core Identification:** Black with printed numbers (ICEA/NEMA-E.3.4 Method 4)
- **Assembly:** Cores assembled together with non-hygroscopic filler if needed
- **Bedding:** Extruded layer of PVC – Type ST2 to IEC 60502-1
- **Armouring:** Single layer of round galvanized steel wires
- **Outer Jacket:** Extruded layer of PVC – Type ST2 to IEC 60502-1

Cable Characteristics

Property	Value	Standard
Max. operating temperature	90 °C	-
Max. short circuit temperature	250 °C	-
Flame propagation	Pass	IEC 60332-1-2
Oil resistance	Fair	ASTM D 1047
Mechanical impact	Very Good	-
UV Resistant	Yes	-
Minimum bending radius	12 ×	-

Control cables, XLPE insulated, steel wire armoured, PVC sheathed with copper conductor. DC Res.: 12.100 Ω /km, AC Res.: 15.429 Ω /km.

1.5 mm² Conductor – 2 to 48 Cores

Cores × mm ²	Ground A	Ducts A	Air A	Dia. mm	Weight kg/km
2 × 1.5	33	24	29	13.1	340
3 × 1.5	27	19	24	13.6	365
4 × 1.5	27	19	24	14.4	410
5 × 1.5	21	15	19	15.7	455
7 × 1.5	18	13	17	17.2	520
10 × 1.5	16	12	15	21.1	805
12 × 1.5	14	11	14	21.6	860
14 × 1.5	13	10	13	22.4	925
16 × 1.5	13	10	13	23.5	1010
19 × 1.5	12	9	12	24.4	1090
24 × 1.5	11	8	11	28.1	1465
30 × 1.5	10	8	10	29.4	1630
37 × 1.5	9	7	10	31.4	1845
40 × 1.5	9	7	9	32.6	1975
48 × 1.5	8	6	9	35.1	2240

Laying conditions: Ambient air 40 °C, ground 35 °C, soil resistivity 1.5 K·m/W, depth 0.5 m. AC resistance at 90 °C (XLPE rated).

Control cables, XLPE insulated, steel wire armoured, PVC sheathed with copper conductor.

2.5 mm² Conductor – DC Res.: 7.410 Ω/km, AC Res.: 9.449 Ω/km

Cores × mm ²	Ground A	Ducts A	Air A	Dia. mm	Weight kg/km
2 × 2.5	42	31	38	14.0	395
3 × 2.5	35	25	32	14.6	435
4 × 2.5	35	25	32	15.5	490
5 × 2.5	27	20	25	16.9	545
7 × 2.5	23	18	22	19.3	750
10 × 2.5	20	15	20	22.7	955
12 × 2.5	19	14	19	23.2	1030
14 × 2.5	18	13	18	24.1	1120
16 × 2.5	17	13	17	26.1	1385
19 × 2.5	15	12	16	27.1	1515
24 × 2.5	14	11	15	30.5	1805
30 × 2.5	13	10	14	32.1	2050
37 × 2.5	12	9	13	34.4	2350
40 × 2.5	11	9	12	35.7	2515
48 × 2.5	10	8	12	39.4	3240

4.0 mm² Conductor – DC Res.: 4.610 Ω/km, AC Res.: 5.878 Ω/km

Cores × mm ²	Ground A	Ducts A	Air A	Dia. mm	Weight kg/km
2 × 4.0	55	40	51	15.1	465
3 × 4.0	45	33	42	15.7	520
4 × 4.0	45	33	42	16.8	600
5 × 4.0	35	26	34	19.3	795
7 × 4.0	30	23	30	21.1	925
10 × 4.0	26	20	27	25.8	1355
12 × 4.0	24	19	25	26.4	1470
14 × 4.0	23	18	24	27.5	1605
16 × 4.0	22	17	23	28.9	1760
19 × 4.0	20	16	21	30.1	1935
24 × 4.0	18	14	20	34.3	2350
30 × 4.0	16	13	18	36.2	2710
37 × 4.0	15	12	17	39.0	3450
40 × 4.0	14	12	17	41.0	3725
48 × 4.0	13	11	16	43.7	4215

Laying conditions: Ambient air 40 °C, ground 35 °C, soil resistivity 1.5 K.m/W, depth 0.5 m. AC resistance at 90 °C (XLPE rated).

Applications

These cables are intended for fixed installations, indoors and outdoors, in low voltage electricity systems. Normally used for the distribution of electrical energy in urban networks, power or switching stations, industrial plants, as well as in switchgears, in applications where there is no risk of mechanical damage.

Cable Construction

- **Conductor:** Plain annealed stranded circular or circular compacted copper conductor (Class 2 to BS EN 60228)
- **Insulation:** Extruded layer of cross-linked polyethylene (XLPE) – Type GP 8 to BS 7655-1.3
- **Core Identification:** Brown or Blue (specified at order)
- **Outer Jacket:** Extruded layer of PVC – Type 9 to BS 7655-4.2

Cable Characteristics

Property	Value	Standard
Max. operating temperature	90 °C	-
Max. short circuit temperature	250 °C	-
Flame propagation	Pass	BS EN 60332-1-2
Oil resistance	Fair	ASTM D 1047
Mechanical impact	Fair	-
UV Resistant	Yes	-
Minimum bending radius	15 ×	-

Single-core, XLPE insulated, PVC sheathed with copper conductor. Installation methods: (a) Ground trefoil, (b) Ground flat, (c) Duct trefoil, (d) Duct flat, (e) Air trefoil, (f) Air flat, (g) Air single.

Single Core Cables – Copper Conductor

Area mm ²	DC Res. Ω/km	AC Res. Ω/km	Gnd (a) A	Gnd (b) A	Duct (c) A	Duct (d) A	Air (e) A	Air (f) A	Air (g) A	Dia. mm	Wt. kg/km
1.5	12.100	15.429	27	28	20	23	23	23	31	5.8	50
2.5	7.410	9.449	36	36	26	30	30	31	40	6.2	65
4	4.610	5.878	46	46	34	38	40	41	53	6.8	85
6	3.080	3.927	57	57	42	48	50	52	68	7.3	105
10	1.830	2.334	75	75	56	63	68	70	91	7.9	140
16	1.150	1.467	97	97	73	82	91	93	121	8.9	205
25	0.727	0.927	124	124	96	106	122	125	161	10.5	300
35	0.524	0.669	149	149	117	128	150	154	198	11.5	395
50	0.387	0.494	175	176	140	153	183	189	240	12.9	520
70	0.268	0.343	214	215	174	188	233	240	304	14.7	725
95	0.193	0.248	257	256	212	227	288	297	374	16.5	980
120	0.153	0.197	291	292	243	260	335	346	434	18.0	1220
150	0.124	0.161	327	327	277	295	388	400	499	20.1	1500
185	0.0991	0.129	369	369	316	336	450	464	577	22.2	1860
240	0.0754	0.100	425	426	371	393	536	553	688	24.9	2415
300	0.0601	0.0817	479	473	422	447	620	641	797	27.7	2990
400	0.0470	0.0663	539	540	482	512	720	743	928	30.9	3845
500	0.0366	0.0545	604	606	549	587	834	862	1084	34.9	4950
630	0.0283	0.0454	674	673	619	668	955	986	1257	39.3	6295
800	0.0221	0.0390	739	741	688	750	1078	1116	1440	43.6	8090
1000	0.0176	0.0346	807	808	766	841	1234	1276	1674	52.2	10150

Laying conditions: Ambient air 40 °C, ground 35 °C, soil resistivity 1.5 K·m/W, depth 0.5 m. AC resistance at 90 °C (XLPE rated).

Applications

These cables are intended for fixed installations, indoors and outdoors, in low voltage electricity systems. Normally used for the distribution of electrical energy in urban networks, power or switching stations, industrial plants, as well as in switchgears, in applications where there is no risk of mechanical damage.

Cable Construction

- **Conductor:** Plain annealed stranded circular (rm) or sector shaped (sm) copper conductor (Class 2 to BS EN 60228)
- **Insulation:** Extruded layer of cross-linked polyethylene (XLPE) – Type GP 8 to BS 7655-1.3
- **Core Identification:** 2C Brown/Blue; 3C Brown/Black/Grey; 4C Blue/Brown/Black/Grey; 5C Green&Yellow/Blue/Brown
- **Assembly:** Cores assembled together with non-hygroscopic filler if needed
- **Outer Jacket:** Extruded layer of PVC – Type 9 to BS 7655-4.2

Cable Characteristics

Property	Value	Standard
Max. operating temperature	90 °C	-
Max. short circuit temperature	250 °C	-
Flame propagation	Pass	BS EN 60332-1-2
Oil resistance	Fair	ASTM D 1047
Mechanical impact	Fair	-
UV Resistant	Yes	-
Minimum bending radius	12 ×	-

Multi-core, XLPE insulated, PVC sheathed with copper conductor. AC resistance at 90 °C. rm = round stranded, sm = sector shaped.

Two Core Cables

Area mm ²	Type	DC Res. Ω/km	AC Res. Ω/km	Ground A	Ducts A	Air A	Dia. mm	Weight kg/km
1.5	rm	12.100	15.429	33	22	28	9.5	130
2.5	rm	7.410	9.449	43	29	36	10.4	165
4	rm	4.610	5.878	56	38	48	11.5	215
6	rm	3.080	3.927	69	48	61	12.6	275
10	rm	1.830	2.334	91	63	82	13.8	365
16	rm	1.150	1.467	118	83	110	15.8	520
25	rm	0.727	0.928	153	110	149	18.9	775
35	rm	0.524	0.669	183	133	183	21.0	1010
50	sm	0.387	0.494	206	152	206	21.3	1085
70	sm	0.268	0.343	251	188	256	23.3	1490
95	sm	0.193	0.248	303	230	319	26.8	2015
120	sm	0.153	0.198	345	266	374	30.3	2525

Three Core Cables

Area mm ²	Type	DC Res. Ω/km	AC Res. Ω/km	Ground A	Ducts A	Air A	Dia. mm	Weight kg/km
1.5	rm	12.100	15.429	27	18	23	10.1	150
2.5	rm	7.410	9.449	35	24	30	11.0	195
4	rm	4.610	5.878	46	31	40	12.1	260
6	rm	3.080	3.927	57	39	51	13.4	340
10	rm	1.830	2.334	75	53	70	15.1	445
16	rm	1.150	1.467	97	69	93	17.3	660
25	rm	0.727	0.928	126	92	126	20.6	940
35	sm	0.524	0.669	144	105	141	20.0	1210
50	sm	0.387	0.494	171	127	173	23.0	1580
70	sm	0.268	0.343	209	159	220	26.5	2210
95	sm	0.193	0.248	251	193	271	29.9	2970
120	sm	0.153	0.198	286	223	317	33.2	3710

Laying conditions: Ambient air 40 °C, ground 35 °C, soil resistivity 1.5 K·m/W, depth 0.5 m.

Multi-core, XLPE insulated, PVC sheathed with copper conductor. AC resistance at 90 °C. rm = round stranded, sm = sector shaped.

Four Core Cables

Area mm ²	Type	DC Res. Ω/km	AC Res. Ω/km	Ground A	Ducts A	Air A	Dia. mm	Weight kg/km
1.5	rm	12.100	15.429	27	18	23	10.8	175
2.5	rm	7.410	9.449	35	24	30	11.9	235
4	rm	4.610	5.878	46	31	40	13.2	315
6	rm	3.080	3.927	57	39	51	14.5	420
10	rm	1.830	2.334	75	53	70	16.4	600
16	rm	1.150	1.467	97	69	93	18.9	840
25	rm	0.727	0.928	126	92	126	22.6	1190
35	sm	0.524	0.669	144	105	141	23.0	1535
50	sm	0.387	0.494	171	127	173	26.5	2020
70	sm	0.268	0.343	209	159	220	30.8	2865
95	sm	0.193	0.248	251	193	271	33.5	3890
120	sm	0.153	0.198	286	223	317	37.6	4890

Five Core Cables

Area mm ²	Type	DC Res. Ω/km	AC Res. Ω/km	Ground A	Ducts A	Air A	Dia. mm	Weight kg/km
1.5	rm	12.100	15.429	27	18	23	12.1	190
2.5	rm	7.410	9.449	35	24	30	13.3	255
4	rm	4.610	5.878	46	31	40	14.8	345
6	rm	3.080	3.927	57	39	51	16.3	460
10	rm	1.830	2.334	75	53	70	17.9	660
16	rm	1.150	1.467	97	69	93	20.6	980
25	rm	0.727	0.928	126	92	126	24.8	1460
35	sm	0.524	0.669	144	105	141	27.1	1915
50	sm	0.387	0.494	171	127	173	31.2	2540
70	sm	0.268	0.343	209	159	220	35.1	3575
95	sm	0.193	0.248	251	193	271	39.3	4850
120	sm	0.153	0.198	286	223	317	43.7	6095

Laying conditions: Ambient air 40 °C, ground 35 °C, soil resistivity 1.5 K.m/W, depth 0.5 m.

Applications

These cables are intended for fixed installations, indoors and outdoors, in low voltage electricity systems. Normally used for the distribution of electrical energy in urban networks, power or switching stations, industrial plants, as well as in switchgears, in applications where there is a risk of mechanical damage.

Cable Construction

- **Conductor:** Plain annealed stranded circular or compacted copper conductor (Class 2 to BS EN 60228)
- **Insulation:** Extruded layer of cross-linked polyethylene (XLPE) – Type GP 8 to BS 7655-1.3
- **Core Identification:** Brown or Blue (specified at order)
- **Bedding:** Extruded layer of PVC
- **Armouring:** Single layer of round non-magnetic (aluminium) wires
- **Outer Jacket:** Extruded layer of PVC – Type 9 to BS 7655-4.2

Cable Characteristics

Property	Value	Standard
Max. operating temperature	90 °C	-
Max. short circuit temperature	250 °C	-
Flame propagation	Pass	BS EN 60332-1-2
Oil resistance	Fair	ASTM D 1047
Mechanical impact	Very Good	-
UV Resistant	Yes	-
Minimum bending radius	12 ×	-

Single-core, XLPE insulated, aluminium wire armoured, PVC sheathed with copper conductor. Installation methods: (a) Ground trefoil, (b) Ground flat, (c) Duct trefoil, (d) Duct flat, (e) Air trefoil, (f) Air flat, (g) Air single.

Single Core Cables – Copper Conductor

Area mm ²	DC Res. Ω/km	AC Res. Ω/km	Gnd (a) A	Gnd (b) A	Duct (c) A	Duct (d) A	Air (e) A	Air (f) A	Air (g) A	Dia. mm	Wt. kg/km
50	0.387	0.494	178	178	152	163	202	206	249	17.0	675
70	0.268	0.343	217	215	189	198	253	257	307	19.5	940
95	0.193	0.247	257	255	223	234	308	310	366	21.3	1215
120	0.153	0.197	290	287	253	263	354	354	413	22.8	1475
150	0.124	0.160	323	318	284	291	403	400	461	26.0	1860
185	0.0991	0.129	361	354	320	322	461	453	512	28.3	2270
240	0.0754	0.0992	411	401	367	360	539	521	579	30.8	2855
300	0.0601	0.0805	456	440	410	391	612	583	637	33.6	3475
400	0.0470	0.0647	494	472	450	410	685	628	672	38.0	4515
500	0.0366	0.0528	539	511	497	439	770	691	729	42.0	5695
630	0.0283	0.0436	582	547	541	465	854	749	783	46.2	7105
800	0.0221	0.0368	599	565	564	481	908	781	829	52.1	9215
1000	0.0176	0.0325	629	595	601	513	996	849	915	60.7	11490

Laying conditions: Ambient air 40 °C, ground 35 °C, soil resistivity 1.5 K·m/W, depth 0.5 m. AC resistance at 90 °C (XLPE rated).

Applications

These cables are intended for fixed installations, indoors and outdoors, in low voltage electricity systems. Normally used for the distribution of electrical energy in urban networks, power or switching stations, industrial plants, as well as in switchgears, in applications where there is a risk of mechanical damage.

Cable Construction

- **Conductor:** Plain annealed stranded circular (rm) or sector shaped (sm) copper conductor (Class 2 to BS EN 60228)
- **Insulation:** Extruded layer of cross-linked polyethylene (XLPE) – Type GP 8 to BS 7655-1.3
- **Core Identification:** 2C Brown/Blue; 3C Brown/Black/Grey; 4C Blue/Brown/Black/Grey
- **Assembly:** Cores assembled together with non-hygroscopic filler if needed
- **Bedding:** Extruded layer of PVC
- **Armouring:** Single layer of round galvanized steel wires
- **Outer Jacket:** Extruded layer of PVC – Type 9 to BS 7655-4.2

Cable Characteristics

Property	Value	Standard
Max. operating temperature	90 °C	-
Max. short circuit temperature	250 °C	-
Flame propagation	Pass	BS EN 60332-1-2
Oil resistance	Fair	ASTM D 1047
Mechanical impact	Very Good	-
UV Resistant	Yes	-
Minimum bending radius	12 ×	-

Multi-core, XLPE insulated, steel wire armoured, PVC sheathed with copper conductor. AC resistance at 90 °C. rm = round stranded, sm = sector shaped.

Two Core Cables

Area mm ²	Type	DC Res. Ω/km	AC Res. Ω/km	Ground A	Ducts A	Air A	Dia. mm	Weight kg/km
1.5	rm	12.100	15.429	33	24	29	11.5	285
2.5	rm	7.410	9.449	42	31	38	13.0	360
4	rm	4.610	5.878	55	40	51	14.1	430
6	rm	3.080	3.927	68	50	64	15.2	510
10	rm	1.830	2.334	90	67	87	16.6	635
16	rm	1.150	1.467	116	87	114	19.3	935
25	rm	0.727	0.928	151	114	154	22.6	1280
35	rm	0.524	0.669	180	138	188	26.0	1765
50	sm	0.387	0.494	204	158	211	26.5	1875
70	sm	0.268	0.343	247	193	259	28.7	2355
95	sm	0.193	0.248	296	235	320	33.4	3280
120	sm	0.153	0.198	336	270	372	36.9	3915
150	sm	0.124	0.161	375	304	421	39.7	4620
185	sm	0.0991	0.130	424	349	489	45.9	6060
240	sm	0.0754	0.101	485	403	569	49.8	7360
300	sm	0.0601	0.0829	538	451	639	53.4	8800
400	sm	0.0470	0.0676	598	504	719	56.9	12800

Laying conditions: Ambient air 40 °C, ground 35 °C, soil resistivity 1.5 K·m/W, depth 0.5 m.

Multi-core, XLPE insulated, steel wire armoured, PVC sheathed with copper conductor. AC resistance at 90 °C. rm = round stranded, sm = sector shaped.

Three Core Cables

Area mm ²	Type	DC Res. Ω/km	AC Res. Ω/km	Ground A	Ducts A	Air A	Dia. mm	Weight kg/km
1.5	rm	12.100	15.429	27	19	24	12.0	315
2.5	rm	7.410	9.449	35	25	32	13.6	400
4	rm	4.610	5.878	45	33	42	14.7	485
6	rm	3.080	3.927	56	41	53	16.0	590
10	rm	1.830	2.334	75	56	73	18.6	840
16	rm	1.150	1.467	96	72	96	21.0	1090
25	rm	0.727	0.928	125	95	130	25.6	1665
35	sm	0.524	0.669	142	109	145	25.2	1905
50	sm	0.387	0.494	169	132	177	28.2	2390
70	sm	0.268	0.343	206	163	222	31.7	3145
95	sm	0.193	0.248	246	197	271	36.5	4325
120	sm	0.153	0.198	279	226	314	39.8	5195
150	sm	0.124	0.161	311	255	356	44.1	6590
185	sm	0.0991	0.130	349	290	407	48.1	7905
240	sm	0.0754	0.101	400	336	470	53.2	9830
300	sm	0.0601	0.0829	446	378	541	58.3	11985
400	sm	0.0470	0.0676	499	427	620	65.5	14940

Laying conditions: Ambient air 40 °C, ground 35 °C, soil resistivity 1.5 K·m/W, depth 0.5 m.

Multi-core, XLPE insulated, steel wire armoured, PVC sheathed with copper conductor. AC resistance at 90 °C. rm = round stranded, sm = sector shaped.

Four Core Cables

Area mm ²	Type	DC Res. Ω/km	AC Res. Ω/km	Ground A	Ducts A	Air A	Dia. mm	Weight kg/km
1.5	rm	12.100	15.429	27	19	24	12.7	350
2.5	rm	7.410	9.449	35	25	32	14.5	455
4	rm	4.610	5.878	45	33	42	15.8	560
6	rm	3.080	3.927	56	41	53	18.0	800
10	rm	1.830	2.334	75	56	73	19.9	990
16	rm	1.150	1.467	96	72	96	22.6	1305
25	rm	0.727	0.928	125	95	130	27.6	2010
35	sm	0.524	0.669	142	109	145	28.2	2380
50	sm	0.387	0.494	169	132	177	31.9	3005
70	sm	0.268	0.343	206	163	222	37.4	4290
95	sm	0.193	0.248	246	197	271	40.1	5435
120	sm	0.153	0.198	279	226	314	45.4	7000
150	sm	0.124	0.161	311	255	356	49.9	8370
185	sm	0.0991	0.130	349	290	407	54.9	10105
240	sm	0.0754	0.101	400	336	470	60.9	12680
300	sm	0.0601	0.0829	446	378	541	66.5	15395
400	sm	0.0470	0.0676	499	427	620	76.8	20215

Laying conditions: Ambient air 40 °C, ground 35 °C, soil resistivity 1.5 K·m/W, depth 0.5 m.

A.1 Aim

The aim of this annex is to inform users of characteristics and limitations of electric cables and thereby to minimize their misuse. It is assumed that the design of installation and the specification, purchase and installation of cables is entrusted to suitably skilled and competent people. In cases of doubt as to the suitability of cables for a particular use, further specific information should be obtained from the manufacturer.

A.2 Cable Selection and Design

- A.2.0** Products specified in this catalogue are intended for electrical energy supply up to rated voltage of 0.6/1 (1.2) kV. This rating should not be exceeded.
- A.2.0** These cables are intended for use within a nominal power frequency range of 49 Hz to 61 Hz.
- A.2.0** In addition to current ratings, due regard should be given to: fault withstand capability, earth loop impedance, operating characteristics of connected equipment, and voltage drop requirements during normal load or motor starting.
- A.2.0** The possible effects of transient over-voltages should be recognized as they can be detrimental to cables.

A.3 Environment and Application

- A.3.0** Reasonable protection against mechanical damage, appropriate to the cable choice and installation conditions, should be provided.
- A.3.0** Cables in this catalogue contain PVC; when exposed to fire they produce harmful smoke and fumes. When bundled together they may propagate fire. Consider fire survival cable products where circumstances dictate.
- A.3.0** Cables can be harmed by exposure to corrosive products or solvent substances, especially petroleum-based chemicals or their vapours.
- A.3.0** Cables in this catalogue are not specifically designed for use as: self-supporting aerial cables, submarine or water-logged installations, areas of subsidence, excessive heat exposure, or post-installation voltage testing on the sheath.
- A.3.0** Localized heat, solar radiation, high ambient temperatures, or high soil thermal resistivity will reduce current carrying capacity.
- A.3.0** Standard PVC sheathing does not protect against rodents, termites, etc., unless specified at time of order.
- A.3.0** Loaded cables can have surface temperatures that require protection against accidental contact.

A.4 Installation

- A.4.0** Precautions should be taken to avoid mechanical damage to cables before and during installation.
- A.4.0** Exceeding the manufacturer's recommended maximum pulling tensions can result in cable damage.
- A.4.0** If cables are to be installed in ducts, the correct size of duct should be used.
- A.4.0** The type of jointing and filling compounds employed should be chemically compatible with the cable materials.
- A.4.0** The cable support system should be such as to avoid damage or danger under normal or fault conditions.
- A.4.0** Cables in this catalogue are designed for fixed installations only – not for use as trailing or reeling cables.
- A.4.0** Repeated over-voltage testing can lead to premature failure of the cable.
- A.4.0** The selection of cable glands, accessories and any associated tools should take account of all aspects of intended use.

A.5 Storage and Handling of Drums

- A.5.0** Cable drums should be regularly inspected during storage to assess their physical condition.
- A.5.0** Battens, where applied, should not be removed from drums until the cable is about to be installed.
- A.5.0** When handling drums, reasonable precautions should be taken to avoid injury. Due regard should be paid to weight, method and direction of rolling, lifting, protruding nails and splinters.
- A.5.0** Care should be taken to avoid deterioration of drums or their becoming a hazard to the general public.
- A.5.0** A detailed guide to the safe handling of cable drums is available in Annex I of this catalogue.

B.1 General

This annex deals solely with the installation conditions used to calculate steady-state continuous current ratings of single-core and multi-core cables having extruded insulation. The tabulated current ratings have been calculated for cables having a rated voltage of 0.6/1 kV and constructions as detailed in each relevant type. Current ratings have been calculated using the methods set out in IEC 60287.

B.2 Temperatures

Maximum conductor temperatures for tabulated current ratings are 70 °C for PVC insulated cables and 90 °C for XLPE insulated cables. The reference ambient temperatures assumed are:

Condition	Temperature
Cables in free air	40 °C
Buried cables (direct or in ducts)	35 °C

Derating factors for other ambient temperatures are given in Tables C.1 and C.2. Current ratings for cables in air do not account for solar or other infra-red radiation. Where cables are subject to such radiation, derive the current rating by methods specified in IEC 60287.

B.3 Soil Thermal Resistivity

Tabulated current ratings for cables in ducts or direct in the ground relate to a soil thermal resistivity of 1.5 °C·m/W. Derating factors for other values are given in Tables C.4 to C.7. Uniform soil properties are assumed; no allowance has been made for moisture migration, which can lead to high thermal resistivity around the cable. If partial drying-out is foreseen, derive permissible current ratings by the methods specified in IEC 60287.

B.4 Methods of Installation

Current ratings tabulated in this catalogue are for cables installed in the following conditions:

- B.4.0 Single-core cables buried direct:** Ratings given for cables at depth of 0.5 m – (a) three cables in trefoil touching, (b) three cables in horizontal flat touching.
- B.4.0 Single-core cables in PVC ducts:** Ratings for cables in PVC ducts at depth 0.5 m with one cable per duct – (c) trefoil formation, (d) horizontal flat formation. Duct inside diameter 1.5× cable OD, wall thickness 6% of duct ID.

B.4.3 Single-Core Cables in Air

Cables are assumed to be spaced at least 0.5 times the cable diameter D_e from any vertical surface, installed on brackets or ladder racks:

- (e) Three cables in trefoil formation touching throughout
- (f) Three cables in horizontal flat formation touching throughout
- (g) Three cables in horizontal flat with clearance of one cable diameter D_e

B.4.4 Multi-Core Cables

Current ratings are given for multi-core cables installed under the following conditions:

- (h) Single cable in air spaced at least $0.3 \times D_e$ from any vertical surface
- (i) Single cable buried direct in ground at depth of 0.5 m
- (j) Single cable in a buried PVC duct (same dimensions as for single-core)

B.5 Cable Loading

Tabulated ratings relate to circuits carrying balanced three-phase load at 60 Hz. These ratings can be safely used at 50 Hz, where continuous current rating values are slightly higher.

B.6 Rating Factors for Grouped Circuits

Tabulated current ratings apply to a set of three single-core cables or one multi-core cable forming either a single-phase (2C) or three-phase circuit. When a number of circuits are installed in close proximity, reduce the rating by the appropriate factor from Tables C.5 to C.9. These factors also apply to groups of parallel cables forming the same circuit.

B.7 Derating Factors

Derating factors given in Tables C.1 to C.9 for temperature, installation conditions and grouping are averages over a range of conductor sizes and cable types. For particular cases, factors may be calculated using methods in IEC 60287.

Table C.1 – Derating Factors for Ambient Ground Temperature

Conductor Temp.	(°C) 10	(°C) 15	(°C) 20	(°C) 25	(°C) 30	(°C) 35	(°C) 40	(°C) 45	(°C) 50	(°C) 55	(°C) 60
70 °C	1.31	1.25	1.19	1.13	1.06	1.00	0.92	0.85	0.75	0.65	0.54
90 °C	1.20	1.17	1.12	1.08	1.04	1.00	0.96	0.90	0.85	0.80	0.73

Ambient ground temperature in °C. 70 °C = PVC insulated, 90 °C = XLPE insulated. Reference: 35 °C (factor = 1.00).

Table C.2 – Derating Factors for Ambient Air Temperature

Conductor Temp.	(°C) 10	(°C) 15	(°C) 20	(°C) 25	(°C) 30	(°C) 35	(°C) 40	(°C) 45	(°C) 50	(°C) 55	(°C) 60
70 °C	1.40	1.34	1.29	1.22	1.15	1.08	1.00	0.91	0.82	0.70	0.57
90 °C	1.26	1.23	1.19	1.14	1.10	1.05	1.00	0.96	0.90	0.84	0.78

Ambient air temperature in °C. 70 °C = PVC insulated, 90 °C = XLPE insulated. Reference: 40 °C (factor = 1.00).

Table C.3 – Derating Factors for Depth of Laying

Depth (m)	Up to 70 mm ²	95 to 240 mm ²	300 mm ² & above
0.50	1.00	1.00	1.00
0.60	0.99	0.98	0.97
0.80	0.97	0.96	0.94
1.00	0.95	0.93	0.92
1.25	0.94	0.92	0.89
1.50	0.93	0.90	0.87
1.75	0.92	0.89	0.86
2.00	0.91	0.88	0.85

Table C.4 – Derating Factors for Soil Thermal Resistivity

Installation Method	(K·m/W) 0.5	(K·m/W) 0.7	(K·m/W) 1.0	(K·m/W) 1.5	(K·m/W) 2.0	(K·m/W) 2.5	(K·m/W) 3.0
Direct buried	1.47	1.27	1.17	1.00	0.88	0.78	0.70
In buried ducts	1.16	1.09	1.07	1.00	0.95	0.91	0.87

Soil thermal resistivity in K·m/W. Reference: 1.5 K·m/W (factor = 1.00). Values are averages; overall accuracy within ±5%.

Table C.5 – Derating for Multiple Circuits Laid Directly in Ground

Single-core or multi-core cables. Circuit-to-circuit clearance (a).

No. of Circuits	Cables Touching	One Cable Diameter	Spacing 0.125 m	Spacing 0.25 m	Spacing 0.5 m
2	0.75	0.80	0.85	0.90	0.90
3	0.65	0.70	0.75	0.80	0.85
4	0.60	0.60	0.70	0.75	0.80
5	0.55	0.55	0.65	0.70	0.80
6	0.50	0.55	0.60	0.70	0.80
7	0.45	0.51	0.59	0.67	0.76
8	0.43	0.48	0.57	0.65	0.75
9	0.41	0.46	0.55	0.63	0.74
12	0.36	0.42	0.51	0.59	0.71
16	0.32	0.38	0.47	0.56	0.68
20	0.29	0.35	0.44	0.53	0.66

Values are averages; rounding can result in errors up to $\pm 10\%$. For (m) parallel conductors per phase, treat as (m) circuits.

Table C.6 – Single-Core Cables in Ducts (Multiple Circuits)

Duct-to-duct clearance (a).

No. of Circuits	Ducts Touching	Spacing 0.25 m	Spacing 0.5 m	Spacing 1.0 m
2	0.80	0.90	0.90	0.95
3	0.70	0.80	0.85	0.90
4	0.65	0.75	0.80	0.90
5	0.60	0.70	0.80	0.90
6	0.60	0.70	0.80	0.90
7	0.53	0.66	0.76	0.87
8	0.50	0.63	0.74	0.87
9	0.47	0.61	0.73	0.86
10	0.45	0.59	0.72	0.85
12	0.41	0.56	0.69	0.84
14	0.37	0.53	0.68	0.83
16	0.34	0.51	0.66	0.83
18	0.31	0.49	0.65	0.82
20	0.29	0.47	0.63	0.81

Table C.7 – Multi-Core Cables in Ducts (Multiple Circuits)

Duct-to-duct clearance (a).

No. of Circuits	Ducts Touching	Spacing 0.25 m	Spacing 0.5 m	Spacing 1.0 m
2	0.85	0.90	0.95	0.95
3	0.75	0.85	0.90	0.95
4	0.70	0.80	0.85	0.90
5	0.65	0.80	0.85	0.90
6	0.60	0.80	0.80	0.90
7	0.57	0.76	0.80	0.88
8	0.54	0.74	0.78	0.88
9	0.52	0.73	0.77	0.87
10	0.49	0.72	0.76	0.86
12	0.45	0.69	0.74	0.85
14	0.42	0.68	0.72	0.84
16	0.39	0.66	0.71	0.83
18	0.37	0.65	0.70	0.83
20	0.34	0.63	0.68	0.82

Values are averages; rounding can result in errors up to $\pm 10\%$. For (n) parallel conductors per phase, treat as (n) circuits.

Table C.8 – Multi-Core Cables in Free Air

Multiply by current-carrying capacity for one multi-core cable in free air.

Horizontal Perforated Cable Tray – Touching

No. of Trays	No. 1	No. 2	No. 3	No. 4	No. 6	No. 9
1	1.00	0.88	0.82	0.79	0.76	0.73
2	1.00	0.87	0.80	0.77	0.73	0.68
3	1.00	0.86	0.79	0.76	0.71	0.66
6	1.00	0.84	0.77	0.73	0.68	0.64

Horizontal Perforated Cable Tray – Spaced

No. of Trays	No. 1	No. 2	No. 3	No. 4	No. 6	No. 9
1	1.00	1.00	0.98	0.95	0.91	–
2	1.00	0.99	0.96	0.92	0.87	–
3	1.00	0.98	0.95	0.91	0.85	–

Horizontal Unperforated Cable Tray

No. of Trays	No. 1	No. 2	No. 3	No. 4	No. 6	No. 9
1	0.97	0.84	0.78	0.75	0.71	0.68
2	0.97	0.83	0.76	0.72	0.68	0.63
3	0.97	0.82	0.75	0.71	0.66	0.61
6	0.97	0.81	0.73	0.69	0.63	0.58

Horizontal Cable Ladder – Touching / Spaced

No. of Ladders	No. 1	No. 2	No. 3	No. 4	No. 6	No. 9
Touching:						
1	1.00	0.87	0.82	0.80	0.79	0.78
2	1.00	0.86	0.80	0.78	0.76	0.73
3	1.00	0.85	0.79	0.76	0.73	0.70
6	1.00	0.84	0.77	0.73	0.68	0.64
Spaced:						
1	1.00	1.00	0.98	0.95	0.91	–
2	1.00	0.99	0.96	0.92	0.87	–
3	1.00	0.98	0.95	0.91	0.85	–

Number of cables per tray/ladder shown in columns. Vertical tray spacing: 300 mm; ≥20 mm from wall. Horizontal tray spacing: 225 mm back-to-back.

Table C.9 – Single-Core Cables in Free Air

Groups of one or more three-phase circuits. Multiply by current-carrying capacity for the relevant formation.

Horizontal Perforated Cable Tray

No. of Trays	No. 1	No. 2	No. 3	Formation
Touching:				
1	0.98	0.91	0.87	Flat
2	0.96	0.87	0.81	Flat
3	0.95	0.85	0.78	Flat
Spaced:				
1	1.00	0.98	0.96	Trefoil
2	0.97	0.93	0.89	Trefoil
3	0.96	0.92	0.86	Trefoil

Vertical Perforated Cable Tray

No. of Trays	No. 1	No. 2	No. 3	Formation
Touching:				
1	0.96	0.86	–	Flat
2	0.95	0.84	–	Flat
Spaced:				
1	1.00	0.91	0.89	Trefoil
2	1.00	0.90	0.86	Trefoil

Horizontal Cable Ladder

No. of Ladders	No. 1	No. 2	No. 3	Formation
Touching:				
1	1.00	0.97	0.96	Flat
2	0.98	0.93	0.89	Flat
3	0.97	0.90	0.86	Flat
Spaced:				
1	1.00	1.00	1.00	Trefoil
2	0.97	0.95	0.93	Trefoil
3	0.96	0.94	0.90	Trefoil

Number of three-phase circuits per tray/ladder shown in columns. Vertical spacing 300 mm; horizontal spacing 225 mm back-to-back. For (m) parallel conductors per phase, treat as (m) circuits.

D.1 Resistance

DC resistance values given in the tables are based on 20 °C. For other temperatures:

$$R_{\theta} = R_{20} \times [1 + \alpha (\theta - 20)] \quad [\Omega/km]$$

R_{θ}	Conductor DC resistance at θ °C
R_{20}	Conductor DC resistance at 20 °C
α	Temperature coefficient: 0.00393 (copper), 0.00403 (aluminium)

To obtain AC resistance at operating temperature:

$$R_{ac} = R_{\theta} \times (1 + y_p + y_s) \quad [\Omega/km]$$

where y_p and y_s are the proximity and skin effect factors, respectively.

D.2 Inductance

$$L = K + 0.2 \ln(2Sd) \quad [mH/km]$$

K	Constant depending on conductor stranding
d	Conductor diameter (mm)
S	Axial spacing: $1 \times S$ for trefoil, $1.26 \times S$ for flat formation

D.3 Capacitance

$$C = \varepsilon_r 18 \ln(D/d) \quad [\mu F/km]$$

ε_r	Relative permittivity of insulation
D	Diameter over insulation (mm)
d	Diameter under insulation (mm)

D.4 Insulation Resistance

$$R = k \ln(Dd) \quad [M\Omega \cdot km]$$

k	Constant depending on insulation material
D	Diameter of insulated core (mm)
d	Diameter of conductor (mm)

D.5 Charging Current

The charging current is the capacitive current which flows when AC voltage is applied, resulting from capacitance between conductor and earth (and between conductors in unscreened multi-core cables):

$$I_c = U_0 \cdot \omega C \times 10^{-6} \quad [A/km]$$

U_0	Phase voltage (V)
ω	$2\pi f$
f	Operating frequency (Hz)
C	Capacitance to neutral ($\mu F/km$)

D.6 Dielectric Losses

Dielectric losses are proportional to capacitance, frequency, phase voltage and power factor:

$$W_d = \omega C \cdot U_0^2 \cdot \tan \delta \times 10^{-6} \quad [W/km/ph]$$

W_d	Dielectric losses (W/km/ph)
U_0	Phase voltage (V)
$\tan \delta$	Dielectric power factor
C	Capacitance to neutral ($\mu F/km$)

D.7 Short Circuit Capacity

Tables F.1 to F.4 give the short circuit current for conductor based on the following conditions:

1. Short circuit starts from the maximum operating conductor temperature of 70 °C and 90 °C for PVC and XLPE insulation respectively.
2. Maximum temperature during short circuit is 160 °C (cross section $\leq 300 \text{ mm}^2$) and 140 °C (cross section $> 300 \text{ mm}^2$) for PVC insulation and 250 °C for XLPE insulation.
3. Maximum short circuit duration is 5 seconds.

If the short circuit current is required at duration not mentioned in the catalogue, it is obtained by dividing the short circuit current for 1 second by the square root of the required duration as follows:

$$I_{s.c.t} = \frac{I_{s.c.1}}{\sqrt{t}}$$

$I_{s.c.t}$	Short circuit current for t second	kA
$I_{s.c.1}$	Short circuit current for 1 second	kA
t	Duration	Sec.

D.8 Voltage Drop

When current flows in a cable conductor there is a voltage drop between the ends of the conductors, which is the product of the current and the impedance. The following equations should be used to calculate the voltage drop:

A. Single phase circuit:

$$V_d = 2 I l (R \cos \phi + X \sin \phi) \quad [V]$$

B. Three phase circuit:

$$V_d = \sqrt{3} I l (R \cos \phi + X \sin \phi) \quad [V]$$

V_d	Voltage drop	V
I	Load current	A
l	Route length	km
R	AC Resistance	Ω/km
X	Reactance	Ω/km
$\cos \phi$	Power factor	

Where $X = L \omega \times 10^{-3} \quad [\Omega/\text{km}], \quad \omega = 2\pi f, \quad f = \text{operating frequency (Hz)}, \quad L = \text{inductance (mH/km)}$

Relation between $\cos \phi$ and $\sin \phi$:

$\cos \phi$	1.0	0.9	0.85	0.8	0.6
$\sin \phi$	0.0	0.44	0.53	0.6	0.8

- LV cabling system should be planned so as not to exceed voltage drop of 3-5% in normal operating conditions.
- Voltage drop data for LV single and multi core cables are tabulated in Tables G.1 and G.2.

Annex E – Electrical Parameters

Table E-1: Single-Core Copper Conductors – PVC Insulated

Area mm ²	DC Res. 20 °C (Ω/km)	AC Res. 70 °C (Ω/km)	Reactance 60 Hz (Ω/km)	Impedance 70 °C (Ω/km)	Capacit. μF/km
Non-armoured Cables					
1.5	12.1000	14.4777	0.178	14.479	0.619
2.5	7.4100	8.8661	0.164	8.868	0.763
4	4.6100	5.5159	0.157	5.518	0.753
6	3.0800	3.6853	0.147	3.688	0.904
10	1.8300	2.1897	0.139	2.194	1.028
16	1.1500	1.3762	0.130	1.382	1.254
25	0.7270	0.8702	0.125	0.879	1.271
35	0.5240	0.6274	0.119	0.639	1.489
50	0.3870	0.4637	0.113	0.477	1.497
70	0.2680	0.3217	0.108	0.339	1.753
95	0.1930	0.2324	0.106	0.255	1.782
120	0.1530	0.1850	0.103	0.212	1.964
150	0.1240	0.1508	0.102	0.182	1.955
185	0.0991	0.1216	0.101	0.158	1.969
240	0.0754	0.0942	0.100	0.137	2.042
300	0.0601	0.0769	0.098	0.125	2.113
400	0.0470	0.0625	0.097	0.115	2.189
500	0.0366	0.0515	0.095	0.108	2.318
630	0.0283	0.0433	0.093	0.103	2.580
800	0.0221	0.0374	0.092	0.099	2.899
1000	0.0176	0.0333	0.089	0.095	3.314
Armoured Cables (AWA)					
6	3.0800	3.6853	0.187	3.690	0.904
10	1.8300	2.1897	0.178	2.197	1.028
16	1.1500	1.3761	0.165	1.386	1.254
25	0.7270	0.8701	0.156	0.884	1.271
35	0.5240	0.6273	0.149	0.645	1.489
50	0.3870	0.4635	0.140	0.484	1.497
70	0.2680	0.3214	0.133	0.348	1.753
95	0.1930	0.2320	0.128	0.265	1.782
120	0.1530	0.1844	0.125	0.223	1.964
150	0.1240	0.1501	0.121	0.193	1.955
185	0.0991	0.1208	0.118	0.169	1.969
240	0.0754	0.0933	0.115	0.148	2.042
300	0.0601	0.0757	0.114	0.137	2.113
400	0.0470	0.0611	0.112	0.127	2.189
500	0.0366	0.0499	0.109	0.120	2.318
630	0.0283	0.0415	0.106	0.114	2.580
800	0.0221	0.0352	0.105	0.111	2.899
1000	0.0176	0.0312	0.101	0.105	3.314

⁽¹⁾ The tabulated values are for armoured cables with round aluminium wires (AWA) only.

Annex E – Electrical Parameters

Table E-2 Single-Core Aluminium Conductors – PVC Insulated

Area mm ²	DC Res. 20 °C (Ω/km)	AC Res. 70 °C (Ω/km)	Reactance 60 Hz (Ω/km)	Impedance 70 °C (Ω/km)	Capacit. μF/km
Non-armoured Cables					
10	3.0800	3.7007	0.139	3.703	1.028
16	1.9100	2.2950	0.130	2.299	1.254
25	1.2000	1.4420	0.125	1.447	1.271
35	0.8680	1.0432	0.119	1.050	1.489
50	0.6410	0.7706	0.113	0.779	1.497
70	0.4430	0.5329	0.108	0.544	1.753
95	0.3200	0.3854	0.106	0.400	1.782
120	0.2530	0.3052	0.103	0.322	1.964
150	0.2060	0.2490	0.102	0.269	1.955
185	0.1640	0.1989	0.101	0.223	1.969
240	0.1250	0.1527	0.100	0.182	2.042
300	0.1000	0.1233	0.098	0.158	2.113
400	0.0778	0.0975	0.097	0.137	2.189
500	0.0605	0.0779	0.095	0.123	2.318
630	0.0469	0.0630	0.093	0.113	2.580
800	0.0367	0.0524	0.091	0.105	2.907
1000	0.0291	0.0450	0.089	0.100	3.314
Armoured Cables (AWA)					
10	3.0800	3.7007	0.178	3.705	1.028
16	1.9100	2.2949	0.165	2.301	1.254
25	1.2000	1.4419	0.156	1.450	1.271
35	0.8680	1.0431	0.149	1.054	1.489
50	0.6410	0.7704	0.140	0.783	1.497
70	0.4430	0.5327	0.133	0.549	1.753
95	0.3200	0.3851	0.128	0.406	1.782
120	0.2530	0.3048	0.125	0.329	1.964
150	0.2060	0.2486	0.121	0.276	1.955
185	0.1640	0.1984	0.118	0.231	1.969
240	0.1250	0.1521	0.115	0.191	2.042
300	0.1000	0.1225	0.114	0.167	2.113
400	0.0778	0.0966	0.112	0.148	2.189
500	0.0605	0.0768	0.109	0.133	2.318
630	0.0469	0.0617	0.106	0.123	2.580
800	0.0367	0.0506	0.105	0.117	2.907
1000	0.0291	0.0431	0.101	0.110	3.314

⁽¹⁾ The tabulated values are for armoured cables with round aluminium wires (AWA) only.

Annex E – Electrical Parameters

Table E3: Single-Core Copper Conductors – XLPE Insulated

Area mm ²	DC Res. 20 °C (Ω/km)	AC Res. 90 °C (Ω/km)	Reactance 60 Hz (Ω/km)	Impedance 90 °C (Ω/km)	Capacit. μF/km
Non-armoured Cables					
1.5	12.1000	15.4287	0.175	15.430	0.212
2.5	7.4100	9.4485	0.161	9.450	0.264
4	4.6100	5.8782	0.150	5.880	0.309
6	3.0800	3.9274	0.141	3.930	0.379
10	1.8300	2.3335	0.134	2.337	0.433
16	1.1500	1.4665	0.125	1.472	0.533
25	0.7270	0.9273	0.121	0.935	0.505
35	0.5240	0.6686	0.115	0.678	0.599
50	0.3870	0.4941	0.108	0.506	0.629
70	0.2680	0.3428	0.104	0.358	0.679
95	0.1930	0.2476	0.102	0.268	0.781
120	0.1530	0.1970	0.100	0.185	0.797
150	0.1240	0.1605	0.099	0.189	0.767
185	0.0991	0.1294	0.098	0.162	0.753
240	0.0754	0.1002	0.096	0.139	0.807
300	0.0601	0.0817	0.094	0.125	0.858
400	0.0470	0.0663	0.094	0.115	0.870
500	0.0366	0.0545	0.092	0.107	0.904
630	0.0283	0.0454	0.092	0.102	0.928
800	0.0221	0.0390	0.091	0.099	0.971
1000	0.0176	0.0346	0.088	0.095	1.105
Armoured Cables (AWA)					
6	3.0800	3.9273	0.184	3.932	0.379
10	1.8300	2.3335	0.175	2.340	0.433
16	1.1500	1.4665	0.162	1.475	0.533
25	0.7270	0.9272	0.153	0.940	0.505
35	0.5240	0.6685	0.145	0.684	0.599
50	0.3870	0.4939	0.137	0.512	0.629
70	0.2680	0.3424	0.130	0.366	0.679
95	0.1930	0.2471	0.125	0.277	0.781
120	0.1530	0.1964	0.122	0.231	0.797
150	0.1240	0.1598	0.118	0.199	0.767
185	0.0991	0.1286	0.116	0.173	0.753
240	0.0754	0.0991	0.113	0.150	0.807
300	0.0601	0.0805	0.109	0.135	0.858
400	0.0470	0.0647	0.110	0.127	0.870
500	0.0366	0.0527	0.107	0.119	0.904
630	0.0283	0.0436	0.104	0.113	0.928
800	0.0221	0.0367	0.105	0.111	0.971
1000	0.0176	0.0324	0.100	0.105	1.105

⁽¹⁾ The tabulated values are for armoured cables with round aluminium wires (AWA) only.

Annex E – Electrical Parameters

Table E-4 Single-Core Aluminium Conductors – XLPE Insulated

Area mm ²	DC Res. 20 °C (Ω/km)	AC Res. 90 °C (Ω/km)	Reactance 60 Hz (Ω/km)	Impedance 90 °C (Ω/km)	Capacit. μF/km
Non-armoured Cables					
10	3.0800	3.9489	0.134	3.951	0.433
16	1.9100	2.4489	0.125	2.452	0.533
25	1.2000	1.5387	0.121	1.543	0.505
35	0.8680	1.1131	0.115	1.119	0.599
50	0.6410	0.8222	0.108	0.829	0.629
70	0.4430	0.5686	0.104	0.578	0.679
95	0.3200	0.4112	0.102	0.424	0.781
120	0.2530	0.3255	0.100	0.341	0.797
150	0.2060	0.2656	0.099	0.283	0.767
185	0.1640	0.2121	0.098	0.234	0.753
240	0.1250	0.1627	0.096	0.189	0.807
300	0.1000	0.1314	0.094	0.162	0.858
400	0.0778	0.1038	0.094	0.140	0.870
500	0.0605	0.0828	0.092	0.124	0.904
630	0.0469	0.0666	0.092	0.114	0.928
800	0.0367	0.0551	0.091	0.106	0.973
1000	0.0291	0.0471	0.088	0.100	1.105
Armoured Cables (AWA)					
10	3.0800	3.9489	0.175	3.953	0.433
16	1.9100	2.4489	0.162	2.454	0.533
25	1.2000	1.5386	0.153	1.546	0.505
35	0.8680	1.1130	0.145	1.122	0.599
50	0.6410	0.8221	0.137	0.833	0.629
70	0.4430	0.5684	0.130	0.583	0.679
95	0.3200	0.4109	0.125	0.429	0.781
120	0.2530	0.3252	0.122	0.347	0.797
150	0.2060	0.2651	0.118	0.290	0.767
185	0.1640	0.2116	0.116	0.241	0.753
240	0.1250	0.1621	0.113	0.197	0.807
300	0.1000	0.1306	0.109	0.170	0.858
400	0.0778	0.1028	0.110	0.150	0.870
500	0.0605	0.0816	0.107	0.134	0.904
630	0.0469	0.0653	0.104	0.123	0.928
800	0.0367	0.0533	0.104	0.117	0.973
1000	0.0291	0.0452	0.100	0.110	1.105

⁽¹⁾ The tabulated values are for armoured cables with round aluminium wires (AWA) only.

Table E.5 – Multi-core cables with copper conductors – PVC Insulated

Area mm ²	DC Res. 20 °C (Ω/km)	AC Res. 70 °C (Ω/km)	Reactance 60 Hz (Ω/km)	Impedance 70 °C (Ω/km)	Capacit. μF/km
1.5	12.1000	14.4777	0.132	14.478	0.630
2.5	7.4100	8.8661	0.123	8.867	0.759
4	4.6100	5.5159	0.123	5.517	0.768
6	3.0800	3.6853	0.116	3.687	0.897
10	1.8300	2.1898	0.111	2.193	1.028
16	1.1500	1.3763	0.105	1.380	1.254
25	0.7270	0.8703	0.104	0.877	1.293
35	0.5240	0.6276	0.101	0.636	1.489
50	0.3870	0.4639	0.097	0.474	1.497
70	0.2680	0.3220	0.094	0.336	1.753
95	0.1930	0.2328	0.094	0.251	1.782
120	0.1530	0.1856	0.091	0.207	1.964
150	0.1240	0.1514	0.091	0.177	1.955
185	0.0991	0.1224	0.091	0.152	1.969
240	0.0754	0.0952	0.090	0.131	2.042
300	0.0601	0.0780	0.089	0.119	2.113
400	0.0470	0.0638	0.089	0.109	2.189
500	0.0366	0.0531	0.088	0.103	2.318

Table E.6 – Multi-core cables with aluminium conductors – PVC Insulated

Area mm ²	DC Res. 20 °C (Ω/km)	AC Res. 70 °C (Ω/km)	Reactance 60 Hz (Ω/km)	Impedance 70 °C (Ω/km)	Capacit. μF/km
10	3.0800	3.7007	0.111	3.702	1.028
16	1.9100	2.2950	0.105	2.297	1.254
25	1.2000	1.4421	0.106	1.446	1.242
35	0.8680	1.0433	0.101	1.048	1.489
50	0.6410	0.7707	0.097	0.777	1.497
70	0.4430	0.5331	0.094	0.541	1.753
95	0.3200	0.3856	0.094	0.397	1.782
120	0.2530	0.3055	0.091	0.319	1.964
150	0.2060	0.2494	0.091	0.265	1.955
185	0.1640	0.1994	0.091	0.219	1.969
240	0.1250	0.1533	0.090	0.178	2.042
300	0.1000	0.1240	0.090	0.153	2.113
400	0.0778	0.0984	0.089	0.132	2.189
500	0.0605	0.0789	0.088	0.118	2.318

Table E.7 – Multi-core cables with copper conductors – XLPE Insulated

Area mm ²	DC Res. 20 °C (Ω/km)	AC Res. 90 °C (Ω/km)	Reactance 60 Hz (Ω/km)	Impedance 90 °C (Ω/km)	Capacit. μF/km
1.5	12.1000	15.4287	0.128	15.429	0.212
2.5	7.4100	9.4485	0.118	9.449	0.264
4	4.6100	5.8783	0.113	5.879	0.309
6	3.0800	3.9274	0.106	3.929	0.379
10	1.8300	2.3336	0.103	2.336	0.433
16	1.1500	1.4667	0.098	1.470	0.533
25	0.7270	0.9275	0.099	0.933	0.505
35	0.5240	0.6688	0.096	0.676	0.599
50	0.3870	0.4944	0.092	0.503	0.629
70	0.2680	0.3431	0.090	0.355	0.679
95	0.1930	0.2481	0.088	0.263	0.781
120	0.1530	0.1976	0.087	0.216	0.797
150	0.1240	0.1612	0.088	0.183	0.767
185	0.0991	0.1302	0.088	0.157	0.753
240	0.0754	0.1012	0.087	0.133	0.807
300	0.0601	0.0829	0.086	0.119	0.858
400	0.0470	0.0676	0.085	0.109	0.870
500	0.0366	0.0561	0.085	0.102	0.904

Table E.8 – Multi-core cables with aluminium conductors – XLPE Insulated

Area mm ²	DC Res. 20 °C (Ω/km)	AC Res. 90 °C (Ω/km)	Reactance 60 Hz (Ω/km)	Impedance 90 °C (Ω/km)	Capacit. μF/km
10	3.0800	3.9490	0.103	3.950	0.433
16	1.9100	2.4490	0.098	2.451	0.533
25	1.2000	1.5388	0.099	1.542	0.497
35	0.8680	1.1133	0.096	1.117	0.599
50	0.6410	0.8224	0.092	0.827	0.629
70	0.4430	0.5688	0.090	0.576	0.679
95	0.3200	0.4115	0.088	0.421	0.781
120	0.2530	0.3259	0.087	0.337	0.797
150	0.2060	0.2660	0.088	0.280	0.767
185	0.1640	0.2126	0.088	0.230	0.753
240	0.1250	0.1634	0.087	0.185	0.807
300	0.1000	0.1321	0.086	0.158	0.858
400	0.0778	0.1047	0.085	0.135	0.870
500	0.0605	0.0838	0.085	0.119	0.904

F.1 Permissible Short Circuit Current

The short circuit capacity of a current carrying component of a cable is determined by the following factors:

- The temperature prior to the short circuit, generally taken to be that corresponding with the maximum conductor operating temperature under normal conditions.
- The energy produced by the short circuit, a function of both the magnitude and the duration of the current.
- The limiting final temperature, generally determined by all materials in direct contact with the conducting component.

The short circuit current ratings given below in Tables F.1 to F.4 are calculated in accordance with the following formula as given in IEC 60949:

$$I = \frac{K \cdot S}{\sqrt{t}} \quad \text{where} \quad K = \sqrt{\frac{\ln(\beta + \theta_f \beta + \theta_i)}{Q_c \cdot \rho_{20} \cdot 10^{-4}}}$$

I	Permissible short circuit current (A)
t	Duration of short circuit (seconds)
S	Cross-sectional area of the current-carrying component (mm ²)
K	Constant depending on the material of the current-carrying component (As ^{1/2} /mm ²)
θ_i	Initial temperature before short circuit (°C)
θ_f	Final temperature at short circuit (°C)
β	Reciprocal of temperature coefficient of resistance of the current carrying component at 0 °C

The short-circuit current ratings given below are the symmetrical currents which will cause the conductor temperature to rise from the normal operating value to the maximum short-circuit value in the time stated, assuming adiabatic conditions (i.e. neglecting heat loss).

Table F.1 – Short circuit current (kA) – Copper conductor – PVC Insulated

Area mm ²	Time 0.1 s	Time 0.2 s	Time 0.3 s	Time 0.4 s	Time 0.5 s	Time 1.0 s	Time 2.0 s	Time 3.0 s	Time 4.0 s	Time 5.0 s
1.5	0.55	0.39	0.31	0.27	0.24	0.17	0.12	0.10	0.09	0.08
2.5	0.91	0.64	0.52	0.45	0.41	0.29	0.20	0.17	0.14	0.13
4	1.45	1.03	0.84	0.73	0.65	0.46	0.33	0.27	0.23	0.21
6	2.18	1.54	1.26	1.09	0.98	0.69	0.49	0.40	0.35	0.31
10	3.6	2.6	2.1	1.8	1.6	1.2	0.8	0.7	0.6	0.5
16	5.8	4.1	3.4	2.9	2.6	1.8	1.3	1.1	0.9	0.8
25	9.1	6.4	5.2	4.5	4.1	2.9	2.0	1.7	1.4	1.3
35	12.7	9.0	7.3	6.4	5.7	4.0	2.8	2.3	2.0	1.8
50	18.2	12.9	10.5	9.1	8.1	5.8	4.1	3.3	2.9	2.6
70	25.5	18.0	14.7	12.7	11.4	8.1	5.7	4.6	4.0	3.6
95	34.5	24.4	19.9	17.3	15.5	10.9	7.7	6.3	5.5	4.9
120	43.6	30.9	25.2	21.8	19.5	13.8	9.8	8.0	6.9	6.2
150	54.5	38.6	31.5	27.3	24.4	17.3	12.2	10.0	8.6	7.7
185	67.3	47.6	38.8	33.6	30.1	21.3	15.0	12.3	10.6	9.5
240	87.3	61.7	50.4	43.6	39.0	27.6	19.5	15.9	13.8	12.3
300	109.1	77.1	63.0	54.5	48.8	34.5	24.4	19.9	17.3	15.4
400	130.0	91.9	75.1	65.0	58.2	41.1	29.1	23.7	20.6	18.4
500	162.5	114.9	93.8	81.3	72.7	51.4	36.3	29.7	25.7	23.0
630	204.8	144.8	118.2	102.4	91.6	64.8	45.8	37.4	32.4	29.0
800	260.1	183.9	150.1	130.0	116.3	82.2	58.2	47.5	41.1	36.8
1000	325.1	229.9	187.7	162.5	145.4	102.8	72.7	59.4	51.4	46.0

Table F.2 – Short circuit current (kA) – Aluminium conductor – PVC Insulated

Area mm ²	Time 0.1 s	Time 0.2 s	Time 0.3 s	Time 0.4 s	Time 0.5 s	Time 1.0 s	Time 2.0 s	Time 3.0 s	Time 4.0 s	Time 5.0 s
10	2.40	1.70	1.39	1.20	1.07	0.76	0.54	0.44	0.38	0.34
16	3.8	2.7	2.2	1.9	1.7	1.2	0.9	0.7	0.6	0.5
25	6.0	4.2	3.5	3.0	2.7	1.9	1.3	1.1	1.0	0.8
35	8.4	5.9	4.9	4.2	3.8	2.7	1.9	1.5	1.3	1.2
50	12.0	8.5	6.9	6.0	5.4	3.8	2.7	2.2	1.9	1.7
70	16.8	11.9	9.7	8.4	7.5	5.3	3.8	3.1	2.7	2.4
95	22.8	16.1	13.2	11.4	10.2	7.2	5.1	4.2	3.6	3.2
120	28.8	20.4	16.7	14.4	12.9	9.1	6.4	5.3	4.6	4.1
150	36.0	25.5	20.8	18.0	16.1	11.4	8.1	6.6	5.7	5.1
185	44.5	31.4	25.7	22.2	19.9	14.1	9.9	8.1	7.0	6.3
240	57.7	40.8	33.3	28.8	25.8	18.2	12.9	10.5	9.1	8.2
300	72.1	51.0	41.6	36.0	32.2	22.8	16.1	13.2	11.4	10.2
400	86.0	60.8	49.7	43.0	38.5	27.2	19.2	15.7	13.6	12.2
500	107.5	76.0	62.1	53.8	48.1	34.0	24.0	19.6	17.0	15.2
630	135.5	95.8	78.2	67.7	60.6	42.8	30.3	24.7	21.4	19.2
800	172.0	121.6	99.3	86.0	76.9	54.4	38.5	31.4	27.2	24.3
1000	215.0	152.1	124.2	107.5	96.2	68.0	48.1	39.3	34.0	30.4

Table F.3 – Short circuit current (kA) – Copper conductor – XLPE Insulated

Area mm ²	Time 0.1 s	Time 0.2 s	Time 0.3 s	Time 0.4 s	Time 0.5 s	Time 1.0 s	Time 2.0 s	Time 3.0 s	Time 4.0 s	Time 5.0 s
1.5	0.68	0.48	0.39	0.34	0.30	0.21	0.15	0.12	0.11	0.10
2.5	1.13	0.80	0.65	0.57	0.51	0.36	0.25	0.21	0.18	0.16
4	1.81	1.28	1.04	0.90	0.81	0.57	0.40	0.33	0.29	0.26
6	2.71	1.92	1.57	1.36	1.21	0.86	0.61	0.50	0.43	0.38
10	4.52	3.20	2.61	2.26	2.02	1.43	1.01	0.83	0.72	0.64
16	7.2	5.1	4.2	3.6	3.2	2.3	1.6	1.3	1.1	1.0
25	11.3	8.0	6.5	5.7	5.1	3.6	2.5	2.1	1.8	1.6
35	15.8	11.2	9.1	7.9	7.1	5.0	3.5	2.9	2.5	2.2
50	22.6	16.0	13.1	11.3	10.1	7.2	5.1	4.1	3.6	3.2
70	31.7	22.4	18.3	15.8	14.2	10.0	7.1	5.8	5.0	4.5
95	43.0	30.4	24.8	21.5	19.2	13.6	9.6	7.8	6.8	6.1
120	54.3	38.4	31.3	27.1	24.3	17.2	12.1	9.9	8.6	7.7
150	67.9	48.0	39.2	33.9	30.4	21.5	15.2	12.4	10.7	9.6
185	83.7	59.2	48.3	41.9	37.4	26.5	18.7	15.3	13.2	11.8
240	108.6	76.8	62.7	54.3	48.6	34.3	24.3	19.8	17.2	15.4
300	135.7	96.0	78.4	67.9	60.7	42.9	30.4	24.8	21.5	19.2
400	181.0	128.0	104.5	90.5	80.9	57.2	40.5	33.0	28.6	25.6
500	226.2	160.0	130.6	113.1	101.2	71.5	50.6	41.3	35.8	32.0
630	285.1	201.6	164.6	142.5	127.5	90.1	63.7	52.0	45.1	40.3
800	362.0	256.0	209.0	181.0	161.9	114.5	80.9	66.1	57.2	51.2
1000	452.5	319.9	261.2	226.2	202.4	143.1	101.2	82.6	71.5	64.0

Table F.4 – Short circuit current (kA) – Aluminium conductor – XLPE Insulated

Area mm ²	Time 0.1 s	Time 0.2 s	Time 0.3 s	Time 0.4 s	Time 0.5 s	Time 1.0 s	Time 2.0 s	Time 3.0 s	Time 4.0 s	Time 5.0 s
10	2.99	2.11	1.73	1.49	1.34	0.94	0.67	0.55	0.47	0.42
16	4.8	3.4	2.8	2.4	2.1	1.5	1.1	0.9	0.8	0.7
25	7.5	5.3	4.3	3.7	3.3	2.4	1.7	1.4	1.2	1.1
35	10.5	7.4	6.0	5.2	4.7	3.3	2.3	1.9	1.7	1.5
50	14.9	10.6	8.6	7.5	6.7	4.7	3.3	2.7	2.4	2.1
70	20.9	14.8	12.1	10.5	9.4	6.6	4.7	3.8	3.3	3.0
95	28.4	20.1	16.4	14.2	12.7	9.0	6.3	5.2	4.5	4.0
120	35.9	25.4	20.7	17.9	16.0	11.3	8.0	6.5	5.7	5.1
150	44.8	31.7	25.9	22.4	20.0	14.2	10.0	8.2	7.1	6.3
185	55.3	39.1	31.9	27.6	24.7	17.5	12.4	10.1	8.7	7.8
240	71.7	50.7	41.4	35.9	32.1	22.7	16.0	13.1	11.3	10.1
300	89.6	63.4	51.8	44.8	40.1	28.3	20.0	16.4	14.2	12.7
400	119.5	84.5	69.0	59.8	53.4	37.8	26.7	21.8	18.9	16.9
500	149.4	105.6	86.3	74.7	66.8	47.2	33.4	27.3	23.6	21.1
630	188.2	133.1	108.7	94.1	84.2	59.5	42.1	34.4	29.8	26.6
800	239.0	169.0	138.0	119.5	106.9	75.6	53.4	43.6	37.8	33.8
1000	298.8	211.3	172.5	149.4	133.6	94.5	66.8	54.6	47.2	42.3

G.1 Voltage Drop

When current flows in a cable conductor, there is a voltage drop between the ends of the conductor, which is the product of the current and the impedance. If the voltage drop were excessive, it could result in the voltage at the equipment being supplied being too low for proper operation. In order to ensure satisfactory operation of electrical equipment, it is necessary to maintain the voltage at which it is supplied within certain limits.

G.2 Voltage Drop Limitation in Consumers' Installations

Most electrical codes normally permit a 3% voltage drop in a "feeder" or "branch circuit" and no more than 5% voltage drop from the supply side of the consumer's service to the point of utilization. The voltage drop limitation applying to a circuit needs to be assessed taking account of the function of the circuit and its relationship with other circuits.

G.3 Use of Tabulated mV/A/m Values

The tabulated voltage drop (mV/A/m) values in Tables G.1 & G.2 represent the worst case conditions, whereby it is assumed that the cable is operating at its maximum permitted operating temperature (70 °C and 90 °C for PVC and XLPE insulated cables respectively) and is supplying a load having a power factor equal to the power factor of the cable. For three-phase circuits, balanced loading is assumed.

Where the cable size and type, load current and length of run are known, the voltage drop can be calculated from:

$$V_d = \frac{V_t \times I \times L}{1000} \quad [V]$$

V_d	Voltage drop for the cable run (V)
V_t	Tabulated voltage drop value for the cable (mV/A/m)
I	Load current (A)
L	Length of cable route/run (m)

G.4 Example

Assume a 4-core 10 mm² cable with copper conductors and XLPE insulated, carrying a load current of 20 A over 60 m route length. At normal operation, the voltage drop would be:

$$3.53 \times 20 \times 60 \times 0.001 = 4.236 \text{ V}$$

Where 3.53 is the tabulated value in Table G.2 for the voltage drop per amp per meter (mV/A/m) of this cable at its maximum permitted operating temperature (90 °C).

Table G.1 – Voltage drop for PVC insulated cables

(mV/A/m)

Area mm ²	Single-core cables								Multi-core	
	Unarmoured				Armoured					
	Copper		Aluminium		Copper		Aluminium			
	Flat	Trfl	Flat	Trfl	Flat	Trfl	Flat	Trfl	Cu	Al
1.5	21.494	21.478	-	-	21.540	21.524	-	-	21.436	-
2.5	13.219	13.203	-	-	13.263	13.247	-	-	13.166	-
4	8.281	8.265	-	-	8.320	8.304	-	-	8.233	-
6	5.576	5.560	-	-	5.614	5.598	-	-	5.532	-
10	3.367	3.351	5.592	5.576	3.403	3.387	5.627	5.611	3.326	5.550
16	2.161	2.145	3.514	3.498	2.193	2.177	3.546	3.530	2.123	3.475
25	1.412	1.396	2.253	2.237	1.440	1.424	2.282	2.266	1.377	2.220
35	1.049	1.033	1.661	1.645	1.076	1.060	1.688	1.672	1.017	1.629
50	0.802	0.786	1.254	1.238	0.827	0.811	1.279	1.263	0.772	1.224
70	0.588	0.572	0.899	0.883	0.611	0.595	0.922	0.906	0.561	0.871
95	0.456	0.440	0.681	0.665	0.475	0.459	0.700	0.684	0.429	0.654
120	0.383	0.367	0.560	0.544	0.402	0.386	0.579	0.563	0.357	0.533
150	0.331	0.315	0.476	0.460	0.348	0.332	0.493	0.477	0.307	0.451
185	0.288	0.272	0.402	0.386	0.302	0.286	0.417	0.401	0.264	0.377
240	0.246	0.230	0.332	0.316	0.259	0.243	0.346	0.330	0.223	0.309
300	0.219	0.203	0.287	0.271	0.232	0.216	0.301	0.285	0.197	0.265
400	0.197	0.181	0.249	0.233	0.209	0.193	0.261	0.245	0.175	0.226
500	0.179	0.163	0.218	0.202	0.189	0.173	0.229	0.213	0.159	0.197
630	0.165	0.149	0.194	0.179	0.174	0.158	0.204	0.188	-	-
800	0.155	0.139	0.177	0.161	0.164	0.148	0.187	0.171	-	-
1000	0.147	0.131	0.164	0.148	0.154	0.138	0.172	0.156	-	-

Note: Values calculated based on: maximum permitted operating temperature 70 °C, power factor 0.85, rated frequency 60 Hz.

Table G.2 – Voltage drop for XLPE insulated cables

(mV/A/m)

Area mm ²	Single-core cables								Multi-core	
	Unarmoured				Armoured					
	Copper		Aluminium		Copper		Aluminium			
	Flat	Trfl	Flat	Trfl	Flat	Trfl	Flat	Trfl	Cu	Al
1.5	22.892	22.876	-	-	22.939	22.923	-	-	22.832	-
2.5	14.074	14.058	-	-	14.120	14.104	-	-	14.019	-
4	8.808	8.792	-	-	8.850	8.834	-	-	8.757	-
6	5.927	5.911	-	-	5.967	5.951	-	-	5.880	-
10	3.574	3.558	5.952	5.936	3.612	3.596	5.990	5.974	3.530	5.908
16	2.289	2.273	3.736	3.720	2.324	2.308	3.770	3.754	2.249	3.696
25	1.492	1.476	2.392	2.376	1.522	1.506	2.422	2.406	1.456	2.357
35	1.106	1.090	1.760	1.744	1.134	1.118	1.788	1.772	1.073	1.727
50	0.843	0.827	1.326	1.310	0.869	0.853	1.352	1.336	0.812	1.295
70	0.617	0.601	0.949	0.933	0.639	0.623	0.972	0.956	0.588	0.920
95	0.474	0.458	0.715	0.699	0.494	0.478	0.735	0.719	0.446	0.687
120	0.398	0.382	0.587	0.571	0.417	0.401	0.607	0.591	0.371	0.560
150	0.343	0.327	0.498	0.482	0.360	0.344	0.515	0.499	0.318	0.472
185	0.296	0.280	0.418	0.402	0.312	0.296	0.434	0.418	0.272	0.394
240	0.252	0.236	0.344	0.328	0.265	0.249	0.358	0.342	0.229	0.320
300	0.223	0.207	0.296	0.280	0.235	0.219	0.308	0.292	0.201	0.273
400	0.199	0.183	0.255	0.239	0.212	0.196	0.268	0.252	0.178	0.232
500	0.181	0.165	0.223	0.207	0.192	0.176	0.234	0.218	0.160	0.201
630	0.167	0.151	0.198	0.182	0.176	0.160	0.208	0.192	-	-
800	0.157	0.141	0.180	0.164	0.166	0.150	0.190	0.174	-	-
1000	0.148	0.132	0.166	0.150	0.156	0.140	0.175	0.159	-	-

Note: Values calculated based on: maximum permitted operating temperature 90 °C, power factor 0.85, rated frequency 60 Hz.

H.1 Cable Sizing Calculations

It is of vital importance that the type and size of cable ordered is suitable for its intended use. The proper sizing of an electric cable is important to ensure that the cable can:

- Operate continuously under full load without being damaged or degraded
- Withstand the worst short-circuit currents flowing through the cable
- Provide the load with a suitable voltage (and avoid excessive voltage drops)

The main three factors that principally affect the minimum size of cable required are:

1. The cable current-carrying capacity (load current), influenced by the cable materials, construction, and installation conditions.
2. The voltage drop in the cable circuit, a function of load current, load power factor, and length of the cable run.
3. The short-circuit current, a function of both the magnitude and duration of the short-circuit current, limited by the cable materials.

H.2 General Methodology for Selection of Conductor Size

To select the proper cable size, all cable sizing methods follow the same basic five-step process:

1. Gathering data about the cable, its installation conditions, and the load it will carry.
2. Determine the minimum cable size based on continuous current-carrying capacity.
3. Determine the minimum cable size based on voltage drop considerations.
4. Determine the minimum cable size based on short-circuit current.
5. Select the cable based on the highest of the sizes calculated in steps 2, 3, and 4.

H.2.1 Step 1: Data Gathering

H.2.1.1 Load Details

Load type (motor/feeder), three-phase/single-phase/DC, system voltage, full load current (A), full load power factor, and distance/length of cable run.

H.2.1.2 Cable Construction

Number of cores (single-core or multi-core), conductor material (copper or aluminium), insulation type (PVC or XLPE), and armour type if required (AWA, SWA, or STA).

H.2.1.3 Installation Conditions

Above ground or underground installation, arrangement (directly buried, in conduit, cable tray/ladder, against wall, in air), ambient or soil temperature, cable grouping and spacing, soil thermal resistivity (underground), depth of laying (underground), and for single-core three-phase cables whether installed in trefoil or laid flat.

H.2.2 Step 2: Selection Based on Current Rating

- H.2.2.1 Determine the minimum current for which the cable is to be rated, i.e. the maximum load current.
- H.2.2.2 Ascertain the actual installation conditions. If different from standard laying conditions, apply appropriate correction (derating) factors from Annex C.
- H.2.2.3 Divide the rating from step 1 by the appropriate derating factor(s) from step 2.
- H.2.2.4 From the tabulated continuous current ratings of the required cable type and installation method, select a cable with a tabulated rating not less than the value obtained from step 3.

H.2.3 Step 3: Selection Based on Voltage Drop

- H.2.3.1 Determine the maximum load current I (A) and the route length L (m) of the circuit.
- H.2.3.2 Calculate the maximum voltage drop V_d (V) permitted in the circuit (e.g. 3.0% of 380 or 400 V).
- H.2.3.3 Calculate V_{ap} (mV/A/m) using:

$$V_{ap} = \frac{V_d \times 1000}{I \times L} \quad [mV/A/m]$$

Then from Tables G.1 & G.2, select a cable with a tabulated voltage drop $\leq V_{ap}$.

H.2.4 Step 4: Selection Based on Short-Circuit Current

- H.2.4.1 Determine the duration t (s) and magnitude I_{sc} (A) of the prospective short-circuit current.
- H.2.4.2 From Tables F.1-F.4, select a cable with a tabulated short-circuit current not less than the value determined in step 1.

H.2.5 Step 5: Determination of Conductor Size

For any circuit, the cable size selected should not be less than the largest of the sizes calculated to meet all three limitations (current rating, voltage drop, and short-circuit current). This is the smallest size which will meet all requirements.

In practice, the current-carrying capacity will prevail in short-run / high-current circuits, while voltage drop considerations will usually prevail in long-run / low-current circuits. It is unusual for short-circuit current requirements to determine the conductor size for low voltage cables.

H.3 Calculation Example

Size a cable for a 40 kW, 400 V three-phase motor from the Motor Control Center (MCC) to the field.

Given Data:

- Cable type: Cu/XLPE/SWA/PVC, 3C+E, 0.6/1 kV
- Installation: above ground on cable ladder, bunched (touching) with 3 other cables, single layer, 30 °C ambient
- Cable run: 80 m (including tails)
- Motor load: 40 kW, 400 V 3-phase, FLC = 68 A, PF = 0.85
- Max permissible voltage drop: 3.0%
- Protection: $I_{sc} = 0.6$ kA, duration $t = 3.0$ s

Step 2: Current Rating

Motor FLC = 68 A. From Annex C: ambient temperature derating = 1.10 (Table C.2), grouping derating for 4 bunched cables on cable ladder = 0.80 (Table C.8). Overall derating factor = $1.10 \times 0.80 = 0.88$. Derated current = $68/0.88 = 78$ A. From tabulated ratings for 4C Cu/XLPE/SWA/PVC in free air: $4 \times 16 \text{ mm}^2$ has rated current 96 A > 78 A.

Step 3: Voltage Drop

$I = 78$ A, $L = 80$ m. Max $V_d = 3.0\% \times 400 = 12$ V. Required $V_{ap} = 12 \times 1000/(78 \times 80) = 1.923$ mV/A/m. From Table G.2: 16 mm^2 has $V_t = 2.249$ mV/A/m > 1.923 (fails). 25 mm^2 has $V_t = 1.456$ mV/A/m < 1.923 (passes). Therefore $4 \times 25 \text{ mm}^2$ is the minimum based on voltage drop.

Step 4: Short-Circuit Current

$I_{sc} = 0.6$ kA, $t = 3.0$ s. From Table F.3 (Cu/XLPE): 10 mm^2 has tabulated value 0.83 kA for 3.0 s > 0.6 kA. Therefore $4 \times 10 \text{ mm}^2$ is the minimum based on short-circuit current.

Step 5: Final Selection

Comparing the three results:

Criterion	Min. Size	Governing?
Current rating	$4 \times 16 \text{ mm}^2$	No
Voltage drop	$4 \times 25 \text{ mm}^2$	Yes
Short-circuit current	$4 \times 10 \text{ mm}^2$	No

⇒ Select $4 \times 25 \text{ mm}^2$ Cu/XLPE/SWA/PVC cable to fulfill all requirements.

I.1 General

This annex provides installation methods commonly encountered in industrial, residential and electric power utility applications and should be used in conjunction with the engineer's installation specifications and all applicable codes/standards. The cables included in this catalogue are designed to be installed in air, or for burial in free draining soil conditions either direct buried in the ground or in buried ducts.

I.1.1 Single-Core Cables

The following points relating to single-core cables should be noted:

1. Single-core cables carrying the phase currents of a three-phase a.c. circuit must be installed as closely as possible together, to minimize inductive reactance and voltage drop. The preferred formation is a "trefoil" or cloverleaf pattern although flat touching formation is also acceptable. Sheaths should be in contact with one another in either case.
2. A single-core cable generates an alternating magnetic field which can cause large increases in voltage drop and power loss due to "transformer effect" when ferrous metal (iron and steel) encircles the cable. Steel racking or ladder will not induce this effect, but:
 - Cable cleats may be of wood, plastic, or non-ferrous metal but steel saddles should not be used on single cores.
 - Where three single-phase cables pass through a steel bulkhead, they must all pass through the same hole. Where glanding is required, use a non-ferrous (metal or plastic) plate.

I.1.2 Lugs and Links

Stranded compacted conductors, either round or sector shaped, must have lugs and links fitted that are manufactured for the same nominal cross-sectional area as the conductor. For example, a 150 mm² conductor must have a 150 mm² lug or link fitted, and the correct dies should be used to compress it. If a smaller lug is fitted, the joint would be over-compressed and likely to fail in service, and would be unable to carry the same maximum current as the larger conductor.

I.2 Pre-Installation

To ensure safety during cable installation and reliability once installed, confirm the following prior to installation:

- The cable selected is proper for your application
- The cable has not been damaged in transit or storage

Review all applicable local, state, provincial, and national codes to verify that the cable is appropriate for the installation.

I.2.1 Drum Handling

The following recommendations for storage and handling of cables packed on wooden cable drums should be followed:

	Correct Practice	Incorrect Practice
1	Cradle both reel flanges between forks	Do not lift by top flange – cable or reel will be damaged
2	Reels can be hoisted with a shaft extended through both flanges	Use a spreader bar to prevent bending the reel flanges and damaging the cable
3	Place spacers under the bottom flange and between reels to create space for forks	Upended heavy reels often arrive damaged – refuse or inspect for hidden damage
4	Lower reels from truck using hydraulic gate, hoist or forklift – lower carefully	Never allow forks to touch cable surface or reel wrap
5	Always load with flanges on edge and chock and block securely	Never drop reels

I.2.2 Cable Inspection

Inspect every reel of cable for damage before accepting shipment. Be particularly alert for cable damage if:

- A reel is laying flat on its flange side
- Several reels are stacked on top of each other
- Nails have been driven into reel flanges to secure shipping blocks
- A reel flange is damaged or a reel has been dropped (hidden damage likely)
- A cable covering has been removed, stained, or damaged
- A cable end seal has been removed or is damaged

I.2.3 Cable Storage

Cables should be stored on hard surfaces so that reel flanges cannot sink. Prevent impact damage by aligning reels flange to flange, using guards across flanges when different reel sizes are stored together, and maintaining adequate aisles and barricades.

I.2.4 Prevention of Moisture Ingress

Care should be exercised during installation to avoid any damage to cable coverings. The protective end cap should not be removed until immediately prior to termination or jointing, especially for cables without an extruded bedding. Unprotected cable ends should not be exposed to moisture.

I.3 Installation

A high percentage of cable failures are due to mechanical damage, which typically occurs during transportation, handling and installation. Most cables are subjected to more mechanical stress during installation than they ever experience in actual operation. When cables are installed in a raceway, underground duct or cable tray, the following must be considered: conductor configuration, raceway/cable tray fill, physical limitations of cables, installation equipment, and ambient temperature and conditions.

I.3.1 Minimum Installation Radius

None of the cables in this catalogue should be bent during installation to a radius smaller than the following (where R is the overall diameter of the cable):

Cable Type	Installation	At Joints
SC - Unarmoured	15	8
SC - Armoured	12	8
MC - Unarmoured	12	6
MC - Armoured	12	6

The reduced radius at joints/terminations applies only when bending is carefully controlled (e.g. by use of a former).

I.3.2 Minimum Temperature During Installation

Cables should be installed only when both the cable and ambient temperature are above 0 °C and have been so for the previous 24 hours, or where special precautions have been taken to maintain the cable above this temperature.

I.3.3 Maximum Pulling Tension

The maximum pulling tension depends on cable design, mechanical limitations, conductor material, and the method of laying and pulling.

I.3.3.1 Pulling eye attached to conductor:

$$T_m = 0.036 \times n \times C_m \quad (\text{Copper})$$

$$T_m = 0.027 \times n \times C_m \quad (\text{Aluminium})$$

Where T_m = max. pulling tension (N), n = number of conductors, C_m = circular mil area of each conductor. Maximum: 22 240 N for single-core cables, 44 480 N for multi-core cables.

I.3.3.2 Cable grip over lead sheath: Max. tension on lead sheath $\leq 10.33 \text{ N/mm}^2$.

I.3.3.3 Cable grip over non-lead cable: Max. pulling tension $\leq 4\,400 \text{ N}$.

I.3.4 Sidewall Pressure

One of the limitations to be considered in the installation of electrical cables is sidewall pressure. The sidewall pressure is the force exerted on the insulation and sheath of the cable at a bend point when the cable is under tension, and is normally the limiting factor in installations where cable bends are involved.

$$P = \frac{T_o}{r}$$

P	Sidewall pressure (N/m)
T_o	Tension leaving the bend (N)
r	Inside radius of conduit (m)

The normal maximum sidewall pressure per meter of radius is as given below:

Cable Type	N/m	lbf/ft
Non-shielded multi-core cables	7 300	500
Single-core cables	7 300	500
Armoured cables	4 400	300

In order to minimize cable damage due to excessive sidewall pressure, the installer should check the proper recommendations for each type of cable to be installed.

The type designation provides information on the cable type, conductor material, insulation and sheath materials, number of cores, and principal design features in abbreviated and simplified form. The designation is made up of up to 18 digits or characters, specifying the conductor first and then construction from inside to outside.

#	Digit(s)	Description
1	Conductor material	C = Copper, A = Aluminium
2	Conductor type	1 = Solid, 2 = Stranded round, 3 = Compacted, 4 = Sector, 5 = Flexible
3-4	Conductor size	08 = 1.5 mm ² , 10 = 2.5, 12 = 4, 13 = 6, 14 = 10, 15 = 16, ... 55 = 1000 mm ²
5	Insulation material	X = XLPE, P = PVC (70 °C), M = PVC (90 °C)
6	Rated voltage	A = 0.6/1 kV
7	Cable construction	1 = Cores, 2 = Pairs
8-9	Number of cores	01 = 1C, 02 = 2C, 03 = 3C, 04 = 4C, 05 = 5C, ... 61 = 61C
10	Shielding	N = Copper tape, C = Copper wires, 0 = Without
11	Armouring	0 = None, A = AWA, W = SWA, G = STA, L = Lead sheath
12	Outer sheath	M = PVC (90 °C), C = PVC (80 °C)
13	Sheath colour	B = Black, R = Red, E = Grey, L = Blue, N = Brown, M = Green/Yellow
14-15	Core identification	51 = 1C Red, 01 = 2C, 04 = 3C, 08 = 4C, 12 = 5C, 21 = 6C+
16	Design standard	I = IEC, B = BS, C = Customer request
17	Packing type	M = Wooden drum, T = Steel drum
18	Cutting length	S = 250 m, F = 500 m, R = 1000 m

Note: Core identification colours and cutting lengths shown are the most common. Other colours and lengths can be supplied upon request.

UNIVERSAL METALS

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