

POWER CABLES

FIRE RESISTANT CABLES



WILSON CABLES PRIVATE LIMITED

New And Old Cable Colour System

International Cable Colour System

For the purpose of standardizing technical requirements, the European Committee for Electrotechnical Standardization (CENELEC) countries (including Austria, Belgium, Czech Republic, Denmark, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Luxembourg, Malta, Netherlands, Norway, Portugal, Slovakia, Spain, Sweden, Switzerland and United Kingdom) have adopted the following colour code :

Systems	Phase (or Line)			Neutral	Earth
1 - phase system	Brown			Blue	Green/Yellow
3 - phase system	L1	L2	L3	Blue	Green/Yellow
	Brown	Black	Grey		

Change to Cable Colour Code / Sequence

Cable Type	Old Cable Colour Code / Sequence	New Cable Colour Code / Sequence
Single - core	Red or Black	Brown or Blue
Two - core	Red, Black	Brown, Blue
Three - core	Red, Yellow, Blue	Brown, Black, Grey
Four - core	Red, Yellow, Blue, Black	Brown, Black, Grey, Blue
Five - core	Red, Yellow, Blue, Black, Green/Yellow	Brown, Black, Grey, Blue, Green/Yellow

The existing cable colour code for fixed electrical wiring stipulated in the Singapore Standard CP5 : 1998 Code of Practice for electrical installations has been amended to align with the new cable colour code in the international standards such as BS 7671 and IEC 60446. A transition period of 24 months from 1 Mar 2009 to 28 Feb 2011 was given before the new cable colour became mandatory on 1 Mar 2011.

With effect from 1 Mar 2011, all new electrical wiring shall comply with the new colour code. **WILSON CABLES** will manufacture and supply cables with new cable colour code only. However, **WILSON CABLES** will continue to provide the cables with old cable colour code to its customers based on request.

Note : Consultants / Customers shall specify their requirements of the cable colour code at the time of order.

Quality Policy

We, at Wilson Cables are committed to:

- Provide Quality Products and Services that comply with specific standards and meet customers' and applicable requirements.
- Achieve the set goals by consistently adhering to the latest manufacturing and management practices.
- Perform the processes in a cost effective manner and continually improve the effectiveness of the quality management system.



FSS Singapore

CERTIFICATE

The Certification Body of TUV SUD PSE Pte Ltd certifies that



WILSON CABLES PTE LTD
No. 142 Sui Circle
Jurong Industrial Estate
Singapore 629602

has established and applies a Quality Management System for

Manufacture & Supply of Electric Cables
(See Appendix to Certificate for Details)

Proof has been furnished that the requirements according to

ISO 9001 : 2015

are fulfilled. The certificate is valid from **2022-05-06 to 2025-06-03**
Certificate Registration No. **92-2-0061**
Date of Print : **2022-05-06**



SIEW Kwan Hong, Tiffany
Head of Certification Body
Management Systems
Business Assurance Division



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Please refer to www.tuv.com.sg for current certificate status in the "Directory of Management System Certified Companies".

TUV SUD PSE Pte Ltd • 10 International Business Park Singapore 609937

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WILSON CABLES

Our Company

connote quality products manufactured since 1974. One of the leading electrical cable facilities in Singapore manufacturing power and special cables. **WILSON CABLES PRIVATE LIMITED** has carved out a special place in the minds of electrical contractors, dealers, consultants and project developers in Singapore and the export markets.

Recognition has come out of hard work and perseverance and many projects in Singapore and the export markets have been wired by “**WILSON CABLES**” and bears testimony to this.

A highly dedicated team of professionals and staff have built up this credibility over the years. Appropriate level of knowledge, customer commitment, quality output, economic pricing and prompt delivery have endeared us to the construction industry as a reliable supplier of **WILSON CABLES**.

WILSON CABLES shares the Singapore Inspiration to become regional and spread the reach to the overseas market. Armed with an ISO 9002 quality system recognition for the manufacture of a range of cables in 1992 (a first among cable companies in Singapore). The quality system has been upgraded to ISO 9001 : 2015 in year 2018.



WILSON CABLES have successfully built up the export market. Projects in China, Hong Kong, Brunei, Malaysia, Thailand, Indonesia, Myanmar, Cambodia, Vietnam, Laos, Philippines, Sri Lanka, Seychelles, Mauritius, Maldives and Middle East Countries use **WILSON CABLES** manufactured in Singapore. We have shown great resilience in handling stringent export requirements and intense competition in catering to this demand.

Confidence grows on performance. “**WILSON CABLES**” with the distinctive TÜV SÜD PSB Pte Ltd Product Listing Scheme Certificates and performance ethics is poised for greater achievements. To the enthusiastic team at **WILSON CABLES PRIVATE LIMITED**, it is a passion to succeed amidst intense competition.

The range of **WILSON CABLES** cover :

Cables For Power Supply And General Purposes

- PVC Insulated Cables 450/750 V to SS 358-3 or BS EN 50525-2-31 or IEC 60227-3
- LSOH Insulated Cables or FRT-3S 450/750 V or 600/1000 V to BSEN 50525-3-41
- PVC Insulated Unarmoured / Armoured PVC Sheathed Power Cables 600/1000 V to IEC 60502-1
- XLPE Insulated Unarmoured / Armoured PVC Sheathed Power Cables 600/1000 V to IEC 60502-1 / BS 5467
- XLPE Insulated Unarmoured / Armoured LSOH Sheathed Power Cables 600/1000 V to IEC 60502-1 / BS 6724
- Variable Speed Drive Unarmoured / Armoured Cables 600/1000 V to IEC 60502-1
- PVC Insulated Flexible Cords 300/500 V to BS EN 50525-2-11 / SS 358-5 / IEC 60227-5
- PVC Insulated Flexible Cables 450/750 V to BS EN 50525-2-31 (70 °C), 600/1000 V to BS 6231 (105 °C)
- PVC Insulated PVC Sheathed Flexible Cables 600/1000 V to IEC 60502-1
- Wilson Flex Multi-Core PVC Insulated Unscreened / Screened Flexible Cables 300/500 V to BS EN 50525-2-11
- XLPE/PE Insulated Unarmoured / Armoured Instrumentation Cables 300/500 V to BS EN 50288-7
- PVC Insulated Unarmoured / Armoured Instrumentation Cables 300/500 V to BS EN 50288-7
- LSOH Insulated Unarmoured /Armoured Instrumentation Cables 300/500 V to BSEN 50288-7
- Copper Tape Screened Unarmoured / Armoured Cables 600/1000 V to IEC 60502-1

Fire Resistant Cables

Flame Retardant LSOH Sheathed Fire Resistant Cables complying to the following standards where applicable:

- a. IEC 60331-21 - Fire Alone Test
 - b. IEC 60331-1/2 - Fire with Shock Test
 - c. BS 6387 / SS 299-1 - Fire Resistance Characteristics Tests Cat. C, W, Z
 - d. IEC 60332-1-2 - Flame Retardant Test
 - e. IEC 60332-3-22 Cat. A - Flame Retardant Tests Cat. A
 - f. IEC 60754-1 - Halogen Content Test
 - g. IEC 60754-2 - Corrosivity Test
 - h. IEC 61034-1&2 - Smoke Density Test
 - i. ASTM D 2863 - Oxygen Index Test
- FR-3S, 450/750 V or 600/1000 V to BSEN 50525-3-41
 - FR-3S Twin Twisted, 450/750 V to BSEN 50525-3-41
 - FR-100, 300/500 V to BS 6387 / SS 299-1
 - FR-200 & FR-200A, 600/1000 V to IEC 60502-1 And BS 7846 or BS 6724
 - FRIC-300 & FRIC-300A, 300/500 V to BS EN 50288-7
 - FRIM-300 & FRIM-300A, 300/500 V to BS EN 50288-7

Shipboard Cables

There are three types of Shipboard Power and Instrumentation Cables:

Flame Retardant PVC Sheathed Shipboard Power And Instrumentation Cables

- MC-210, MC-210Q & MC-210C, 600/1000 V to IEC 60092-353
- MIC-210, MIC-210Q & MIC-210C, 150/250 V to IEC 60092-376
- MIP-210, MIP-210Q & MIP-210C, 150/250 V to IEC 60092-376
- MIM-210, MIM-210Q & MIM-210C, 150/250 V to IEC 60092-376

Flame Retardant LSOH Sheathed Shipboard Power And Instrumentation Cables

- MC-200, MC-200Q & MC-200C, 600/1000 V to IEC 60092-353
- MIC-200, MIC-200Q & MIC-200C, 150/250 V to IEC 60092-376
- MIP-200, MIP-200Q & MIP-200C, 150/250 V to IEC 60092-376
- MIM-200, MIM-200Q & MIM-200C, 150/250 V to IEC 60092-376

Flame Retardant LSOH Sheathed Fire Resistant Shipboard Power And Instrumentation Cables

- FR-200-M, FR-200Q-M & FR-200C-M, 600/1000 V to IEC 60092-353
- FRIC-200-M, FRIC-200Q-M & FRIC-200C-M, 150/250 V to IEC 60092-376
- FRIP-200-M, FRIP-200Q-M & FRIP-200C-M, 150/250 V to IEC 60092-376
- FRIM-200-M, FRIM-200Q-M & FRIM-200C-M, 150/250 V to IEC 60092-376

Cables For Oil And Gas Industry

Flame Retardant Reduced Toxicity (FRRT) Cables to IEC 60332-3-22 Cat. A And IEC 60754-1 (HCL < 17%)

- FRT-3S, 600/1000 V to BSEN50525-3-41
- FRT-211Q, FRT-211C, 600/1000 V to IEC 60502-1
- FRT-211, FRT-211A, 600/1000 V to IEC 60502-1
- FRT-411, FRT-411A, 600/1000 V to IEC 60502-1
- IC-111, IP-111, IM-111, IC-111A, IP-111A, IM-111A, IC-111Q, IP-111Q & IM-111Q, 300/500 V to BS EN 50288-7
- IC-411, IP-411, IM-411, IC-411A, IP-411A, IM-411A, IC-411Q, IP-411Q & IM-411Q, 300/500 V to BS EN 50288-7
- IC-211, IP-211, IM-211, IC-211A, IP-211A, IM-211A, IC-211Q, IP-211Q & IM-211Q, 300/500 V to BS EN 50288-7

Flame Retardant LSOH Sheathed Cables to IEC 60332-3-22 Cat. A, IEC 60754-1&2 And IEC 61034-1&2

- FRT-200Q, FRT-200C, 600/1000 V to IEC 60502-1
- FRT-200, FRT-200A, 600/1000 V to IEC 60502-1
- IC-200, IP-200, IM-200, IC-200A, IP-200A, IM-200A, IC-200Q, IP-200Q & IM-200Q, 300/500 V to BS EN 50288-7
- IC-300, IP-300, IM-300, IC-300A, IP-300A, IM-300A, IC-300Q, IP-300Q & IM-300Q, 300/500 V to BS EN 50288-7

The list that keeps pace with Customers' need and our adaptability to the dynamic needs of the market.

We welcome you to visit our website at <http://www.wilson-cables.com>

All your requirements can be sent to Marketing Department.

By Phone : +65 68617888

By Fax : +65 68617871

By Email : exports@wilson-cables.com.sg / sales.sg@wilson-cables.com.sg

By Visiting us : at 142 Gul Circle, Jurong Industrial Estate, Singapore 629602

WILSON CABLES is your reliable source of quality cables. We are here to serve all your cable needs.



Manufacturing Facilities & Warehouse



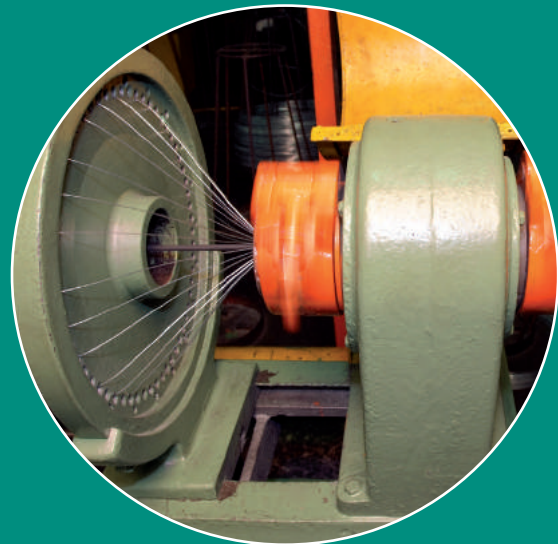
Storage



Storage Facility



Stranding Process



Armouring Process

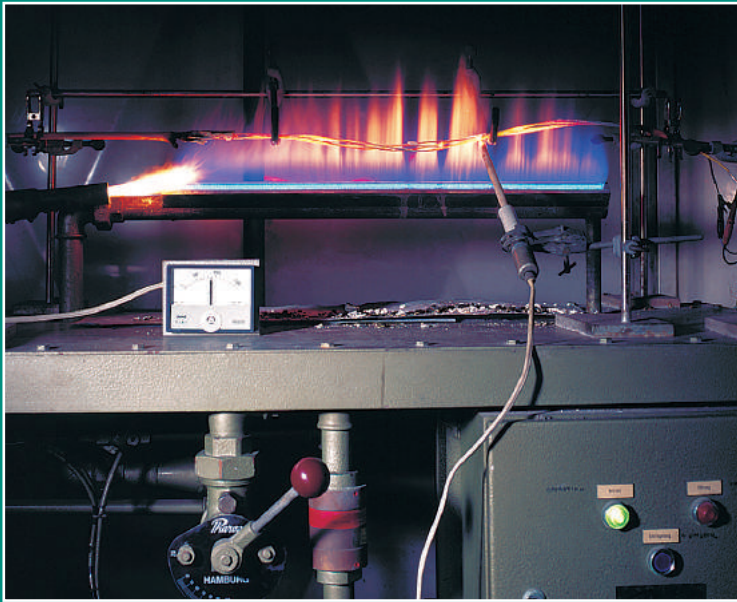


Taping Process



Extrusion Process

Test Facilities



Fire Alone Test Equipment - IEC 60331-21 & BS 6387 Protocol C



Flame Retardant Test Equipment - IEC 60332-3



Electrical Test Equipment - High Voltage Test



XLPE Hot Set Test Equipment - Oven



Halogen Content & Corrosivity Tests Equipment
- IEC 60754-1 & IEC 60754-2

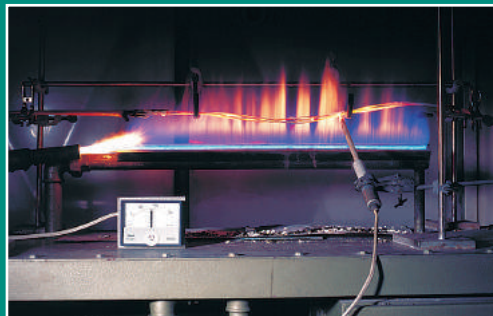


Wall Thickness Measuring Equipment
- Profile Projector

Test Methods

1. Fire Alone Test : IEC 60331-21

WILSON CABLES provides Fire Resistant Cables meeting IEC 60331-21 requirement.



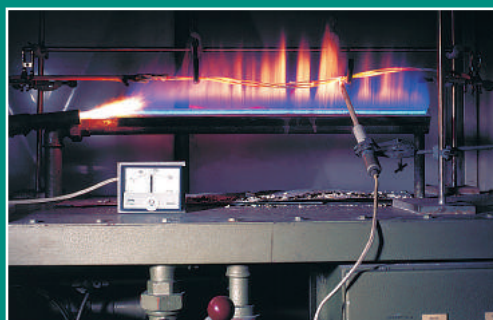
Fire Alone Test : IEC 60331-21

The Fire Resistant Cable is subjected to the flame at least 750 °C continuously for a period of 90 minutes or the specified application time. Test voltage equal to the cable designated voltage is applied to the cable continuously during the entire testing. After which the flame shall be extinguished but the cable sample shall remain energised for a further 15 minutes. During the test procedure the cable shall maintain circuit integrity.

2. Fire Resistance Characteristics Tests : SS 299-1 Cat. C, W, Z or BS 6387 Protocol C, W, Z

WILSON CABLES provides Fire Resistant Cables comply with the most stern Singapore Standard of SS 299-1 Cat. C, W, Z or British Standard of BS 6387 Protocol C, W, Z.

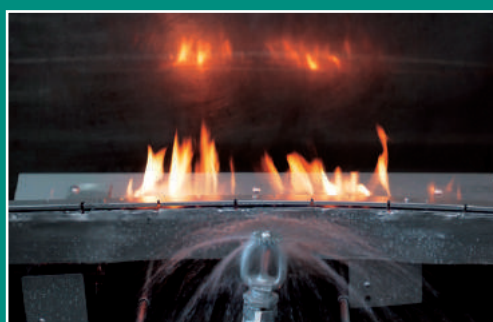
a. Resistance to Fire Alone Test : SS 299-1 Cat. C or BS 6387 Protocol C



The Fire Resistant Cable is subjected to the specific flame temperature continuously for a period of the specific combustion time. Test voltage equal to the cable designated voltage is applied to the cable continuously during the entire testing. During the test procedure the cable shall maintain circuit integrity.

Cat./Protocol	Flame Temperature (°C)	Combustion Time
C	950 ± 40 °C	3 Hours

b. Resistance to Fire With Water Test : SS 299-1 Cat. W or BS 6387 Protocol W



The Fire Resistant Cable is subjected to the flame at 650 °C continuously for 15 minutes, then continue the flame and water spray for a further 15 minutes. Test voltage equal to the cable designated voltage is applied to the cable continuously during the entire testing. During the test procedure the cable shall maintain circuit integrity.

Category W/ Protocol W : Flame temperatures 650 ± 40 °C

c. Resistance to Fire With Mechanical Shock Test : SS 299-1 Cat. X, Y, Z or BS 6387 Protocol Z

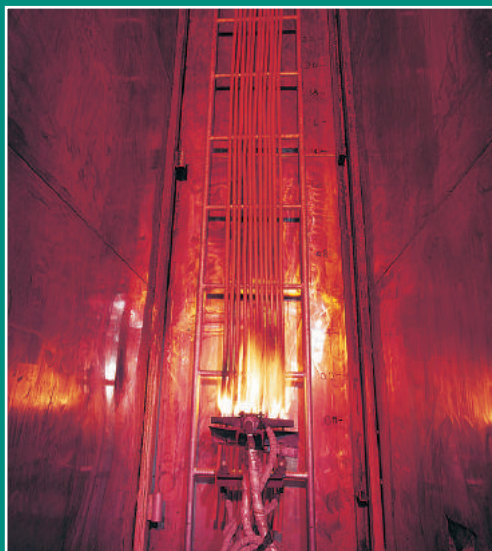


The Fire Resistant Cable is subjected to the specific flame temperature and mechanical shock continuously for a period of 15 minutes. Test voltage equal to the cable designated voltage is applied to the cable continuously during the entire testing. During the test procedure the cable shall maintain circuit integrity.

Cat./Protocol	Flame Temperature (°C)
Z	950 °C for 15 min + Mechanical Shock

Test Methods

3. Flame Retardant Test : IEC 60332-3-22 Cat. A IEC 60332-3-23 Cat. B IEC 60332-3-24 Cat. C



WILSON CABLES can provide Flame Retardant (Reduced Flame Propagation (RFP) and Self-Extinguished) type of cables meeting Flame Retardant test requirement to IEC 60332-3 Cat. A, B & C.

Flame Retardant Test (Bunch) : IEC 60332-3 Cat. A, B, C

A bunch of cables are installed vertically on the test ladder. A burner, as specified in the test standard, is used as ignition source. The flame is continuously applied for the test duration in the below table. Flame is cut off after the test duration. After flame extinction, length of charred portion is measured and should not exceed 2.5 meters from the bottom edge of the burner.

Cat.	Total Volume of Non-Metallic Material	Burning Time
A	7 Litre / m	40 min
B	3.5 Litre / m	40 min
C	1.5 Litre / m	20 min

4. Halogen Content & Corrosivity Test : IEC 60754-1 & IEC 60754-2



WILSON CABLES provide LSOH type of cables with Low Smoke Halogen Free material, which comply with IEC 60754-1 & IEC 60754-2 (if applicable) requirements.

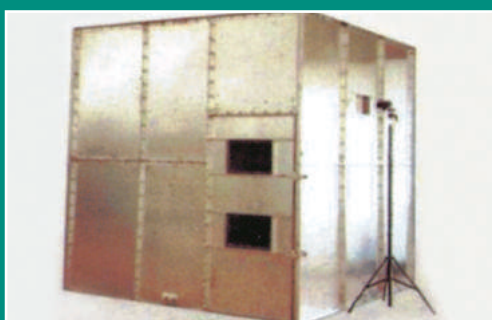
Halogen Content Test : IEC 60754-1

Determine the amount of halogen acid gas, which is evolved during the combustion of compounds based on halogenated polymers and compounds containing halogenated additives taken from cable constructions. The amount of halogen acid shall not exceed 0.5%.

Corrosivity Test : IEC 60754-2

Determine the degree of pH value and conductivity of the gases, which is evolved during the combustion of compounds taken from cable components. The weighted pH value should not be less than 4.3 and the weighted value of conductivity should not exceed 10 μ S/mm.

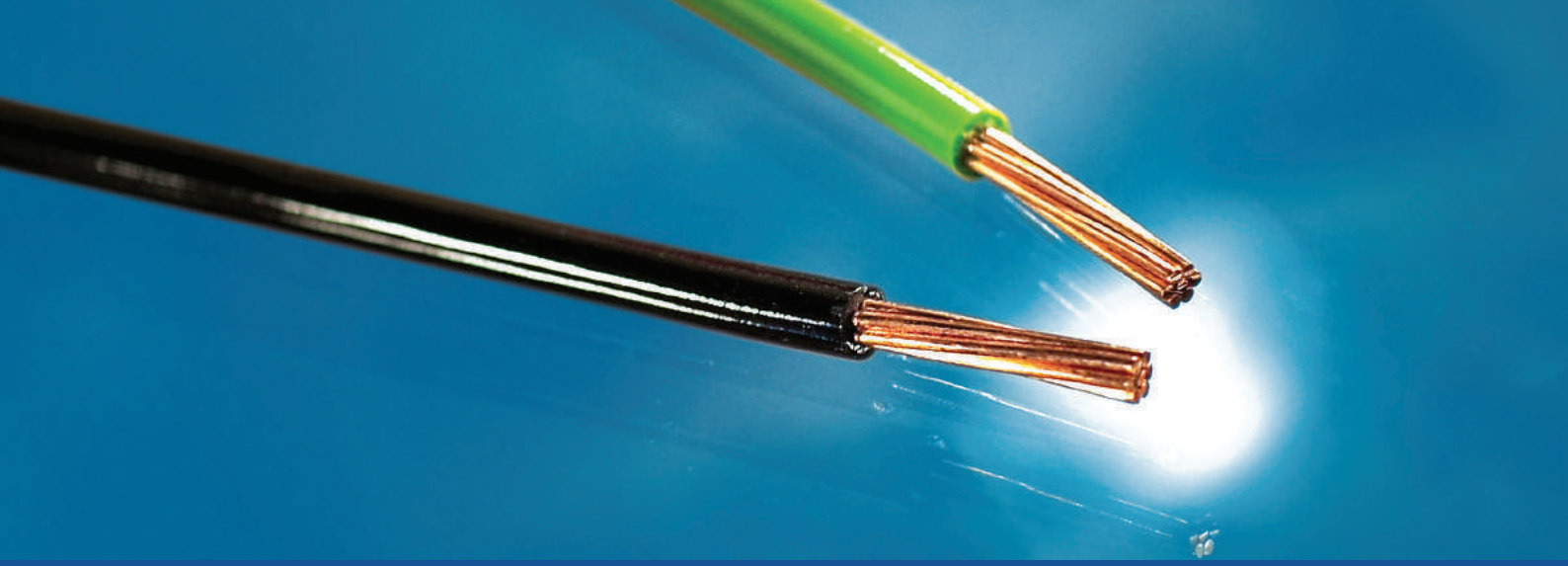
5. Smoke Density Test : IEC 61034-1 & IEC 61034-2



WILSON CABLES LSOH type of cables with Low Smoke Halogen Free materials release very little smoke emission during a fire, which are complying with IEC 61034-1 and IEC 61034-2 requirements, it provide one more layer of safety protection to the personnel.

Smoke Density Test : IEC 61034-1 & IEC 61034-2

Burn the cable sample(s) in a test cube of 27 m³ volume, measure the light transmittance of the smoke to determine the measurement of the smoke density. The minimum value of 60% is adopted. Generally the smoke density shall be followed the requirement specified in the cable specification.



Single Core PVC Insulated Power Cables

APPLICATION

This cable is suitable for installation in conduit, in trunking, on trays or fixed protected installation in light fitting and inside switching and control equipment. It can carry voltage up to 1000 V a.c. or up to 750 V to earth, d.c.

CONSTRUCTION

1. Conductor : Plain Annealed, Stranded Circular Non-Compacted or Circular Compacted Copper
2. Insulation : PVC
3. Insulation Colour : Brown, Grey, Blue, Black, Green/Yellow, White, Red, Yellow

TECHNICAL DATA

- Applicable Standard : SS 358-3 or BS EN 50525-2-31 or IEC 60227-3
 Rated Voltage : 450/750 V
 Testing Voltage : 2.5 KV / 5 min (SS & IEC)
 2.5 KV / 15 min (BS)
 Operating Temperature : Max. 70 °C

PRODUCT CERTIFICATION

TÜV SÜD PSB Pte Ltd. - Product Listing Scheme (PLS)
 For SS 358-3
 Range : 1C X 1.5 mm² to 1C X 630 mm²
 For IEC 60227-3
 Range : 1C X 1.5 mm² to 1C X 400 mm²

PRODUCT FEATURES

IEC 60332-1-2

Number of Cores	Nominal Area of Conductor	Approx. Overall Diameter	Approx. Weight
No.	mm ²	mm	Kg / Km
1	1.5 rm	3.1	22
	2.5 rm	3.7	32
	4 rm	4.2	50
	6 rm	4.8	70
	10 rm	6.2	110
	16 rm	7.2	170
	25 cm	8.5	260
	35 cm	10.0	360
	50 cm	11.6	480
	70 cm	13.1	680
	95 cm	15.6	930
	120 cm	17.0	1160
	150 cm	18.8	1470
	185 cm	21.0	1790
	240 rm	25.5	2360
	300 rm	28.2	2960
400 rm	31.5	3750	
500 rm	35.5	4800	
630 rm	39.0	6010	

rm : Stranded Circular Non-Compacted

cm : Stranded Circular Compacted

Note :

For the cable manufactured under BS EN 50525-2-31 or IEC 60227-3 is available upon request.



Single Core PVC Insulated PVC Sheathed Power Cables

APPLICATION

This cable is preferably used for supplying main power. It is also used for industrial installation such as in cable duct, cable trunking, cable tray, cable ladder and in switchgear.

CONSTRUCTION

1. Conductor : Plain Annealed, Stranded Circular Non-Compacted or Circular Compacted Copper
2. Insulation : PVC
3. Sheath : PVC
4. Insulation Colour : Black
5. Sheath Colour : Grey/Black

TECHNICAL DATA

- Applicable Standard : IEC 60502-1
 Rated Voltage : 600/1000 V
 Testing Voltage : 3.5 KV / 5 min
 Operating Temperature : Max. 70 °C

PRODUCT CERTIFICATION

- TÜV SÜD PSB Pte Ltd. - Product Listing Scheme (PLS)
 Range : 1C X 1.5 mm² to 1C X 1000 mm²

PRODUCT FEATURES

IEC 60332-1-2

Number of Cores	Nominal Area of Conductor	Approx. Overall Diameter	Approx. Weight
No.	mm ²	mm	Kg / Km
1	1.5 rm	6.4	55
	2.5 rm	7.0	70
	4 rm	8.0	90
	6 rm	9.0	115
	10 rm	10.0	160
	16 rm	11.0	220
	25 cm	12.0	325
	35 cm	13.0	430
	50 cm	15.0	560
	70 cm	16.5	770
	95 cm	19.0	1040
	120 cm	20.8	1280
	150 cm	22.5	1570
	185 cm	25.0	1960
	240 rm	28.6	2570
	300 rm	32.5	3210
400 rm	36.5	4050	
500 rm	40.0	5060	
630 rm	44.5	6420	
800 rm	49.0	8140	
1000 rm	54.5	10140	

rm : Stranded Circular Non-Compacted
 cm : Stranded Circular Compacted

PVC Insulated PVC Sheathed Unarmoured Power Cables

APPLICATION

This cable is preferably used for supplying main power / as a control cable. It is also used for industrial installation such as in cable duct, cable trunking, cable tray, cable ladder and in switchgear.

CONSTRUCTION

1. Conductor : Plain Annealed, Stranded Circular Non-Compacted or Shaped Copper
2. Insulation : PVC
3. Sheath : PVC
4. Insulation Colour :
 - 2C - Brown & Blue
 - 3C - Brown, Black & Grey
 - 4C - Brown, Black, Grey, Blue
 - 2C + E - Brown, Blue + Green/Yellow
 - 3C + E - Brown, Black, Grey + Green/Yellow
 - 4C + E - Brown, Black, Grey, Blue + Green/Yellow
 - 5C & above - White cores printed with numbers
5. Sheath Colour : Black

TECHNICAL DATA

- Applicable Standard : IEC 60502-1
 Rated Voltage : 600/1000 V
 Testing Voltage : 3.5 KV / 5 min
 Operating Temperature : Max. 70 °C

PRODUCT FEATURES

IEC 60332-1-2

Number of Cores	Nominal Area of Conductor	Approx. Overall Diameter	Approx. Weight
No.	mm ²	mm	Kg / Km
2	1.5 rm	10.0	130
	2.5 rm	11.4	170
	4 rm	13.0	240
	6 rm	14.0	300
	10 rm	17.0	445
	16 rm	19.0	550
	25 sm	19.0	680
	35 sm	21.0	900
	50 sm	23.0	1180
	70 sm	26.0	1620
3	1.5 rm	10.5	150
	2.5 rm	12.5	200
	4 rm	13.5	285
	6 rm	15.0	360
	10 rm	18.0	520
	16 rm	20.0	665
	25 sm	21.0	1050
	35 sm	23.0	1290
	50 sm	26.5	1700
	70 sm	29.5	2360
	95 sm	35.0	3240
	120 sm	37.0	4000
	150 sm	41.0	5000
	185 sm	46.0	6100
	240 sm	51.0	7900
300 sm	58.0	9770	

rm : Stranded Circular Non-Compacted

sm : Stranded Shaped

PVC Insulated PVC Sheathed Unarmoured Power Cables

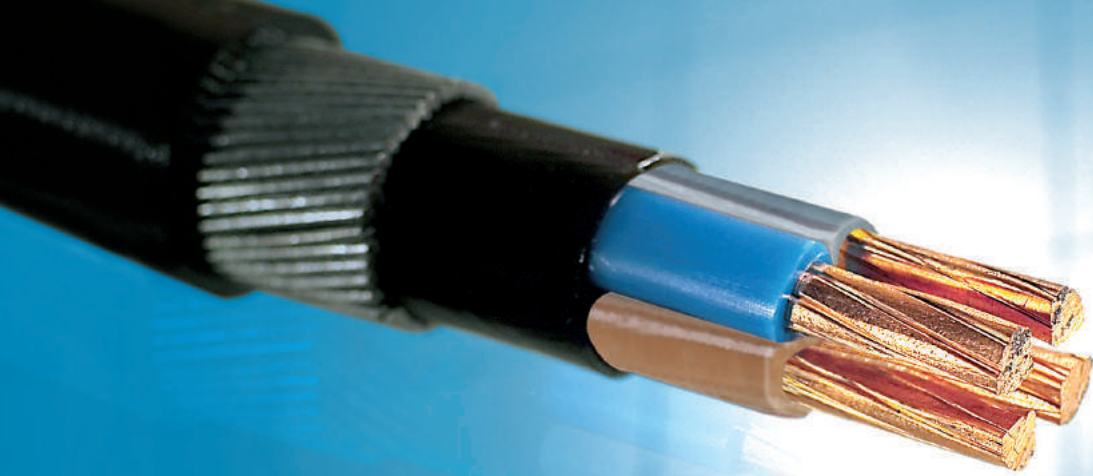
Number of Cores	Nominal Area of Conductor	Approx. Overall Diameter	Approx. Weight
No.	mm ²	mm	Kg / Km
4	1.5 rm	11.5	180
	2.5 rm	13.0	240
	4 rm	14.5	340
	6 rm	16.0	445
	10 rm	19.5	690
	16 rm	22.0	920
	25 sm	24.0	1285
	35 sm	26.5	1695
	50 sm	30.0	2255
	70 sm	34.0	3120
	95 sm	39.5	4270
	120 sm	44.0	5300
	150 sm	47.5	6460
	185 sm	52.0	8080
	240 sm	58.0	10500
	300 sm	65.0	13040
400 sm	73.3	16600	
5 (Colour)	1.5 rm	12.0	230
	2.5 rm	13.8	285
	4 rm	15.8	400
	6 rm	17.1	570
	10 rm	20.7	760
	16 rm	23.5	1260

Number of Cores	Nominal Area of Conductor	Approx. Overall Diameter	Approx. Weight
No.	mm ²	mm	Kg / Km
5	1.5 rm	12.0	230
7		13.0	260
10		14.8	380
12		15.8	440
19		18.6	635
27		22.0	850
37		24.5	1120
40		25.2	1180
5		2.5 rm	13.8
7	15.0		380
10	17.0		460
12	18.2		565
19	21.8		860
27	25.5		1165
37	29.0		1555
5	4 rm		15.8
7		17.0	515
10		19.8	730
12		21.5	850
19		25.5	1260
27		29.6	1730

rm : Stranded Circular Non-Compacted
sm : Stranded Shaped

Notes :

1. For 7 cores & above cables with earth core (Green/Yellow) are available upon request.
2. Any other cores (up to 48 cores) not indicated in this table are also available upon request.



PVC Insulated PVC Sheathed Armoured Power Cables

APPLICATION

This cable is preferably used for supplying main power / as a control cable. It can also be used for industrial installation such as in cable trench, cable duct, switchgear and in power stations. This cable is ideal for ground emplacement if a higher electrical or mechanical protection is required.

CONSTRUCTION

- | | | |
|----------------------|---|--|
| 1. Conductor | : | Plain Annealed, Stranded Circular Non-Compacted or Circular Compacted or Shaped Copper |
| 2. Insulation | : | PVC |
| 3. Bedding | : | PVC or PVC Tapes |
| 4. Armour | : | Galvanized Round Steel Wires |
| 5. Sheath | : | PVC |
| 6. Insulation Colour | : | |
| 2C | - | Brown & Blue |
| 3C | - | Brown, Black & Grey |
| 4C | - | Brown, Black, Grey, Blue |
| 2C + E | - | Brown, Blue + Green/Yellow |
| 3C + E | - | Brown, Black, Grey + Green/Yellow |
| 4C + E | - | Brown, Black, Grey, Blue + Green/Yellow |
| 5C & above | - | White cores printed with numbers |
| 7. Sheath Colour | : | Black |

TECHNICAL DATA

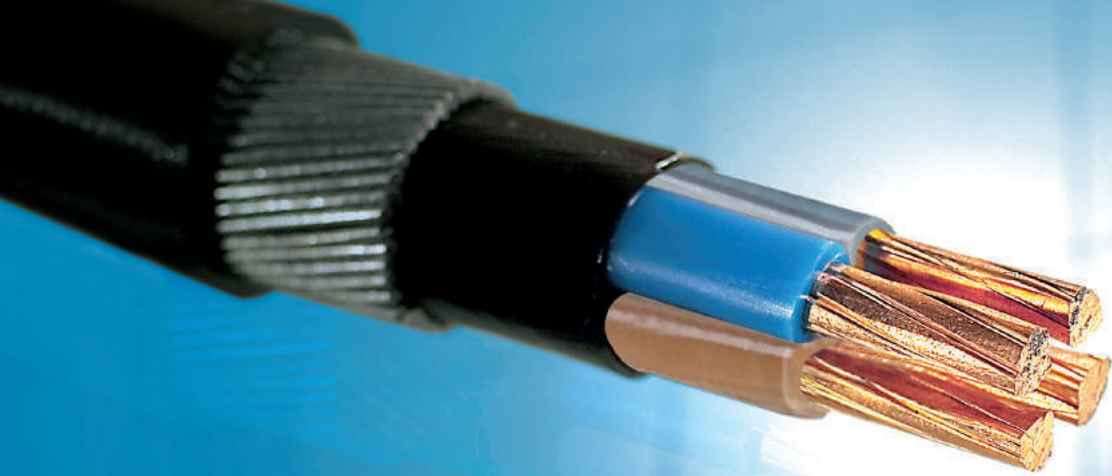
- | | | |
|-----------------------|---|----------------|
| Applicable Standard | : | IEC 60502-1 |
| Rated Voltage | : | 600/1000 V |
| Testing Voltage | : | 3.5 KV / 5 min |
| Operating Temperature | : | Max. 70 °C |

PRODUCT FEATURES

- IEC 60332-1-2
 IEC 60332-3-22 Cat. A (On Request)
 Oxygen Index - Min. 30% (On Request)

Number of Cores	Nominal Area of Conductor	Approx. Overall Diameter	Approx. Weight
No.	mm ²	mm	Kg / Km
2	1.5 rm	12.0	315
	2.5 rm	13.4	385
	4 rm	15.0	480
	6 rm	16.3	550
	10 rm	20.0	900
	16 rm	21.5	1120
	25 sm	22.0	1430
	35 sm	24.0	1610
	50 sm	27.0	2130
3	70 sm	29.5	2470
	1.5 rm	12.5	330
	2.5 rm	14.0	430
	4 rm	15.4	545
	6 rm	17.4	715
	10 rm	20.8	1000
	16 rm	22.5	1240
	25 sm	24.5	1700
	35 sm	26.6	2050
	50 sm	29.5	2550
	70 sm	33.0	3570
	95 sm	37.4	4590
120 sm	40.4	5450	
150 sm	46.0	6880	
185 sm	50.0	8320	
240 sm	55.0	10370	
300 sm	59.8	12480	

rm : Stranded Circular Non-Compacted
 cm : Stranded Circular Compacted
 sm : Stranded Shaped



PVC Insulated PVC Sheathed Armoured Power Cables

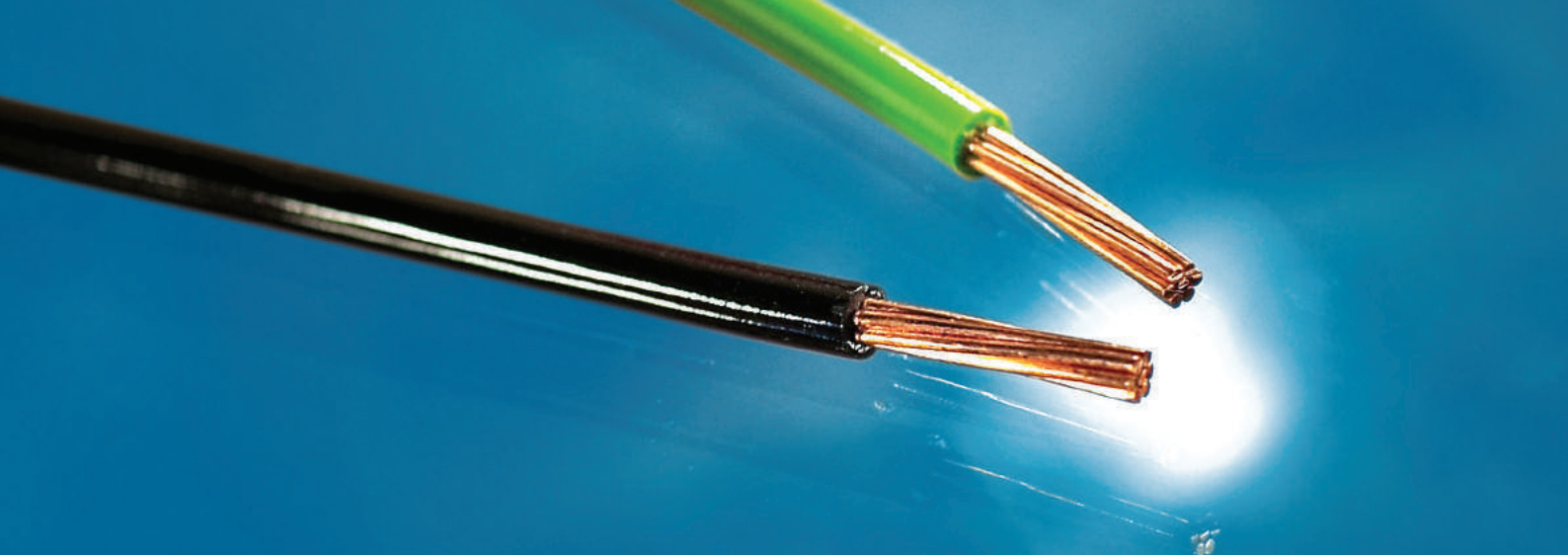
Number of Cores	Nominal Area of Conductor	Approx. Overall Diameter	Approx. Weight
No.	mm ²	mm	Kg / Km
4	1.5 rm	13.5	370
	2.5 rm	14.5	465
	4 rm	17.0	730
	6 rm	18.8	840
	10 rm	22.2	1180
	16 rm	25.6	1570
	25 sm	26.6	2040
	35 sm	29.3	2550
	50 sm	34.0	3450
	70 sm	37.6	4480
	95 sm	43.0	5770
	120 sm	47.5	7400
	150 sm	51.5	8770
	185 sm	56.0	10630
	240 sm	63.0	13300
	300 sm	68.5	16150
400 sm	80.6	21600	
5 (Colour)	1.5 rm	15.0	440
	2.5 rm	16.5	540
	4 rm	19.5	790
	6 rm	20.8	1030
	10 rm	25.8	1560
	16 rm	28.0	1990
	25 cm	32.1	2680
	35 cm	34.8	3330
	50 cm	41.0	4570
70 cm	45.4	5830	

Number of Cores	Nominal Area of Conductor	Approx. Overall Diameter	Approx. Weight
No.	mm ²	mm	Kg / Km
5	1.5 rm	15.0	440
7		15.2	480
10		17.7	700
12		18.8	820
19		21.8	1110
27		26.0	1590
37		29.0	1960
5	2.5 rm	16.5	540
7		17.8	720
10		20.0	920
12		21.4	1090
19		26.0	1660
27		29.8	2120
37		33.5	2660
5	4 rm	19.5	790
7		20.2	870
10		24.4	1410
12		25.8	1560
19		30.2	2130
27		36.0	3040

rm : Stranded Circular Non-Compacted
cm : Stranded Circular Compacted
sm : Stranded Shaped

Notes :

1. The Bedding of cable sizes from 25 mm² and above are taped bedding.
2. For 7 cores & above Cables with earth core (Green/Yellow) are available upon request.
3. Any other cores (up to 48 cores) not indicated in this table are available upon request.



FRT - 3S - Single Core LSOH Insulated Power Cables

APPLICATION

This cable is suitable for installation in conduit, in trunking, on trays or fixed protected installation in light fitting and inside switching and control equipment, where flame retardant and low smoke halogen free properties are required. It can carry voltage up to 1000 V a.c. or up to 750 V to earth d.c.

CONSTRUCTION

1. Conductor : Plain Annealed, Stranded Circular Non-Compacted or Circular Compacted Copper
2. Insulation : LSOH
3. Insulation Colour : Brown, Grey, Blue, Black, Green/Yellow, White, Red, Yellow

TECHNICAL DATA

- Applicable Standard : BSEN 50525-3-41
 Rated Voltage : 450/750 V (or 600/1000 V *)
 Testing Voltage : 2.5 KV / 15 min (or 3.5 KV / 5 min *)
 Operating Temperature : Max. 90 °C

PRODUCT CERTIFICATION

TÜV SÜD PSB Pte Ltd. - Product Listing Scheme (PLS)

Range : 1C X 1.5 mm² to 1C X 630 mm²

PRODUCT FEATURES

- IEC 60332-1-2
 IEC 60332-3-22 Cat. A
 IEC 60754-1 & IEC 60754-2
 IEC 61034-1 & IEC 61034-2
 Oxygen Index - Min. 30%
 Rated Voltage 600/1000 V (On Request)
 High Voltage Test - 3.5 KV / 5 min (On Request)

Note : * = On request

Number of Cores	Nominal Area of Conductor	Approx. Overall Diameter	Approx. Weight
No.	mm ²	mm	Kg / Km
1	1.5 rm	3.1	23
	2.5 rm	3.7	34
	4 rm	4.3	50
	6 rm	4.8	70
	10 rm	6.2	120
	16 rm	7.2	180
	25 cm	8.5	270
	35 cm	9.8	370
	50 cm	11.3	500
	70 cm	12.9	700
	95 cm	15.2	970
	120 cm	16.6	1205
	150 cm	18.3	1480
	185 cm	20.6	1860
	240 rm	24.9	2450
	300 rm	27.7	3070
400 rm	31.1	3900	
500 rm	34.6	4900	
630 rm	38.6	6250	

rm : Stranded Circular Non-Compacted
 cm : Stranded Circular Compacted



XLPE Insulated PVC or LSOH Sheathed Unarmoured Power Cables

APPLICATION

This cable is preferably used for supplying main power / as a control cable. It is also used for industrial installation such as in cable duct, cable trunking, cable tray, cable ladder and in switchgear.

Use LSOH sheathed cables if low smoke halogen free properties are required.

CONSTRUCTION

1. Conductor : Plain Annealed, Stranded Circular Non-Compacted or Circular Compacted or Shaped Copper
2. Insulation : XLPE
3. Sheath : PVC or LSOH
4. Insulation Colour :
 - 1C - Natural
 - 2C - Brown & Blue
 - 3C - Brown, Black & Grey
 - 4C - Brown, Black, Grey, Blue
 - 2C + E - Brown, Blue + Green/Yellow
 - 3C + E - Brown, Black, Grey + Green/Yellow
 - 4C + E - Brown, Black, Grey, Blue + Green/Yellow
 - 5C & above - White cores printed with numbers
5. Sheath Colour : Black

TECHNICAL DATA

- Applicable Standard : IEC 60502-1
 Rated Voltage : 600/1000 V
 Testing Voltage : 3.5 KV / 5 min
 Operating Temperature : Max. 90 °C

PRODUCT CERTIFICATION

- TÜV SÜD PSB Pte Ltd. - Product Listing Scheme (PLS)
 For XLPE / PVC Cables only
 Range : 1C X 1.5 mm² to 1C X 1000 mm²
 Range : 2C X 1.5 mm² to 4C X 400 mm²

PRODUCT FEATURES

- For XLPE / PVC Cables
 IEC 60332-1-2
 IEC 60332-3-22 Cat. A (On Request)
 Oxygen Index - Min. 30% (On Request)
- For XLPE / LSOH Cables
 IEC 60332-1-2
 IEC 60754-1 & IEC 60754-2
 IEC 61034-1 & IEC 61034-2
 Oxygen Index - Min. 30%
 IEC 60332-3-22 Cat. A (On Request)

Number of Cores	Nominal Area of Conductor	Approx. Overall Diameter	Approx. Weight
No.	mm ²	mm	Kg / Km
1	1.5 rm	6.5	48
	2.5 rm	7.0	60
	4 rm	7.5	80
	6 rm	8.0	100
	10 rm	9.0	145
	16 rm	10.0	205
	25 cm	11.5	300
	35 cm	12.5	400
	50 cm	14.0	520
	70 cm	15.8	720
	95 cm	18.0	975
	120 cm	19.8	1220
	150 cm	22.0	1500
	185 cm	24.0	1860
	240 rm	28.0	2440
	300 rm	31.0	3030
	400 rm	34.5	3860
500 rm	38.0	4860	
630 rm	43.0	6200	
800 rm	48.0	7900	
1000 rm	53.5	9940	
2	1.5 rm	10.4	130
	2.5 rm	11.5	170
	4 rm	12.4	230
	6 rm	13.8	290
	10 rm	15.8	400
	16 rm	17.8	515
	25 sm	17.2	690
	35 sm	18.0	900
50 sm	20.5	1140	
70 sm	23.5	1530	

rm : Stranded Circular Non-Compacted
 cm : Stranded Circular Compacted
 sm : Stranded Shaped

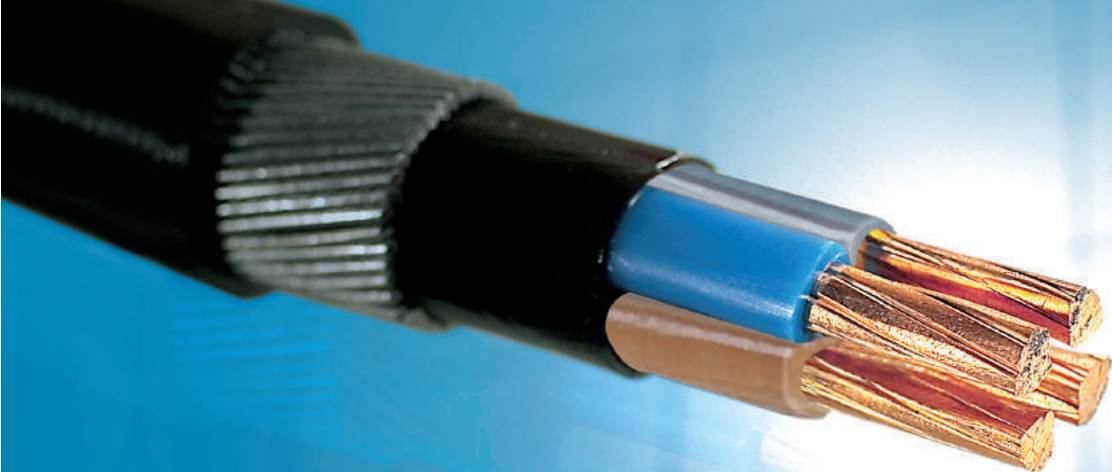


XLPE Insulated PVC or LSOH Sheathed Unarmoured Power Cables

Number of Cores	Nominal Area of Conductor	Approx. Overall Diameter	Approx. Weight
No.	mm ²	mm	Kg / Km
3	1.5 rm	10.8	145
	2.5 rm	12.0	210
	4 rm	13.1	270
	6 rm	14.2	350
	10 rm	16.8	480
	16 rm	18.8	680
	25 sm	19.5	910
	35 sm	21.5	1220
	50 sm	24.0	1580
	70 sm	27.5	2250
	95 sm	31.0	3040
	120 sm	35.0	3820
	150 sm	38.5	4670
	185 sm	43.5	5820
	240 sm	49.5	7620
	300 sm	55.0	9370
400 sm	62.0	12000	
4	1.5 rm	11.8	190
	2.5 rm	12.8	250
	4 rm	14.2	330
	6 rm	15.8	410
	10 rm	18.2	600
	16 rm	20.6	920
	25 sm	22.0	1190
	35 sm	24.0	1600
	50 sm	27.0	2100
	70 sm	32.0	2970
	95 sm	36.0	4030
	120 sm	41.0	5060
	150 sm	45.0	6180
	185 sm	50.0	7760
	240 sm	57.0	10120
	300 sm	63.0	12520
400 sm	72.0	16000	

Number of Cores	Nominal Area of Conductor	Approx. Overall Diameter	Approx. Weight
No.	mm ²	mm	Kg / Km
5 (Colour)	1.5 rm	12.5	240
	2.5 rm	13.8	270
	4 rm	15.3	430
	6 rm	16.5	550
	10 rm	19.1	780
	16 rm	21.9	1120
	25 cm	25.2	1540
	35 cm	28.1	2090
	50 cm	32.7	3110
	70 cm	38.2	4200
	95 cm	44.2	5650
	120 cm	48.5	6970
5	1.5 rm	12.5	240
7		13.6	270
10		15.4	400
12		16.5	460
19		19.6	665
27		23.2	890
37		26.3	1180
5		2.5 rm	13.8
7	15.0		360
10	17.0		430
12	18.2		525
19	21.8		810
27	25.5		1050
37	29.0		1400

rm : Stranded Circular Non-Compacted
cm : Stranded Circular Compacted
sm : Stranded Shaped



XLPE Insulated PVC Sheathed Armoured Power Cables

APPLICATION

This cable preferably used for supplying main power / as a control cable. It can also be used for industrial installation such as in cable trench, cable duct, switchgear and in power stations. This cable is ideal for ground emplacement if a higher electrical or mechanical protection is required.

CONSTRUCTION

1. Conductor	:	Plain Annealed, Stranded Circular Non-Compacted or Circular Compacted or Shaped Copper
2. Insulation	:	XLPE
3. Bedding	:	PVC or PVC Tapes
4. Armour	:	Galvanized Round Steel Wires / Plain Aluminium Wires *
5. Sheath	:	PVC
6. Insulation Colour	:	
1C	-	Natural
2C	-	Brown & Blue
3C	-	Brown, Black & Grey
4C	-	Brown, Black, Grey, Blue
2C + E	-	Brown, Blue + Green/Yellow
3C + E	-	Brown, Black, Grey + Green/Yellow
4C + E	-	Brown, Black, Grey, Blue + Green/Yellow
5C & above	-	White cores printed with numbers
7. Sheath Colour	:	Black

TECHNICAL DATA

Applicable Standard	:	IEC 60502-1
Rated Voltage	:	600/1000 V
Testing Voltage	:	3.5 KV / 5 min
Operating Temperature	:	Max. 90 °C

PRODUCT CERTIFICATION

TÜV SÜD PSB Pte Ltd. - Product Listing Scheme (PLS)		
Range	:	Single core up to 1000 mm ² : 2C X 1.5 mm ² to 4 C X 400 mm ²

PRODUCT FEATURES

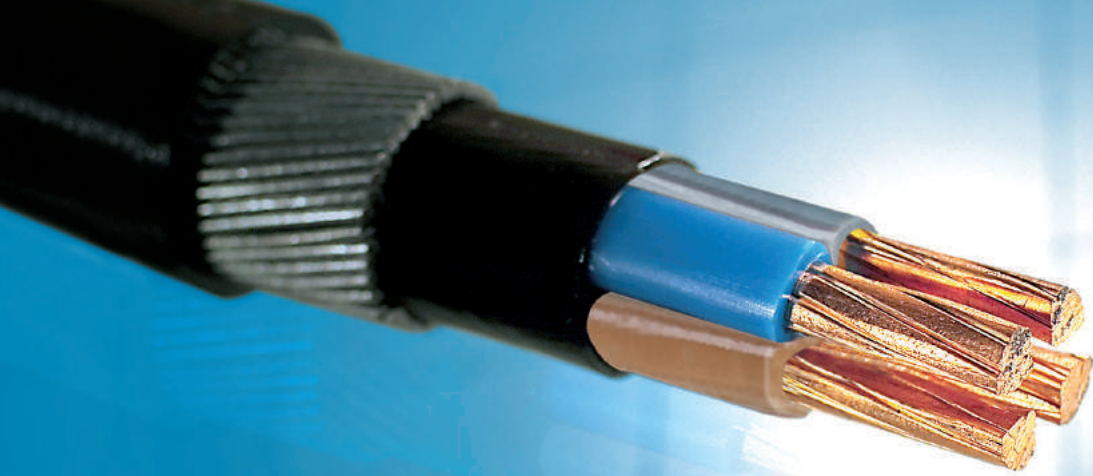
IEC 60332-1-2	
IEC 60332-3-22 Cat. A (On Request)	
Oxygen Index - Min. 30% (On Request)	

Number of Cores	Nominal Area of Conductor	Approx. Overall Diameter	Approx. Weight
No.	mm ²	mm	Kg / Km
1	50 cm	19.0	890
	70 cm	21.0	1170
	95 cm	22.8	1460
	120 cm	25.3	1610
	150 cm	26.9	1970
	185 cm	28.8	2350
	240 rm	33.5	3020
	300 rm	35.6	3640
	400 rm	40.5	4710
	500 rm	44.0	5780
2	630 rm	48.5	7260
	800 rm	55.0	9310
	1000 rm	60.8	11500
	1.5 rm	13.2	330
	2.5 rm	14.5	390
	4 rm	15.8	470
	6 rm	16.9	565
	10 rm	19.6	810
	16 rm	21.0	960
	25 sm	21.2	1230
35 sm	23.0	1590	
50 sm	25.0	1830	
70 sm	28.0	2510	

rm : Stranded Circular Non-Compacted
cm : Stranded Circular Compacted

Notes :

- * = Single core cable is aluminum wires armoured.
- The Bedding of cable sizes from 25 mm² and above are taped bedding.

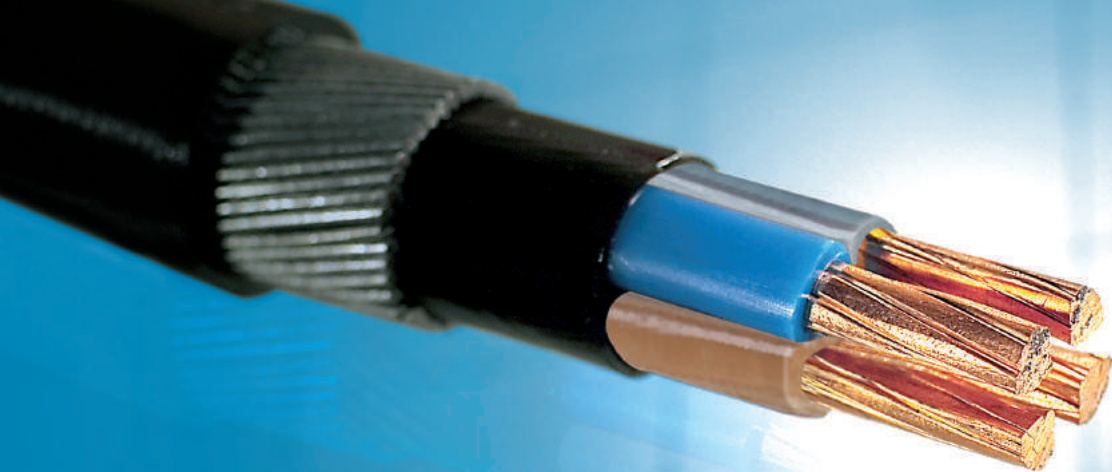


XLPE Insulated PVC Sheathed Armoured Power Cables

Number of Cores	Nominal Area of Conductor	Approx. Overall Diameter	Approx. Weight
No.	mm ²	mm	Kg / Km
3	1.5 rm	14.0	370
	2.5 rm	15.5	430
	4 rm	16.5	525
	6 rm	17.8	640
	10 rm	20.0	940
	16 rm	22.4	1160
	25 sm	24.0	1610
	35 sm	26.0	1930
	50 sm	28.8	2420
	70 sm	33.2	3440
	95 sm	36.8	4370
	120 sm	40.2	5290
	150 sm	45.6	6690
	185 sm	50.0	8120
	240 sm	56.0	10180
	300 sm	60.5	12140
4	1.5 rm	15.0	410
	2.5 rm	16.0	495
	4 rm	17.4	610
	6 rm	19.3	845
	10 rm	21.6	1150
	16 rm	25.5	1595
	25 sm	26.5	1930
	35 sm	29.0	2450
	50 sm	32.0	3070
	70 sm	37.0	4325
	95 sm	41.4	5565
	120 sm	47.0	7200
	150 sm	51.0	8530
	185 sm	57.0	10400
	240 sm	63.0	13080
	300 sm	68.0	15680
400 sm	79.0	20890	

Number of Cores	Nominal Area of Conductor	Approx. Overall Diameter	Approx. Weight
No.	mm ²	mm	Kg / Km
5 (Colour)	1.5 rm	15.3	460
	2.5 rm	17.7	580
	4 rm	19.7	800
	6 rm	21.2	1080
	10 rm	26.0	1600
	16 rm	28.2	2000
	25 cm	32.0	2680
	35 cm	34.6	3310
	50 cm	41.0	4590
	70 cm	45.0	5850
	95 cm	51.7	7100
	120 cm	57.1	9450
5	1.5 rm	15.3	460
7		16.8	530
10		19.3	750
12		20.3	850
19		23.2	1150
27		26.7	1600
37		30.0	1960
5		2.5 rm	17.7
7	19.4		800
10	21.5		1010
12	22.7		1100
19	27.3		1640
27	30.8		2100
37	34.5		2600

rm : Stranded Circular Non-Compacted
cm : Stranded Circular Compacted
sm : Stranded Shaped



XLPE Insulated LSOH Sheathed Armoured Power Cables

APPLICATION

This cable is mainly used in power stations, mass transit underground passenger systems, airports, petrochemical plants, hotels, hospitals, high-rise buildings, etc where flame retardant and low smoke halogen free properties are required.

CONSTRUCTION

- | | |
|----------------------|--|
| 1. Conductor | : Plain Annealed, Stranded Circular Non-Compacted or Circular Compacted or Shaped Copper |
| 2. Insulation | : XLPE |
| 3. Bedding | : Extruded LSOH |
| 4. Armour | : Galvanized Round Steel Wires / Plain Aluminium Wires * |
| 5. Sheath | : LSOH |
| 6. Insulation Colour | : |
| 1C | - Natural |
| 2C | - Brown & Blue |
| 3C | - Brown, Black & Grey |
| 4C | - Brown, Black, Grey, Blue |
| 2C + E | - Brown, Blue + Green/Yellow |
| 3C + E | - Brown, Black, Grey + Green/Yellow |
| 4C + E | - Brown, Black, Grey, Blue + Green/Yellow |
| 5C & above | - White cores printed with numbers |
| 7. Sheath Colour | : Black |

TECHNICAL DATA

- | | |
|-----------------------|------------------|
| Applicable Standard | : BS 6724 |
| Rated Voltage | : 600/1000 V |
| Testing Voltage | : 3.5 KV / 5 min |
| Operating Temperature | : Max. 90 °C |

PRODUCT FEATURES

- IEC 60332-1-2
 IEC 60332-3-22 Cat. A
 IEC 60754-1 & IEC 60754-2
 IEC 61034-1 & IEC 61034-2
 Oxygen Index - Min. 30%

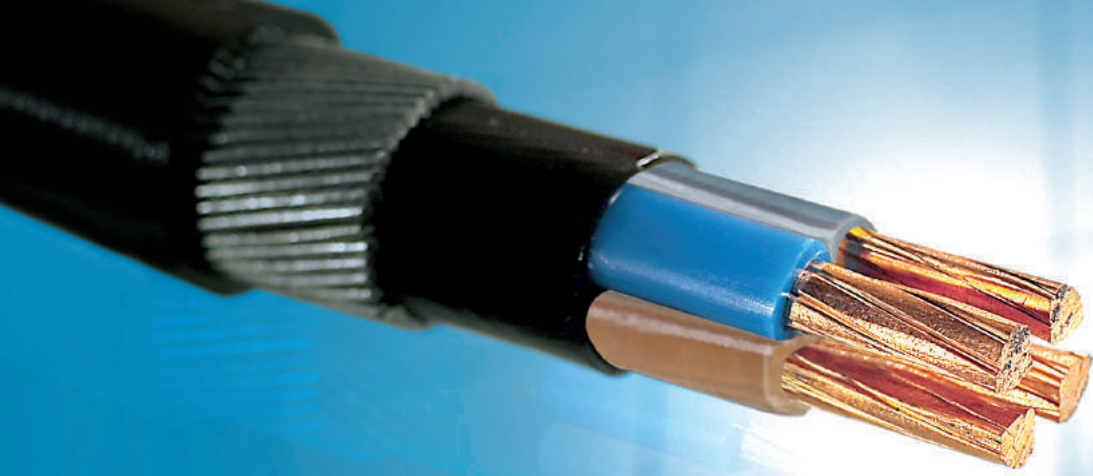
Number of Cores	Nominal Area of Conductor	Approx. Overall Diameter	Approx. Weight
No.	mm ²	mm	Kg / Km
1	50 cm	17.5	750
	70 cm	20.2	1040
	95 cm	22.3	1350
	120 cm	24.2	1630
	150 cm	27.4	2030
	185 cm	30.0	2460
	240 rm	32.8	3130
	300 rm	35.6	3810
	400 rm	40.5	4880
	500 rm	44.2	5980
2	630 rm	48.8	7480
	800 rm	55.4	9600
	1000 rm	60.6	11790
	1.5 rm	12.1	320
	2.5 rm	13.6	400
	4 rm	14.7	480
	6 rm	15.9	570
	10 rm	18.0	710
	16 rm	20.4	1040
	25 sm	20.4	1260
35 sm	23.3	1510	
50 sm	25.8	1870	
70 sm	29.0	2400	

rm : Stranded Circular Non-Compacted

cm : Stranded Circular Compacted

sm : Stranded Shaped

Note : * = Single core cable is aluminium wires armoured.



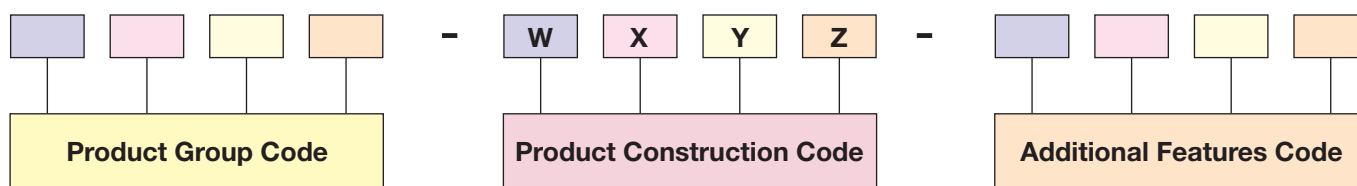
XLPE Insulated LSOH Sheathed Armoured Power Cables

Number of Cores	Nominal Area of Conductor	Approx. Overall Diameter	Approx. Weight
No.	mm ²	mm	Kg / Km
3	1.5 rm	12.6	350
	2.5 rm	14.1	425
	4 rm	15.3	520
	6 rm	16.6	640
	10 rm	19.5	860
	16 rm	21.6	1220
	25 sm	23.6	1630
	35 sm	25.7	2010
	50 sm	28.5	2500
	70 sm	32.2	3320
	95 sm	37.0	4530
	120 sm	40.4	5510
	150 sm	45.5	6980
	185 sm	49.8	8440
	240 sm	55.1	10540
	300 sm	60.2	12570
	400 sm	66.6	16100
4	1.5 rm	13.3	390
	2.5 rm	15.0	495
	4 rm	16.4	610
	6 rm	18.7	810
	10 rm	21.1	1110
	16 rm	23.4	1480
	25 sm	26.1	1980
	35 sm	28.6	2480
	50 sm	32.0	3180
	70 sm	37.7	4410
	95 sm	41.7	5750
	120 sm	47.1	7450
	150 sm	51.4	8820
	185 sm	56.6	10660
	240 sm	63.0	13430
	300 sm	68.8	16330
	400 sm	78.1	21500

Number of Cores	Nominal Area of Conductor	Approx. Overall Diameter	Approx. Weight
No.	mm ²	mm	Kg / Km
5 (Colour)	1.5 rm	14.3	440
	2.5 rm	16.1	468
	4 rm	17.8	795
	6 rm	20.0	1200
	10 rm	22.9	1580
	16 rm	26.6	1970
	25 cm	31.5	2600
	35 cm	34.8	3170
	50 cm	40.4	4390
	70 cm	46.3	5630
7	1.5 rm	15.2	505
10		18.1	720
12		19.4	800
19		22.2	1070
27		26.7	1520
37		29.0	1865
7	2.5 rm	17.1	725
10		21.0	925
12		22.4	1030
19		26.6	1570
27		30.7	2000
37	33.8	2480	
7	4 rm	19.7	940
10		24.0	1370
12		25.7	1535
19		29.3	2080
27		34.4	2560

rm : Stranded Circular Non-Compacted
cm : Stranded Circular Compacted
sm : Stranded Shaped

Product Group, Product Construction & Additional Features Codes



Product Group Code

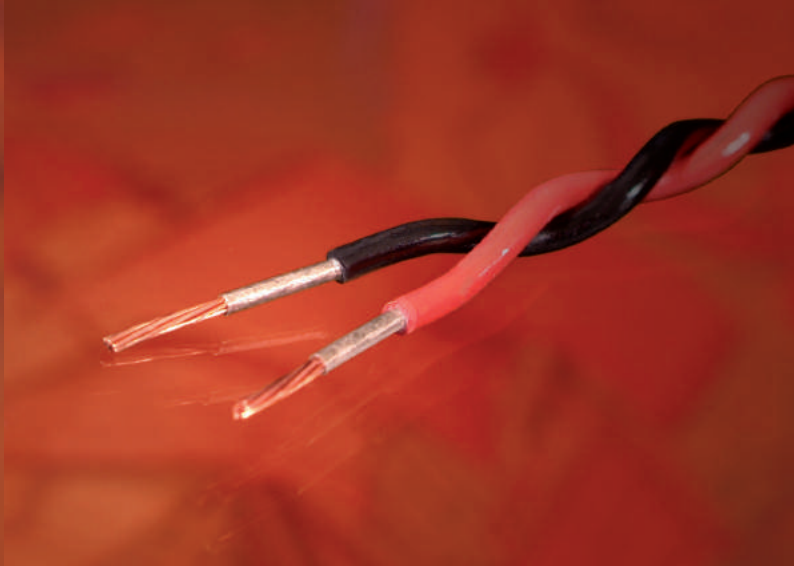
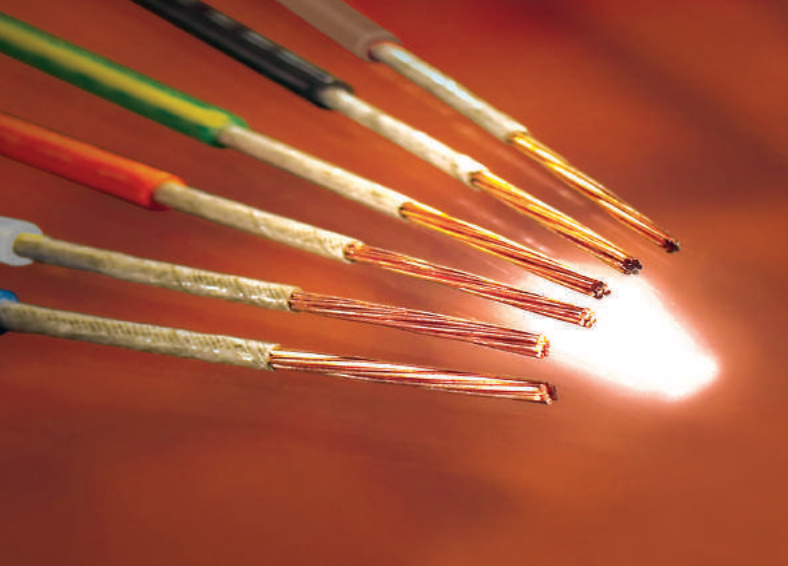
Product Group Code	Description
FRT	Flame Retardant Power Cables
FR	Fire Resistant Power Cables
FRIC	Single & Multi Unit Fire Resistant Instrumentation Cables With Collectively Screened
FRIM	Multi Core Fire Resistant Instrumentation Cables With Collectively Screened
FRIP	Multi Unit Fire Resistant Instrumentation Cables With Individually Taped Screened And Collectively Screened
VSD	Variable Speed Drive Cable with Copper Tape Screen

Product Construction Code

Product Construction Code	Abbreviation	Description
W = First Digit (Insulation Material)	1	PE = Polyethylene
	2	XLPE = Crosslink Polyethylene
	3	LSOH = Low Smoke Zero Halogen
	4	PVC = Polyvinyl Chloride
X = Second Digit (Sheath Material)	0	LSOH = Low Smoke Zero Halogen
	1	PVC = Polyvinyl Chloride
	NIL	Non-Sheathed
Y = Third Digit (Product's Family)	0	Product With Basic Specification as per Standard / Brochure
	1	Product With Basic Specification as per Standard / Brochure Plus Sheaths' Oxygen Index > 30% & HCL Content < 17%, Product Complying With IEC 60332-3-22 Cat. A
	NIL	Non-Sheathed Product Without Other Family
Z = Fourth Digit (Construction)	A	Single Wire Armour
	C	Plain Copper Wire Braid
	T	Tinned Copper Wire Braid
	Q	Galvanized Round Steel Wire Braid
	S	Insulated Core(s) Without Sheath

Additional Features Code

Additional Features Code	Description
C	Chemical Resistant
D	According to Customer's Requirements
H	Heat Resistant 105 °C
L	Low Temperature (< - 15 °C)
M	Shipboard Cables Complying With Flame Retardant Test to IEC 60332-3-22 Cat. A
O	Oil Resistant
R	Flame Retardant Test (Bunch) to IEC 60332-3 Cat. A, B & C
T	Anti - Termite
U	UV Resistant
V	Vermin Proof



FR - 3S Fire Resistant Power Cables

APPLICATION

Single core cable is suitable use in fire extinguishing systems to operate sprinklers, control panels, exit lights in high-rise buildings, hotels, hospitals, sub-ways and public facilities.

Twin Twisted cable option is having the similar product characteristics and product feature, which comply with all the fire testing requirements.

Twin Twisted cable is your ultimate choice for fire services installation, emergency power supply, especially for fire alarm addressable system and other essential services where twisting and flexibility and prerequisites.

CONSTRUCTION

- | | | |
|-----------------------------|---|--|
| 1. Conductor | : | Plain Annealed, Stranded Circular
Non-Compacted or Circular Compacted |
| 2. Fire Barrier | : | Mica Tape |
| 3. Insulation | : | LSOH |
| 4. Insulation Colour | : | |
| Single Core | - | Orange, Brown, Grey, Blue, Black,
Green/Yellow, White, Red, Yellow |
| Two Cores
(Twin Twisted) | - | Red & Black or other combinations |

TECHNICAL DATA

- | | | |
|-----------------------|---|---|
| Applicable Standard | : | BSEN 50525-3-41 |
| Rated Voltage | : | 450/750 V (or 600/1000 V *) |
| Testing Voltage | : | 2.5 KV / 15 min (or 3.5 KV / 5 min *) |
| Operating Temperature | : | Max. 90 °C |

PRODUCT FEATURES

Single Core FR - 3S 450/750 V or 600/1000 V *	FR - 3S Twin Twisted 450/750 V
IEC 60331-21 SS 299-1 Cat. C SS 299-1 Cat. W, Z *	IEC 60331-21 SS 299-1 Cat. C, W, Z
BS 6387 Protocol C, W, Z *	BS 6387 Protocol C, W, Z
IEC 60332-1-2	IEC 60332-1-2
IEC 60332-3-22 Cat. A	IEC 60332-3-22 Cat. A
IEC 60754-1 & IEC 60754-2	IEC 60754-1 & IEC 60754-2
IEC 61034-1 & IEC 61034-2	IEC 61034-1 & IEC 61034-2
Oxygen Index - Min. 30%	Oxygen Index - Min. 30%
H. V. Test - 3.5 KV / 5 min *	H. V. Test - 2.5 KV / 15 min

Note : * = On Request

Number of Cores	Nominal Area of Conductor	Approx. Overall Diameter	Approx. Weight
No.	mm ²	mm	Kg / Km
1	1.0 rm	3.1	18
	1.5 rm	3.5	24
	2.5 rm	4.1	36
	4 rm	4.6	50
	6 rm	5.2	70
	10 rm	6.5	120
	16 rm	7.6	180
	25 cm	9.0	275
	35 cm	10.2	370
	50 cm	11.8	505
	70 cm	13.4	705
	95 cm	15.8	975
	120 cm	17.1	1210
	150 cm	18.8	1485
	185 cm	21.0	1860
2	1.0 rm	6.3	40
	1.5 rm	7.1	50
	2.5 rm	8.3	80

rm : Stranded Circular Non-Compacted

cm : Stranded Circular Compacted

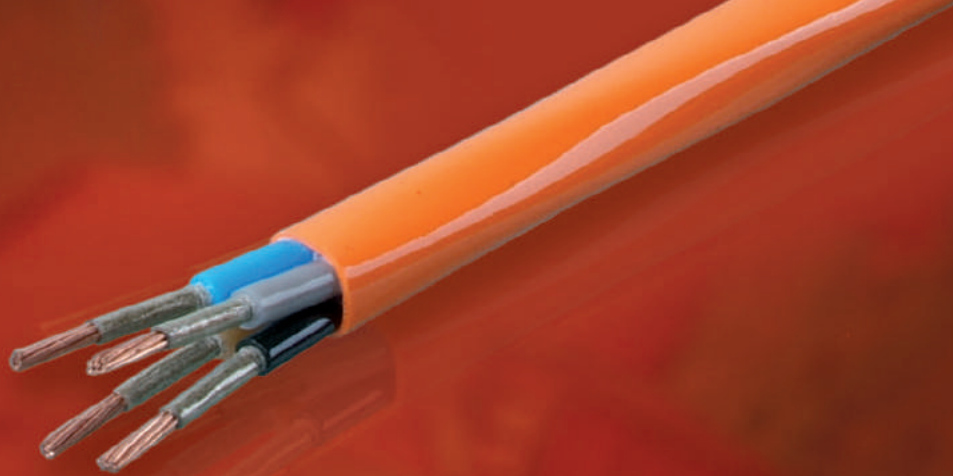
PRODUCT CERTIFICATION

TÜV SÜD PSB Pte Ltd. - Product Listing Scheme (PLS)

1 C X 1.5 mm² ~ 1 C X 4 mm² 450/750 V to SS 299-1 Cat. C

1 C X 1.5 mm² ~ 1 C X 4 mm² 600/1000 V to SS 299-1 Cat. C

2 C X 1.0 mm² ~ 2 C X 2.5 mm² 450/750 V to SS 299-1 Cat. C, W, Z



FR - 100 Fire Resistant Power Cables

APPLICATION

This cable is specially designed for areas where integrity of electrical circuit is critical to maintain the power supply. Application usage can be found in :

- emergency lightings, control and power circuits
- power stations
- fire alarm systems
- underground tunnels
- communication systems
- sewage treatment plants
- lifts and escalators
- high-rise buildings

CONSTRUCTION

1. Conductor : Plain Annealed, Stranded Circular Non-Compacted Copper
2. Fire Barrier : Mica Tape
3. Insulation : PE
4. Sheath : LSOH
5. Earth Conductor : Plain Annealed, Stranded Circular Non-Compacted Copper (If Required)
6. Insulation Colour :
 - 2C - Brown & Blue
 - 3C - Brown, Black & Grey
 - 4C - Brown, Black, Grey & Blue
7. Sheath Colour : Orange

TECHNICAL DATA

- Applicable Standard : SS 299-1 / BS 6387
 Rated Voltage : 300/500 V
 Testing Voltage : 2 KV / 5 min
 Operating Temperature : Max. 70 °C

PRODUCT FEATURES

- IEC 60331-21
 SS 299-1 Cat. C, W, Z
 BS 6387 Protocol C, W, Z
 IEC 60332-1-2
 IEC 60754-1 & IEC 60754-2
 IEC 61034-1 & IEC 61034-2
 Oxygen Index - Min. 30%
 IEC 60332-3-22 Cat. A (On Request)

PRODUCT CERTIFICATION

TÜV SÜD PSB Pte Ltd. - Product Listing Scheme (PLS)

- Range : 2C X 1.0 mm² to 4C X 4 mm² with or without earth conductor to SS 299-1 Cat. C, W, Z

FR-100 Cables Without Earth Conductor

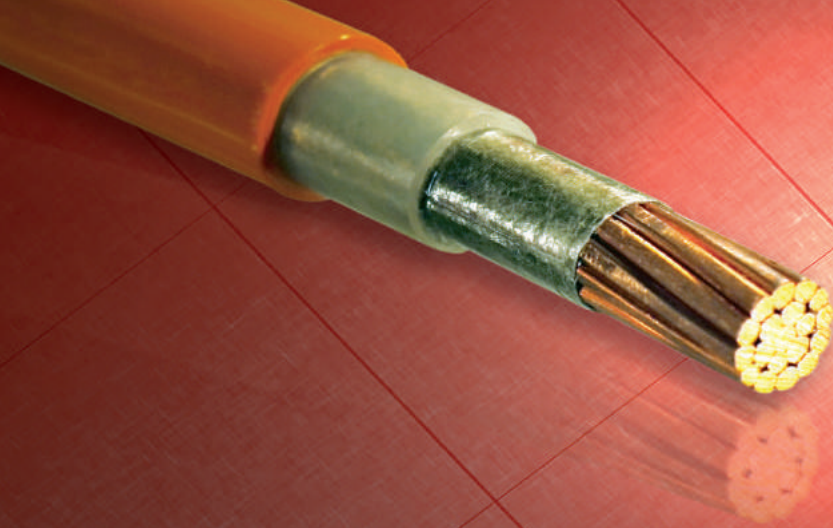
Number of Cores	Nominal Area of Conductor	Approx. Overall Diameter	Approx. Weight
No.	mm ²	mm	Kg / Km
2	1.0 rm	7.8	58
	1.5 rm	8.4	70
	2.5 rm	9.2	100
	4 rm	10.3	140
3	1.0 rm	8.3	74
	1.5 rm	8.9	92
	2.5 rm	9.8	125
	4 rm	11.0	180
4	1.0 rm	9.1	90
	1.5 rm	9.8	104
	2.5 rm	10.9	155
	4 rm	12.2	255

rm : Stranded Circular Non-Compacted

FR-100 Cables With Earth Conductor

Number of Cores	Nominal Area of Conductor	Earth Conductor	Approx. Overall Diameter	Approx. Weight
No.	mm ²	No./mm	mm	Kg / Km
2	1.0 rm	7 / 0.43	8.2	70
	1.5 rm	7 / 0.53	8.9	80
	2.5 rm	7 / 0.67	9.8	120
	4 rm	7 / 0.85	10.9	170
3	1.0 rm	7 / 0.43	9.0	80
	1.5 rm	7 / 0.53	9.7	100
	2.5 rm	7 / 0.67	10.5	145
	4 rm	7 / 0.85	12.1	215
4	1.0 rm	7 / 0.43	9.9	100
	1.5 rm	7 / 0.53	10.7	120
	2.5 rm	7 / 0.67	11.9	185
	4 rm	7 / 0.85	13.3	270

rm : Stranded Circular Non-Compacted



Single Core FR - 200 or FR - 300 Fire Resistant Power Cables

APPLICATION

This cable is specially designed for areas where integrity of electrical circuit is critical to maintain the power supply.

FR - 200 application usage can be found in :

- emergency lightings, control and power circuits
- power stations
- fire alarm system
- underground tunnels
- communication systems
- sewage treatment plants
- lifts and escalators
- high-rise buildings

FR - 300 is used in power stations, mass transit underground passenger systems, airports, petrochemical plants, hotels, hospitals, high-rise buildings.

CONSTRUCTION

1. Conductor : Plain Annealed, Stranded Circular Non-Compacted or Circular Compacted Copper
2. Fire Barrier : Mica Tape
3. Insulation : XLPE (For FR - 200) or LSOH (For FR - 300)
4. Sheath : LSOH
5. Insulation Colour : Natural
6. Sheath Colour : Orange

TECHNICAL DATA

- Applicable Standard : IEC 60502-1
 Rated Voltage : 600/1000 V
 Testing Voltage : 3.5 KV / 5 min
 Operating Temperature : Max. 90 °C

PRODUCT FEATURES

Single Core FR-200 Cables	Single Core FR-300 Cables
IEC 60331-21	IEC 60331-21
SS 299-1 Cat. C	SS 299-1 Cat. C
IEC 60332-1-2	IEC 60332-1-2
IEC 60754-1 & IEC 60754-2	IEC 60754-1 & IEC 60754-2
IEC 61034-1 & IEC 61034-2	IEC 61034-1 & IEC 61034-2
Oxygen Index - Min. 30%	Oxygen Index - Min. 30%
IEC 60332-3-22 Cat. A *	IEC 60332-3-22 Cat. A
SS 299-1 Cat. W, Z *	SS 299-1 Cat. W, Z *
BS 6387 Protocol C, W, Z *	BS 6387 Protocol C, W, Z *

Note : * = On Request

Number of Cores	Nominal Area of Conductor	Approx. Overall Diameter	Approx. Weight
No.	mm ²	mm	Kg / Km
1	1.5 rm	6.7	53
	2.5 rm	7.1	64
	4 rm	7.7	82
	6 rm	8.2	106
	10 rm	9.2	152
	16 rm	10.2	216
	25 cm	11.6	315
	35 cm	12.6	416
	50 cm	14.6	600
	70 cm	16.7	820
	95 cm	18.7	1095
	120 cm	20.5	1350
	150 cm	22.3	1640
	185 cm	24.6	2035
	240 rm	29.0	2650
	300 rm	31.6	3260
400 rm	35.4	4130	
500 rm	39.1	5180	
630 rm	43.8	6600	
800 rm	48.8	8320	
1000 rm	53.9	10380	

rm : Stranded Circular Non-Compacted
 cm : Stranded Circular Compacted

Note :

The approximate weights of the FR - 200 Cables are tabulated in the table. For FR - 300 Cables, add 2.5 - 4.5% more to the approx. weights of the FR - 200 Cables.

PRODUCT CERTIFICATION

TÜV SÜD PSB Pte Ltd. - Product Listing Scheme (PLS)

For Single Core FR-200 Cables Only :

- 1 C X 1.5 mm² ~ 1 C X 1000 mm² to SS 299-1 Cat. C only.
- 1 C X 1.5 mm² ~ 1 C X 1000 mm² to all the listed product features except Oxygen Index Test.

FR - 200 or FR - 300 Fire Resistant Unarmoured Power Cables

APPLICATION

This cable is specially designed for areas where integrity of electric circuit is critical to maintain the power supply.

FR - 200 application usage can be found in :

- emergency lightings, control & power circuits
- power stations
- fire alarm system
- underground tunnels
- communication systems
- sewage treatment plants
- lifts and escalators
- high-rise buildings

FR - 300 is used in power stations, mass transit underground passenger systems, airports, petrochemical plants, hotels, hospitals, high-rise buildings.

CONSTRUCTION

1. Conductor : Plain Annealed, Stranded Circular Non-Compacted or Circular Compacted or Shaped Copper
2. Fire Barrier : Mica Tape
3. Insulation : XLPE (For FR - 200) or LSOH (For FR - 300)
4. Sheath : LSOH
5. Insulation Colour :
 - 2C - Brown & Blue
 - 3C - Brown, Black & Grey
 - 4C - Brown, Black, Grey, Blue
 - 2C + E - Brown, Blue + Green/Yellow
 - 3C + E - Brown, Black, Grey + Green/Yellow
 - 4C + E - Brown, Black, Grey, Blue + Green/Yellow
 - 5C & above - White cores printed with numbers
6. Sheath Colour : Orange

TECHNICAL DATA

- Applicable Standard : IEC 60502-1
 Rated Voltage : 600/1000 V
 Testing Voltage : 3.5 KV / 5 min
 Operating Temperature : Max. 90 °C

PRODUCT FEATURES

Multi Core FR-200 Cables	Multi Core FR-300 Cables
IEC 60331-21	IEC 60331-21
SS 299-1 Cat. C, W, Z	SS 299-1 Cat. C, W, Z
BS 6387 Protocol C, W, Z	BS 6387 Protocol C, W, Z
IEC 60332-1-2	IEC 60332-1-2
IEC 60754-1 & IEC 60754-2	IEC 60754-1 & IEC 60754-2
IEC 61034-1 & IEC 61034-2	IEC 61034-1 & IEC 61034-2
Oxygen Index - Min. 30%	Oxygen Index - Min. 30%
IEC 60332-3-22 Cat. A *	IEC 60332-3-22 Cat. A

Number of Cores	Nominal Area of Conductor	Approx. Overall Diameter	Approx. Weight
No.	mm ²	mm	Kg / Km
2	1.5 rm	11.1	175
	2.5 rm	12.0	215
	4 rm	13.0	265
	6 rm	14.2	330
	10 rm	16.1	465
	16 rm	18.2	545
	25 cm	20.9	725
	35 cm	23.2	985
	50 cm	26.2	1275
	70 cm	30.4	1785
3	1.5 rm	11.6	200
	2.5 rm	12.6	245
	4 rm	13.7	315
	6 rm	15.0	400
	10 rm	17.0	590
	16 rm	19.3	740
	25 cm	22.2	1000
	35 cm	24.8	1370
	50 cm	27.9	1790
	70 sm	28.5	2420
	95 sm	32.1	3240
	120 sm	36.0	4040
	150 sm	40.4	4930
	185 sm	44.5	6380
240 sm	50.0	7930	
300 sm	53.2	9800	
400 sm	64.0	12300	

rm : Stranded Circular Non-Compacted sm : Stranded Shaped
 cm : Stranded Circular Compacted

PRODUCT CERTIFICATION

TÜV SÜD PSB Pte Ltd. - Product Listing Scheme (PLS)

For FR-200 Cables only to SS 299-1 Cat. C, W, Z

- Range : 2C X 1.5 mm² to 4C X 300 mm² and
 : 5C X 1.5 mm² to 37C X 4 mm²

Note : * = On Request

FR - 200 or FR - 300 Fire Resistant Unarmoured Power Cables

Number of Cores	Nominal Area of Conductor	Approx. Overall Diameter	Approx. Weight
No.	mm ²	mm	Kg / Km
4	1.5 rm	12.5	234
	2.5 rm	13.6	290
	4 rm	14.8	375
	6 rm	16.3	485
	10 rm	18.6	725
	16 rm	21.0	950
	25 cm	24.4	1300
	35 cm	27.1	1760
	50 cm	31.0	2340
	70 sm	33.3	3190
	95 sm	38.7	4290
	120 sm	43.1	5350
	150 sm	46.5	6490
	185 sm	52.9	8090
	240 sm	61.0	10530
	300 sm	65.2	13010
400 sm	77.0	16250	
5 (Colour)	1.5 rm	13.6	274
	2.5 rm	14.8	345
	4 rm	16.1	445
	6 rm	17.4	550
	10 rm	21.7	800
	16 rm	23.5	1170
	25 cm	26.8	1610
	35 cm	29.6	2100
	50 cm	34.2	3200
	70 cm	39.6	4150
	95 cm	45.4	5860
120 cm	49.7	7180	

Number of Cores	Nominal Area of Conductor	Approx. Overall Diameter	Approx. Weight
No.	mm ²	mm	Kg / Km
7	1.5 rm	14.6	335
10		16.9	446
12		18.1	512
19		21.6	730
27		25.1	980
37		28.8	1275
7	2.5 rm	16.0	425
10		18.6	575
12		20.0	665
19		24.0	965
27		27.8	1297
37		31.8	1710
7	4 rm	17.6	565
10		20.4	770
12		22.0	890
19		26.5	1305
27		31.0	1755
rm : Stranded Circular Non-Compacted cm : Stranded Circular Compacted sm : Stranded Shaped			

Note :

The approximate weights of the FR - 200 Cables are tabulated in the table. For FR - 300 Cables, add 3.0 - 5.0% for 2C to 4C and 6.0 - 9.0% for 5C & above to the approx. weights of the FR - 200 Cables.



FR - 200A or FR - 300A Fire Resistant Armoured Power Cables

APPLICATION

This cable is specially designed for areas where integrity of electrical circuit is critical to maintain the main power supplies. It is used in power stations, mass transit underground passenger systems, airports, petrochemical plants, hotels, hospitals, high-rise buildings.

CONSTRUCTION

- | | |
|----------------------|---|
| 1. Conductor | : Plain Annealed, Stranded Circular
Non-Compacted or Circular Compacted
or Shaped Copper |
| 2. Fire Barrier | : Mica Tape |
| 3. Insulation | : XLPE (For FR -200A) / LSOH (For FR -300A) |
| 4. Bedding | : Extruded LSOH |
| 5. Armour | : Galvanized Round Steel Wires /
Plain Aluminium Wires * |
| 6. Sheath | : LSOH |
| 7. Insulation Colour | :
1C - Natural
2C - Brown & Blue
3C - Brown, Black & Grey
4C - Brown, Black, Grey, Blue
2C + E - Brown, Blue + Green/Yellow
3C + E - Brown, Black, Grey + Green/Yellow
4C + E - Brown, Black, Grey, Blue + Green/Yellow
5C & above - White cores printed with numbers |
| 8. Sheath Colour | : Orange |

TECHNICAL DATA

- | | |
|-----------------------|-----------------------|
| Applicable Standard | : BS 7846 / BS 6724 * |
| Rated Voltage | : 600/1000 V |
| Testing Voltage | : 3.5 KV / 5 min |
| Operating Temperature | : Max. 90 °C |

PRODUCT FEATURES

- | | |
|--------------------------|---------------------------|
| IEC 60331-21 | IEC 60332-3-22 Cat. A |
| SS 299-1 Cat. C, W, Z | IEC 60754-1 & IEC 60754-2 |
| BS 6387 Protocol C, W, Z | IEC 61034-1 & IEC 61034-2 |
| IEC 60332-1-2 | Oxygen Index - Min. 30% |

PRODUCT CERTIFICATION

- TÜV SÜD PSB Pte Ltd. - Product Listing Scheme (PLS)
For FR - 200A Cables only to SS 299-1 Cat. C, W, Z
- | | |
|-------|---|
| Range | : 1C X 120 mm ² to 1C X 1000 mm ² |
| | : 2C X 1.5 mm ² to 4C X 300 mm ² |
| | : 5C X 1.5 mm ² to 37C X 4 mm ² |

Number of Cores	Nominal Area of Conductor	Approx. Overall Diameter	Approx. Weight
No.	mm ²	mm	Kg / Km
1*	50 cm	18.6	805
	70 cm	21.2	1105
	95 cm	23.2	1400
	120 cm	24.6	1687
	150 cm	27.5	2080
	185 cm	29.9	2530
	240 rm	34.3	3210
	300 rm	36.9	3890
	400 rm	41.3	4970
	500 rm	45.6	6080
2	630 rm	50.2	7620
	800 rm	56.6	9720
	1000 rm	62.0	11960
	1.5 rm	14.0	385
	2.5 rm	15.2	445
	4 rm	15.9	525
	6 rm	17.0	620
	10 rm	19.2	725
	16 rm	22.2	1090
	25 cm	24.9	1375
35 cm	28.1	1830	
50 cm	31.9	2300	
70 cm	36.0	2995	

rm : Stranded Circular Non-Compacted

cm : Stranded Circular Compacted

Note :

* = Single core cables are aluminium wires armoured. All dimensions of the single core cables are adopted from BS 6724.



FR - 200A or FR - 300A Fire Resistant Armoured Power Cables

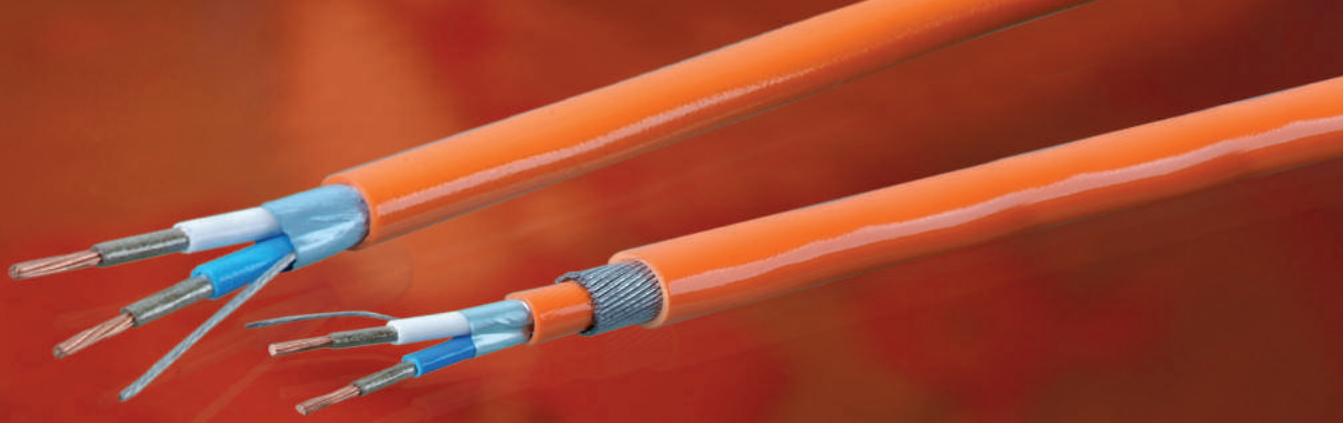
Number of Cores	Nominal Area of Conductor	Approx. Overall Diameter	Approx. Weight
No.	mm ²	mm	Kg / Km
3	1.5 rm	14.5	420
	2.5 rm	16.0	495
	4 rm	16.6	600
	6 rm	18.0	785
	10 rm	21.0	1030
	16 rm	23.5	1340
	25 cm	27.5	1900
	35 cm	30.3	2320
	50 cm	33.5	2880
	70 sm	33.9	3520
	95 sm	39.2	4800
	120 sm	42.9	5690
	150 sm	48.3	7260
	185 sm	52.7	8970
	240 sm	58.1	10800
	300 sm	61.6	12950
400 sm	77.8	16400	
4	1.5 rm	15.4	475
	2.5 rm	16.8	570
	4 rm	17.8	685
	6 rm	20.5	940
	10 rm	22.5	1220
	16 rm	25.5	1420
	25 cm	29.8	2290
	35 cm	32.7	2810
	50 cm	36.6	3530
	70 sm	40.2	4780
	95 sm	45.6	6140
	120 sm	51.2	7860
	150 sm	54.6	9200
	185 sm	61.2	11130
	240 sm	68.5	13940
	300 sm	72.0	16540
400 sm	88.9	22000	

Number of Cores	Nominal Area of Conductor	Approx. Overall Diameter	Approx. Weight
No.	mm ²	mm	Kg / Km
5 (Colour)	1.5 rm	16.4	530
	2.5 rm	18.0	640
	4 rm	19.9	855
	6 rm	21.3	1240
	10 rm	24.4	1330
	16 rm	29.8	2090
	25 cm	32.5	2730
	35 cm	35.8	3250
	50 cm	42.1	4610
	70 cm	47.0	6050
	95 cm	53.7	7250
	120 cm	59.4	9600
7	1.5 rm	17.4	615
10		20.5	890
12		21.8	985
19		25.4	1310
27		30.0	1865
37		33.6	2275
7	2.5 rm	19.2	700
10		22.7	1100
12		24.0	1250
19		29.5	1800
27		33.8	2380
37		37.5	2910
7	4 rm	21.3	1160
10		24.8	1400
12		27.0	1715
19		31.8	2320
27		36.8	2965

rm : Stranded Circular Non-Compacted sm : Stranded Shaped
cm : Stranded Circular Compacted

Note :

The weight of FR-200A cables are tabulated in the table. For FR-300A cables, add 1.5 - 2.5% for 1C to 4C and 3.0 - 5.0% for 5C & above to the approx. weights.



FRIC - 300 & FRIC - 300A Fire Resistant Instrumentation Cables

APPLICATION

This cable is suitable for control, instrumentation and telecommunication in the power stations, mass transit underground passenger systems, airport, hotels, hospitals, high-rise buildings.

CONSTRUCTION

1. Conductor : Plain Annealed, Stranded Circular Non-Compacted Copper
2. Fire Barrier : Mica Tape
3. Insulation : LSOH
4. Collective Screen : Aluminium Mylar Foil With Drain Wire
5. Bedding (If Any) : Extruded LSOH
6. Armour (If Any) : Galvanized Round Steel Wires
7. Sheath : LSOH
8. Insulation Colour :
 - Each Pair - Black and White cores with pair number printed on the cores
 - 1 Triple - Black, White and Red
 - 1 Quad - 2 pairs cables are twisted in a Star Quad Formation
9. Sheath Colour : Orange

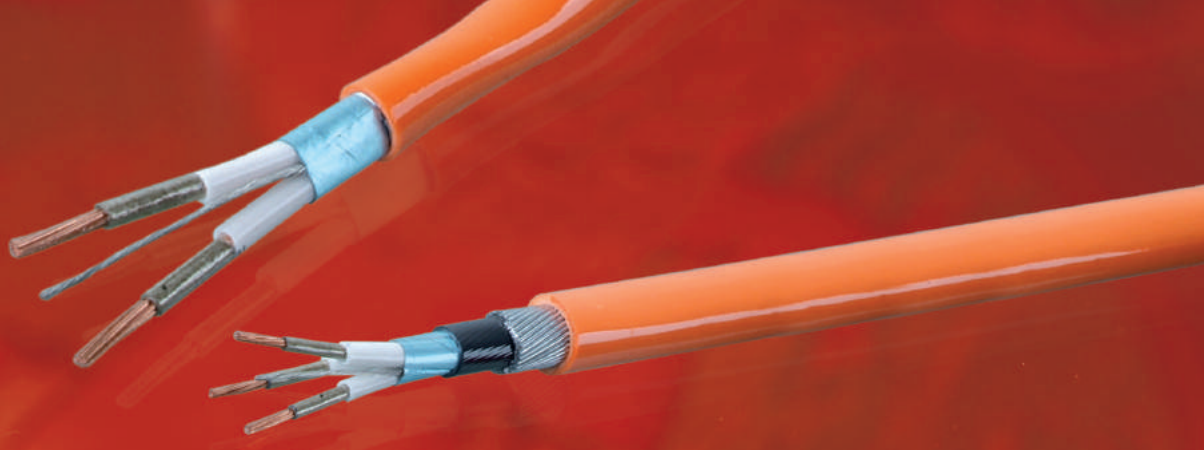
TECHNICAL DATA

- Standard : BS EN 50288-7
 Rated Voltage : 300/500 V
 Testing Voltage : 2.0 KV / 1 min
 Operating Temperature : Max. 70 °C

PRODUCT FEATURES

- IEC 60331-21
 SS 299-1 Cat. C, W, Z
 BS 6387 Protocol C, W, Z
 IEC 60332-1-2
 IEC 60332-3-22 Cat. A
 IEC 60754-1 & IEC 60754-2
 IEC 61034-1 & IEC 61034-2
 Oxygen Index - Min. 30%

No. of Core & Nominal Area of Conductor	FRIC -300		FRIC -300A	
	Approx. Overall Diameter	Approx. Weight	Approx. Overall Diameter	Approx. Weight
No. X mm ²	mm	Kg / Km	mm	kg / Km
1 X 2 X 0.75	8.5	83	13.1	310
1 X 3 X 0.75	9.0	104	13.8	352
1 X 4 X 0.75	9.8	127	14.6	391
2 X 2 X 0.75	12.5	154	17.3	491
4 X 2 X 0.75	14.8	251	20.5	765
6 X 2 X 0.75	17.9	366	23.6	984
8 X 2 X 0.75	20.1	458	26.0	1158
10 X 2 X 0.75	23.0	568	29.3	1378
1 X 2 X 1.0	8.9	93	13.5	332
1 X 3 X 1.0	9.4	117	14.2	373
1 X 4 X 1.0	10.4	150	15.2	434
2 X 2 X 1.0	13.2	172	18.0	525
4 X 2 X 1.0	15.6	286	21.3	826
6 X 2 X 1.0	18.8	417	24.7	1076
8 X 2 X 1.0	21.3	538	27.2	1288
10 X 2 X 1.0	24.2	652	30.5	1513
1 X 2 X 1.5	9.5	108	14.3	364
1 X 3 X 1.5	10.2	145	15.0	422
1 X 4 X 1.5	11.1	178	15.9	478
2 X 2 X 1.5	14.3	212	19.3	604
4 X 2 X 1.5	16.8	344	22.5	921
6 X 2 X 1.5	20.3	503	26.3	1212
8 X 2 X 1.5	23.0	651	29.2	1469
10 X 2 X 1.5	26.5	808	32.9	1753
1 X 2 X 2.5	10.9	150	15.7	443
1 X 3 X 2.5	11.6	196	16.4	509
1 X 4 X 2.5	12.6	244	17.4	581
2 X 2 X 2.5	16.4	285	22.1	851
4 X 2 X 2.5	19.4	488	25.3	1172
6 X 2 X 2.5	23.7	728	29.9	1564
8 X 2 X 2.5	27.0	944	33.4	1907
10 X 2 X 2.5	31.0	1171	38.3	2504



FRIM - 300 & FRIM - 300A Fire Resistant Instrumentation Cables

APPLICATION

This cable is suitable for control, instrumentation and telecommunication in the power stations, mass transit underground passenger systems, airport, hotels, hospitals, high-rise buildings.

CONSTRUCTION

1. Conductor : Plain Annealed, Stranded Circular Non-Compacted Copper
2. Fire Barrier : Mica Tape
3. Insulation : LSOH
4. Collective Screen : Aluminium Mylar Foil With Drain Wire
5. Bedding (If Any) : Extruded LSOH
6. Armour (If Any) : Galvanized Round Steel Wires
7. Sheath : LSOH
8. Insulation Colour :
Each Core - White cores with number printed on the cores
9. Sheath Colour : Orange

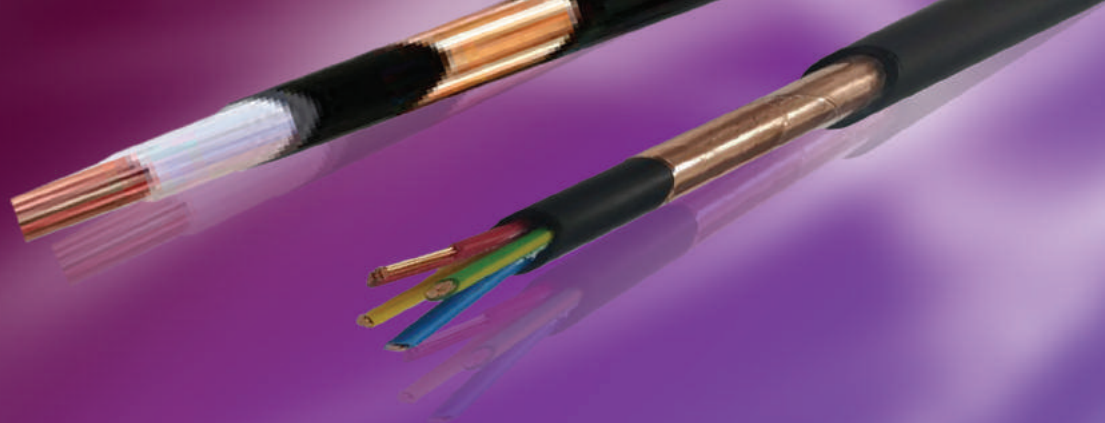
TECHNICAL DATA

- Standard : BS EN 50288-7
 Rated Voltage : 300/500 V
 Testing Voltage : 2.0 KV / 1 min
 Operating Temperature : Max. 70 °C

PRODUCT FEATURES

- IEC 60331-21
 SS 299-1 Cat. C, W, Z
 BS 6387 Protocol C, W, Z
 IEC 60332-1-2
 IEC 60332-3-22 Cat. A
 IEC 60754-1 & IEC 60754-2
 IEC 61034-1 & IEC 61034-2
 Oxygen Index - Min. 30%

No. of Core & Nominal Area of Conductor	FRIM -300		FRIM -300A	
	Approx. Overall Diameter	Approx. Weight	Approx. Overall Diameter	Approx. Weight
No. X mm ²	mm	Kg / Km	mm	kg / Km
2 X 1.0	8.9	80	13.4	350
3 X 1.0	9.4	100	14.2	390
4 X 1.0	10.4	130	15.2	440
6 X 1.0	12.5	190	17.1	580
10 X 1.0	15.7	290	21.5	760
12 X 1.0	16.2	355	21.9	900
19 X 1.0	19.2	500	25.5	1100
2 X 1.5	9.5	110	14.2	420
3 X 1.5	10.2	140	15.0	460
4 X 1.5	11.1	180	15.8	560
6 X 1.5	13.4	270	18.0	710
10 X 1.5	16.9	400	22.7	1080
12 X 1.5	17.6	480	23.4	1200
19 X 1.5	20.7	710	26.8	1760
2 X 2.5	10.9	140	15.5	460
3 X 2.5	11.6	180	16.4	520
4 X 2.5	12.7	230	17.4	630
6 X 2.5	15.2	330	20.9	940
10 X 2.5	19.5	510	25.5	1340
12 X 2.5	20.4	600	26.4	1520
19 X 2.5	24.1	910	30.3	2080



CTS-210 & CTS-200 Copper Tape Screened Unarmoured Cable

APPLICATION

This cable is suitable for fixed installations in distribution networks or industrial installations Such as Plant engineering, Industrial machinery, Heating and air-conditioning systems, Power stations, Applications etc. or where the screened cables require.

CONSTRUCTION

- | | |
|----------------------|---|
| 1. Conductor | : Plain Annealed, Stranded Circular
Non-Compacted or Compacted or
Shaped Copper |
| 2. Insulation | : XLPE |
| 3. Bedding | : Extruded PVC or LSOH |
| 4. Screen | : Copper Tape |
| 5. Sheath | : PVC or LSOH |
| 6. Insulation Colour | : |
| 1C | - Natural |
| 3C | - Brown ,Black & Grey |
| 4C | - Brown,Black, Grey,Blue |
| 2C+E | - Brown ,Black +Green/Yellow |
| 3C+E | - Brown ,Black ,Grey +Green/Yellow |

TECHNICAL DATA

- | | |
|-----------------------|----------------|
| Applicable Standard | : IEC 60502-1 |
| Rated Voltage | : 600/1000V |
| Testing Voltage | : 3.5 KV/5 min |
| Operating Temperature | : Max. 90 °C |

PRODUCT FEATURES

- For XLPE/PVC/CT/PVC Cables
IEC 60332-1-2
IEC60332-3-22 Cat. A (On request)
- For XLPE/LSOH/CT/LSOH Cables
IEC 60332-1-2
IEC 60754-1 & IEC 60754-2
IEC 61034-1 & IEC61034-2
Oxygen Index - Min. 30%

Number of Cores	Nomonal Area of Conductor	Approx. Overall Diameter	Approx. Weight
No.	mm ²	mm	kg / Km
1	50cm	16.5	695
	70cm	18.3	928
	95 cm	20.4	1213
	120cm	22.1	1475
	150cm	23.7	1767
	185cm	26.0	2166
	240rm	29.7	2783
	300rm	32.8	3417
	400rm	36.8	4354
	500rm	40.9	5411
	630rm	45.4	6867
	800rm	50.7	8701
	1000rm	56.0	10848
3	1.5rm	12.7	251
	2.5rm	13.6	302
	4rm	14.8	373
	6rm	16.0	471
	10rm	18.1	642
	16rm	20.3	873
	25sm	21.0	1152
	35sm	22.9	1483
	50sm	25.5	1905
	70sm	29.8	2641
	95sm	33.5	3536
	120sm	37.4	4373
	150sm	41.6	5364
	185sm	46.1	6631
	240sm	52.3	8557
300sm	55.4	10529	
400sm	60.6	13309	
4	1.5rm	13.5	283
	2.5rm	14.6	346
	4rm	15.9	435
	6rm	17.2	556
	10rm	19.5	773
	16rm	22.0	1069
	25sm	24.0	1493
	35sm	27.1	1950
	50sm	29.8	2510
	70sm	34.6	3518
	95sm	38.8	4670
	120sm	43.8	5842
	150sm	47.9	7061
	185sm	53.8	8787
	240sm	62.1	11428
300sm	66.0	13977	
400sm	76.3	17908	

rm: Stranded Circular Non-Compacted, cm: Stranded Circular Compacted, sm: stranded shaped rm:Stranded Circular

CTS-210A & CTS-200A Copper Tape Screened Armoured Cable

APPLICATION

This cable is suitable for fixed installations in distribution networks or industrial installations Such as Plant engineering, Industrial machinery, Heating and air-conditioning systems, Power stations, Applications etc. or where the screened cables required. Armoured cable suitable for direct burial.

CONSTRUCTION

1. Conductor : Plain Annealed, Stranded Circular Non-Compacted or Compacted or Shaped Copper
2. Insulation : XLPE
3. Bedding : Extruded PVC or LSOH
4. Screen : Copper Tape
5. Sheath : PVC or LSOH
6. Armour : Aluminium Round Wire (for single core cables) Galvanised Round Steel Wire (For Multi Core Cables)
7. Armour : PVC or LSOH
8. Armour :
 - 1C - Natural
 - 3C - Brown ,Black & Grey
 - 4C - Brown,Black,Grey,Blue
 - 2C+E - Brown ,Black +Green/Yellow
 - 3C+E - Brown ,Black ,Grey +Green/Yellow
9. Sheath Colour :

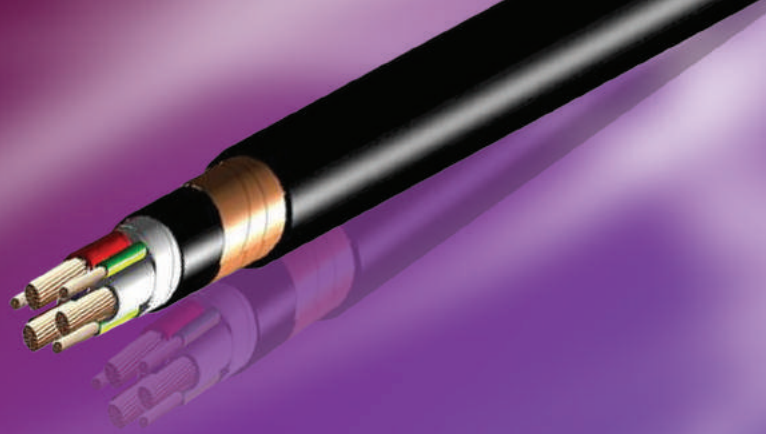
TECHNICAL DATA

- Applicable Standard : IEC 60502-1
 Rated Voltage : 600/1000V
 Testing Voltage : 3.5 KV/5 min
 Operating Temperature : Max. 90 °C

PRODUCT FEATURES

1. For XLPE/PVC/CT/PVC Cables
IEC 60332-1-2
IEC60332-3-22 Cat. A (On request)
2. For XLPE/LSOH/CT/LSOH Cables
IEC 60332-1-2
IEC 60754-1 & IEC 60754-2
IEC 61034-1 & IEC61034-2
Oxygen Index - Min. 30%

Number of Cores	Nomonal Area of Conductor	Approx. Overall Diameter	Approx. Weight
No.	mm2	mm	kg / Km
1	50cm	21.5	955
	70cm	24.0	1260
	95 cm	26.1	1580
	120cm	27.8	1868
	150cm	29.6	2202
	185cm	31.8	2642
	240rm	36.5	3424
	300rm	39.7	4133
	400rm	43.6	5134
	500rm	47.8	6295
	630rm	53.6	8023
	800rm	59.3	10052
1000rm	64.7	12329	
3	1.5rm	17.8	655
	2.5rm	18.7	731
	4rm	19.8	838
	6rm	21.1	962
	10rm	23.1	1189
	16rm	26.0	1625
	25sm	27.0	1936
	35sm	28.9	2343
	50sm	32.7	3106
	70sm	36.7	4006
	95sm	40.4	5053
	120sm	45.8	6478
	150sm	50.0	7699
	185sm	54.9	9256
	240sm	61.3	11536
	300sm	64.6	13725
400sm	71.5	17658	
4	1.5rm	18.6	711
	2.5rm	19.6	800
	4rm	20.9	926
	6rm	22.3	1084
	10rm	25.2	1505
	16rm	27.7	1878
	25sm	29.9	2408
	35sm	34.0	3221
	50sm	36.9	3922
	70sm	41.5	5095
	95sm	47.2	6896
	120sm	52.1	8307
	150sm	56.6	9814
	185sm	62.8	11904
	240sm	71.3	15057
	300sm	76.8	18718
400sm	87.6	23454	



VFD / VSD Cable (3 Cores + 3 Earth)

APPLICATION

This cable is designed to significantly reduce where electrical interference distorts signal transmission in electrical motors. Suitable for variable speed drive equipment in fixed installation or where the screened cables required.

CONSTRUCTION

- | | |
|----------------------|---|
| 1. Conductor | : Plain Annealed, Stranded Circular
Non-Compacted or Compacted or
Shaped Copper |
| 2. Insulation | : XLPE |
| 3. Bedding | : Extruded PVC or LSOH |
| 4. Screen | : Copper Tape |
| 5. Sheath | : PVC or LSOH |
| 6. Insulation Colour | : |
| 3Phase +3Earth | - Brown + Green/Yellow,
- Black + Green/Yellow,
- Grey + Green/Yellow
OR
- Red + Green/Yellow,
- Yellow + Green/Yellow,
- Blue + Green/Yellow |
| 6. Sheath Colour | : Black |

TECHNICAL DATA

- | | |
|-----------------------|----------------|
| Applicable Standard | : IEC 60502-1 |
| Rated Voltage | : 600/1000V |
| Testing Voltage | : 3.5 KV/5 min |
| Operating Temperature | : Max. 90 °C |

PRODUCT FEATURES

- For XLPE/PVC/CT/PVC Cables
IEC 60332-1-2
IEC60332-3-22 Cat. A (On request)
- For XLPE/LSOH/CT/LSOH Cables
IEC 60332-1-2
IEC 60754-1 & IEC 60754-2
IEC 61034-1 & IEC61034-2
Oxygen Index - Min. 30%

No. and Nom. Area of Phase Conductor	No. and Nom. Area of Earth Conductor	Approx. Overall Diameter	Approx. Wt.
No. X mm ²	No. X mm ²	mm	kg / Km
3 x 1.5 rm	3 x 1.5 rm	16.0	486
3 x 2.5 rm	3 x 1.5 rm	16.6	529
3 x 4 rm	3 x 1.5 rm	17.4	599
3 x 6 rm	3 x 2.5 rm	18.1	738
3 x 10 rm	3 x 4 rm	20.5	965
3 x 16 rm	3 x 6 rm	23.1	1265
3 x 25 cm	3 x 10 rm	26.8	1775
3 x 35 cm	3 x 10 rm	29.2	2105
3 x 50 cm	3 x 10 rm	31.4	2549
3 x 70 cm	3 x 16 rm	36.1	3546
3 x 95 cm	3 x 16 rm	40.5	4565
3 x 120 cm	3 x 25 rm	44.4	5792
3 x 150 cm	3 x 25 rm	47.8	6779
3 x 185 cm	3 x 35 rm	53.1	8409
3 x 240 cm	3 x 50 rm	62.2	10829
3 x 300 cm	3 x 50 rm	66.6	13075

rm: Stranded Circular Non-Compacted, cm: Stranded Circular Compacted, sm: stranded shaped rm: Stranded Circular

Methods of Installation, Current - Carrying Capacity, Voltage Drop & Correction Factors For FR - 100 Fire Resistant Cables

Table 1 : Current - Carrying Capacity & Voltage Drop

Conductor Operating Temperature : 70 °C
Ambient Temperature : 30 °C

Nominal Area of Conductor mm ²	Installation in Air				Installation in Conduit					
	Two-core cable single phase a.c.		Three or four core cable three phase a.c.		Single-core cable (trefoil)		Two-core cable single phase a.c.		Three or four core cable three phase a.c.	
	A	mV/A/m	A	mV/A/m	A	mV/A/m	A	mV/A/m	A	mV/A/m
1.0	18	44	16	38	16	38	14	44	12	38
1.5	22	30	20	25	20	25	19	30	15	25
2.5	31	18	27	16	27	16	25	18	21	16
4	43	11	36	9.7	36	9.7	33	11	29	9.7

Notes :

1. Correction factors for ambient temperature other than 30 °C, refer to Table 2
2. Correction factors for groups of more than one circuit of cable(s), refer to Table 3

Table 2 : Correction Factors For Ambient Temperature

Correction factors for ambient temperature other than 30 °C

Ambient Temperature (°C)	25	30	35	40	45	50	55	60	65
PE 70 °C	1.03	1.0	0.94	0.87	0.79	0.71	0.61	0.50	0.35

Table 3 : Correction Factors For Groups

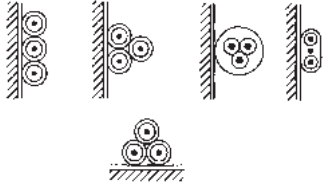

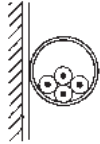
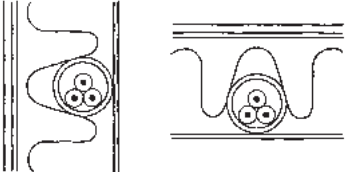
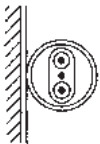


Correction factors for groups of more than one circuit of single-core cables or more than one multicore cables

Type of cable and Installation Condition	Number of Loaded Conductors											
	4	6	8	10	12	16	20	24	28	32	36	40
Single-core cables : Factor to be applied to the values for two single-core cables	0.80	0.69	0.62	0.59	0.55	0.51	0.48	0.43	0.41	0.39	0.38	0.36
	Number of Cables											
Multicore cables : Factors to be applied to the values for one cable	2	3	4	5	6	8	10	12	14	16	18	20
	0.80	0.70	0.65	0.60	0.57	0.52	0.48	0.45	0.43	0.41	0.39	0.38

Notes :

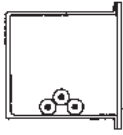
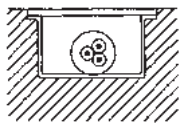

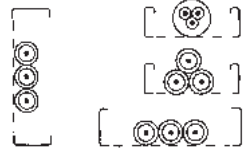
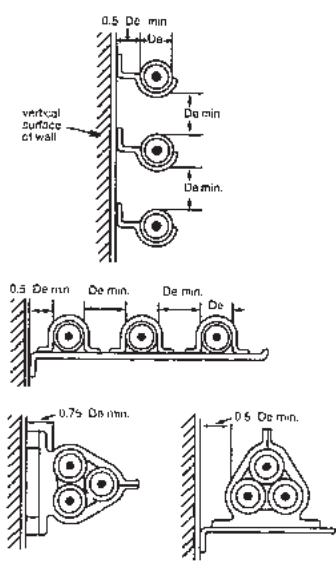
1. The factors in the table are applicable to groups of cables of all one size, equally loaded, including groups bunched in more than one plane.
2. Spacing clearance between adjacent surface of at least one cable diameter (De). Where the horizontal clearance between adjacent cables exceed 2 De, no correction factor need be applied.
3. Information given here is extracted from IEE Wiring Regulation and is reproduced for reference only. Wilson Cables Private Limited does not assure obligation or liability whatsoever in connection with these data. The customer are requested to verify the above information with their electrical consultants and contractors.

Schedule of Installation Methods of Cables (Including Reference Methods)

Installation Method		Examples	Appropriate Reference Method for Determining Current - Carrying Capacity
Number	Description		
Open and clipped direct :			
1	Sheathed cables clipped direct to or lying on a non-metallic surface.		Method 1
Cables embedded direct in building materials :			
2	Sheathed cables embedded directly in masonry, brickwork, concrete, plaster or the like (other than thermally insulating materials).		Method 1
In conduit :			
3	Single-core non-sheathed cables in metallic or non-metallic conduit on a wall or ceiling.		Method 3
4	Single-core non-sheathed cables in metallic or non-metallic conduit in a thermally insulating wall or above a thermally insulating ceiling, the conduit being in contact with a thermally conductive surface on one side. +		Method 4
5	Multicore cables having non-metallic sheath, in metallic or non-metallic conduit on a wall or ceiling.		Method 3
6	Sheathed cables in conduit in a thermally insulating wall etc. (otherwise as Ref. Method 4).		Method 4
7	Cables in conduit embedded in masonry (other than thermally insulating masonry)		Method 3

+ The wall is assumed to consist of an outer weatherproof skin, thermal insulation and an inner skin of plasterboard or wood-like material having a coefficient of heat transfer not less than 10 W/m²K. The conduit is fixed so as to be close to, but not necessarily touching the inner skin. Heat from the cables is assumed to escape through the inner skin only.

Schedule of Installation Methods of Cables (Including Reference Methods)

Installation Method		Examples	Appropriate Reference Method for Determining Current - Carrying Capacity
Number	Description		
In trunking :			
8	Cables in trunking on a wall or suspended in air.		Method 3
9	Cables in flush floor trunking.		Method 3
10	Single-core cables in skirting trunking.		Method 3
On trays :			
11	Sheathed cables on a perforated cable tray, bunched and unenclosed. A perforated cable tray is considered as a tray in which the holes occupy at least 30% of the surface area.		Method 11
In free air :			
12	<p>Sheathed single-core cables in free air (any supporting metalwork under the cables occupying less than 10% of the plan area) :</p> <p>- Two or three cables vertically one above the other, minimum distance between cable surfaces equal to the overall cable diameter (D_c) ; distance from the wall not less than $0.5 D_c$.</p> <p>- Two or three cables horizontally, with spacings as above.</p> <p>- Three cables in trefoil, distance between wall and surface of nearest cable $0.5 D_c$ or nearest cable $0.75 D_c$.</p>		Method 12

Current - Carrying Capacity For Single - Core PVC Insulated Cables With or Without Sheath

Table 4 : Current -Carrying Capacity

Conductor Operating Temperature : 70 °C
Ambient Temperature : 30 °C

BS EN 50525-2-31
SS 358-3 / IEC 60227-3
IEC 60502-1

Nominal Area of Conductor	Reference Method 4 (enclosed in conduit in thermally insulated wall etc.)		Reference Method 3 (enclosed in conduit on a wall or in trunking etc.)		Reference Method 1 (clipped direct)		Reference Method 11 (on a perforated cable tray horizontal or vertical)		Reference Method 12 (free air)		
	2 cables single-phase a.c. or d.c.	3 or 4 cables three-phase a.c.	2 cables single-phase a.c. or d.c.	3 or 4 cables three-phase a.c.	2 cables single-phase a.c. or d.c. flat and touching	3 or 4 cables three-phase a.c. flat and touching or trefoil	2 cables single-phase a.c. or d.c. flat and touching	3 or 4 cables three-phase a.c. flat and touching or trefoil	Horizontal flat spaced	Vertical flat spaced	Trefoil
									2 cables single-phase a.c. or d.c. or 3 cables three-phase a.c.	2 cables single-phase a.c. or d.c. or 3 cables three-phase a.c.	3 cables trefoil three-phase a.c.
mm ²	A	A	A	A	A	A	A	A	A	A	A
1.5	14.5	13.5	17.5	15.5	20	18	-	-	-	-	-
2.5	19.5	18	24	21	27	25	-	-	-	-	-
4	26	24	32	28	37	33	-	-	-	-	-
6	34	31	41	36	47	43	-	-	-	-	-
10	46	42	57	50	65	59	-	-	-	-	-
16	61	56	76	68	87	79	-	-	-	-	-
25	80	73	101	89	114	104	126	112	146	130	110
35	99	89	125	110	141	129	156	141	181	162	137
50	119	108	151	134	182	167	191	172	219	197	167
70	151	136	192	171	234	214	246	223	281	254	216
95	182	164	232	207	284	261	300	273	341	311	264
120	210	188	269	239	330	303	349	318	396	362	308
150	240	216	300	262	381	349	404	369	456	419	356
185	273	245	341	296	436	400	463	424	521	480	409
240	320	286	400	346	515	472	549	504	615	569	485
300	367	328	458	394	594	545	635	584	709	659	561
400	-	-	546	467	694	634	732	679	852	795	656
500	-	-	626	533	792	723	835	778	982	920	749
630	-	-	720	611	904	826	953	892	1138	1070	855
800	-	-	-	-	1030	943	1086	1020	1265	1188	971
1000	-	-	-	-	1154	1058	1216	1149	1420	1337	1079

Notes :

1. For group reduction factors, refer to Table 13.
2. For correction factors for ambient air temperatures other than 30 °C, please refer to Table 12.
3. For voltage drop data, please refer to Table 5.

Voltage Drop (mV/A/m) For Single - Core PVC Insulated Cables With or Without Sheath

Table 5 : Voltage Drop

Conductor Operating Temperature : 70 °C

BS EN 50525-2-31
SS 358 / IEC 60227-3
IEC 60502-1

Nominal Area of Conductor	2 Cables d.c.	2 cables-single-phase a.c.									3 or 4 cables-three-phase a.c.											
		Reference Methods 3 & 4 (Enclosed in conduit etc. in or on a wall)			Reference Methods 1 & 11 (Clipped direct or on trays, touching)			Reference Methods 12 (Spaced*)			Reference Methods 3 & 4 (Enclosed in conduit etc. in or on a wall)			Reference Methods 1, 11 & 12 (In trefoil)			Reference Methods 1 & 11 (Flat and touching)			Reference Methods 12 (Flat spaced*)		
mm ²	mV/A/m	mV/A/m			mV/A/m			mV/A/m			mV/A/m			mV/A/m			mV/A/m			mV/A/m		
1.5	29	29			29			29			25			25			25			25		
2.5	18	18			18			18			15			15			15			15		
4	11	11			11			11			9.5			9.5			9.5			9.5		
6	7.3	7.3			7.3			7.3			6.4			6.4			6.4			6.4		
10	4.4	4.4			4.4			4.4			3.8			3.8			3.8			3.8		
16	2.8	2.8			2.8			2.8			2.4			2.4			2.4			2.4		
		r	x	z	r	x	z	r	x	z	r	x	z	r	x	z	r	x	z	r	x	z
25	1.75	1.80	0.33	1.80	1.75	0.20	1.75	1.75	0.29	1.80	1.50	0.29	1.55	1.50	0.175	1.50	1.50	0.25	1.55	1.50	0.32	1.55
35	1.25	1.30	0.31	1.30	1.25	0.195	1.25	1.25	0.28	1.30	1.10	0.27	1.10	1.10	0.170	1.10	1.10	0.24	1.10	1.10	0.32	1.15
50	0.93	0.95	0.30	1.00	0.93	0.190	0.95	0.93	0.28	0.97	0.81	0.26	0.85	0.80	0.165	0.82	0.80	0.24	0.84	0.80	0.32	0.86
70	0.63	0.65	0.29	0.72	0.63	0.185	0.66	0.63	0.27	0.69	0.56	0.25	0.61	0.55	0.160	0.57	0.55	0.24	0.60	0.55	0.31	0.63
95	0.46	0.49	0.28	0.56	0.47	0.180	0.50	0.47	0.27	0.54	0.42	0.24	0.48	0.41	0.155	0.43	0.41	0.23	0.47	0.40	0.31	0.51
120	0.36	0.39	0.27	0.47	0.37	0.175	0.41	0.37	0.26	0.45	0.33	0.23	0.41	0.32	0.150	0.36	0.32	0.23	0.40	0.32	0.30	0.44
150	0.29	0.31	0.27	0.41	0.30	0.175	0.34	0.29	0.26	0.39	0.27	0.23	0.36	0.26	0.150	0.30	0.26	0.23	0.34	0.26	0.30	0.40
185	0.23	0.25	0.27	0.37	0.24	0.170	0.29	0.24	0.26	0.35	0.22	0.23	0.32	0.21	0.145	0.26	0.21	0.22	0.31	0.21	0.30	0.36
240	0.180	0.195	0.26	0.33	0.185	0.165	0.25	0.185	0.25	0.31	0.17	0.23	0.29	0.160	0.145	0.22	0.160	0.22	0.27	0.160	0.29	0.34
300	0.145	0.160	0.26	0.31	0.150	0.165	0.22	0.150	0.25	0.29	0.14	0.23	0.27	0.130	0.140	0.190	0.130	0.22	0.25	0.130	0.29	0.32
400	0.105	0.130	0.26	0.29	0.120	0.160	0.20	0.115	0.25	0.27	0.12	0.22	0.25	0.105	0.140	0.175	0.105	0.21	0.24	0.100	0.29	0.31
500	0.086	0.110	0.26	0.28	0.098	0.155	0.185	0.093	0.24	0.26	0.10	0.22	0.25	0.086	0.135	0.160	0.086	0.21	0.23	0.081	0.29	0.30
630	0.068	0.094	0.25	0.27	0.081	0.155	0.175	0.076	0.24	0.25	0.08	0.22	0.24	0.072	0.135	0.150	0.072	0.21	0.22	0.066	0.28	0.29
800	0.053	-	-	-	0.068	0.150	0.165	0.061	0.24	0.25	-	-	-	0.060	0.130	0.145	0.060	0.21	0.22	0.053	0.28	0.29
1000	0.042	-	-	-	0.059	0.150	0.160	0.050	0.24	0.24	-	-	-	0.052	0.130	0.140	0.052	0.20	0.21	0.044	0.28	0.28

* Spacing larger than those specified in Method 12 will result in large voltage drop.

Notes :

1. X = Reactance, Z = Impedance, R = A.C. resistance at operating temperature (ohm/km).

2. $Z = \sqrt{(R^2 + X^2)}$

Current - Carrying Capacity & Volt Drop For Multi - Core PVC Insulated Cables With Sheath

Table 6 : Current - Carrying Capacity

Conductor Operating Temperature : 70 °C
Ambient Temperature : 30 °C

BS EN 50525-2-31
IEC 60502-1

Nominal Area of Conductor	Reference Method 4 (enclosed in an insulated wall, etc.)		Reference Method 3 (enclosed in conduit on a wall or ceiling, or in trunking)		Reference Method 1 (clipped direct)		Reference Method 11 (on a perforated cable tray)	
	1 two-core cable* single-phase a.c. or d.c.	1 three-core cable* or 1 four-core cable, three-phase a.c.	1 two-core cable* single-phase a.c. or d.c.	1 three-core cable* or 1 four-core cable, three-phase a.c.	1 two-core cable* single-phase a.c. or d.c.	1 three-core cable* or 1 four-core cable, three-phase a.c.	1 two-core cable* single-phase a.c. or d.c.	1 three-core cable* or 1 four-core cable, three-phase a.c.
mm ²	A	A	A	A	A	A	A	A
1.5	14	13	16.5	15	19.5	17.5	22	18.5
2.5	18.5	17.5	23	20	27	24	30	25
4	25	23	30	27	36	32	40	34
6	32	29	38	34	46	41	51	43
10	43	39	52	46	63	57	70	60
16	57	52	69	62	85	76	94	80
25	75	68	90	80	112	96	119	101
35	92	83	111	99	138	119	148	126
50	110	99	133	118	168	144	180	153
70	139	125	168	149	213	184	232	196
95	167	150	201	179	258	223	282	238
120	192	172	232	206	299	259	328	276
150	219	196	258	225	344	299	379	319
185	248	223	294	255	392	341	434	364
240	291	261	344	297	461	403	514	430
300	334	298	394	339	530	464	593	497
400	-	-	470	402	634	557	715	597

* With or without protective conductor

- Notes : 1. For group reduction factors, refer to Table 13.
2. For correction factors, for ambient air temperatures other than 30 °C, please refer to Table 12.
3. For voltage drop data, please refer to Table 7.

Table 7 : Voltage Drop

Conductor Operating Temperature : 70 °C

BS EN 50525-2-31
IEC 60502-1

Nominal Area of Conductor	Two-core cable d.c.	Two-core cable (single-phase a.c.)			Three or four-core cable three-phase a.c.		
mm ²	mV/A/m	mV/A/m			mV/A/m		
1.5	29	29			25		
2.5	18	18			15		
4	11	11			9.5		
6	7.3	7.3			6.4		
10	4.4	4.4			3.8		
16	2.8	2.8			2.4		
		r	x	z	r	x	z
25	1.75	1.75	0.170	1.75	1.50	0.145	1.50
35	1.25	1.25	0.165	1.25	1.10	0.145	1.10
50	0.93	0.93	0.165	0.94	0.80	0.140	0.81
70	0.63	0.63	0.160	0.65	0.55	0.140	0.57
95	0.46	0.47	0.155	0.50	0.41	0.135	0.43
120	0.36	0.38	0.155	0.41	0.33	0.135	0.35
150	0.29	0.30	0.155	0.34	0.26	0.130	0.29
185	0.23	0.25	0.150	0.29	0.21	0.130	0.25
240	0.180	0.190	0.150	0.24	0.165	0.130	0.21
300	0.145	0.155	0.145	0.21	0.135	0.130	0.185
400	0.105	0.115	0.145	0.185	0.100	0.125	0.160

Notes : 1. X = Reactance, Z = Impedance, R = A.C. resistance at operating temperature (ohm/km).

$$2. Z = \sqrt{(R^2 + X^2)}$$

Current - Carrying Capacity For Single - Core XLPE / LSOH Insulated Cables With or Without Sheath

Table 8 : Current -Carrying Capacity

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

BSEN 50525-3-41
IEC 60502-1

Nominal Area of Conductor	Reference Method 4 (enclosed in conduit in thermally insulated wall etc.)		Reference Method 3 (enclosed in conduit on a wall or in trunking etc.)		Reference Method 1 (clipped direct)		Reference Method 11 (on a perforated cable tray horizontal or vertical)		Reference Method 12 (free air)		
	2 cables single-phase a.c. or d.c.	3 or 4 cables three-phase a.c.	2 cables single-phase a.c. or d.c.	3 or 4 cables three-phase a.c.	2 cables single-phase a.c. or d.c. flat and touching	3 or 4 cables three-phase a.c. flat and touching or trefoil	2 cables single-phase a.c. or d.c. flat and touching	3 or 4 cables three-phase a.c. flat and touching or trefoil	Horizontal flat spaced	Vertical flat spaced	Trefoil
									2 cables single-phase a.c. or d.c. or 3 cables three-phase a.c.	2 cables single-phase a.c. or d.c. or 3 cables three-phase a.c.	3 cables trefoil three-phase a.c.
mm ²	A	A	A	A	A	A	A	A	A	A	A
1.0	14	13	17	15	19	17.5	-	-	-	-	-
1.5	18	17	22	19	25	23	-	-	-	-	-
2.5	24	23	30	26	34	31	-	-	-	-	-
4	33	30	40	35	46	41	-	-	-	-	-
6	43	39	51	45	59	54	-	-	-	-	-
10	58	53	71	63	81	74	-	-	-	-	-
16	76	70	95	85	109	99	-	-	-	-	-
25	100	91	126	111	143	130	158	140	183	163	138
35	124	111	156	138	176	161	195	176	226	203	171
50	149	135	189	168	228	209	293	215	274	246	209
70	189	170	240	214	293	268	308	279	351	318	270
95	228	205	290	259	355	326	375	341	426	389	330
120	263	235	336	299	413	379	436	398	495	453	385
150	300	270	375	328	476	436	505	461	570	524	445
185	341	306	426	370	545	500	579	530	651	600	511
240	400	358	500	433	644	590	686	630	769	711	606
300	459	410	573	493	743	681	794	730	886	824	701
400	-	-	683	584	868	793	915	849	1065	994	820
500	-	-	783	666	990	904	1044	973	1228	1150	936
630	-	-	900	764	1130	1033	1191	1115	1423	1338	1069
800	-	-	-	-	1288	1179	1358	1275	1581	1485	1214
1000	-	-	-	-	1443	1323	1520	1436	1775	1671	1349

Notes :

1. For voltage drop data, refer to Table 9.
2. Correction factors for ambient air temperatures other than 30 °C, please refer to Table 12.
3. Correction factors for groups of more than one circuit, refer to Table 13.

Volt Drop For Single - Core XLPE / LSOH Insulated Cables With or Without Sheath

Table 9 : Voltage Drop

Conductor Operating Temperature : 90 °C

BSEN 50525-3-41
IEC 60502-1

Nominal Area of Conductor	2 Cables d.c.	2 cables-single-phase a.c.									3 or 4 cables-three-phase a.c.											
		Reference Methods 3 & 4 (Enclosed in conduit etc. in or on a wall)			Reference Methods 1 & 11 (Clipped direct or on trays, touching)			Reference Methods 12 (Spaced*)			Reference Methods 3 & 4 (Enclosed in conduit etc. in or on a wall)			Reference Methods 1, 11 & 12 (In trefoil)			Reference Methods 1 & 11 (Flat and touching)			Reference Methods 12 (Flat spaced*)		
mm ²	mV/A/m	mV/A/m			mV/A/m			mV/A/m			mV/A/m			mV/A/m			mV/A/m			mV/A/m		
1.0	46	46			46			46			40			40			40			40		
1.5	31	31			31			31			27			27			27			27		
2.5	19	19			19			19			16			16			16			16		
4	12	12			12			12			10			10			10			10		
6	7.9	7.9			7.9			7.9			6.8			6.8			6.8			6.8		
10	4.7	4.7			4.7			4.7			4.0			4.0			4.0			4.0		
16	2.9	2.9			2.9			2.9			2.5			2.5			2.5			2.5		
		r	x	z	r	x	z	r	x	z	r	x	z	r	x	z	r	x	z	r	x	z
25	1.85	1.85	0.37	1.90	1.85	0.190	1.85	1.85	0.28	1.85	1.60	0.27	1.65	1.60	0.165	1.60	1.60	0.190	1.60	1.60	0.27	1.65
35	1.35	1.35	0.29	1.35	1.35	0.180	1.35	1.35	0.27	1.35	1.15	0.25	1.15	1.15	0.155	1.15	1.15	0.180	1.15	1.15	0.26	1.20
50	0.99	1.00	0.29	1.05	0.99	0.180	1.00	0.99	0.27	1.00	0.87	0.25	0.90	0.86	0.155	0.87	0.86	0.180	0.87	0.86	0.26	0.89
70	0.68	0.70	0.28	0.75	0.68	0.175	0.71	0.68	0.26	0.73	0.60	0.24	0.65	0.59	0.150	0.61	0.59	0.175	0.62	0.59	0.25	0.65
95	0.49	0.51	0.27	0.58	0.49	0.170	0.52	0.49	0.26	0.56	0.44	0.23	0.50	0.43	0.145	0.45	0.43	0.170	0.46	0.43	0.25	0.49
120	0.39	0.41	0.26	0.48	0.39	0.165	0.43	0.39	0.25	0.47	0.35	0.23	0.42	0.34	0.140	0.37	0.34	0.165	0.38	0.34	0.24	0.42
150	0.32	0.33	0.26	0.43	0.32	0.165	0.36	0.32	0.25	0.41	0.29	0.23	0.37	0.28	0.140	0.31	0.28	0.165	0.32	0.28	0.24	0.37
185	0.25	0.27	0.26	0.37	0.26	0.165	0.30	0.25	0.25	0.36	0.23	0.23	0.32	0.22	0.140	0.26	0.22	0.165	0.28	0.22	0.24	0.33
240	0.190	0.21	0.26	0.33	0.20	0.160	0.25	0.195	0.25	0.31	0.185	0.22	0.29	0.170	0.140	0.22	0.170	0.165	0.24	0.170	0.24	0.29
300	0.155	0.175	0.25	0.31	0.160	0.160	0.22	0.155	0.25	0.29	0.150	0.22	0.27	0.140	0.140	0.195	0.135	0.160	0.21	0.135	0.24	0.27
400	0.120	0.140	0.25	0.29	0.130	0.155	0.20	0.125	0.24	0.27	0.125	0.22	0.25	0.110	0.135	0.175	0.110	0.160	0.195	0.110	0.24	0.26
500	0.093	0.120	0.25	0.28	0.105	0.155	0.185	0.098	0.24	0.26	0.100	0.22	0.24	0.090	0.135	0.160	0.088	0.160	0.180	0.085	0.24	0.25
630	0.072	0.100	0.25	0.27	0.086	0.155	0.175	0.078	0.24	0.25	0.088	0.21	0.23	0.074	0.135	0.150	0.071	0.160	0.170	0.068	0.23	0.24
800	0.056	-	-	-	0.072	0.150	0.170	0.064	0.24	0.25	-	-	-	0.062	0.130	0.145	0.059	0.155	0.165	0.055	0.23	0.24
1000	0.045	-	-	-	0.063	0.150	0.165	0.054	0.24	0.24	-	-	-	0.055	0.130	0.140	0.050	0.155	0.165	0.047	0.23	0.24

* Spacing larger than those specified in Method 12 will result in large voltage drop.

Notes :

1. X = Reactance, Z = Impedance, R = A.C. resistance at operating temperature (ohm/km).

2. $Z = \sqrt{(R^2 + X^2)}$

Current - Carrying Capacity & Volt Drop For Multi - Core XLPE / LSOH Insulated Cables With Sheath

Table 10 : Current - Carrying Capacity

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

BSEN 50525-3-41
IEC 60502-1

Nominal Area of Conductor	Reference Method 4 (enclosed in an insulated wall, etc.)		Reference Method 3 (enclosed in conduit on a wall or ceiling, or in trunking)		Reference Method 1 (clipped direct)		Reference Method 11 (on a perforated cable tray)	
	1 two-core cable* single-phase a.c. or d.c.	1 three-core cable* or 1 four-core cable, three-phase a.c.	1 two-core cable* single-phase a.c. or d.c.	four-core cable*, three-phase a.c.	1 two-core cable* single-phase a.c. or d.c.	1 three or four-core cable*, three-phase a.c.	1 two-core cable* single-phase a.c. or d.c.	1 three or four-core cable*, three-phase a.c.
mm ²	A	A	A	A	A	A	A	A
1.5	18.5	16.5	22	19.5	24	22	26	23
2.5	25	22	30	26	33	30	36	32
4	33	30	40	35	45	40	49	42
6	42	38	51	44	58	52	63	54
10	57	51	69	60	80	71	86	75
16	76	68	91	80	107	96	115	100
25	99	89	119	105	138	119	149	127
35	121	109	146	128	171	147	185	158
50	145	130	175	154	209	179	225	192
70	183	164	221	194	269	229	289	246
95	220	197	265	233	328	278	352	298
120	253	227	305	268	382	322	410	346
150	290	259	334	300	441	371	473	399
185	329	295	384	340	506	424	542	456
240	386	346	459	398	599	500	641	538
300	442	396	532	455	693	576	741	621
400	-	-	625	536	803	667	865	741

* With or without protective conductor

- Notes : 1. For voltage drop data, please refer to Table 11.
2. Correction factors, for ambient air temperatures other than 30 °C, please refer to Table 12.
3. Correction factors for groups of more than one circuit, refer to Table 13.

Table 11 : Voltage Drop

Conductor Operating Temperature : 90 °C

BSEN 50525-3-41
IEC 60502-1

Nominal Area of Conductor	Two-core cable d.c.	Two-core cable (single-phase a.c.)			Three or four-core cable three-phase a.c.		
mm ²	mV/A/m	mV/A/m			mV/A/m		
1.5	31	31			27		
2.5	19	19			16		
4	12	12			10		
6	7.9	7.9			6.8		
10	4.7	4.7			4.0		
16	2.9	2.9			2.5		
		r	x	z	r	x	z
25	1.85	1.85	0.160	1.90	1.60	0.140	1.65
35	1.35	1.35	0.155	1.35	1.15	0.135	1.15
50	0.98	0.99	0.155	1.00	0.86	0.135	0.87
70	0.67	0.67	0.150	0.69	0.59	0.130	0.60
95	0.49	0.50	0.150	0.52	0.43	0.130	0.45
120	0.39	0.40	0.145	0.42	0.34	0.130	0.37
150	0.31	0.32	0.145	0.35	0.28	0.125	0.30
185	0.25	0.26	0.145	0.29	0.22	0.125	0.26
240	0.195	0.200	0.140	0.24	0.175	0.125	0.21
300	0.155	0.160	0.140	0.21	0.140	0.120	0.185
400	0.120	0.130	0.140	0.190	0.115	0.120	0.165

- Notes : 1. X = Reactance, Z = Impedance, R = A.C. resistance at operating temperature (ohm/km).
2. $Z = \sqrt{(R^2 + X^2)}$

Correction Factors For Single & Multi - Core PVC / XLPE / LSOH Insulated Cables With or Without Sheath

Table 12 : Correction Factors For Ambient Temperature

Correction factors for ambient temperature other than 30 °C. To be applied when determining the current carrying capacity of a cable.

Ambient Temperature (°C)	25	30	35	40	45	50	55	60	65	70	75	80	85
PVC 70 °C	1.03	1.0	0.94	0.87	0.79	0.71	0.61	0.50	0.35	-	-	-	-
XLPE / LSOH 90 °C	1.02	1.0	0.96	0.91	0.87	0.82	0.76	0.71	0.65	0.58	0.50	0.41	0.29

Table 13 : Correction Factors For Groups

Correction factors for groups of more than one circuit of single-core cables, or more than one multicore cable (to be applied to the corresponding current-carrying capacity for single circuit in Tables 4, 6, 8 & 10)

Reference Method of Installation (see page 32 & 33)		Correction Factor (C _g)													
		Number of Circuits or Multicore Cables													
		2	3	4	5	6	7	8	9	10	12	14	16	18	20
Enclosed (Method 3 or 4) or bunched and clipped direct to a non-metallic surface (Method 1)		0.80	0.70	0.65	0.60	0.57	0.54	0.52	0.50	0.48	0.45	0.43	0.41	0.39	0.38
Single layer clipped to a non-metallic surface (Method 1)	Touching	0.85	0.79	0.75	0.73	0.72	0.72	0.71	-	-	-	-	-	-	-
	Spaced *	0.94	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Single layer multi-core on a perforated metal cable tray vertical or horizontal (Method 11)	Touching	0.86	0.81	0.77	0.75	0.74	0.73	0.73	0.72	0.71	0.70	-	-	-	-
	Spaced *	0.91	0.89	0.88	0.87	0.87	-	-	-	-	-	-	-	-	-
Single layer single-core on a perforated metal cable tray, touching (Method 11)	Horizontal	0.90	0.85	-	-	-	-	-	-	-	-	-	-	-	-
	Vertical	0.85	-	-	-	-	-	-	-	-	-	-	-	-	-
Single layer multi-core touching on ladder supports		0.86	0.82	0.80	0.79	0.78	0.78	0.78	0.77	-	-	-	-	-	-

* “ Spaced “ means a clearance between adjacent surfaces of at least one cable diameter (De). Where the horizontal clearances between adjacent cables exceeds 2 De, no correction factor need to be applied.

Notes :

- The factors in the table are applicable to groups of cables of all one size. The value of current derived from application of the appropriate factors is the maximum continuous current to be carried by any of the cables in the group.
- If, due to known operating conditions, a cable is expected to carry not more than 30% of its grouped rating, it may be ignored for the purposes of obtaining the rating factor for the rest of the group.

For example, a group of N loaded cables would normally require a group reduction factor of C_g applied to the tabulated I_t. However, if M cables in the group carry loads which are not greater than 0.3 C_g I_t amperes the other cables can be sized by using the group rating factor corresponding to (N - M) cables.

Current - Carrying Capacity & Volt Drop For PVC Insulated Armoured Cables Laid Direct in Ground / Ducts

Table 14 : Single - Core Armoured Cables

Conductor Operating Temperature : 70 °C

IEC 60502-1

Nominal Area of Conductor	Direct in Ground				In Single Way Ducts			
	Two cables touching		Three cables touching		Two cables ducts touching		Three cables ducts trefoil touching	
	Current Carrying Capacity	Approx. volt drop per amp per meter	Current Carrying Capacity	Approx. volt drop per amp per meter	Current Carrying Capacity	Approx. volt drop per amp per meter	Current Carrying Capacity	Approx. volt drop per amp per meter
mm ²	A	mV/A/m	A	mV/A/m	A	mV/A/m	A	mV/A/m
50	238	0.97	203	0.82	216	1.00	199	0.88
70	292	0.67	248	0.58	262	0.76	241	0.66
95	349	0.50	297	0.44	308	0.61	282	0.53
120	396	0.42	337	0.36	341	0.54	311	0.47
150	443	0.36	376	0.31	375	0.48	342	0.42
185	497	0.31	423	0.27	414	0.44	375	0.38
240	571	0.26	485	0.23	463	0.40	419	0.34
300	640	0.23	542	0.20	509	0.37	459	0.32
400	708	0.22	600	0.19	545	0.34	489	0.30
500	780	0.20	660	0.18	585	0.32	523	0.28
630	856	0.19	721	0.16	632	0.30	563	0.26

Table 15 : Multi - Core Armoured Cables

Conductor Operating Temperature : 70 °C

IEC 60502-1

Nominal Area of Conductor	Direct in Ground				In Single Way Ducts			
	Two cores		Three or four cores		Two cores		Three or four cores	
	Current Carrying Capacity	Approx. volt drop per amp per meter	Current Carrying Capacity	Approx. volt drop per amp per meter	Current Carrying Capacity	Approx. volt drop per amp per meter	Current Carrying Capacity	Approx. volt drop per amp per meter
mm ²	A	mV/A/m	A	mV/A/m	A	mV/A/m	A	mV/A/m
1.5	32	29	27	25	26	29	22	25
2.5	41	17	35	15	34	17	29	15
4	55	11	47	9.5	45	11	38	9.5
6	69	7.4	59	6.4	57	7.4	48	6.4
10	92	4.4	78	3.8	76	4.4	64	3.8
16	119	2.8	101	2.4	98	2.8	83	2.4
25	158	1.7	132	1.5	129	1.7	107	1.5
35	190	1.3	159	1.1	154	1.3	129	1.1
50	225	0.94	188	0.82	183	0.94	153	0.82
70	277	0.66	233	0.57	225	0.66	190	0.57
95	332	0.49	279	0.42	271	0.49	228	0.42
120	377	0.40	317	0.35	309	0.40	260	0.35
150	422	0.34	355	0.29	346	0.34	292	0.29
185	478	0.29	401	0.25	393	0.29	331	0.25
240	551	0.24	462	0.21	455	0.24	382	0.21
300	616	0.21	517	0.18	510	0.21	428	0.18
400	693	0.19	580	0.17	574	0.19	490	0.17

Basic assumptions and conditions of installations

Ground thermal resistivity	1.2 K.m/W
Ground temperature	15 °C
Depth of laying	0.5 metre (to the centre of cable or trefoil group of ducts)

Rating factors for other ground temperatures

Ground temperature	20 °C	25 °C	30 °C	35 °C	40 °C	45 °C
Rating factor	0.95	0.90	0.85	0.80	0.74	0.67

Effect of grouping of cables

The current ratings given apply to one multicore cable, or a single set of single core cables forming a circuit. When two or more circuits are laid in close proximity the ratings of the cable must be reduced by the group rating factors given on page 35 & 36 and in ERA Report 69-30 Part III.

Current - Carrying Capacity & Volt Drop For XLPE / LSOH Insulated Armoured Cables Laid Direct in Ground / Ducts

Table 16 : Single - Core Armoured Cables

Conductor Operating Temperature : 90 °C

IEC 60502-1
BS 6724 / BS 7846

Nominal Area of Conductor	Direct in Ground				In Single Way Ducts			
	Two cables touching		3 or 4 cables trefoil touching		Two cables ducts touching		3 or 4 cables trefoil touching	
	Single phase a.c.		Three phase		Single phase a.c.		Three phase	
mm ²	A	mV/A/m	A	mV/A/m	A	mV/A/m	A	mV/A/m
50	275	0.99	235	0.86	256	1.1	235	0.93
70	340	0.70	290	0.61	310	0.80	280	0.70
95	405	0.53	345	0.46	365	0.65	330	0.56
120	460	0.43	390	0.37	410	0.55	370	0.48
150	510	0.37	435	0.32	445	0.50	405	0.43
185	580	0.31	490	0.27	485	0.45	440	0.39
240	670	0.26	560	0.23	550	0.40	500	0.35
300	750	0.24	630	0.21	610	0.37	550	0.32
400	830	0.21	700	0.19	640	0.35	580	0.30
500	910	0.20	770	0.18	690	0.33	620	0.28
630	1000	0.19	840	0.17	750	0.30	670	0.26
800	1117	0.18	931	0.16	828	0.28	735	0.24
1000	1254	0.17	1038	0.15	919	0.26	811	0.22

Table 17 : Multi - Core Armoured Cables

Conductor Operating Temperature : 90 °C

IEC 60502-1
BS 6724 / BS 7846

Nominal Area of Conductor	Direct in Ground				In Single Way Ducts			
	Two cores		Three or four cores		Two cores		Three or four cores	
	Single phase a.c.		Three phase		Single phase a.c.		Three phase	
	Current Carrying Capacity	Volt drop per amp per meter	Current Carrying Capacity	Volt drop per amp per meter	Current Carrying Capacity	Volt drop per amp per meter	Current Carrying Capacity	Volt drop per amp per meter
mm ²	A	mV/A/m	A	mV/A/m	A	mV/A/m	A	mV/A/m
16	140	2.9	115	2.6	115	2.9	94	2.6
25	180	1.9	150	1.6	145	1.9	125	1.6
35	215	1.3	180	1.2	175	1.3	150	1.2
50	255	1.0	215	0.87	210	1.0	175	0.87
70	315	0.70	265	0.61	260	0.70	215	0.61
95	380	0.52	315	0.45	310	0.52	260	0.45
120	430	0.42	360	0.36	355	0.42	300	0.36
150	480	0.35	405	0.30	400	0.35	335	0.30
185	540	0.29	460	0.25	455	0.29	380	0.25
240	630	0.24	530	0.21	520	0.24	440	0.21
300	700	0.21	590	0.19	590	0.21	495	0.19
400	790	0.19	670	0.18	660	0.19	560	0.18

Basic assumptions and conditions of installations

Ground thermal resistivity : 1.2 K.m/W
 Ground temperature : 15 °C
 Depth of laying : 0.5 metre (to the centre of cable or trefoil group of ducts)

Rating factors for other ground temperatures

Ground temperature	10 °C	15 °C	20 °C	25 °C	30 °C	35 °C	40 °C	45 °C	50 °C
Rating factor	1.03	1.00	0.97	0.93	0.89	0.86	0.82	0.76	0.72

Rating Factors For Cables Laid Direct in Ground

Rating Factors

Ratings for cables installed direct in the ground are based on values of soil temperature and soil thermal resistivity which are generally representative of conditions in the United Kingdom. Rating factors to take account of variation in ground temperatures are given with the current rating tables.

Where conditions of operation can be fairly accurately estimated, and knowledge of the soil along the route is available, it is possible to determine the ratings more precisely by the use of the soil thermal resistivity factors, grouping factors, and factors for the depths of laying given in Table 18 to 21. These factors are more fully tabulated in ERA report 69-30 Part III Table 61-71.

Table 18 : Soil

Rating factors for variation in thermal resistivity of soil (average values).

Size of Cables mm ²	Soil Thermal Resistivity in Km / W					
	0.8	0.9	1.0	1.5	2.0	2.5
Single - Core Cables						
Up to 150	1.16	1.12	1.07	0.91	0.81	0.73
From 185 to 300	1.17	1.12	1.07	0.91	0.80	0.73
From 380 to 1200	1.17	1.12	1.07	0.91	0.80	0.73
Multi - Core Cables						
Up to 16	1.12	1.08	1.05	0.93	0.84	0.77
From 25 to 150	1.14	1.10	1.06	0.92	0.82	0.75
From 185 to 400	1.15	1.10	1.07	0.92	0.81	0.74

In ERA Report 60-30 Part III, the types of load are classified under three headings, viz :

- Type A Cables carrying a constant load throughout the year.
- Type B Cables carrying varying loads, maximum in summer period.
- Type C Cables carrying varying loads, maximum in winter period.

With knowledge of the type of load to be imposed on the cable it is then possible to determine the soil thermal resistivity along the cable route in accordance with recommendations in ERA Report 69-30.


Table 19 : Depth of Laying

Rating factors for depth of laying (to centre of cable or trefoil group of cables).

Depth of Laying m	Up to 50 mm ²	70 mm ² to 300 mm ²	Above 300 mm ²
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
3.00 or more	0.89	0.85	0.82

Table 20 : Group - Single Core


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

Number of Circuits						
	Touching		Spacing			
	Trefoil	Laid Flat	0.15 m	0.30 m	0.45 m	0.60 m
2	0.78	0.81	0.83	0.88	0.91	0.93
3	0.66	0.70	0.73	0.79	0.84	0.87
4	0.61	0.64	0.68	0.73	0.81	0.85
5	0.56	0.60	0.64	0.73	0.79	0.85
6	0.53	0.57	0.61	0.71	0.78	0.82

* This configuration, at 0.15m spacing, may not be practical for the larger size cables

Table 21 : Group - Multi Core

Group rating factors for multicore cables in horizontal formation.

Number of Cables in Group					
	Spacing				
	Touching	0.15 m	0.30 m	0.45 m	0.60 m
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

Rating Factors For Cables Installed in Ducts

Rating Factors

The term ducts applies to single way earthenware, fibre or ferrous pipes.

Table 22 : Ducts Dimensions

Recommended ducts dimensions and cable sizes

Cable Overall Diameter	Duct	
	Inside Diameter	Outside Diameter
mm	mm	mm
Up to and including 65	100	130
Above 65 up to and including 90	125	160

Ratings for cables installed in single way ducts, underground, have been based on values soil temperature and soil thermal resistivity which are generally representative of conditions in the United Kingdom. Rating factors to take account of variation in ground temperatures are given with the current rating tables.

Where conditions of operation can be fairly accurately estimated, and knowledge of the soil along the route is available, it is possible to determine the ratings more precisely by the use of the soil thermal resistivity factors, grouping factors, and factors for the depths of laying given in Table 22 to 26. These factors are more fully tabulated in ERA Report 69-30 Part III Tables 72-80.

Table 23 : Soil

Rating factors for variation in thermal resistivity of soil (average values).

Size of Cables mm ²	Soil Thermal Resistivity in Km / W					
	0.8	0.9	1.0	1.5	2.0	2.5
Single - Core cables						
Up to 150	1.10	1.07	1.04	0.94	0.86	0.80
From 185 to 300	1.11	1.08	1.05	0.93	0.85	0.79
From 380 to 1200	1.12	1.08	1.05	0.93	0.84	0.78
Multi - Core cables						
Up to 16	1.04	1.03	1.02	0.97	0.92	0.88
From 25 to 150	1.06	1.04	1.03	0.95	0.90	0.85
From 185 to 400	1.07	1.05	1.03	0.95	0.88	0.83

In ERA Report 60-30 Part III, the types of load are classified under three headings, viz :

Type A Cables carrying a constant load throughout the year.

Type B Cables carrying varying loads, maximum in summer period.

Type C Cables carrying varying loads, maximum in winter period.

With knowledge of the type of load to be imposed on the cable it is then possible to determine the soil thermal resistivity along the cable route in accordance with recommendations in ERA Report 69-30.

Table 24 : Depth of Laying

Rating factors for depth of laying
(to centre of cable or trefoil group of cables).

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 25 : Group - Single Core

Group rating factors for single core cables, in trefoil single way ducts, horizontal formation.



Number of Circuits			
	Spacing		
	Touching	0.45 m	0.60 m
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 26 : Group - Multi Core

Group rating factors for multicore cables in single way ducts, horizontal formation.

Number of Ducts in Group				
	Spacing			
	Touching	0.30 m	0.45 m	0.60 m
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

Shorts Circuit Rating For One Second For PVC / XLPE / LSOH Insulated Cables With Copper Conductor

Table 27 : Short Circuit Rating For One Second

Nominal Area of Conductor mm ²	Short Circuit Rating For One Second (KA)	
	XLPE or LSOH Insulated Cables	PVC Insulated Cables
1.5	0.2145	0.1725
2.5	0.3575	0.2875
4	0.5720	0.4600
6	0.8580	0.6900
10	1.4300	1.1500
16	2.2880	1.8400
25	3.5750	2.8750
35	5.0050	4.0250
50	7.1500	5.7500
70	10.0100	8.0500
95	13.5850	10.9250
120	17.1600	13.8000
150	21.4500	17.2500
185	26.4550	21.2750
240	34.3200	27.6000
300	42.9000	34.5000
400	57.2000	46.0000
500	71.5000	57.5000
630	90.0900	72.4500
800	114.4000	92.0000
1000	143.0000	115.0000

The above rating is calculated using the following formula :

XLPE or LSOH Insulated Cables	PVC Insulated Cables
$I = \frac{0.143 S}{\sqrt{T}} \text{ KA}$	$I = \frac{0.115 S}{\sqrt{T}} \text{ KA}$

Where
 I = Short circuit rating (KA)
 S = Conductor area (mm²)
 T = Duration of short circuit (sec)

Basic conditions for short circuit calculation :

Before short circuit conductor temperature is assumed to be 90 °C (XLPE or LSOH) or 70 °C (PVC) and short circuit temperature 250 °C (XLPE or LSOH) or 160 °C / 140 °C * (PVC). Above ratings are based on fault duration (Symmetrical short circuit) of one second.

* = Above 300 mm²

Note : For other periods, divide the above tabulated values by the square root of the time in seconds

Technical Information

Table 28 : Maximum Conductor Resistances

Maximum resistance of class 2 plain stranded copper conductor at 20 °C

Nominal Area of Conductor	Maximum Conductor Resistance at 20 °C
mm ²	Ohm / Km
0.5	36.0
0.75	24.5
1.0	18.1
1.5	12.1
2.5	7.41
4	4.61
6	3.08
10	1.83
16	1.15
25	0.727
35	0.524
50	0.387

Nominal Area of Conductor	Maximum Conductor Resistance at 20 °C
mm ²	Ohm / Km
70	0.268
95	0.193
120	0.153
150	0.124
185	0.0991
240	0.0754
300	0.0601
400	0.0470
500	0.0366
630	0.0283
800	0.0221
1000	0.0176

Table 29 : Correction Factors For Temperature

Correction factors for calculating resistances at other temperature from the value at 20 °C

Temperature (°C)	Correction Factor
10	0.9607
11	0.9646
12	0.9686
13	0.9725
14	0.9764
15	0.9804
16	0.9843
17	0.9882
18	0.9921
19	0.9961
20	1.0000
21	1.0039
22	1.0079
23	1.0118
24	1.0157
25	1.0197

Temperature (°C)	Correction Factor
30	1.0393
35	1.0589
40	1.0786
45	1.0982
50	1.1179
55	1.1375
60	1.1572
65	1.1768
70	1.1965
75	1.2161
80	1.2358
85	1.2555
90	1.2751
650	3.4759
750	3.8689
950	4.6549

Note : The value of correction factors are based on a resistance - temperature co-efficient of 0.00393 per °C at 20 °C

Technical Information

Selection of Cable Based on Volt Drops & Current-Carrying Capacity

Voltage drop is normally only of importance for cables of voltage rating not exceeding 600/1000 volts. If the voltage drop is to be in compliance with regulation of the CP5 / IEE Wiring Regulations, then the voltage drop for any particular cable run must be such that the total voltage drop in the circuit of which the cable forms a part does not exceed 4 percent of the nominal voltage, i.e. 9.2 volts for a single phase 230 volt supply and 16.6 volts for a three phase 415 volt supply.

Since the actual power factor of the load is usually not known, the most practical approach to the question of the voltage drop is to assume the worst conditions, i.e. power factor equal to one and the conductor is at maximum operating temperature. The voltage drop value given in the tables are based on these assumptions and tabulated for a current of 1 amp for a 1 metre run, i.e. for a distance of 1 metre along the route taken by the cables, and represent the result of the voltage drops in all the circuit conductors. For balanced three phase a.c. circuits, the values relate to the line voltage. For any given run, the values need to be multiplied by the length of the run (in meters) and by the current (in amps) that the cables are to carry.

Voltage drop can be calculated using the following formulas :

- $V_{max} = 4\% \times \text{supply voltage} \dots\dots\dots (1)$
- $V_d = \frac{V_{max} \times 1000}{I \times L} \dots\dots\dots (2)$
- $V_{ds} \leq V_d \dots\dots\dots (3)$
- $V_t = \frac{V_{ds} \times I \times L}{1000} \dots\dots\dots (4)$

Where

- I = Current (A)
- L = Length of cable installed (m)
- V_{max} = Max. permissible volt drop in the circuit (V)
- V_d = Max. volt drop in the circuit (mV/A/m)
- V_{ds} = Volt drop of the selected cable (mV/A/m)
- V_t = Total volt drop in the circuit (V)

Example :

Consider a route of 200 metres of cable to be laid direct in ground and to carry a 100 amp load, the supply voltage being 415 V, three phase a.c. and the cable to be copper conductor, XLPE insulated armoured.

1. $V_{max} = \text{Max. permissible volt drop in the circuit} = 4\% \times 415 \text{ V} = 16.6 \text{ V}$
2. $V_d = \text{Max. volt drop in the circuit} = \frac{16.6 \times 1000}{100 \times 200} = 0.83 \text{ mV/A/m}$
3. Select a cable from Table 17, such that the V_{ds} value is equal to, or less than V_d the 0.83 mV/A/m calculated, at the same time ensuring that it will carry the current. It will be seen that this value (V_{ds}) is 0.61 mV/A/m giving a cable size of 70 mm²
4. $V_t = \text{Total volt drop in the circuit} = \frac{0.61 \times 100 \times 200}{1000} = 12.2 \text{ V}$

Selection of Cable Exposed to Fire Condition Based on Conductor Resistance

Conductor resistance of cable is suddenly increased as the cable is subjected to the flame in case of fire condition and conductor resistance at 750 °C is 3.87 times as large as the one at 20 °C.

(For other temperatures, refer to Table 29)

Accordingly, voltage drop is also increased that much.

In case of selecting the size of cable exposed to fire condition, calculate R_o using the formula shown in the right and select the size of cable based on the value shown in Table 28 which shall be not more than R_o calculated by the formula.

$$R_o \leq \frac{V_{max}}{K I} \times \frac{1}{L \left[1 + (F - 1) \frac{L_1}{L} \right]} \times 10^3 \text{ (} \Omega / \text{ Km)}$$

Where

- R_o = Conductor resistance at 20 °C ($\Omega / \text{ Km}$)
- V_{max} = Max. permissible volt drop in the circuit (V)
- K = Factor according to wiring
Single phase 2 cores, $K = 2$
Three phase 3 cores, $K = \sqrt{3}$
- I = Current (A)
- L = Length of cable installed (m)
- L_1 = Length of cable subjected to the flame (m)
- F = Correction factor (Table 29)

Technical Information

Table 30 : Minimum Bending Radius

For safety installation without damaging electrical and physical properties, the tabulated minimum bending radius must be observed.

Type of Cables	Construction	Overall Diameter (mm)		Min. Bending Radius	
		Single-core	Multi-core	Single-core	Multi-core
PVC Insulated Power Cables	Unarmoured For Fixed Wiring	25 ≤ D	25 ≤ D	3D	4D
		D > 25	D > 25	6D	6D
	Unarmoured / Armoured	Any		6D	
XLPE or LSOH Insulated Power Cables	Any	Any		8D	
All Fire Resistant Cables	Any	Any		8D	

Note : D means the overall diameter of the cable

Side Wall Pressure to Cable

Permissible maximum side wall pressure to the cable at bending point during installation is 500 kgf / m.

$$\begin{aligned} \text{Side Wall Pressure to Cable} &= \frac{\text{Pulling Tension (kgf)}}{\text{Bending Radius (m)}} \\ &= \frac{T}{R} \end{aligned}$$

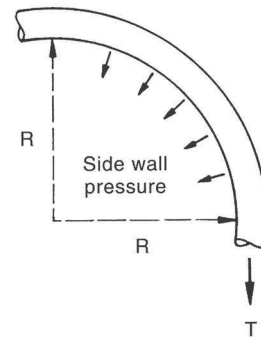


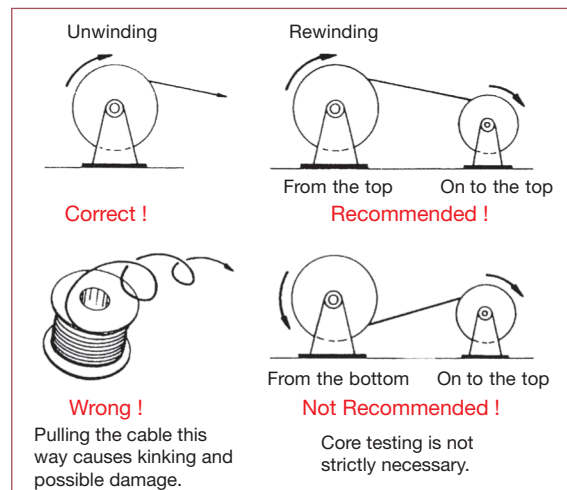
Table 31 : Permissible Maximum Pulling Tension (T)

Conductor	Maximum Pulling Tension (Kgf)
Copper	7 x No. of Core x Nominal Area of Conductor

Drum Handling

Handling the drum with care !
It is always recommended and a must with heavy drums -

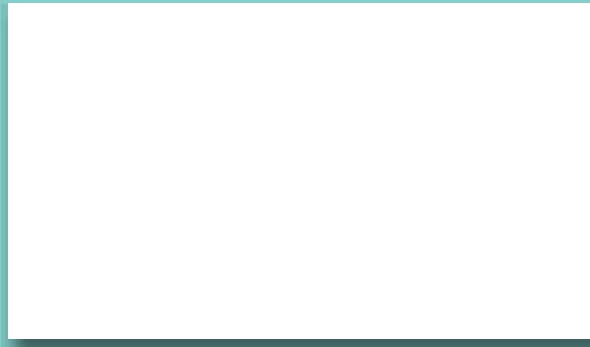
- To lift drums with a fork-life truck or a crane when removing them from the vehicle.
- Always take care to lower the drums into an upright position on their flanges.



Application Standards

S/N	Standard Number	Description
1	IEC 60502 -1	Power cables with extruded insulation and their accessories for rated voltages from 1 kV ($U_m = 1.2 \text{ kV}$) upto 30 kV ($U_m = 36 \text{ kV}$) - Part 1 : Cables for rated voltages of 1 kV ($U_m = 1.2 \text{ kV}$) and 3 kV ($U_m = 3.6 \text{ kV}$)
2	BS 6724	Electric cables - Thermosetting insulated, armoured cables for voltages of 600/1000 V and 1900/3300 V, having low emission of smoke and corrosive gases when affected by fire-Specification
3	BS 7846	Electric cables - Thermosetting insulated, armoured, fire-resistant cables of rated voltage 600/1000 V, having low emission of smoke and corrosive gases when affected by fire-Specification
4	BS7211	Electric cables - Thermosetting insulated and Thermoplastic sheathed cables for votages up to and including 450/750 V for electric power and lighting and having low emission of smoke and corrosive gases when affected by fire
5	BSEN 50525-3-41	Electric Cables - Low voltage energy cables of rated voltages up to and including 450/750 V (U ₀ /U) Part 3-41: Cables with special fire performance - Single core non - sheathed cables with halogen-free crosslinked insulation, and low emission of smoke
6	BS EN 50288-7	Multi-element metallic cables used in analogue and digital communication and control. Part 7: Sectional specification for instrumentation and control cables
7	BS EN 50525-2-31	Electric cables. Low voltage energy cables of rated voltages up to and including 450/750 V (U ₀ /U). Part 2-31: Cables for general applications. Single core non-sheathed cables with thermoplastic PVC insulation
8	BS 6004	Electric cables-PVC insulated and PVC sheathed cables for voltages up to and including 300/500 V,for electric power and lighting
9	SS 358 Part 3 (IEC 60227 Part 3)	Polyvinyl Chloride insulated cables of rated voltages up to and including 450/750 V Part 3 : Non-sheathed cables for fixed wiring
10	SS 299	Performance requirements for cables required to maintain circuit integrity under fire conditions Category C : fire test alone at 950 °C for 3 hours Category W : fire with water Category Z : fire with mechanical shock at 950 °C
11	BS6387	Test Method for resistance to fire of cables required to maintain circuit integrity under fire conditions
12	IEC 60331 Part 21	Tests for electric cables under fire conditions - Circuit integrity - Part 21 : Procedures and requirements - Cables of rated voltage up to and including 0.6/1.0 kV
13	IEC60332-1-2	Tests on electric and optical fibre cables under fire conditions - Part 1-2 : Test for vertical flame propagation for a single insulated wire or cable - Procedure for 1kW pre-mixed flame
14	IEC 60332 Part 3	Tests on electric and optical fibre cables under fire conditions - Part 3 : Test for vertical flame spread of vertically - mounted bunched wires or cables
15	IEC 60754 Part 1	Test on gases evolved during combustion of materials from cables - Part 1 : Determination of the amount of halogen and gas
16	IEC 60754 Part 2	Test on gases evolved during combustion of electric cables - Part 2 : Determination of degree of acidity of gases evolved during the combustion of materials taken from electric cables by measuring PH and conductivity
17	IEC 61034 Part 1 & 2	Measurement of smoke density of electric cables burning under defined conditions
18	ASTM D 2863	Measuring the minimum oxygen concentration to support candle-like combustion of plastics (Oxygen Index)

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