LOW VOLTAGE LEAD SHEATHED POWER CABLES

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GENERAL
INTRODUCTION

Bahra Cables Company was established in 2008 to serve Saudi & GCC Markets. It is based in Bahra industrial city located 25km from Jeddah. Bahra Cables Factory occupies over 300,000 square meters of prime manufacturing space together with associated design offices, laboratories and storage area. It specializes in Manufacturing and Distributing Electric Cables.

Bahra Cables Company is committed to the production of the best product quality and service, utilizing cutting edge European Technology in manufacturing. The core technologies in production processes, material applications and logistic procedures were provided German experts and the key functions are being managed by German engineers.

The organization has a lean vertical management structure which is designed to integrate with a highly developed IT-based structure. This partnership allows the rapid flow of information through the management chain and facilities timely response in the best traditions of 'hands on' management. Bahra Cables Company has the flexibility to provide a versatile product range to serve the construction, electric utilities, distribution, industrial, oil & gas and petrochemical sectors. The cables produced comply with both American standards (CSA, ANSI and ICEA) and European standards (IEC, BS, NF and VDE Specifications.)

The scope of this catalogue is to provide an in depth view of the technical information of the low voltage cables 0.6/1.0KV, with PVC or XLPE insulation to IEC 60502-1 and XLPE insulation to BS 5467.

Bahra Cables Company Catalogues is about Control & Auxiliary cables, Power and control Tray Cables to UL 1277, cables having low emission of smoke and corrosive gases, zero halogens (LSZH) to IEC60502-1 or BS 6724 are available upon request.

AREA

Bahra Cables Company has a total land area of about 300,000sqm at disposal.
The built-up area, including offices and plant, of start up phase is more than 62,000sqm.
The factory extension under construction is more than 8,000sqm.
The total available stock yard for(drum) storage is more than 80,000sqm.

PRODUCT SCOPE

BAHRA CABLES COMPANY is committed to deliver the highest standard wires and power cables to the local market, GCC and for export.

To do so, Bahra Cables Company produces a versatile product range cover most of our customer needs:

Additionally,other products described in separate publications covers:

- Flexible wires and cables up to 300 mm2 to IEC 60227 , BS 6004 & BS 6500 .
- Building wires, THHN/THWN & THW to UL 8.3, with conductor sizes starting from 16 AWG.
- Thermosetting insulated wires types XHHW-2 , XHHW, XHH, RHW-2, RHW &RHH to UL44
- Building wires (NYA) to IEC 60227 and BS 6004, from 1.5 mm2 and above.
- LV power Cables with PVC and XLPE insulation to IEC 60502-1, BS 5476, BS 7889 and UL 1277.
- MV cables to IEC 60502-2 up to 18/30 (36) kv and to BS 6622 up to 19/33 (36) kv.
- Low smoke and fume , zero halogen building wire (LSFZH) to BS 7611 , with thermosetting insulation which is alternative to wire type (NYA) , where the application requires higher standards of safety against the emission of smoke, fumes and toxic gases.
- LV cables with LSFZH, thermosetting insulation which under exposure of to fire generate low emission of smoke, fumes and toxic gases and zero halogens. The cables are produced according to BS 6724, IEC 60502-1 and tested to IEC 61034 , IEC 60754 & IEC 60332.
- MV cables with LSFZH to BS 7835.
- HV cables up to 69 kv to IEC 60840, and to ANSI / ICEA S-108-720, with conductor sizes up to 1200 mm2.

The future product scope will be extended to Extra High Voltage cables up to 480 kv and conductor cross sections bigger than 2000 mm2.

FACTORY MACHINERY

All production machines are top of the line of the cables machinery suppliers. From start up with wire drawing lines to extrusion lines, to assembly machines up to the laboratories and the final test fields , all technical equipment is provided with the highest European standards of electronic control equipment and measuring devices which insures that the requirements of different quality standards are met.

All machines/production lines are prepared for data communication and data exchange bottom up and top down using the most modern decentralized control software at the lines (PLC) combined with an efficient central steering and a planning system focused on the demand of cable manufacturers. This way, full traceability will be guaranteed from production start to end, by being able to follow up the machines involved and the material used.

LOGISTICS

All material flow in BCC from incoming raw material up to outgoing cables will be planned and controlled by a complete software system. Herein a classical ERP system will be enhanced and completed by the most modern MES (Manufacturing Executive System) which has a unique focus on the specific problematic issues of cables manufacturing with longitudinal products being winded up and winded off.

The Manufacturing Executive System - MES - covers:

PLANNING

The planning system is active on several levels. For the proper function, all master data (material properties, dimensions, etc.) are saved and permanently maintained in the central database based on

- Cable design
- Planning of Sales Orders
- Planning of Production Orders

DATA COMMUNICATION

The exchange of data is important in several areas

- Incoming inspection
- Raw Materials – Status quo of production orders
- Finished goods
- Shipping status

Bahra Cables Company is willing to provide advice and assistance on all matters concerning PVC and XLPE insulated power cables. Please contact the Technology Department for any query.

QUALITY IS OUR MAIN TARGET

Bahra Cables Company is born to be one of the leading Power Cables Manufacturers in Saudi Arabia and the GCC area. We are working in different axes to completely fulfill customers satisfaction which is the milestone of our business, such axes are:

1. Product quality complying with the local and international standards

2. Product Reliability is starting from the time of product design to fit for the intended application and environmental conditions, to the selection of the raw material from only the highest class suppliers with internationally trusted reputation. Our state of art testing equipments and the strict quality procedures ensure the product quality and integrity so we can guarantee that our cables are defect free and suitable for the intended application through the cable service lifetime.

3. High performance of the product and service through cooperation between experienced staff from Germany and local experts who are aware of the local market requirements and the highest international standards of cables manufacturing. Such cooperation in knowhow is invested to provide our customer with the best service and support.

4. Bahra Cables Company's Quality Management System conforms to the ISO 9001: 2008 International Management Quality System Standard with scope of Design and Manufacturing of Electrical Power Cables and Wires. BCC is certified by American Systems Registrar (ASR), ANAB Accredited.

5. Bahra Cables Company is frequently testing its products at internationally reputable labs, diversity of products have been tested and confirmed compliance to the international standard at KEMA, IPH, SAG(Berlin), BSI and BASEC Labs.

TECHNICAL INFORMATION
GENERAL

PRODUCT RANGE

Cables can be categorized with different criteria, for example the voltage rate, Conductor Material, Insulation Material and Armouring type.

This catalogue is intended for Low Voltage Lead Sheathed Power Cables, Aluminum and Copper conductors of voltage range: 0.6/1.0 kV

CABLE TYPES BELOW 1) TO 5) IN SEPARATE CATALOUGE.

1) Copper Conductor Cables
2) Aluminum Conductor Cables
3) Thermoplastic / PVC insulated cables
4) Thermoplastic /XLPE insulated cables
5) Armoured / Non armoured Cables
6) Lead Sheathed (Lead or Lead Alloy) Cables

Single core cables up to and including 1000 mm2

2 core cables up to and including 95 mm2

3, 4 core & 4 core with reduced neutral cables up to and including 500 mm2

APPLICABLE STANDARDS

IEC 60502 (Part 1) "PVC/ XLPE insulated cables" single core / multi-core

BS 5467 for XLPE insulated armoured cables

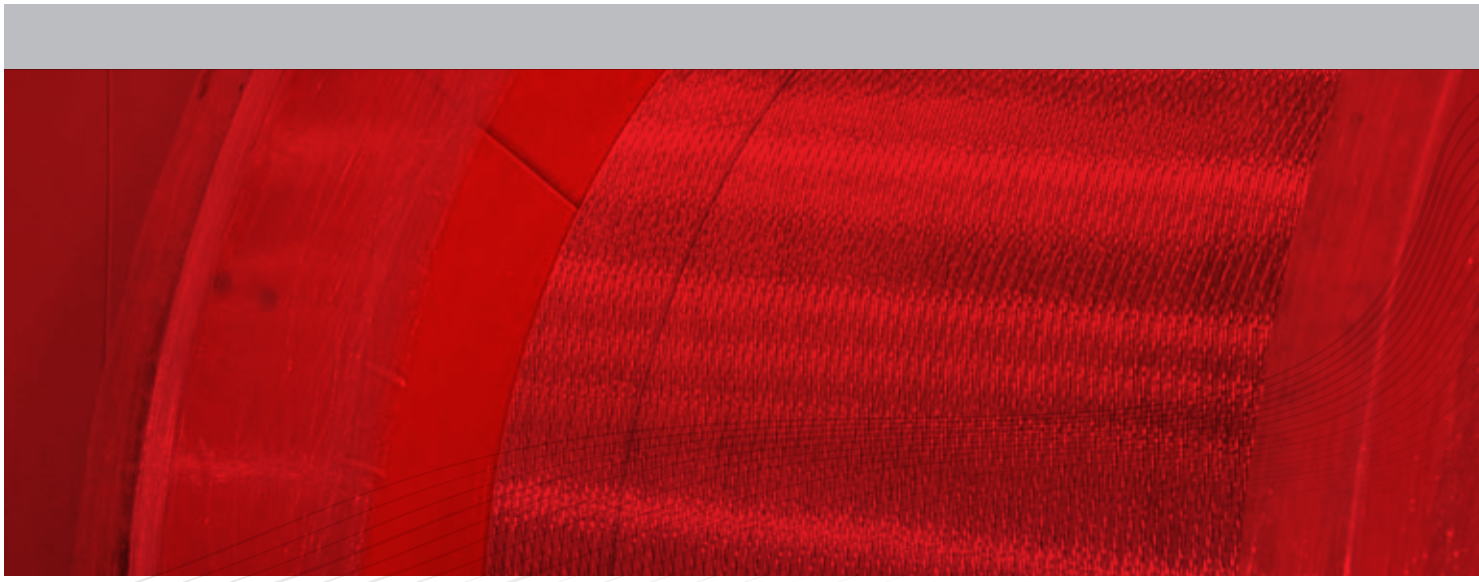
IEC 60502-1 & BS 5467/EEMUA 133 & for XLPE insulated Lead Sheathed cables

BS 7889 for XLPE insulated single and multi-core unarmoured cables

UL 83, THW, THW-2, THHN/THWN,

UL 44 XHHW-2, XHHW, XHH, RHW-2,RHW & RHH wires

Any other customer of International standards e.g. ANSI/ACEA, VDE/DIN, NF, etc...



1. NOMINAL VOLTAGE

The Nominal voltage is to be expressed with two values of alternative current Uo/U in V (volt)
Uo/U : Phase to earth voltage
Uo : Voltage between conductor and earth
U : Voltage between phases (conductors)

2. RESISTANCE

The Values of conductor DC resistance are dependent on temperature as given by :

$Rt = R20 \times [1 + \alpha\ 20(t - 20)]$	Ω/km
Rt : conductor DC resistance at t ° C	Ω/km
R20 : conductor DC resistance at 20 ° C	Ω/km
t : operating temperature	° C

α : resistance temperature coefficient
= 0.00393 for copper
= 0.00403 for aluminum

Generally DC resistance is based on IEC 60228 To calculate AC resistance of the conductor at the operating temperature as the following:
RAC = Rt x[1+ ys + yp]
ys : skin effect factor
yp : proximity effect
Generally AC resistance is based on IEC 60287

3. CAPACITANCE

$$C = \frac{\epsilon_r}{18 \ln \frac{D}{d}}$$ μF/km

C : Operating capacitance	μF/km
D : Diameter over insulation	mm
d : Conductor diameter	mm

ϵr :Relative permittivity of insulation material
ϵr = 4.8 for PVC
ϵr = 2.3 for XLPE

4. INDUCTANCE

$L = K + 0.2 \ln (2s/d)$	mH/km
L : Inductance	mH/km

K :Constant depends on number of wires of conductor
d: Conductor diameter
S : Axial spacing between cables (Trefoil formation)
S : 1.26 x axial spacing between cables(Flat formation)

5. REACTANCE

The inductive reactance per phase of a cable may be obtained by the formula:

$X = 2 \pi f L \times 10^{-3}$	Ω/km
X: Reactance	Ω/km
f : Frequency	Hz
L : Inductance	mH/km

6. IMPEDANCE

$$Z = \sqrt{R^2_{ac} + X^2}$$ Ω/km

Z : Phase impedance of cable	Ω/km
Rac : AC resistance at operating temperature	Ω/km
X : Reactance	Ω/km

7. INSULATION RESISTANCE

$$R = \frac{1000}{2 * \pi} * LN (D/d)$$

R : Insulation resistance at 20° C	MΩ.km
D : Insulated conductor diameter	mm
d : Conductor diameter	mm

8.CHARGING CURRENT

$I = Uo \times 2\Pi f \times C \times 10^{-6}$

I : Charging current	A/km
Uo : voltage between phase and earth	V
C : Capacitance to neutral	μF/km

9. DIELECTRIC LOSSES

$D = 2 \pi f C Uo^2 \tan \delta 10^{-6}$

D : Dielectric losses	watt/km/phase
Uo : Voltage between phase and earth	V
C : Capacitance to neutral	μF/km
tan δ : Dielectric power factor	

10. CABLE SHORT CIRCUIT CAPACITY

$ISC(t) = ISC(1) / \sqrt{t}$	kA
ISC(t): Short circuit for t second	kA
ISC(1): Short circuit for 1 second	kA

Data about short circuit are tabulated from table 26 to table 28

11. VOLTAGE DROP

When the current flows in conductor, there is a voltage drop between the ends of the conductor. For low voltage cable network of normal operation, it is advisable of a voltage drop of 3-5 %. To calculate voltage drop as the following:

1- for single phase circuit:

$Vd = 2I \iota (R \cos\phi + X \sin\phi)$

2- for three phase circuit :

$Vd = \sqrt{3} I \iota (R \cos\phi + X \sin\phi)$

Vd : Voltage drop	V
I : Load current	A
R : AC resistance	Ω/km
X : Reactance	Ω/km
ι : Length	km
cosϕ : Power factor	

- Relation between cosϕ and sinϕ as following:

cosϕ	1.0	0.9	0.8	0.71	0.6	0.5
sinϕ	0.0	0.44	0.6	0.71	0.8	0.87

1.0 CONDUCTORS

A conductor is the metallic part of cables that is carrying the electric current
Conductor materials are :

1.1 Plain annealed or tin coated copper conductor (to BS EN 1977, ASTM B3, ASTM B49 & ASTM B 33)

1.2 Aluminum (to ASTM B233)

The conductor structure is complying to the requirements of BS EN 60228 (IEC 60228) class 2 stranded, non Compacted , compacted or compacted sector shaped conductors. The shape codes are:

re, round solid
rm, round stranded
rmc, round compacted stranded
sm, sectoral stranded
dm, ('D' Shape) stranded

2.0 INSULATION

2.1 Each core conductor is insulated by extruded plastic material as will follow; the insulation thickness is selected based on the designated voltage rate complying with IEC 60502-1 & BS 5467 suitable for 0.6/1.0 KV.

2.2 The insulation integrity is controlled online by an AC spark tester with test methods specified in BS EN 62230 and using test voltages specified in BS5099.

2.3 Insulation Material :
Insulation material is selected to match the desired customer require ments and customer specification.

2.3.1 Standard Polyvinyl chloride type (PVC/A 70 °C) complying with IEC 60502-1 requirements or Types (TI 1 70 °C) & heat resistant PVC type TI-3 (90 °C) complying with BS EN 50363-3.

2.3.2 Cross Linked Polyethylene XLPE complying with IEC 60502.
The XLPE is selected to comply with the requirements of GP-8 type as specified in BS 7655-1.3

2.3.3 Bahra Cables' stranded insulation color codes are described in Table-1 (i.e. used in the products of this catalogue), meanwhile the color code as per BS 5467 is offered to our customers upon their request.

2.3.4 The insulation is covered by Ultra-violet (UV) resistant Masterbatch. This protects the insulation from deterioration when exposed to continuous sunlight, the UV resistant performance of the Insulation is assessed by using the Arc Xenon test as per UL 1581

Table 1: Insulated Core Color Codes

Number of Cores	Colors to IEC 60502-1	Colors to BS 5467 (A:2008)
1	Red or Black	Brown or Blue
2	Red & Black	Brown & Blue
3	Red, Yellow and Blue	Brown, Black and Grey
4	Red, Yellow, Blue and Black	Blue, Brown, Black and Grey
5	Red, Yellow, Blue, Black and Green / Yellow	Green / Yellow, Blue, Brown, Black and Grey

3.0 CABLE ASSEMBLY

The insulated cores are laid up together to form the laid up cable cores. Extruded suitable polymer compound or non-hygroscopic polypropylene filler is applied (when required) between laid up cores to provide a circular shape to the cable.

Polypropylene tape(s) or PETP (Polyester) tape(s) is used as a barrier tape over the laid up cores. Such tape(s) will bind the cores together and prevent them from opening out, acts as a separator between different polymers used in a cable and works as a heat barrier between the cores and the extruded bedding.

4.0 BEDDING

It could be also called inner sheath or inner jacket, which serves as a bedding under Lead Sheath to protect the laid up cores and as a inner sheath. The bedding is an extruded PVC type 9 Compound as per BS 7655-4.2.

5.0 LEAD SHEATH

It consists of Lead or Lead Alloy Compound as per BS EN 12659 & protects the cable against moisture, hydrocarbons & corrosive contaminants.

6.0 BEDDING

It could be also called separation sheath , which serves as a bedding under cable armouring to protect the lead Sheath as a separation sheath. The bedding is an extruded PVC type 9 Compound as per BS 7655-4.2.

7.0 ARMOURING

The cable intended for tray application is protected enough and does not require lead sheath & armour in general, while it is recommended to have an armour for the cable intended for Direct Burial applicable. The armour provides mechanical protection against crushing forces. Armour also can serve as an Earth Continuity Conductor (ECC). The armouring type could be:

7.1 One layer of Galvanized Round Steel Wire to BS EN 10257 is applied helically over the bedding.

7.2 Aluminum wire armouring for a single core cable acts as non magnetic armour.

8.0 OUTERSHEATH (OUTERJACKET)

8.1 It is the outer protection part of the cable against the surrounding environment.

8.2 Several materials can be used as oversheath based on the intended application.

8.2.1 General purpose PVC Type ST2 compound as specified in IEC 60502-1, or its equivalent PVC Type 9 to BS 7655-4.2.

8.2.2 The standard sheath color is Black, meanwhile other colors such as Red and Light Blue can also be provided as per customer request and in this case suitable UV proved additive is added to the Master batch to ensure resistance to sunlight.

8.2.3 When the cable is required to be antitermite / antivermin, a special additive is added to the sheathing compound.

8.2.4 All cables produced at Bahra Cables Company with PVC or Halogen free jackets are complying with the flame retardant test to IEC 60332-1. Whenever a requirement for more severe tests as IEC 60332-3 is needed, a jacketing compound with Oxygen index value more than 30% will be used.

LEAD SHEATHED, LOW VOLTAGE CABLES

Underground Electrical installations at petrochemical, refinery and oil&gas industry could be exposed to a high risk of damage and circuit failures in case spillage or seepage of organic chemicals - aliphatic or aromatic. These chemicals in form of gases or liquids could deteriorate the cables sheathings and insulation, keeping the conductors unprotected.

*EEMUA Publication No 133 (Specification of underground Armourd Cables Protected against Solvent and Corrosive Attack) provides the requirements for protection to these installations by implementing a protective layer of Lead / Lead Alloy E to BS EN 12659 extruded over bedding.
Lead is a very stable material against all hydrocarbons, which provides a robust protection to control and power cables insulation in case of any spillage or seepage.
In addition to its superior chemical protections, lead sheath could also serve as a return path to short circuit current, especially for MV and HV cables.

*EEMUA

EEMUA is the Engineerig Equipment and Materials Users' Associaation, UK.

Table 2 : Cables bending radius

Cable Type	Cable Minimum Bending Radius
Circular /Shaped Copper or Aluminum Conductors, Lead Sheathed D: Cable diameter	20D

1 CURRENT RATING ASSUMPTIONS

The calculation of the current ratings, Current rating equations (100% load factor) and calculation of losses are based on IEC 60287 series , and the values of Current ratings for under ground applications (In Duct or Direct Buried) are derived from the latest issue of ERA Report' Current Rating Standards 69.30 Part V '.

Bahra Cables Company offers heat resistant PVC type TI-3 (90 °C) as insulation, which almost has the same current carrying capacity as XLPE 90 °C operating temperature.

The calculation is based on the standard dimensions of cables based on IEC 60502-1, which may have a slight difference from the applied cable dimension which are following the best common manufacturing practices.

The values given in the tables are for one circuit installed thermally isolated from other circuits or any other heat source.

The basis of the standard conditions is the climate condition of the Kingdom of Saudi Arabia, which is :

Ambient Air Temperature:	40 °C
Ambient Ground Temperature:	35 °C
Depth of laying in ground:	0.50 m
Soil Thermal Resistivity	1.2 K.m/W

For other installation conditions or any value of different air/ ground temperature, depth of laying, different soil thermal resistivity the customer is divided to multiply the tabulated current rating by the de-rating factor values as in tables 3 to 7 for direct buried cables in ground and tables 9 to 12 for cables installed in duct.

2 INSTALLATION CONDITIONS FOR DIRECT BURIAL CABLES

For a cable installed direct buried, the following tables will be used to calculate the current rates based on the actual soil thermal resistivity, Ground ambient temperature and the Depth of Laying.

Table 3 : Rating factors for ground temperature variation

Ground Temparature	15°C	20°C	25°C	30°C	35°C	40°C	45°C	50°C	55°C
Cable Type									
PVC Insulated	1.18	1.15	1.1	1.04	1	0.95	0.88	0.83	0.77
XLPE Insulated	1.16	1.13	1.09	1.03	1	0.95	0.89	0.84	0.79

Table 4 : Rating factors for depth of laying (to center of cable or trefoil group of cables)

Depth of Laying (m)	upto 70mm²	95mm² to 240mm²	Above 300mm²
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
2.50	0.90	0.87	0.84

Table 5 : Rating factors for variation in thermal resistivity of soil (average values)

Size of Cables mm²	Soil Thermal Resistivity (°C.m/W)						
	0.8	0.9	1.0	1.5	2.0	2.5	3.0
	Single Core Cables						
Upto 150	1.16	1.12	1.07	0.91	0.81	0.73	0.66
From 185 to 300	1.17	1.12	1.07	0.91	0.80	0.73	0.66
From 400 to 1000	1.18	1.12	1.07	0.91	0.80	0.73	0.66
	Multi Core Cables						
Upto16	1.12	1.08	1.05	0.93	0.84	0.77	0.72
From 25 to 150	1.14	1.10	1.06	0.92	0.82	0.75	0.69
From 185 to 500	1.15	1.10	1.07	0.92	0.81	0.74	0.67

Table 6 : Group rating factors for circuits of three single core cables in trefoil or laid flat touching, in horizontal formation

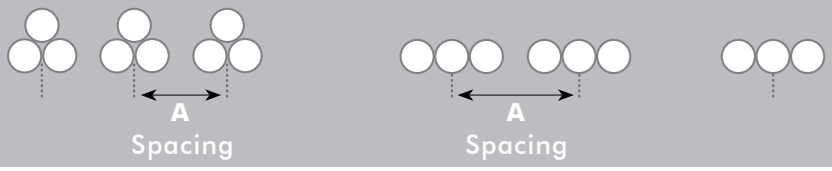
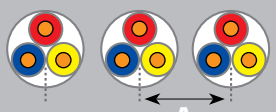
Number of Circuits						
	Nil (cables Touching)		Cable to Cable Clearance A			
	Trefoil	Flat Laying	0.15m	0.30m	0.45m	0.60m
2	0.78	0.81	0.83	0.88	0.91	0.93
3	0.66	0.7	0.73	0.79	0.84	0.87
4	0.61	0.64	0.68	0.73	0.79	0.85
5	0.56	0.6	0.64	0.73	0.79	0.85
6	0.53	0.57	0.61	0.71	0.78	0.82

Table 7 : Group rating factors for multicore cables in horizontal formation

Number of Cables in Group					
	Cable to Cable Clearance A				
	Touching	0.15m	0.30m	0.45m	0.60
2	0.81	0.87	0.91	0.93	0.95
3	0.70	0.78	0.84	0.88	0.90
4	0.63	0.74	0.81	0.86	0.89
5	0.59	0.70	0.78	0.84	0.87
6	0.55	0.68	0.77	0.83	0.87

3 INSTALLATION CONDITIONS FOR CABLES IN DUCTS

A duct is an enclosure of metal or insulating material other than conduits or cable trunking, intended for the protection of cables which are drawn in after erection of the ducting.
The recommended relation between the cable size and duct size is as in table 8

Table 8 : Recommended duct dimensions and cable sizes

Number of Cables in Group	Duct	
	Inside Diameter (mm)	Outside Diameter (mm)
Upto and including 65	100	130
Above 65 upto and including 90	125	160

As the same principal of cables installed in direct burial methods above, the current carrying capacities of cables depends on the installed condition, the rating is calculated based on the values in section 1.5.

The de-rating factors of other conditions should be considered to calculate the actual possible maximum current carrying capacity of the cables.

Tables 9-13 are for the factors to be multiplied by the tabulated current.

Table 9 : Rating factors for ground temperature variation

Ground Temparature	15°C	20°C	25°C	30°C	35°C	40°C	45°C	50°C	55°C
Cable Type									
PVC Insulated	1.18	1.15	1.1	1.04	1	0.95	0.89	0.83	0.77
XLPE Insulated	1.16	1.13	1.09	1.03	1	0.95	0.89	0.84	0.79

Table 10 : Rating factors for variation in thermal resistivity of soil (average values)

Size of Cables mm²	Soil Thermal Resistivity (°C.m/W)						
	0.8	0.9	1.0	1.5	2.0	2.5	3.0
	Single Core Cables						
Upto 150	1.10	1.07	1.04	0.94	0.86	0.80	0.76
From 185 to 300	1.11	1.08	1.05	0.93	0.85	0.79	0.75
From 400 to 1000	1.12	1.08	1.05	0.93	0.84	0.78	0.74
	Multi Core Cables						
Upto16	1.04	1.03	1.02	0.97	0.92	0.88	0.86
From 25 to 150	1.06	1.04	1.03	0.95	0.90	0.85	0.81
From 185 to 500	1.07	1.05	1.03	0.95	0.88	0.83	0.78

Table 11 : Rating factors of depth of laying (to center of duct or trefoil group of ducts)

Depth of Laying (m)	Single Core	Multi Core
0.50	1.00	1.00
0.60	0.98	0.99
0.80	0.95	0.98
1.00	0.93	0.96
1.25	0.91	0.95
1.50	0.89	0.94
1.75	0.88	0.94
2.00	0.87	0.93
2.50	0.86	0.92
3.00 or more	0.85	0.91

Table 12 : Group rating factors for single core cables in trefoil Single way ducts, horizontal (average values)

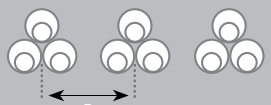
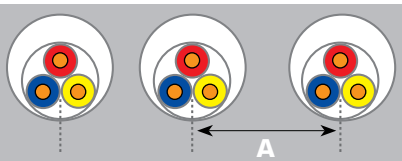
Number of Circuits			
	Cable to Cable Clearance A		
	Touching	0.45m	0.60m
2	0.87	0.91	0.93
3	0.78	0.84	0.87
4	0.74	0.81	0.85
5	0.70	0.79	0.83
6	0.69	0.78	0.82

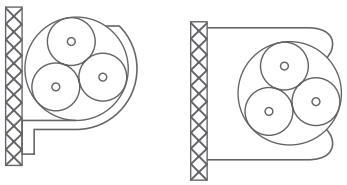
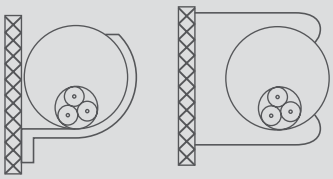
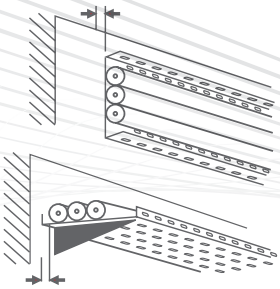
Table 13 : Group rating factors for multicore cables in single way ducts Horizontal formation (average values)

Number of Cables in Group				
	Cable to Cable Clearance A			
	Nil Cables Touching	0.30m	0.45m	0.60
2	0.90	0.93	0.95	0.96
3	0.83	0.88	0.91	0.93
4	0.79	0.85	0.89	0.92
5	0.75	0.83	0.88	0.91
6	0.73	0.82	0.87	0.90
2	0.88	0.91	0.93	0.94
3	0.80	0.85	0.88	0.90
4	0.76	0.81	0.85	0.88
5	0.72	0.78	0.83	0.86
6	0.69	0.76	0.81	0.85

4 INSTALLATION CONDITIONS FOR CABLES IN AIR

Cables installed in air could have many forms of installation methods as described in BS 7671 IEE wiring regulation 17th edition. Some of these methods are like C or B (for cables on Trefoil format laying as in table 14) or like E or F (For cables laid Flat vertically or horizontally as in table 14). It is assumed that the cables are not exposed to the direct sunlight and away from any external heat sources. The de-rating factors for cables laid in free air are as in tables 15 through 17. Additionally there are more de-rating factors tables for other methods of installation, the user has to review BS7671- IEE Wiring Regulations for Electrical Installations, 17th Edition for detailed information.

Table 14 : Installation methods for cables

Installation Method	Description	Current Carrying Capacity Reference
	Single Core or multi core cables: Fixed on (clipped direct) or spaced less than 0.3 times the cable diameter from a wall	C
	Multi core cable in conduit, spaced less than 0.3 x conduit diameter	B
	Cables run horizontally or vertically flat on perforated tray For multi core cable De = Cable diameter, And for 3 single core cables De = 3xcable diameter	E or F

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Important note for single core cables:

The conductors of an A.C. circuit installed in a ferromagnetic enclosure shall be arranged so that all line conductors and the neutral conductor, if any, and the appropriate protective conductor are contained in the same enclosure.

When such conductors enter a ferrous enclosure, they shall be arranged such that the conductors are only collectively surrounded by ferrous material.

Table 15 : Rating factors for other ambient air temperatures

Air Temparature	25°C	30°C	35°C	40°C	45°C	50°C	55°C	60°C
Cable Type								
PVC Insulated	1.18	1.15	1.08	1.00	0.90	0.82	0.70	0.59
XLPE Insulated	1.12	1.10	1.055	1.00	0.96	0.90	0.835	0.78

Table 16 : Rating factors of one or more circuits of single core cables laid in free air

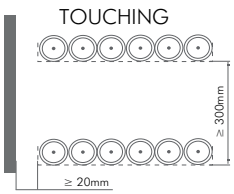
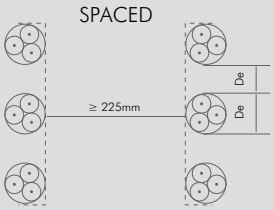
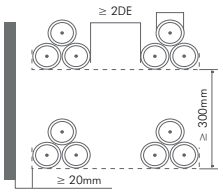
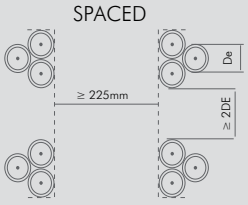
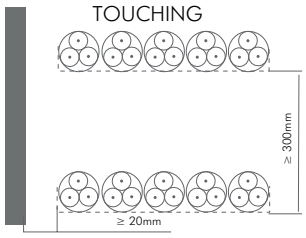
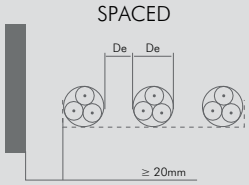
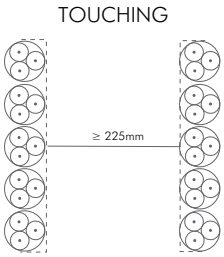
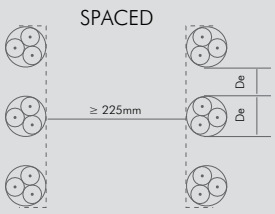
Number of Trays	Number of three phases circuits			Installation form	Type
	1	2	3		
1	0.98	0.91	0.87		Three cables in horizontal formation
2	0.96	0.87	0.81		
3	0.95	0.85	0.78		
1	0.96	0.86	-		Three cables in vertical formation
2	0.95	0.84	-		
1	1.00	0.98	0.96		Three cables in trefoil formation
2	0.97	0.93	0.89		
3	0.96	0.92	0.86		
1	1.00	0.91	0.89		
2	1.00	0.90	0.86		

Table 17 : Rating factors for groups of more than one multi core cable laid in free air

Number of Trays	Number of Cables			Installation form	Type
	1	2	3		
1	1.00	0.88	0.82		Cables in horizontal formation
2	1.00	0.87	0.80		
3	1.00	0.86	0.79		
1	1.00	1.00	0.98		
2	1.00	0.99	0.96		
3	1.00	0.98	0.95		Cables in vertical formation
1	1.00	0.88	0.82		
2	1.00	0.88	0.81		
1	1.00	0.91	0.89		
2	1.00	0.91	0.88		

5 CURRENT CARRYING CAPACITY

Table 18 : Lead sheathed Single core cables with conductors PVC 70 °C insulated and PVC Sheathed. 0.6/1 KV

Conductor	Conductor Resistance			Current Carrying Capacity					
				In Ground			In Air		
Cross Sectional Area mm²	DC at 20°C Maximum ohm/km	AC at 70°C in Flat Formation Approx ohm/km	AC at 70°C in Trefoil Formation Approx ohm/km	Direct Laid (Flat) Approx Amps	Direct Laid (Trefoil) Approx Amps	In Duct Approx Amps	Free (Flat) Approx Amps	Free (Trefoil) Approx Amps	In Pipes Approx Amps
1.5	12.1	14.5	14.5	25	24	18	20	18	15
2.5	7.41	8.87	8.87	33	31	24	27	23	19
4	4.61	5.52	5.52	42	41	31	36	31	25
6	3.08	3.69	3.69	53	51	39	46	40	32
10	1.83	2.19	2.19	70	68	52	62	54	43
16	1.15	1.38	1.38	91	87	67	83	71	56
25	0.727	0.870	0.870	116	112	87	109	94	73
35	0.524	0.627	0.627	140	134	104	135	116	89
50	0.387	0.463	0.464	166	158	125	164	141	107
70	0.268	0.321	0.322	204	194	154	208	179	134
95	0.193	0232	0232	245	233	186	259	222	163
120	0.153	0.184	0.185	279	264	212	301	258	188
150	0.124	0.150	0.151	313	296	238	345	296	213
185	0.0991	0.1200	0.1215	354	334	270	399	343	243
240	0.0754	0.0922	0.0941	412	385	313	476	407	285
300	0.0601	0.0743	0.0767	466	433	353	551	469	324
400	0.0470	0.0593	0.0623	531	488	399	642	542	369
500	0.0366	0.0476	0.0513	603	546	449	747	624	417
630	0.0283	0.386	0.0431	686	609	501	875	717	470

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Table 19 : Lead sheathed Three and four core cable with copper conductor, PVC 70°C insulated and PVC sheathed

Conductor	Conductor Resistance		In Ground	In Air
Cross Sectional Area mm²	DC at 20°C Maximum ohm/km	AC at 70°C Approx ohm/km	Direct Laid Approx Amps	Free Approx Amps
1.5	12.1	14.5	-	-
2.5	7.41	8.87	-	-
4	4.61	5.52	36	29
6	3.08	3.69	45	37
10	1.83	2.19	60	51
16	1.15	1.38	78	66
25	0.727	0.870	100	88
35	0.524	0.628	124	109
50	0.387	0.464	147	133
70	0.268	0.323	180	167
95	0.193	0232	215	204
120	0.153	0.185	245	235
150	0.124	0.151	273	268
185	0.0991	0.121	306	305
240	0.0754	0.0939	349	355
300	0.0601	0.0764	387	401
400	0.0470	0.0619	428	454
500	0.0366	0.0507	468	506

Table 20 : Lead sheathed Single core cables with copper conductor, XLPE insulated and PVC sheathed, 0.6/1 kv

Conductor	Conductor Resistance			Current Carrying Capacity					
				In Ground			In Air		
Cross Sectional Area mm²	DC at 20°C Maximum ohm/km	AC at 90°C in Flat Formation Approx ohm/km	AC at 90°C in Trefoil Formation Approx ohm/km	Direct Laid (Flat) Approx Amps	Direct Laid (Trefoil) Approx Amps	In Duct Approx Amps	Free (Flat) Approx Amps	Free (Trefoil) Approx Amps	In Pipes Approx Amps
1.5	12.1	15.2	15.2	31	30	22	27	22	19
2.5	7.41	9.45	9.45	40	39	29	36	29	24
4	4.61	5.88	5.88	52	50	38	47	38	32
6	3.08	3.93	3.93	65	63	47	60	49	40
10	1.83	2.33	2.33	87	83	63	82	66	54
16	1.15	1.47	1.47	112	107	82	109	88	70
25	0.727	0.927	0.927	144	137	105	145	116	92
35	0.524	0.668	0.669	172	165	127	178	143	112
50	0.387	0.494	0.494	204	195	151	218	175	134
70	0.268	0.342	0.343	251	238	187	277	222	168
95	0.193	0.247	0.248	301	286	225	344	274	205
120	0.153	0.196	0.197	345	327	258	409	326	237
150	0.124	0.159	0.16	385	363	290	461	367	269
185	0.0991	0.128	0.129	436	410	330	534	425	308
240	0.0754	0.098	0.100	507	474	382	638	505	361
300	0.0601	0.079	0.0185	573	532	431	740	583	411
400	0.0470	0.0629	0.0661	645	600	489	865	676	469
500	0.0366	0.0504	0.0543	744	673	550	1009	779	533
630	0.0283	0.0407	0.0453	847	752	615	1184	900	603

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Table 21 : Lead sheathed Three and four core cable with copper conductor, XLPE insulated and PVC sheathed, 0.6/1 kv

Conductor	Conductor Resistance		In Ground	In Air
Cross Sectional Area mm²	DC at 20°C Maximum ohm/km	AC at 90°C Approx ohm/km	Direct Laid Approx Amps	Free Approx Amps
1.5	12.1	15.4	-	-
2.5	7.41	9.45	-	-
4	4.61	5.88	46	39
6	3.08	3.93	57	50
10	1.83	2.33	76	67
16	1.15	1.47	98	89
25	0.727	0.927	128	120
35	0.524	0.669	158	149
50	0.387	0.494	188	182
70	0.268	0.343	229	229
95	0.193	0.248	274	280
120	0.153	0.197	310	322
150	0.124	0.160	346	368
185	0.0991	0.129	387	420
240	0.0754	0.0998	444	491
300	0.0601	0.0812	494	557
400	0.0470	0.0656	549	635
500	0.0366	0.0536	597	705

Table 22 : Lead sheathed Single core cables with aluminum conductor, XLPE insulated and PVC sheathed, 0.6/1 kv

Conductor	Conductor Resistance			Current Carrying Capacity					
				In Ground			In Air		
Cross Sectional Area mm²	DC at 20°C Maximum ohm/km	AC at 90°C in Flat Formation Approx ohm/km	AC at 90°C in Trefoil Formation Approx ohm/km	Direct Laid (Flat) Approx Amps	Direct Laid (Trefoil) Approx Amps	In Duct Approx Amps	Free (Flat) Approx Amps	Free (Trefoil) Approx Amps	In Pipes Approx Amps
16	1.91	2.45	2.45	87	83	63	85	68	54
25	1.20	1.54	1.54	111	107	82	112	90	71
35	0.868	1.113	1.113	133	128	98	138	111	87
50	0.641	0.822	0.822	158	151	117	169	135	104
70	0.443	0.568	0.569	194	185	145	215	172	131
95	0.320	0.411	0.411	233	222	175	266	213	159
120	0.253	0.325	0.325	266	252	201	312	249	184
150	0.206	0.265	0.265	298	282	226	357	285	209
185	0.164	0.211	0.212	339	320	257	416	332	241
240	0.125	0.161	0.163	395	371	300	497	396	283
300	0.100	0.130	0.131	448	419	340	578	459	324
400	0.0778	0.1016	0.1037	514	479	390	681	540	375
500	0.0605	0.0799	0.0826	590	546	446	801	631	432
630	0.0469	0.0632	0.0666	681	621	509	954	746	498

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Table 23 : Lead sheathed Three and four core cable with aluminum conductor, XLPE insulated and PVC sheathed, 0.6/1 kv

Conductor	Conductor Resistance		In Ground	In Air
Cross Sectional Area mm²	DC at 20°C Maximum ohm/km	AC at 90°C Approx ohm/km	Direct Laid Approx Amps	Free Approx Amps
16	1.91	2.45	76	69
25	1.20	1.54	99	93
35	0.868	1.113	122	115
50	0.641	0.822	146	141
70	0.443	0.569	178	178
95	0.320	0.411	213	218
120	0.253	0.325	242	252
150	0.206	0.265	270	288
185	0.164	0.212	305	331
240	0.125	0.163	352	390
300	0.100	0.131	395	445
400	0.0778	0.1034	447	516
500	0.0605	0.0822	497	586

VOLTAGE DROP

According to BS 7671 IEE wiring regulation 17th edition, under normal service conditions the voltage at the terminals of any fixed current-using equipment shall be greater than the lower limit corresponding to the product standard relevant to the equipment and where fixed current-using equipment is not the subject of a product standard the voltage at the terminals shall be such as not to impair the safe functioning of the equipment.
This infers the importance of the voltage drop calculation for the low voltage cables which is covered by this catalogue.

Table 24 : Approximate voltage drop at 60 HZ for lead sheathed single core stranded plain copper/aluminum conductors, PVC insulated, PVC sheathed

Nominal Area of Conductor	Copper Conductor mV/Amp/m		Aluminum Conductor mV/Amp/m	
	PVC Rated 90°C	PVC Rated 90°C	PVC Rated 90°C	PVC Rated 90°C
mm^2	Flat	Trefoil	Flat	Trefoil
1.5	22.6	22.5	-	-
2.5	13.9	13.8	-	-
4	8.7	8.7	-	-
6	5.80	5.8	-	-
10	3.50	3.50	-	-
16	2.30	2.20	3.70	3.70
25	1.50	1.50	2.40	2.30
35	1.10	1.10	1.70	1.70
50	0.83	0.82	1.30	1.30
70	0.61	0.60	0.94	0.92
95	0.47	0.45	0.71	0.69
120	0.39	0.38	0.58	0.56
150	0.34	0.33	0.49	0.48
185	0.29	0.28	0.41	0.40
240	0.25	0.24	0.34	0.33
300	0.22	0.21	0.29	0.28
400	0.20	0.18	.025	.024
500	0.18	0.17	0.22	0.21
630	0.16	0.15	0.19	0.18

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Table 25 : Approximate voltage drop at 60 HZ for three and four core lead sheathed stranded plain copper/aluminum conductors, PVC insulated, PVC sheathed

Nominal Area of Conductor mm^2	Copper Conductor mV/Amp/m PVC Rated 90°C	Aluminum Conductor mV/Amp/m PVC Rated 90°C
1.5	22.6	-
2.5	13.8	-
4	8.6	-
6	5.80	-
10	3.50	-
16	2.20	3.60
25	1.40	2.30
35	1.10	1.70
50	0.80	1.30
70	0.58	0.91
95	0.44	0.68
120	0.37	0.55
150	0.32	0.47
185	0.27	0.39
240	0.23	0.32
300	0.20	0.27
400	0.18	0.23
500	0.15	0.20

Table 26 : Approximate voltage drop at 60 HZ for lead sheathed single core stranded plain copper/aluminum conductors, XLPE insulated, PVC sheathed

Nominal Area of Conductor	Copper Conductor mV/Amp/m		Aluminum Conductor mV/Amp/m	
	XLPE Rated 90°C	XLPE Rated 90°C	XLPE Rated 90°C	XLPE Rated 90°C
mm^2	Flat	Trefoil	Flat	Trefoil
1.5	22.9	22.8	-	-
2.5	14.1	14.1	-	-
4	8.8	8.7	-	-
6	5.90	5.90	-	-
10	3.60	3.60	-	-
16	2.30	2.30	3.70	3.70
25	1.50	1.50	2.40	2.40
35	1.10	1.10	1.80	1.70
50	0.84	0.83	1.30	1.30
70	0.61	0.60	0.95	0.93
95	0.47	0.46	0.71	0.70
120	0.39	0.38	0.58	0.57
150	0.34	0.33	0.50	0.48
185	0.29	0.28	0.42	0.40
240	0.25	0.24	0.34	0.33
300	0.22	0.21	0.29	0.28
400	0.19	0.18	0.25	0.24
500	0.17	0.16	0.22	0.21
630	0.16	0.15	0.19	0.18

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Table 27 : Approximate voltage drop at 60 HZ for lead sheathed three and four core stranded plain copper/aluminum conductors, XLPE insulated, PVC sheathed

Nominal Area of Conductor mm²	Copper Conductor mV/Amp/m XLPE Rated 90°C	Aluminum Conductor mV/Amp/m XLPE Rated 90°C
1.5	22.8	-
2.5	14	-
4	8.7	-
6	5.90	-
10	3.50	-
16	2.20	3.70
25	1.50	2.40
35	1.10	1.70
50	0.81	1.30
70	0.58	0.92
95	0.44	0.68
120	0.37	0.56
150	0.31	0.47
185	0.27	0.39
240	0.23	0.32
300	0.20	0.27
400	0.18	0.23
500	0.15	0.20

SHORT CIRCUIT RATING - CONDUCTORS

Short circuit characteristics is based on IEC 60724, for an insulated conductor with operating temperature of 70 °C for PVC and 90°C for XLPE cable , the maximum temperature during the fault is 140 °C or 160°C for PVC insulated cables , small sizes and big sizes respectively , and up to 250°C for XLPE insulated cables

Table 28 Max. Short Circuit temperature for cable components

Material	Item	Temp. °C
Insulation	PVC insulation	140 For C.S.A. <300 mm2
		160 For C.S.A. ≥300 mm2
	XLPE insulation	250
Sheathing	PVC sheathing	200
	LDPE sheathing	150
	HDPE sheathing	180

Table 29 : PVC (based on 70 °C type TI-1 or 90 °C type TI-3) cables copper and aluminum conductor

Conductor Size	Short Circuit Ratings for 1 second in k Amp	
	Copper Conductor	Aluminum Conductor
10	1.20	0.86
16	1.80	1.10
25	2.85	1.80
35	3.55	2.55
50	5.00	3.40
70	6.90	4.90
95	10.9	6.80
120	11.80	8.50
150	15.30	11.00
185	18.70	13.00
240	23.60	16.50
300	30.10	22.50
400	41.20	29.50
500	51.50	36.00
630	64.90	45.50
800	82.40	62.00
1000	103.0	78.00

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Table 30 : XLPE cables copper and aluminum conductor

Conductor Size	Short Circuit Ratings for 1 second in k Amp	
	Copper Conductor	Aluminum Conductor
10	1.43	0.94
16	2.29	1.50
25	3.58	2.35
35	5.00	3.29
50	7.15	4.70
70	10.01	6.58
95	13.59	8.93
120	17.16	11.28
150	21.45	14.10
185	26.46	17.39
240	34.32	22.56
300	42.90	28.20
400	57.20	37.60
500	71.5	46.09
630	90.09	59.22
800	114.40	75.20
1000	143.00	94.00

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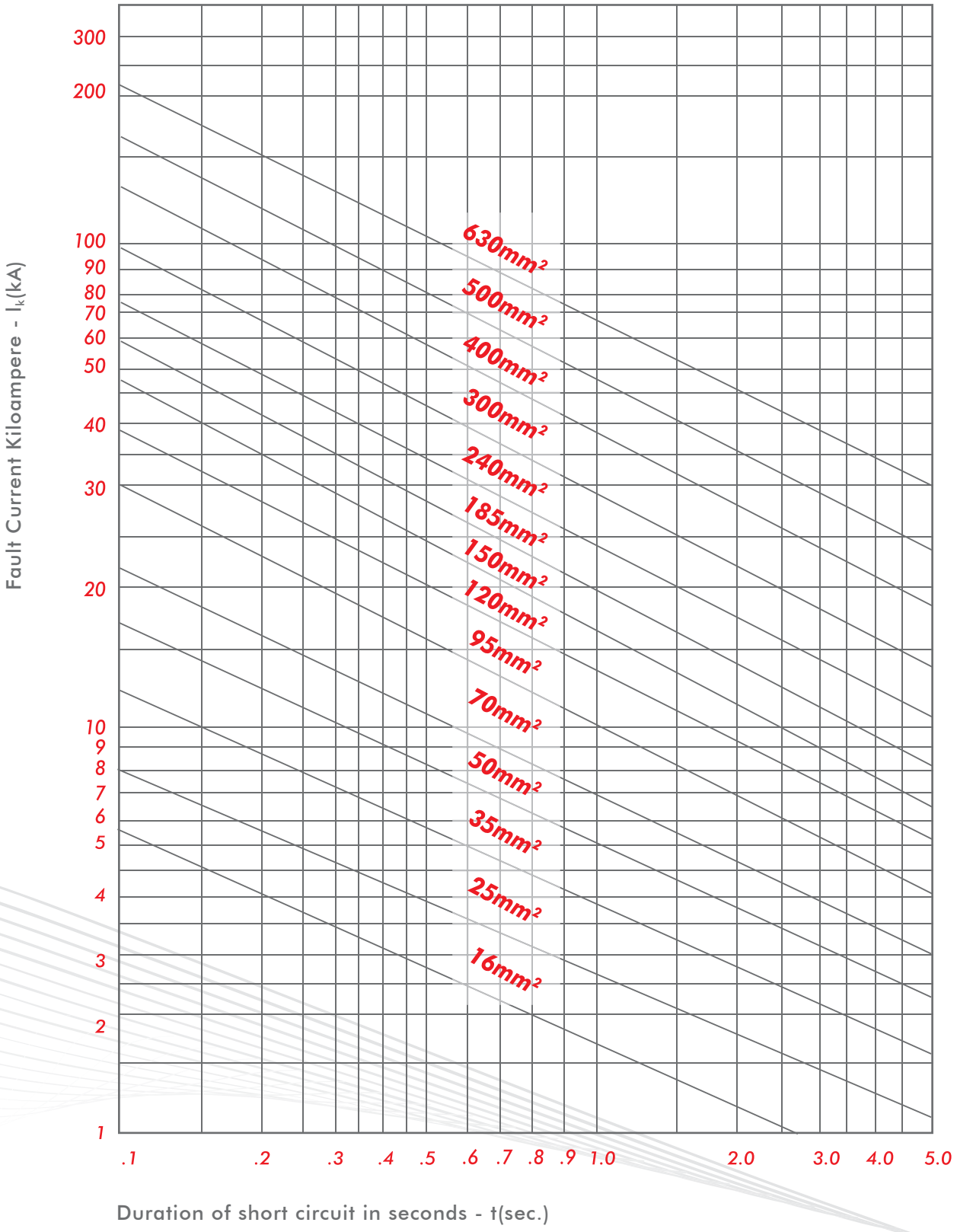
Graph 1 : PVC (90 °C type) insulated cables short circuit (Copper Conductor)



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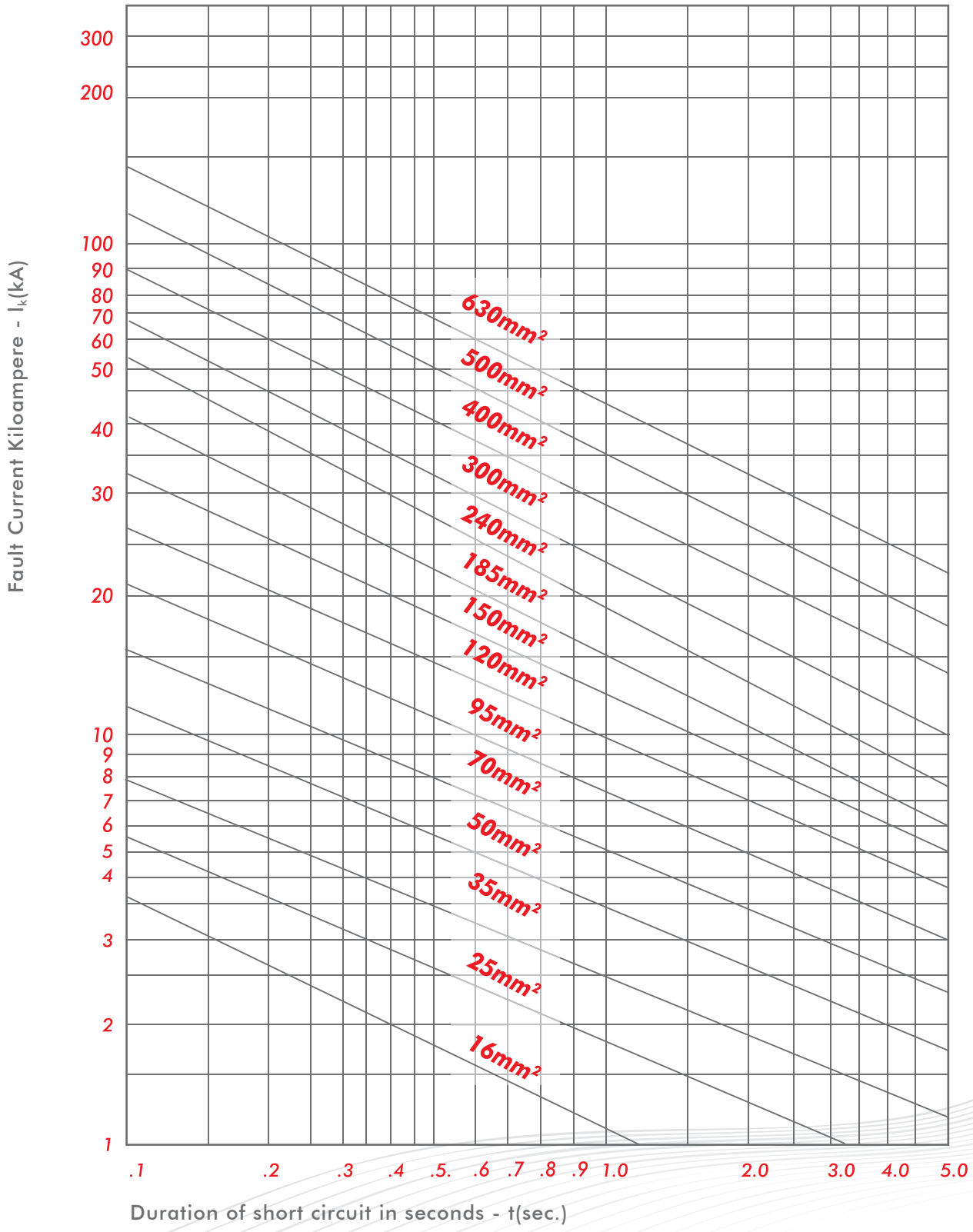
Graph 2 : PVC (90 °C type) insulated cables short circuit (Aluminum Conductor)



TECHNICAL INFORMATION

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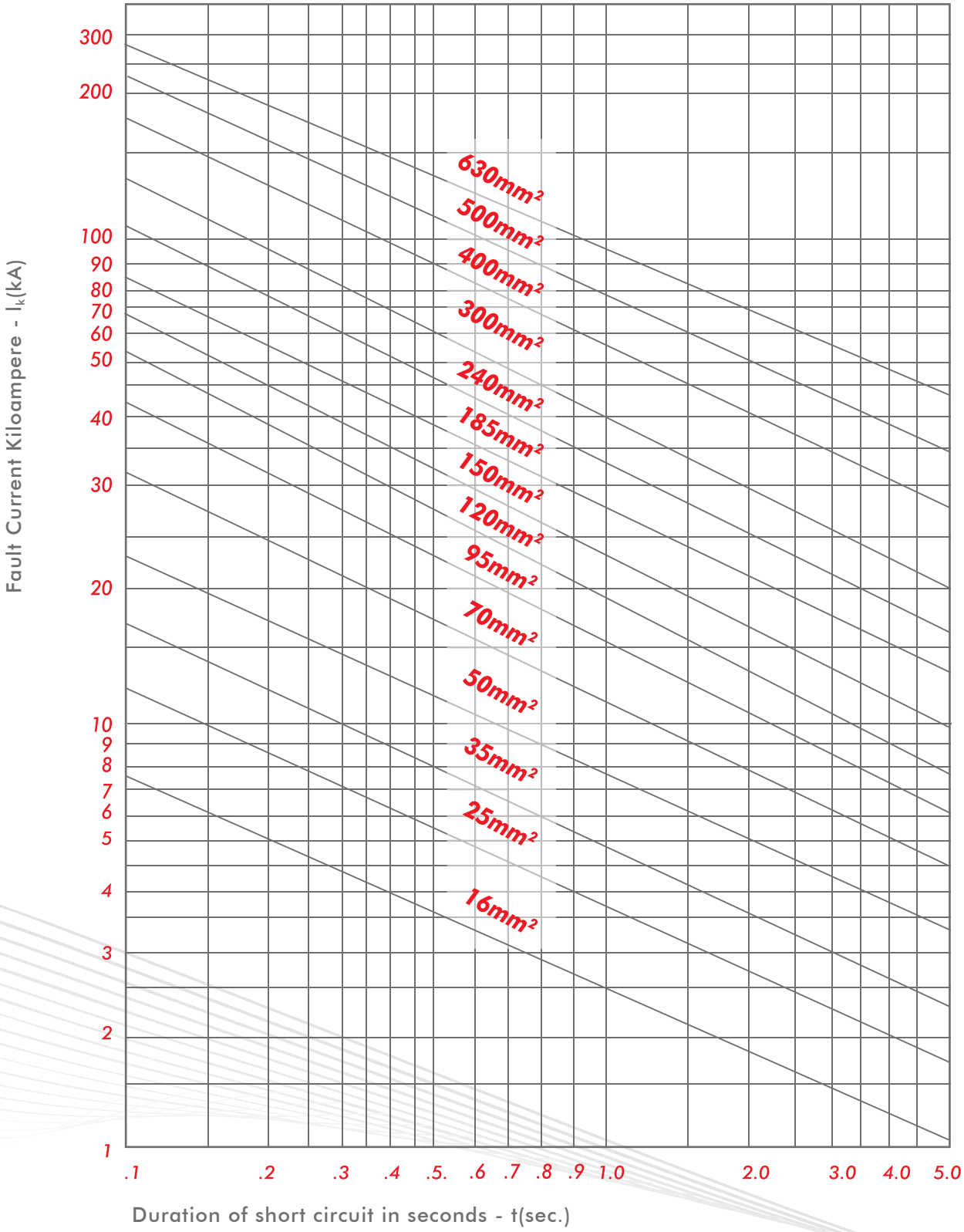
SHORT CIRCUIT RATING - CONDUCTORS

Graph 3 : XLPE Insulated cables short cicuit (Copper Conductor)

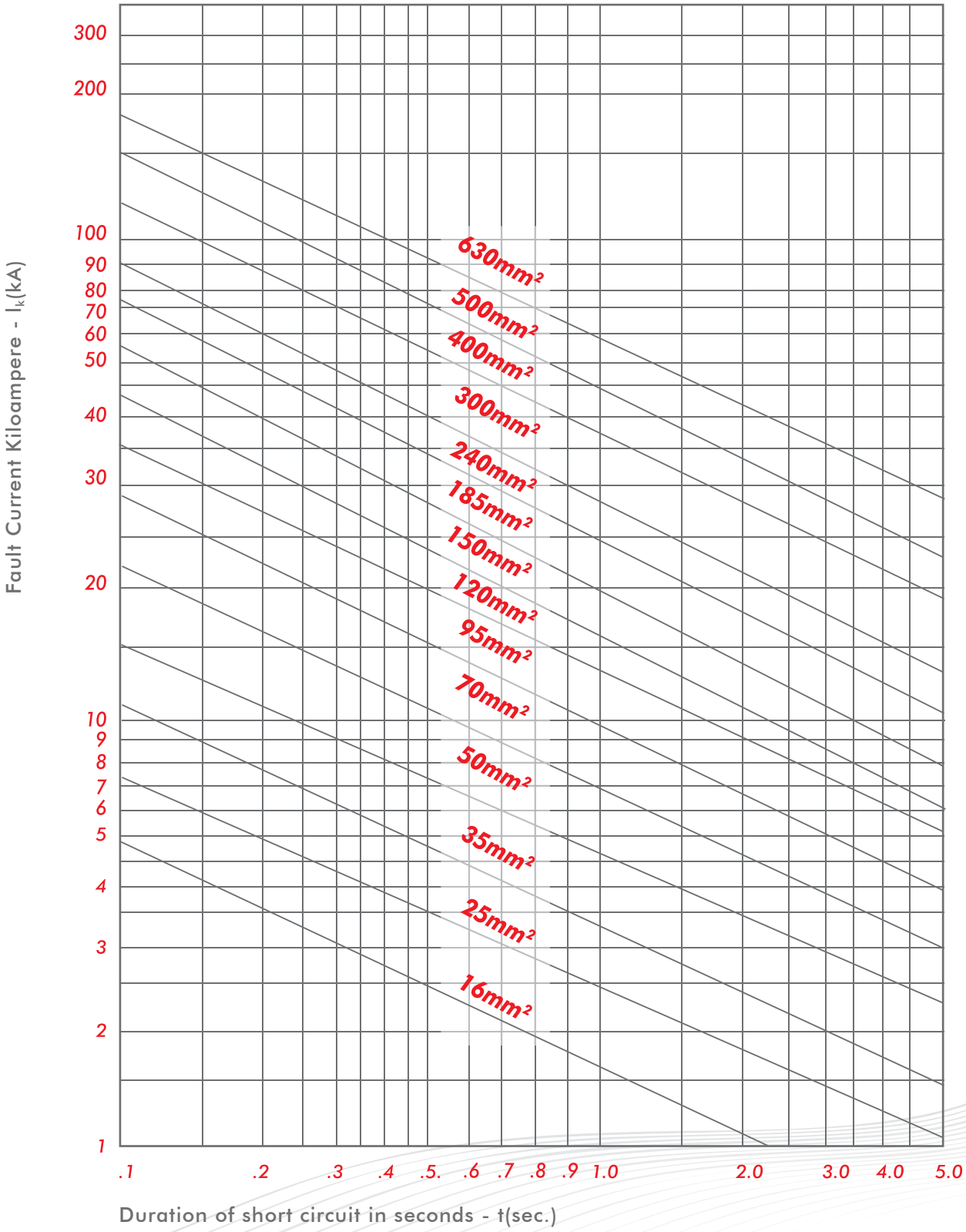


TECHNICAL INFORMATION

ELECTRICAL CHARACTERISTICS

SHORT CIRCUIT RATING - CONDUCTORS

Graph 4 : XLPE Insulated cables short cicuit (Aluminum Conductor)



PVC INSULATED LEAD SHEATHED CABLES

COPPER CONDUCTOR | LEAD SHEATHED | ALUMINUM WIRE ARMOURED | 0.6/1 kV

CU/PVC/PVC/LC/PVC/AWA/PVC

Single core

Cable Code	Conductor		Insulation	*Inner Sheath	Lead Sheath	Bedding	Armouring	Outer Sheath		Packaging	
	Cross Sectional Area Nominal mm^2	Number of Wires	Thickness Nominal mm	Thickness Nominal mm	Thickness Nominal mm	Thickness Nominal mm	Dia. of Aluminum wire Nominal mm	Thickness Nominal mm	Overall Diameter Approx mm	Net Weight Approx kg/km	Standard Drum m+/-2%
14200002	50rm	19	1.4	1.0	1.2	1.0	1.8	1.7	25.5	1700	1000
14200003	70rm	19	1.4	1.0	1.2	1.0	1.8	1.7	27.2	2020	1000
14200004	95rm	19	1.6	1.0	1.2	1.0	1.8	1.8	29.8	2480	1000
14200005	120rm	19	1.6	1.0	1.2	1.0	1.8	1.9	31.5	2830	500
14200006	150rm	37	1.8	1.0	1.2	1.0	1.8	1.9	33.3	3230	500
14200007	185rm	37	2.0	1.0	1.3	1.1	1.8	2.0	36.3	3940	500
14200008	240rm	61	2.2	1.0	1.4	1.1	1.8	2.1	39.9	4880	400
14200009	300rm	61	2.4	1.0	1.5	1.2	2.0	2.2	43.5	5930	300
14200010	400rm	61	2.6	1.2	1.6	1.2	2.0	2.3	47.7	7280	300
14200011	500rm	61	2.8	1.2	1.6	1.3	2.5	2.5	52.8	8870	300
14200012	630rmc	61	2.8	1.2	1.7	1.4	2.5	2.6	55.3	10600	300
14200013	800rmc	61	2.8	1.4	1.8	1.4	2.5	2.7	60.2	13020	300
14200014	1000rmc	127	3.0	1.4	2.0	1.5	2.5	2.9	67.7	16100	300

* Inner Sheath is optional as per EEMUA '133'

PVC INSULATED LEAD SHEATHED CABLES

COPPER CONDUCTOR | LEAD SHEATHED | STEEL WIRE ARMOURED | 0.6/1 kV

CU/PVC/PVC/LC/PVC/SWA/PVC

Two cores

Cable Code	Conductor		Insulation	*Inner Sheath	Lead Sheath	Bedding	Armouring	Outer Sheath		Packaging	
	Cross Sectional Area Nominal mm²	Number of Wires	Thickness Nominal mm	Thickness Nominal mm	Thickness Nominal mm	Thickness Nominal mm	Dia. of Aluminum wire Nominal mm	Thickness Nominal mm	Overall Diameter Approx mm	Net Weight Approx kg/km	Standard Drum m+/-2%
14130004	6rm	7	1.0	1.0	1.2	1.0	1.25	1.8	22.4	1500	1000
14130005	10rm	7	1.0	1.0	1.2	1.0	1.6	1.8	25.2	1920	1000
14130006	16rm	7	1.0	1.0	1.2	1.0	1.6	1.8	27.2	2260	1000
14130007	25rm	7	1.2	1.0	1.2	1.0	1.6	1.9	30.9	2890	1000
14130008	35rm	7	1.2	1.0	1.3	1.0	1.6	1.9	33.8	3260	1000
14130009	50dm	7	1.4	1.0	1.4	1.1	2.0	2.1	33.1	3620	1000
14130010	70dm	19	1.4	1.0	1.5	1.2	2.0	2.2	35.9	4380	1000
14130011	95dm	19	1.6	1.2	1.6	1.2	2.0	2.4	40.2	5560	1000
14130012	120dm	37	1.6	1.2	1.7	1.3	2.5	2.5	44.3	6850	1000
14130013	150dm	37	1.8	1.2	1.8	1.4	2.5	2.6	47.7	8000	500
14130014	185dm	37	2.0	1.4	1.9	1.5	2.5	2.8	52.2	9530	500
14130015	240dm	61	2.2	1.4	2.0	1.6	2.5	3.0	58.2	11860	500

Three cores

14130103	6rm	7	1.0	1.0	1.2	1.0	1.60	1.8	23.9	1750	1000
14130104	10rm	7	1.0	1.0	1.2	1.0	1.60	1.8	26.2	2120	1000
14130105	16rm	7	1.0	1.0	1.2	1.0	1.60	1.8	28.3	2520	1000
14130106	25rm	7	1.2	1.0	1.2	1.0	1.6	1.9	32.3	3240	1000
14130107	35rm	7	1.2	1.0	1.3	1.1	2.0	2.0	36.5	4070	1000
14130108	50sm	7	1.4	1.0	1.4	1.1	2.0	2.2	36.3	4370	1000
14130109	70sm	19	1.4	1.2	1.5	1.2	2.0	2.3	39.7	5330	1000
14130110	95sm	19	1.6	1.2	1.6	1.3	2.5	2.5	46.0	7390	1000
14130111	120sm	37	1.6	1.2	1.7	1.4	2.5	2.6	49.1	8950	1000
14130112	150sm	37	1.8	1.4	1.9	1.4	2.5	2.8	53.7	10230	500
14130113	185sm	37	2.0	1.4	2.0	1.5	2.5	2.9	58.2	12080	500
14130114	240sm	61	2.2	1.6	2.1	1.7	2.5	3.1	65.0	15140	300
14130115	300sm	61	2.4	1.6	2.3	1.8	3.15	3.4	70.4	17900	300
14130116	400rm	61	2.6	1.6	2.5	1.9	3.15	3.7	89.5	24000	250
14130117	500rm	61	2.8	1.8	2.7	2.0	3.15	3.9	94.4	29060	250

* Inner Sheath is optional as per EEMUA '133'

PVC INSULATED LEAD SHEATHED CABLES

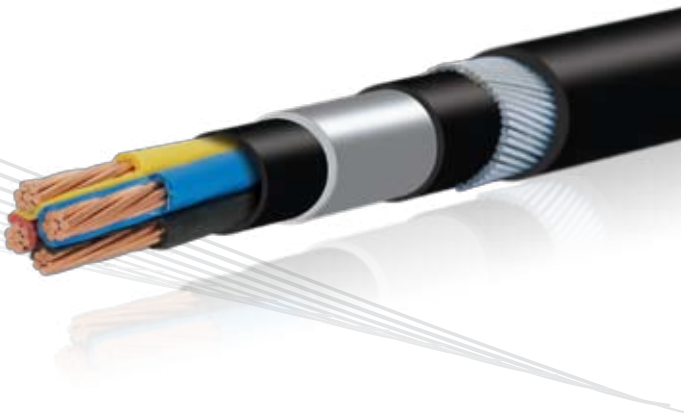
COPPER CONDUCTOR | LEAD SHEATHED | STEEL WIRE ARMOURED | 0.6/1 kV

CU/PVC/PVC/LC/PVC/SWA/PVC

Four core

Cable Code	Conductor		Insulation	*Inner Sheath	Lead Sheath	Bedding	Armouring	Outer Sheath		Packaging	
	Cross Sectional Area Nominal mm²	Number of Wires	Thickness Nominal mm	Thickness Nominal mm	Thickness Nominal mm	Thickness Nominal mm	Dia. of Aluminum wire Nominal mm	Thickness Nominal mm	Overall Diameter Approx mm	Net Weight Approx kg/km	Standard Drum m+/-2%
14130202	4rm	7	1.0	1.0	1.2	1.0	1.6	1.8	23.5	1730	1000
14130203	6rm	7	1.0	1.0	1.2	1.0	1.6	1.8	25.0	1940	1000
14130204	10rm	7	1.0	1.0	1.2	1.0	1.6	1.8	27.5	2380	1000
14130205	16rm	7	1.0	1.0	1.2	1.0	1.6	1.8	30.0	2870	1000
14130206	25rm	7	1.2	1.0	1.3	1.1	2.0	2.0	35.1	3870	1000
14130207	35sm	7	1.2	1.0	1.4	1.1	2.0	2.1	35.5	4400	1000
14130208	50sm	7	1.4	1.2	1.5	1.2	2.0	2.3	40.4	5550	1000
14130209	70sm	19	1.4	1.2	1.6	1.3	2.5	2.4	45.4	7260	1000
14130210	95sm	19	1.6	1.2	1.8	1.4	2.5	2.6	50.9	9320	1000
14130211	120sm	37	1.6	1.4	1.9	1.4	2.5	2.8	55.0	10950	500
14130212	150sm	37	1.8	1.4	2.0	1.5	2.5	2.9	59.0	12900	500
14130213	185sm	37	2.0	1.6	2.1	1.6	2.5	3.1	65.0	15400	500
14130214	240sm	61	2.2	1.6	2.3	1.8	3.15	3.4	73.5	20100	500
14130215	300sm	61	2.4	1.6	2.5	1.9	3.15	3.6	81.5	24300	250
14130216	400sm	61	2.6	1.8	2.8	2.1	3.15	4.0	89.5	30200	250
14130217	500sm	61	2.8	1.8	3.0	2.2	3.15	4.2	97.5	36400	250

* Inner Sheath is optional as per EEMUA '133'



PVC INSULATED LEAD SHEATHED CABLES

COPPER CONDUCTOR | LEAD SHEATHED | STEEL WIRE ARMOURED | 0.6/1 kV

CU/PVC/PVC/LC/PVC/SWA/PVC

Four cores with reduced neutral

Cable Code	Conductor				Insulation		* Inner Sheath	Lead Sheath	Bedding	Armouring	Outer Sheath		Packaging	
	Cross Sectional Area Nominal mm^2		Number of Wires		Thickness Nominal mm		Thickness Nominal mm	Thickness Nominal mm	Thickness Nominal mm	Dia. of Steel wire Nominal mm	Thickness Nominal mm	Overall Diameter Approx mm	Net Weight Approx kg/km	Standard Drum m+/-2%
	Ph	Ne	Ph	Ne	Ph	Ne								
14130250	16rm	10rm	7	7	1.0	1.0	1.0	1.2	1.0	1.6	1.8	29.5	2740	1000
14130251	25rm	16rm	7	7	1.2	1.0	1.0	1.3	1.0	1.6	2.0	33.7	3610	1000
14130252	35sm	16rm	7	7	1.2	1.0	1.0	1.3	1.1	2.0	2.1	35.7	4110	1000
14130253	50sm	25rm	7	7	1.4	1.2	1.0	1.5	1.2	2.0	2.2	39.9	5220	1000
14130254	70sm	35rm	19	7	1.4	1.2	1.2	1.6	1.2	2.0	2.3	44.0	6550	1000
14130255	95sm	50rm	19	19	1.6	1.4	1.2	1.7	1.3	2.5	2.5	50.5	8680	1000
14130256	120sm	70rm	37	19	1.6	1.4	1.4	1.8	1.4	2.5	2.7	54.7	10300	1000
14130257	150sm	70rm	37	19	1.8	1.4	1.4	1.9	1.5	2.5	2.8	59.2	11950	1000
14130258	185sm	95rm	37	19	2.0	1.6	1.4	2.0	1.6	2.5	3.0	64.5	14270	500
14130259	240sm	120rm	61	37	2.2	1.6	1.6	2.2	1.7	2.5	3.2	71.8	17810	500
14130260	300sm	150rm	61	37	2.4	1.8	1.6	2.4	1.8	3.15	3.5	81.2	22590	500
14130261	400sm	185rm	61	37	2.6	2.0	1.8	2.6	2.0	3.15	3.8	88.9	27630	300
14130262	500sm	240rm	61	61	2.8	2.2	1.8	2.8	2.1	3.15	4.0	97.0	32280	300

* Inner Sheath is optional as per EEMUA '133'

PVC INSULATED LEAD SHEATHED CABLES

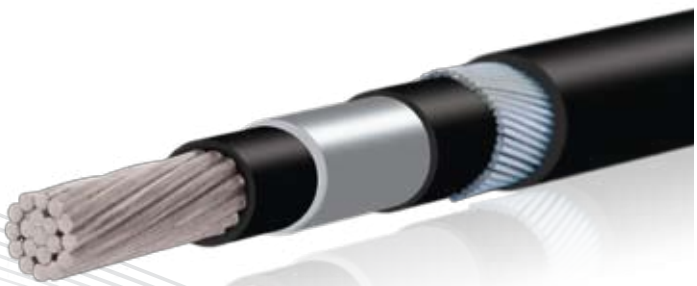
ALUMINUM CONDUCTOR | LEAD SHEATHED | ALUMINUM WIRE ARMOURED | 0.6/1 kV

AL/PVC/PVC/LC/PVC/AWA/PVC

Single core

Cable Code	Conductor		Insulation	Inner Sheath	Lead Sheath	Bedding	Armouring	Outer Sheath		Packaging	
	Cross Sectional Area Nominal mm^2	Number of Wires	Thickness Nominal mm	Thickness Nominal mm	Thickness Nominal mm	Thickness Nominal mm	Dia. of Aluminum wire Nominal mm	Thickness Nominal mm	Overall Diameter Approx mm	Net Weight Approx kg/km	Standard Drum m+/-2%
14400001	16 rmc	7	1.0	1.0	1.2	1.0	1.8	1.5	20.4	920	1000
14400002	25 rmc	7	1.2	1.0	1.2	1.0	1.8	1.6	22.2	1090	1000
14400003	35 rmc	7	1.2	1.0	1.2	1.0	1.8	1.6	23.2	1200	1000
14400004	50 rmc	7	1.4	1.0	1.2	1.0	1.8	1.7	25.3	1420	1000
14400005	70 rmc	19	1.4	1.0	1.2	1.0	1.8	1.7	27.0	1600	1000
14400006	95 rmc	19	1.6	1.0	1.2	1.0	1.8	1.8	29.4	1870	1000
14400007	120 rmc	19	1.6	1.0	1.2	1.0	1.8	1.9	30.8	2050	1000
14400008	150 rmc	19	1.8	1.0	1.2	1.0	1.8	1.9	33.1	2340	1000
14400009	185 rmc	37	2.0	1.0	1.3	1.1	1.8	2.0	36.1	2790	1000
14400010	240 rmc	37	2.2	1.0	1.4	1.1	2.0	2.1	39.5	3050	1000
14400011	300 rmc	61	2.4	1.0	1.5	1.2	2.0	2.2	43.0	3990	1000
14400012	400 rmc	61	2.6	1.2	1.6	1.2	2.0	2.3	47.1	4820	500
14400013	500 rmc	61	2.8	1.2	1.6	1.3	2.5	2.5	52.1	5750	500
14400014	630 rmc	61	2.8	1.2	1.7	1.4	2.5	2.6	56.5	6750	500

* Inner Sheath is optional as per EEMUA '133'



PVC INSULATED LEAD SHEATHED CABLES

ALUMINUM CONDUCTOR | LEAD SHEATHED | STEEL WIRE ARMOURED | 0.6/1 kV

AL/PVC/PVC/LC/PVC/SWA/PVC

Two cores

Cable Code	Conductor		Insulation	*Inner Sheath	Lead Sheath	Bedding	Armouring	Outer Sheath		Packaging	
	Cross Sectional Area Nominal mm^2	Number of Wires	Thickness Nominal mm	Thickness Nominal mm	Thickness Nominal mm	Thickness Nominal mm	Dia. of Aluminum wire Nominal mm	Thickness Nominal mm	Overall Diameter Approx mm	Net Weight Approx kg/km	Standard Drum m+/-2%
14330001	25 rmc	7	1.2	1.0	1.2	1.0	1.6	1.9	30.5	2580	1000
14330002	35 rmc	7	1.2	1.0	1.3	1.0	1.6	1.9	33.5	2930	1000
14330003	50dm	19	1.4	1.0	1.4	1.1	2.0	2.1	32.6	3280	1000
14330004	70dm	19	1.4	1.0	1.5	1.2	2.0	2.2	35.3	4030	1000
14330005	95dm	19	1.6	1.2	1.6	1.2	2.0	2.4	39.5	4380	1000
14330006	120dm	19	1.6	1.2	1.7	1.3	2.5	2.5	43.3	5360	1000
14330007	150dm	19	1.8	1.2	1.8	1.4	2.5	2.6	46.7	6140	1000
14330008	185dm	37	2.0	1.4	1.9	1.5	2.5	2.8	51.2	7240	1000
14330009	240dm	37	2.2	1.4	2.0	1.6	2.5	3.0	57.1	8890	500

Three cores

14330100	25 rmc	7	1.2	1.0	1.2	1.0	1.6	1.9	27.5	2776	1000
14330101	35 rmc	7	1.2	1.0	1.3	1.1	2.0	2.0	30.5	3580	1000
14330102	50 sm	19	1.4	1.0	1.4	1.1	2.0	2.2	34.5	3860	1000
14330103	70 sm	19	1.4	1.2	1.5	1.2	2.0	2.3	39.5	4810	1000
14330104	95 sm	19	1.6	1.2	1.6	1.3	2.5	2.5	44.3	5620	1000
14330105	120 sm	19	1.6	1.2	1.7	1.4	2.0	2.6	48.3	6720	1000
14330106	150 sm	19	1.8	1.4	1.9	1.4	2.5	2.8	54.2	7440	1000
14330107	185 sm	37	2.0	1.4	2.0	1.5	2.5	2.9	59.2	8640	1000
14330108	240 sm	37	2.2	1.6	2.2	1.7	2.5	3.1	66.0	10680	500
14330109	300 sm	37	2.4	1.6	2.3	1.8	3.15	3.4	73.0	12330	500
14330110	400 rmc	61	2.6	1.6	2.5	1.9	3.15	3.7	82.0	16570	300
14330111	500 rmc	61	2.8	1.8	2.7	2.1	3.15	3.9	90.8	19780	300

* Inner Sheath is optional as per EEMUA '133'

PVC INSULATED LEAD SHEATHED CABLES

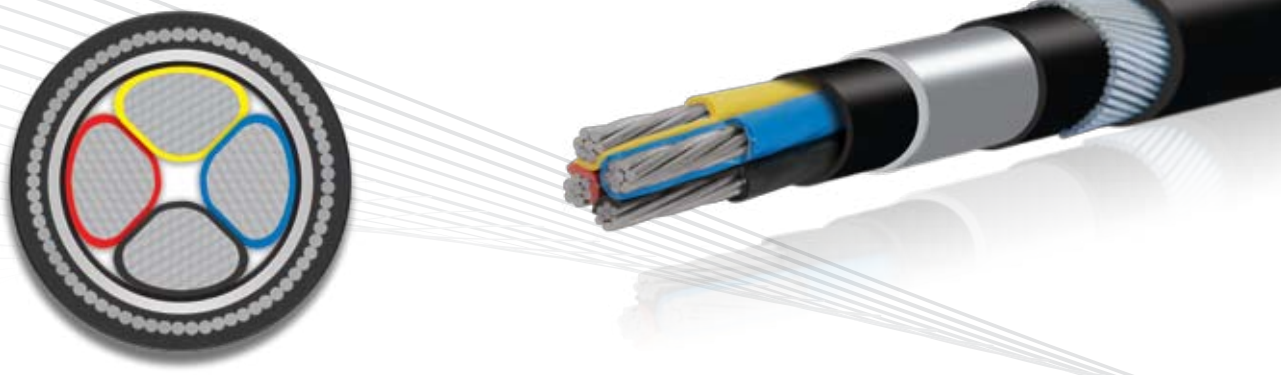
ALUMINUM CONDUCTOR | LEAD SHEATHED | STEEL WIRE ARMOURED | 0.6/1 kV

AL/PVC/PVC/LC/PVC/SWA/PVC

Four core

Cable Code	Conductor		Insulation	*Inner Sheath	Lead Sheath	Bedding	Armouring	Outer Sheath		Packaging	
	Cross Sectional Area Nominal mm²	Number of Wires	Thickness Nominal mm	Thickness Nominal mm	Thickness Nominal mm	Thickness Nominal mm	Dia. of Aluminum wire Nominal mm	Thickness Nominal mm	Overall Diameter Approx mm	Net Weight Approx kg/km	Standard Drum m+/-2%
14330205	16 rmc	7	1.0	1.0	1.2	1.0	1.6	1.8	29.9	2450	1000
14330206	25 rmc	7	1.2	1.0	1.3	1.1	1.6	2.0	34.5	3190	1000
14330207	35 sm	7	1.2	1.0	1.4	1.1	2.0	2.1	35.9	3520	1000
14330208	50 sm	19	1.4	1.2	1.5	1.2	2.0	2.3	40.4	4380	1000
14330209	70 sm	19	1.4	1.2	1.6	1.3	2.5	2.4	55.4	5580	1000
14330210	95 sm	19	1.6	1.2	1.8	1.4	2.5	2.6	50.9	6990	1000
14330211	120 sm	19	1.6	1.4	1.9	1.4	2.5	2.8	55.0	8040	500
14330212	150 sm	19	1.8	1.4	2.0	1.5	2.5	2.9	59.4	9300	500
14330213	185 sm	37	2.0	1.6	2.1	1.6	2.5	3.1	65.2	10940	500
14330214	240 sm	37	2.2	1.6	2.3	1.8	3.15	3.4	73.7	14120	500
14330215	300 sm	37	2.4	1.6	2.5	1.9	3.15	3.6	81.6	16870	250
14330216	400 sm	61	2.6	1.8	2.8	2.1	3.15	4.0	89.7	20450	250
14330217	500 sm	61	2.8	1.8	3.0	2.2	3.15	4.2	97.7	24140	250

* Inner Sheath is optional as per EEMUA '133'



PVC INSULATED LEAD SHEATHED CABLES

ALUMINUM CONDUCTOR | LEAD SHEATHED | STEEL WIRE ARMOURED | 0.6/1 kV

AL/PVC/PVC/LC/PVC/SWA/PVC

Four cores with reduced neutral

Cable Code	Conductor				Insulation		*Inner Sheath	Lead Sheath	Bedding	Armouring	Outer Sheath		Packaging	
	Cross Sectional Area Nominal mm^2		Number of Wires		Thickness Nominal mm		Thickness Nominal mm	Thickness Nominal mm	Thickness Nominal mm	Dia. of Steel wire Nominal mm	Thickness Nominal mm	Overall Diameter Approx mm	Net Weight Approx kg/km	Standard Drum m+/-2%
	Ph	Ne	Ph	Ne	Ph	Ne								
14330250	25rmc	16rmc	7	7	1.2	1.0	1.0	1.3	1.0	1.6	1.9	33.2	2990	1000
14330251	35sm	16rmc	7	7	1.2	1.0	1.0	1.3	1.1	2.0	2.1	35.7	3350	1000
14330252	50sm	25rmc	19	7	1.4	1.2	1.0	1.5	1.2	2.0	2.2	39.9	4200	1000
14330253	70sm	35rmc	19	7	1.4	1.2	1.2	1.6	1.2	2.0	2.3	44.1	5060	1000
14330254	95sm	50rmc	19	7	1.6	1.4	1.2	1.7	1.3	2.5	2.5	50.4	6650	1000
14330255	120sm	70rmc	19	19	1.6	1.4	1.4	1.8	1.4	2.5	2.7	54.7	7700	1000
14330256	150sm	70rmc	19	19	1.8	1.4	1.4	1.9	1.5	2.5	2.8	59.2	8790	1000
14330257	185sm	95rmc	37	19	2.0	1.6	1.4	2.0	1.6	2.5	3.0	64.5	10300	500
14330258	240sm	120rmc	37	19	2.2	1.6	1.6	2.2	1.7	2.5	3.2	71.8	12590	500
14330259	300sm	150rmc	37	19	2.4	1.8	1.6	2.4	1.8	3.15	3.5	81.2	16080	400
14330260	400sm	185rmc	61	37	2.6	2.0	1.8	2.6	2.0	3.15	3.8	88.9	19130	400
14330261	500sm	240rmc	61	37	2.8	2.2	1.8	2.8	2.1	3.15	4.0	97.0	22590	400

* Inner Sheath is optional as per EEMUA '133'

XLPE INSULATED LEAD SHEATHED CABLES

COPPER CONDUCTOR | LEAD SHEATHED | ALUMINUM WIRE ARMOURED | 0.6/1 kV

CU/XLPE/PVC/LC/PVC/AWA/PVC

Single core

Cable Code	Conductor		Insulation	*Inner Sheath	Lead Sheath	Bedding	Armouring	Outer Sheath		Packaging	
	Cross Sectional Area Nominal mm^2	Number of Wires	Thickness Nominal mm	Thickness Nominal mm	Thickness Nominal mm	Thickness Nominal mm	Dia. of Aluminum wire Nominal mm	Thickness Nominal mm	Overall Diameter Approx mm	Net Weight Approx kg/km	Standard Drum m+/-2%
14700002	50rm	19	1.0	1.0	1.2	1.0	1.8	1.7	24.7	1600	1000
14700003	70rm	19	1.2	1.0	1.2	1.0	1.8	1.7	26.6	1930	1000
14700004	95rm	19	1.1	1.0	1.2	1.0	1.8	1.8	28.8	2330	1000
14700005	120rm	37	1.2	1.0	1.2	1.0	1.8	1.8	30.5	2690	1000
14700006	150rm	37	1.4	1.0	1.2	1.0	1.8	1.9	32.5	3090	1000
14700007	185rm	37	1.6	1.0	1.3	1.0	1.8	2.0	35.3	3750	500
14700008	240rm	61	1.7	1.0	1.4	1.1	2.0	2.1	38.9	4650	500
14700009	300rm	61	1.8	1.0	1.4	1.1	2.0	2.2	41.8	5500	500
14700010	400rm	61	2.0	1.2	1.5	1.2	2.0	2.3	46.3	6830	500
14700011	500rm	61	2.2	1.2	1.6	1.3	2.5	2.4	51.4	8470	300
14700012	630rmc	61	2.4	1.2	1.7	1.3	2.5	2.6	54.3	10250	300
14700013	800rmc	61	2.6	1.4	1.8	1.4	2.5	2.7	59.8	12750	300
14700014	1000rmc	61	2.8	1.4	2.0	1.5	2.5	2.9	67.3	15790	300

* Inner Sheath is optional as per EEMUA '133'

XLPE INSULATED LEAD SHEATHED CABLES

COPPER CONDUCTOR | LEAD SHEATHED | STEEL WIRE ARMOURED | 0.6/1 kV

CU/XLPE/PVC/LC/PVC/SWA/PVC

Two cores

Cable Code	Conductor		Insulation	*Inner Sheath	Lead Sheath	Bedding	Armouring	Outer Sheath		Packaging	
	Cross Sectional Area Nominal mm^2	Number of Wires	Thickness Nominal mm	Thickness Nominal mm	Thickness Nominal mm	Thickness Nominal mm	Dia. of Aluminum wire Nominal mm	Thickness Nominal mm	Overall Diameter Approx mm	Net Weight Approx kg/km	Standard Drum m+/-2%
14630004	6rm	7	0.7	1.0	1.2	1.0	1.25	1.8	21.2	1350	1000
14630005	10rm	7	0.7	1.0	1.2	1.0	1.60	1.8	24.0	1760	1000
14630006	16rm	7	0.7	1.0	1.2	1.0	1.60	1.8	26.0	2090	1000
14630007	25rm	7	0.9	1.0	1.2	1.0	1.60	1.8	29.5	2670	1000
14630008	35rm	7	0.9	1.0	1.2	1.0	1.60	1.9	32.4	2980	1000
14630009	50dm	19	1.0	1.0	1.3	1.1	2.00	2.0	31.0	3280	1000
14630010	70dm	19	1.1	1.0	1.4	1.1	2.00	2.2	34.0	4050	500
14630011	95dm	19	1.1	1.2	1.5	1.2	2.00	2.3	37.8	5070	500
14630012	120dm	37	1.2	1.2	1.6	1.3	2.50	2.4	42.3	6350	400
14630013	150dm	37	1.4	1.2	1.7	1.3	2.50	2.6	45.7	7470	400
14630014	185dm	37	1.6	1.4	1.8	1.4	2.50	2.7	50.0	8910	300
14630015	240dm	61	1.7	1.4	2.0	1.5	2.50	2.9	55.6	11000	300

Three cores

14630103	6rm	7	0.7	1.0	1.2	1.0	1.25	1.8	21.9	1460	1000
14630104	10rm	7	0.7	1.0	1.2	1.0	1.6	1.8	24.8	1940	1000
14630105	16rm	7	0.7	1.0	1.2	1.0	1.6	1.9	27.0	2330	1000
14630106	25rm	7	0.9	1.0	1.2	1.0	1.6	1.9	31.0	3020	1000
14630107	35rm	7	0.9	1.0	1.3	1.0	1.6	1.9	34.0	3560	1000
14630108	50sm	7	1.0	1.0	1.4	1.1	2.0	2.1	34.6	4190	1000
14630109	70sm	19	1.1	1.2	1.5	1.2	2.0	2.2	39.0	5380	1000
14630110	95sm	19	1.1	1.2	1.6	1.3	2.5	2.4	43.9	7060	1000
14630111	120sm	37	1.2	1.2	1.7	1.3	2.5	2.5	47.3	8360	1000
14630112	150sm	37	1.4	1.4	1.8	1.4	2.5	2.7	51.9	10000	1000
14630113	185sm	37	1.6	1.4	1.9	1.5	2.5	2.8	56.5	11800	1000
14630114	240sm	61	1.7	1.6	2.1	1.6	2.5	3.1	62.8	14770	1000
14630115	300sm	61	1.8	1.6	2.2	1.7	2.5	3.2	67.8	17550	400
14630116	400rm	61	2.0	1.6	2.5	1.9	3.15	3.6	86.5	23500	250
14630117	500rm	61	2.2	1.8	2.7	2.0	3.15	3.8	91.2	28700	250

* Inner Sheath is optional as per EEMUA '133'

XLPE INSULATED LEAD SHEATHED CABLES

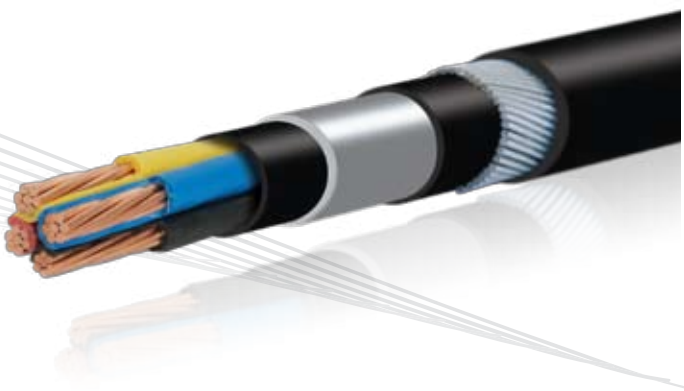
COPPER CONDUCTOR | LEAD SHEATHED | STEEL WIRE ARMOURED | 0.6/1 kV

CU/XLPE/PVC/LC/PVC/SWA/PVC

Four core

Cable Code	Conductor		Insulation	*Inner Sheath	Lead Sheath	Bedding	Armouring	Outer Sheath		Packaging	
	Cross Sectional Area Nominal mm^2	Number of Wires	Thickness Nominal mm	Thickness Nominal mm	Thickness Nominal mm	Thickness Nominal mm	Dia. of Aluminum wire Nominal mm	Thickness Nominal mm	Overall Diameter Approx mm	Net Weight Approx kg/km	Standard Drum m+/-2%
14630202	4rm	7	0.7	1.0	1.2	1.0	1.25	1.8	21.7	1420	1000
14630203	6rm	7	0.7	1.0	1.2	1.0	1.60	1.8	23.7	1750	1000
14630204	10rm	7	0.7	1.0	1.2	1.0	1.60	1.8	26.2	2160	1000
14630205	16rm	7	0.7	1.0	1.2	1.0	1.6	1.8	28.7	2630	1000
14630206	25rm	7	0.9	1.0	1.3	1.0	1.6	1.9	33.3	3560	1000
14630207	35sm	7	0.9	1.0	1.3	1.1	2.0	2.1	33.7	4000	1000
14630208	50sm	7	1.0	1.0	1.5	1.2	2.0	2.2	37.9	5040	1000
14630209	70sm	19	1.1	1.2	1.6	1.2	2.0	2.3	42.5	6500	1000
14630210	95sm	19	1.1	1.2	1.7	1.3	2.5	2.5	47.9	8500	500
14630211	120sm	37	1.2	1.4	1.8	1.4	2.5	2.7	52.6	10200	500
14630212	150sm	37	1.4	1.4	1.9	1.5	2.5	2.9	57.3	12120	500
14630213	185sm	37	1.6	1.4	2.1	1.6	2.5	3.0	62.6	14500	500
14630214	240sm	61	1.7	1.6	2.3	1.7	2.5	3.3	69.6	18300	400
14630215	300sm	61	1.8	1.6	2.4	1.8	3.15	3.5	75.1	22800	300
14630216	400sm	61	2.0	1.8	2.7	2.0	3.15	3.8	85.0	28400	300
14630217	500sm	61	2.2	1.8	2.9	2.2	3.15	4.1	94.4	34500	200

* Inner Sheath is optional as per EEMUA '133'



XLPE INSULATED LEAD SHEATHED CABLES

COPPER CONDUCTOR | LEAD SHEATHED | STEEL WIRE ARMOURED | 0.6/1 kV

CU/XLPE/PVC/LC/PVC/SWA/PVC

Four cores with reduced neutral

Cable Code	Conductor				Insulation		*Inner Sheath	Lead Sheath	Bedding	Armouring	Outer Sheath		Packaging	
	Cross Sectional Area Nominal mm^2		Number of Wires		Thickness Nominal mm		Thickness Nominal mm	Thickness Nominal mm	Thickness Nominal mm	Dia. of Steel wire Nominal mm	Thickness Nominal mm	Overall Diameter Approx mm	Net Weight Approx kg/km	Standard Drum m+/-2%
	Ph	Ne	Ph	Ne	Ph	Ne								
14630250	16rm	10rm	7	7	0.7	0.7	1.0	1.2	1.0	1.60	1.8	28.0	2520	1000
14630251	25rm	16rm	7	7	0.9	0.7	1.0	1.2	1.0	1.6	1.9	32.0	3260	1000
14630252	35sm	16rm	7	7	0.9	0.7	1.0	1.3	1.0	1.6	2.0	33.1	3590	1000
14630253	50sm	25rm	7	7	1.0	0.9	1.0	1.4	1.1	2.0	2.1	37.3	4710	1000
14630254	70sm	35rm	19	7	1.1	0.9	1.2	1.5	1.2	2.0	2.3	42.4	6100	1000
14630255	95sm	50rm	19	19	1.1	1.0	1.2	1.6	1.3	2.5	2.5	47.9	7960	1000
14630256	120sm	70rm	37	19	1.2	1.1	1.2	1.7	1.4	2.5	2.6	50.0	9500	1000
14630257	150sm	70rm	37	19	1.4	1.1	1.4	1.8	1.4	2.5	2.7	56.7	11170	500
14630258	185sm	95rm	37	19	1.6	1.1	1.4	2.0	1.5	2.5	2.9	62.2	13560	500
14630259	240sm	120rm	61	37	1.7	1.2	1.6	2.1	1.6	2.5	3.1	68.8	16670	500
14630260	300sm	150rm	61	37	1.8	1.4	1.6	2.3	1.8	3.15	3.4	77.9	21170	400
14630261	400sm	185rm	61	37	2.0	1.6	1.6	2.5	1.9	3.15	3.7	85.0	25800	400
14630262	500sm	240rm	61	61	2.2	1.7	1.8	2.7	2.1	3.15	3.9	93.7	31520	400

* Inner Sheath is optional as per EEMUA '133'

XLPE INSULATED LEAD SHEATHED CABLES

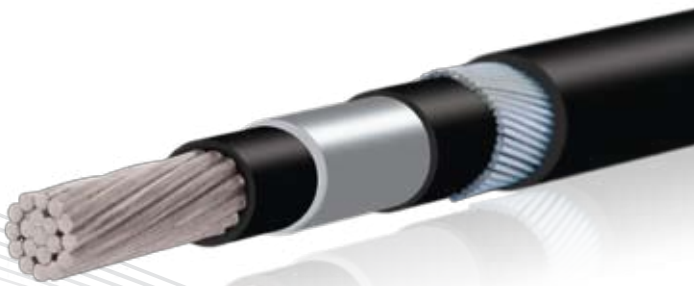
ALUMINUM CONDUCTOR | LEAD SHEATHED | ALUMINUM WIRE ARMOURED | 0.6/1 kV

AL/XLPE/PVC/LC/PVC/AWA/PVC

Single core

Cable Code	Conductor		Insulation	*Inner Sheath	Lead Sheath	Bedding	Armouring	Outer Sheath		Packaging	
	Cross Sectional Area Nominal mm^2	Number of Wires	Thickness Nominal mm	Thickness Nominal mm	Thickness Nominal mm	Thickness Nominal mm	Dia. of Aluminum wire Nominal mm	Thickness Nominal mm	Overall Diameter Approx mm	Net Weight Approx kg/km	Standard Drum m+/-2%
14900002	25 rmc	7	0.9	1.0	1.2	1.0	1.8	1.6	21.6	1020	1000
14900003	35 rmc	7	0.9	1.0	1.2	1.0	1.8	1.6	22.6	1120	1000
14900004	50 rmc	7	1.1	1.0	1.2	1.0	1.8	1.7	24.5	1310	1000
14900005	70 rmc	19	1.1	1.0	1.2	1.0	1.8	1.7	26.5	1520	1000
14900006	95 rmc	19	1.1	1.0	1.2	1.0	1.8	1.8	28.2	1720	1000
14900007	120 rmc	19	1.2	1.0	1.2	1.0	1.8	1.9	29.4	1880	1000
14900008	150 rmc	19	1.4	1.0	1.2	1.0	1.8	1.9	32.3	2200	1000
14900009	185 rmc	37	1.6	1.0	1.3	1.0	1.8	2.0	35.1	2600	500
14900010	240 rmc	37	1.7	1.0	1.4	1.1	2.0	2.1	38.5	3160	500
14900011	300 rmc	37	1.8	1.0	1.4	1.1	2.0	2.2	41.4	3600	500
14900012	400 rmc	61	2.0	1.2	1.5	1.2	2.0	2.3	44.2	4240	400
14900013	500 rmc	61	2.2	1.2	1.6	1.3	2.5	2.4	50.7	5390	400
14900014	630 rmc	61	2.4	1.2	1.7	1.3	2.5	2.6	55.5	6400	400

* Inner Sheath is optional as per EEMUA '133'



XLPE INSULATED LEAD SHEATHED CABLES

ALUMINUM CONDUCTOR | LEAD SHEATHED | STEEL WIRE ARMOURED | 0.6/1 kV

AL/XLPE/PVC/LC/PVC/AWA/PVC

Two cores

Cable Code	Conductor		Insulation	*Inner Sheath	Lead Sheath	Bedding	Armouring	Outer Sheath		Packaging	
	Cross Sectional Area Nominal mm^2	Number of Wires	Thickness Nominal mm	Thickness Nominal mm	Thickness Nominal mm	Thickness Nominal mm	Dia. of Aluminum wire Nominal mm	Thickness Nominal mm	Overall Diameter Approx mm	Net Weight Approx kg/km	Standard Drum m+/-2%
14830001	25rmc	7	0.9	1.0	1.2	1.0	1.60	1.8	29.0	2360	1000
14830002	35rmc	7	0.9	1.0	1.2	1.0	1.60	1.9	32.0	2540	1000
14830003	50dm	19	1.0	1.0	1.3	1.1	2.00	2.0	30.5	2660	1000
14830004	70dm	19	1.1	1.0	1.4	1.1	2.00	2.2	33.5	3180	1000
14830005	95dm	19	1.1	1.2	1.5	1.2	2.00	2.3	37.2	3890	1000
14830006	120dm	19	1.2	1.2	1.6	1.3	2.50	2.4	41.6	4860	1000
14830007	150dm	19	1.4	1.2	1.7	1.3	2.50	2.6	44.9	5610	1000
14830008	185dm	37	1.6	1.4	1.8	1.4	2.50	2.7	49.0	6620	1000
14830009	240dm	37	1.7	1.4	2.0	1.5	2.50	2.9	54.6	7030	500

Three cores

14830100	16rmc	7	0.7	1.0	1.2	1.0	1.6	1.8	26.8	2000	1000
14830101	25rmc	7	0.9	1.0	1.2	1.0	1.6	1.9	30.0	2510	1000
14830102	35rmc	7	0.9	1.0	1.3	1.0	1.6	1.9	33.3	2840	1000
14830103	50sm	19	1.0	1.0	1.4	1.1	2.0	2.1	34.6	3680	1000
14830104	70sm	19	1.1	1.2	1.5	1.2	2.0	2.2	38.5	4860	1000
14830105	95sm	19	1.1	1.2	1.6	1.2	2.0	2.4	43.0	5290	1000
14830106	120sm	19	1.2	1.2	1.7	1.3	2.5	2.5	46.3	6130	1000
14830107	150sm	19	1.4	1.4	1.8	1.4	2.5	2.7	50.9	7210	1000
14830108	185sm	37	1.6	1.4	1.9	1.5	2.5	2.9	55.5	8360	500
14830109	240sm	37	1.7	1.6	2.1	1.6	2.5	3.1	61.8	10310	500
14830110	300sm	37	1.8	1.6	2.2	1.7	2.5	3.2	66.8	11980	500
14830111	400rmc	61	2.0	1.6	2.5	1.9	3.15	3.6	85.5	17660	400
14830112	500rmc	61	2.2	1.8	2.7	2.0	3.15	3.8	90.2	19400	400

* Inner Sheath is optional as per EEMUA '133'

XLPE INSULATED LEAD SHEATHED CABLES

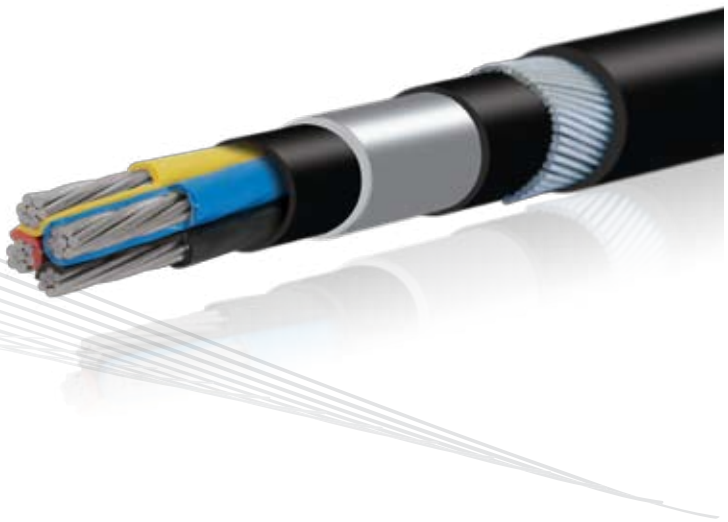
ALUMINUM CONDUCTOR | LEAD SHEATHED | STEEL WIRE ARMOURED | 0.6/1 kV

AL/XLPE/PVC/LC/PVC/AWA/PVC

Four core

Cable Code	Conductor		Insulation	*Inner Sheath	Lead Sheath	Bedding	Armouring	Outer Sheath		Packaging	
	Cross Sectional Area Nominal mm²	Number of Wires	Thickness Nominal mm	Thickness Nominal mm	Thickness Nominal mm	Thickness Nominal mm	Dia. of Aluminum wire Nominal mm	Thickness Nominal mm	Overall Diameter Approx mm	Net Weight Approx kg/km	Standard Drum m+/-2%
14830200	16rmc	7	0.7	1.0	1.2	1.0	1.6	1.8	28.4	2220	1000
14830201	25rmc	7	0.9	1.0	1.3	1.0	1.6	1.9	32.7	2880	1000
14830202	35sm	7	0.9	1.0	1.3	1.1	2.0	2.1	34.2	3160	1000
14830203	50sm	19	1.0	1.0	1.5	1.2	2.0	2.2	37.9	3900	1000
14830204	70sm	19	1.1	1.2	1.6	1.2	2.0	2.3	42.5	4840	1000
14830205	95sm	19	1.1	1.2	1.7	1.3	2.5	2.5	47.9	6200	1000
14830206	120sm	19	1.2	1.4	1.8	1.4	2.5	2.7	52.6	7300	1000
14830207	150sm	19	1.4	1.4	1.9	1.5	2.5	2.9	57.3	8490	1000
14830208	185sm	37	1.6	1.4	2.1	1.6	2.5	3.0	62.6	10090	500
14830209	240sm	37	1.7	1.6	2.3	1.7	2.5	3.3	69.6	12330	500
14830210	300sm	37	1.8	1.6	2.4	1.8	3.15	3.5	78.1	15370	500
14830211	400sm	61	2.0	1.8	2.7	2.0	3.15	3.8	85.9	18720	400
14830212	500sm	61	2.2	1.8	2.9	2.2	3.15	4.1	94.4	22300	400

* Inner Sheath is optional as per EEMUA '133'



XLPE INSULATED LEAD SHEATHED CABLES

ALUMINUM CONDUCTOR | LEAD SHEATHED | STEEL WIRE ARMOURED | 0.6/1 kV

AL/XLPE/PVC/LC/PVC/AWA/PVC

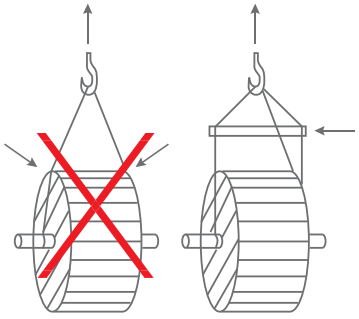
Four cores with reduced neutral

Cable Code	Conductor				Insulation		*Inner Sheath	Lead Sheath	Bedding	Armouring	Outer Sheath		Packaging	
	Cross Sectional Area Nominal mm^2		Number of Wires		Thickness Nominal mm		Thickness Nominal mm	Thickness Nominal mm	Thickness Nominal mm	Dia. of Steel wire Nominal mm	Thickness Nominal mm	Overall Diameter Approx mm	Net Weight Approx kg/km	Standard Drum m+/-2%
	Ph	Ne	Ph	Ne	Ph	Ne								
14830250	25rmc	16rmc	7	7	0.9	0.7	1.0	1.2	1.0	1.6	1.9	31.5	2650	1000
14830251	35sm	16rmc	7	7	0.9	0.7	1.0	1.3	1.0	1.6	2.0	33.0	2840	1000
14830252	50sm	25rmc	19	7	1.0	0.9	1.0	1.4	1.1	2.0	2.1	37.3	3700	1000
14830253	70sm	35rmc	19	7	1.1	0.9	1.2	1.5	1.2	2.0	2.3	42.4	4640	1000
14830254	95sm	50rmc	19	7	1.1	1.0	1.2	1.6	1.3	2.5	2.5	47.8	5790	1000
14830255	120sm	70rmc	19	19	1.2	1.1	1.2	1.7	1.4	2.5	2.6	52.0	6910	1000
14830256	150sm	70rmc	19	19	1.4	1.1	1.4	1.8	1.4	2.5	2.7	56.6	8030	1000
14830257	185sm	95rmc	37	19	1.6	1.1	1.4	2.0	1.5	2.5	2.9	62.2	9610	500
14830258	240sm	120rmc	37	19	1.7	1.2	1.6	2.1	1.6	2.5	3.1	68.8	11470	500
14830259	300sm	150rmc	37	19	1.8	1.4	1.6	2.3	1.8	3.15	3.4	77.9	14690	500
14830260	400sm	185rmc	61	37	2.0	1.6	1.6	2.5	1.9	3.15	3.7	85.0	17400	400
14830261	500sm	240rmc	61	37	2.2	1.7	1.8	2.7	2.1	3.15	3.9	93.7	20900	400

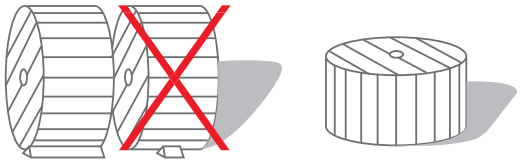
* Inner Sheath is optional as per EEMUA '133'

DRUM HANDLING INSTRUCTIONS

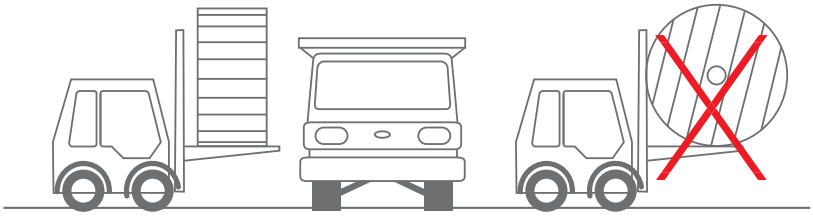
Cables and Conductors should be installed by trained personnel in accordance with good engineering practices, recognized codes of practise, statutory local requirements, IEE wiring regulations and where relevant, in accordance with any specific instructions issued by the company. Cables are often supplied in heavy cable reels and handling these reels can constitute a safety hazard. In particular, dangers may arise during the removal of steel binding straps and during the removal of retaining battens and timbers which may expose projecting nails.



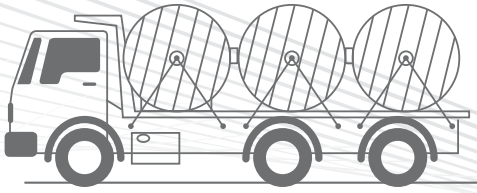
Lifting cable drums using crane.



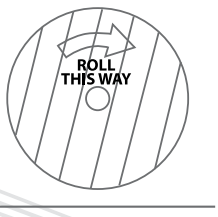
Do not lay drums flat on their sides, use proper stops to prevent drums roling.



Lift drums on fork trucks correctly.



Secure drums adequately before transportation.



Roll in the direction shown by the arrow.

RECOMMENDATIONS FOR CABLES INSTALLATION

PRODUCT LIFE DATA

Low Voltage cables is not subjected to high electric stress, the XLPE insulating material has a dielectric strength voltage of about 22 KV, with the best manufacturing and testing practice applied in Bahra Cables Company to ensure good quality insulation . As Insulation treeing is uncommon problem for LV cables, the chance of electric break down is very minor. The PVC or PE jacketing material is very stable against most of the Chemical traces could be existing at the soil, these material with Black colour Master batch up to 2.5 % have a strong resistance against UV and Environmental conditions.

The cables have to be selected and installed as per the recommendation mentioned below.

By keeping such standard of installation and operation, Low Voltage cables can survive in service for a time of 25 years or more without failure.

RECOMMENDATIONS FOR THE SELECTION, INSTALLATIONS AND OPERATION OF CABLES

• The cables are intended to be installed in air, or for burial in free draining soil Conditions. Where the cables are to be laid in any other environment, reference should be made to the cable Bahra Cables Company.

• The rated voltage of the cable for a given application should be suitable for the operating conditions in the system in which the cable is used. To facilitate the selection of the cable, systems are divided into three categories as follows.

a) Category A

This category comprises those systems in which any phase conductor that comes in contact with earth or an earth conductor is disconnected from the system within 1 min.

b) Category B

This category comprises those systems which, under fault conditions, are operated for a short time with one phase earthed. This period, according to IEC 60183, should not exceed 1 h. For cables specified in this standard, a longer period, not exceeding 8 h on any occasion, can be tolerated. The total duration of earth faults in any year should not exceed 125 h.

c) Category C

This category comprises all systems which do not fall into categories A and B.

The nominal system voltage U, (up to 1.0 KV) is the nominal voltage between phases,

The maximum sustained system voltage, Um (1.2 KV) is the highest voltage between phases that can be sustained under normal operating conditions at any time and at any point in the system. It excludes transient voltage variations, due, for example, to lightning impulses, fault conditions and rapid connection of loads.

Single-core cables are suitable for d.c. systems operating at up to 1 000 V to earth and two-core 600/1 000 V cables at up to 1 500 V between conductors.

CABLES INSTALLED IN HAZARDOUS AREAS

Where cables are required to be installed in areas classified as hazardous, i.e. potentially explosive gas

atmospheres, reference should be made to IEC 60079-14.

CURRENT RATINGS

The current rates introduced previously in this catalogue have to be followed.

• Cables should be installed and used in association with other equipment in accordance with BS7671 and/or the Electricity Safety, Quality and Continuity Regulations, as appropriate.

In special environments, the appropriate regulations and codes of practice should be observed.

• Minimum temperature during installation

It is recommended that the cables be installed only when both the cable and ambient temperatures are above 0 °C and have been so for the previous 24 h, or where special precautions have been taken to maintain the cable above this temperature.

MINIMUM INSTALLATION RADIUS

None of the cables specified in this catalogue should be bent during installation to a radius smaller than that given in BCC product Catalogues and the offered data sheets, wherever possible, larger installation radii should be used.

PREVENTION OF MOISTURE INGRESS

Care should be exercised during installation to avoid any damage to cable coverings. This is important in wet or other aggressive environments. The protective cable end cap should not be removed from the ends of the cable until immediately prior to termination or jointing, especially for cables that do not have extruded bedding. When the end caps have been removed the unprotected ends of the cable should not be exposed to any kind of moisture.

TEST AFTER INSTALLATION

A voltage test after installation should be performed with direct current of 3.5 KV DC between conductor phases and the same value between each conductor and armouring.

During the test, the voltage should be increased gradually to the full value and maintained continuously for 15 min. The test should be made between conductors and between each conductor and armour.

The requirement is : No breakdown should occur.

The test voltages given above are intended for cables immediately after installation and not for cables that have been in service. When testing is required after cables have been in service, regardless of service duration, Bahra Cables Company- Technology Department should be consulted for the appropriate test conditions, which depend on the individual circumstances.

CABLES FAULTS PREVENTION

The Low Voltage Cables faults are possible due to different reasons:

1. Physical damage due to mishandling or misuse
2. Physical Damage during operations.
3. Over current.
4. Fire or excessive temperature at the cables location.
5. Manufacturing malfunction, which Bahra Cables Company guarantees its product against any defect or wrong workmanship, meanwhile in case of damage due to this reason, the action will be taken as per the submitted warranty letter, and the company will apply the required corrective and preventive actions.

Recommendation for failures:

Insulation failure, the defected section is recommended to be replaced , the replacement should be from joint to joint.

Serving/ jacketing failure, if the water did not ingress through the cable, the jacket will be repaired using proper repairing techniques carried out by skilled technician. If the water came inside the cables to insulation, for cables suitable for wet location, practically dry the defected portion before repair.

If the cable is not suitable for wet applications and the underground water engrossed inside it, replacing the defected section from joint to joint is the recommend solution.

ORDERING INFORMATION

To serve our customer in minimum time and high efficiency, our valuable customers are requested to provide the following details along with their enquiries and orders:

1. Number of phases/cores.
2. Conductor required cross sectional area (conductor size along with size of neutral phase).
3. System Voltage Rate .
4. Applicable customer specification or International Standard / Norm.
5. Conductor material (Copper/Aluminum).
6. Insulation Material (PVC/XLPE/LSZH).
7. Bedding / Inner Sheathing (Inner Jacketing (PVC/PE, ..).
8. Lead Sheath.
9. Armouring Type (SWA, AWA or STA).
10. Cable jacketing material (PVC/MDPE/LSZH).
11. Cable special features required, e.g. circular conductors, Flame Retardant Type to IEC 60332-3, Anti-termite
12. Required length of cables (drum schedules)

LOCATION MAP