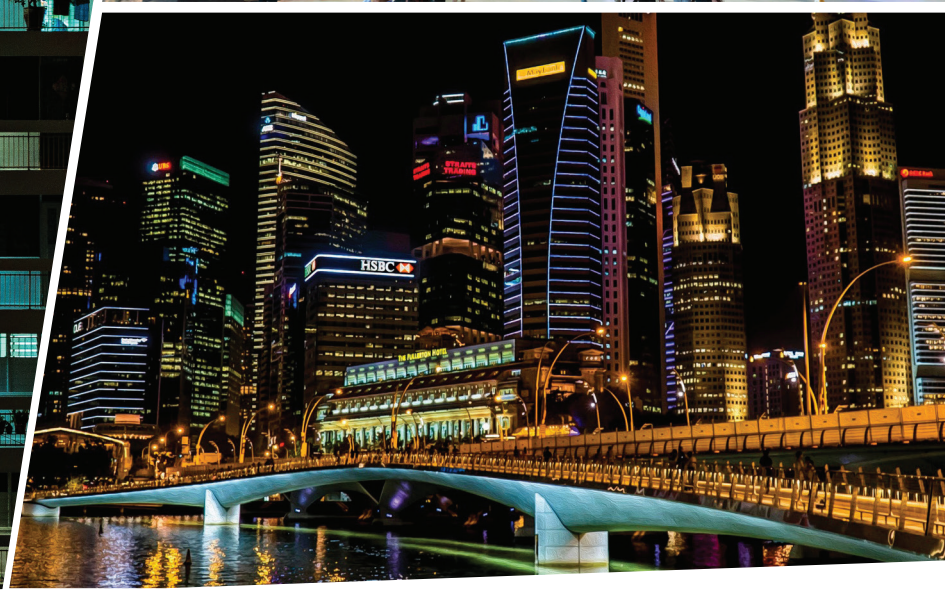
Prysmian Group

Fire Performance Cables



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Prysmian Group

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PRYSMIAN

Draka

General Cable

World leader in energy and telecom cables & systems

With nearly 140 years of experience, sales of over €11 billion in 2017, 30,000 employees across 50 countries and 112 plants, the Prysmian Group is strongly positioned in high-tech markets and offers the widest possible range of products, services, technologies and know-how.

Through three renowned commercial brands - **Prysmian, Draka and General Cable** – which are distributed globally, we're constantly close to our customers, enabling them to further develop the world's energy and telecoms infrastructures, and achieve sustainable, profitable growth.


Marina Bay Sands, Singapore


Petronas Twin Towers, Kuala Lumpur


Hanoi Museum, Hanoi


Suvarnabhumi International Airport, Bangkok

Prysmian Group in ASEAN

Prysmian Group ASEAN operates with 7 plants in Malaysia, Indonesia, Philippines and Thailand, as well as a regional distribution centre in Singapore that serves the Energy, Infrastructure and Telecom markets in the region.

From creating a new system to address complex cable-fitting of the Marina Bay Sands, to providing European expertise on unprecedented submarine cable projects in South Vietnam, a rigorous culture of innovation is core to the Prysmian business.

With a robust physical presence and our innovative edge, the group is poised to take on the rapidly growing ASEAN market.

Prysmian Group

OUR CORPORATE BRAND

One name that represents our global presence and what we stand for.

PRYSMIAN

Draka

General Cable

OUR COMMERCIAL BRANDS

Strong, reliable and familiar. Prysmian, Draka & General Cable products resonate greatly within the industry and has been doing so for decades.

Our Strengths and Businesses

UTILITIES

- **Power Transmission**
  - Underground EHV, HV-DC/AC
  - Submarine (turn-key) EHV - DC/AC
  (extruded, mass impregnated and SCFF) and MV
- **Power Distribution**
  - LV, MV (P-Laser)
- **Network Components**
  - Joints, connectors and terminations from LV to EHV

TRADE & INSTALLERS

- **LV cables for construction**
  - Fire Performance
  - Environment-Friendly standards
  - Low Smoke Halogen Free (LSHF)
  - Application-specific products

INDUSTRIAL

- **Specialities & OEM**
  - (rolling stock, nuclear, defence, crane, mining, marine, electro medical, railway, other infrastructure)
- **Automotive**
- **OGP & SURF**
- **Renewables**
- **Elevator**
- **Other industrial (aviation, branchment, other)**

TELECOM

- **Telecom solutions**
  - Optical fibre
  - Connectivity
  - OPGW
  - Copper cable
- **Multimedia solutions**
  - Datacoms & Structure Cablings Solutions
  - Multimedia specials
  - Mobile networks
  - Signalling
- **Optical Fibre**

Contents

— Fire Performance Cables by Prysmian Group —

2018 Edition

Fire Demands Performance

In any infrastructure, safety features designed to mitigate loss of human life and damage to property are not just required by regulations worldwide, but represent the gold standard in construction. One of these staple features supplied by Prysmian are Fire Performance cables, which connect critical building systems such as fire alarms, emergency lighting, PA & CCTV systems, emergency power supplies and smoke & fire shutters.

Fire Performance cables are crucial in an emergency situation, ensuring that under mechanical stress and high heat, these systems will continue to operate to effectively conduct an orderly evacuation of the premise and aid emergency services in gaining quick & effective entry to deal with the hazard.

Prysmian Group has been manufacturing the widest range of industry-leading Fire Performance cables, known as MAX FOH™ in ASEAN, for over twenty years.

Prysmian Means Performance

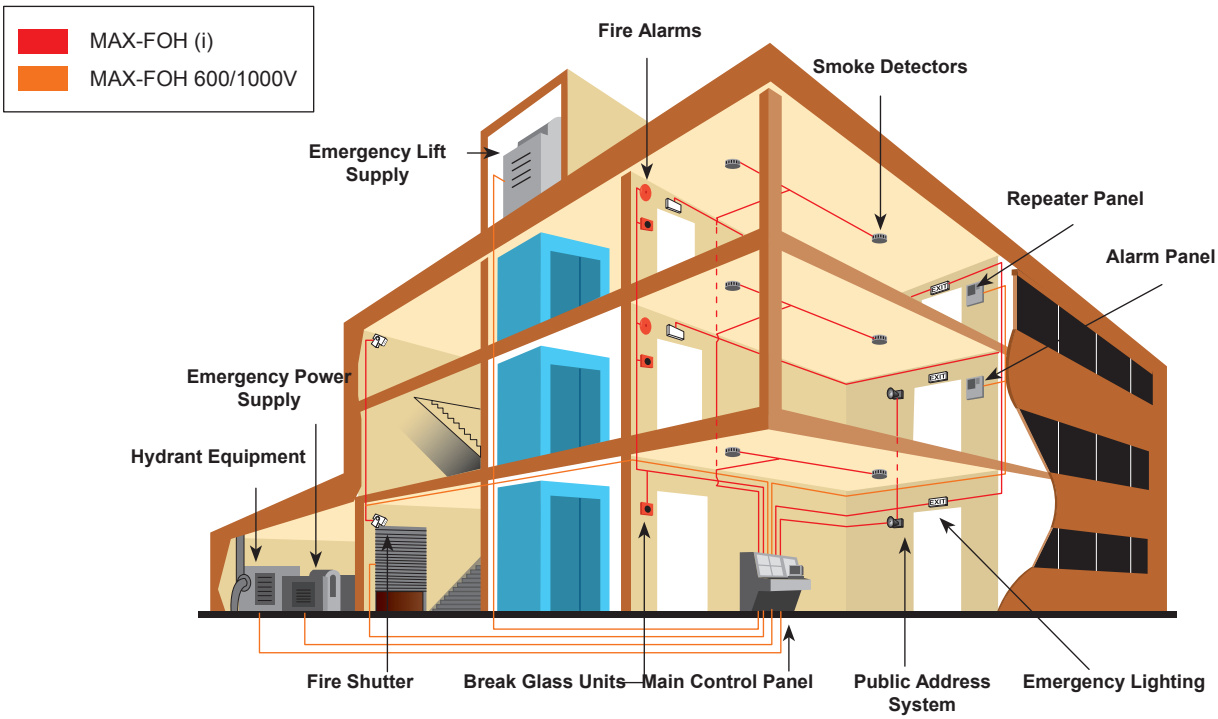
6 advantages of buying MAX-FOH over OEM & substitutes:

1. **Original manufacturer certification** eliminates OEM-related problems like consistency and warranty.
2. **Full-sized conductors, insulation and sheathing** are used; that means no cutting corners with cheaper undersized ones.
3. **Multi-layered Mica fire barrier tape** meets industry standards, exceeds those of competitor makes.
4. Insulated by **Low Smoke Halogen Free (LSHF) material, an industry standard** for flame retardant cables.
5. Only the **best flame and smoke suppressants** are used. Cheap polymers save cost, but are not worth the **safety risk**.
6. All MAX-FOH products undergo **recognised 3rd party standards and approvals**, meeting various International Electrotechnical Commission and British Standards.

Prysmian & Draka Cables, Flame Propagation Test

Generic Cables

Applications

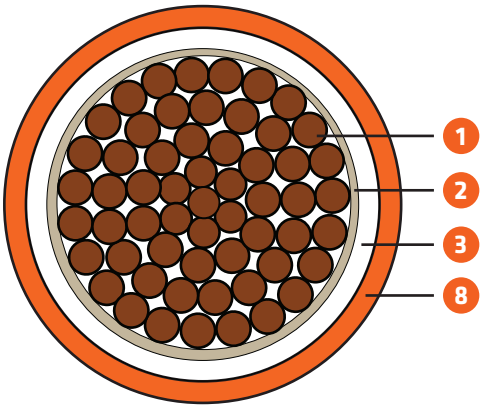


MAX-FOH cables are specially designed to facilitate a quick and orderly evacuation of the building occupants in the event of an emergency. Purpose-designed to maintain circuit integrity within a system of critical safety devices from emergency power supply to fire alarms, MAX-FOH cables are a vital component of building safety.

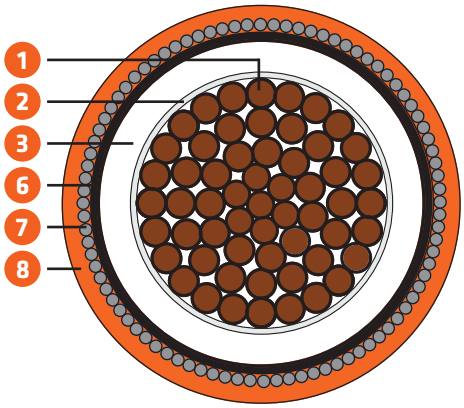
The special characteristics of the MAX-FOH range make it suitable for an almost infinite number of applications and environments.

The diagram below illustrates common safety systems in a building which should be fitted with MAX-FOH cables.

Construction of Cable



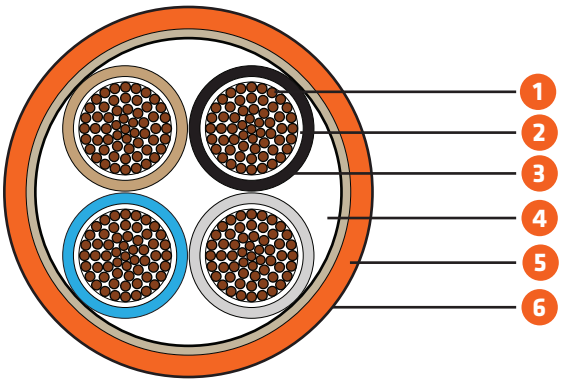
SINGLE CORE, UNARMOURED



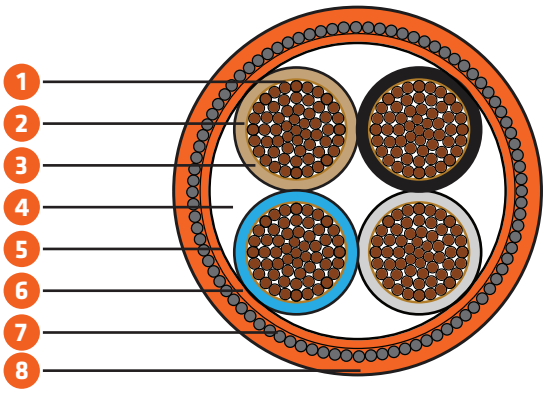
SINGLE CORE, ARMOURED

#	1	2	3	4*	5*	6*	7*	8*
Construction	Conductor	Fire Barrier	Insulation	Filler	Binder Tape	Bedding	Armour	Sheath
Material	Stranded Annealed Copper	Mica Tape	Low Smoke Halogen-Free (LSHF) / Crosslinked Polyethylene (XLPE) compound	LSHF or Polypropylene Split Yarn	Polyester	LSHF compound	Galvanised Steel or Aluminium Wire (Braiding Optional)	LSHF compound

*optional to cable construction



MULTI-CORE, UNARMOURED



MULTI-CORE, ARMOURED

Core Identification

Core Numbers	1	2	3	4	5	6 and above
Colour configurations	White	or	or	or	or	Black with white numbers

These are standard configurations. Customisations to any component is available upon request.

Standards and Approvals

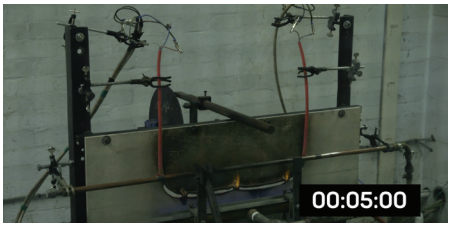
Draka cables are certified by multiple internationally recognised cable standards.
Here are the listed IEC, SS and BS standards categorised by type of fire test.

Fire Resistance Tests

These tests are used to determine if a cable is capable of maintaining circuit integrity under:

Fire

Fire with water



Fire with mechanical shock

These tests use a number of alternative time and temperature parameters and depending on the level achieved by the cable, a corresponding letter is assigned to denote the category that the cable passes.

Standard	Part / Category	Resistance to	Temperature	Time
IEC 60331	60331-21	Fire	750°C	At least 90 mins
	60331-1	Fire	850°C	At least 120 mins
BS 6387 : 2013	Protocol C	Fire	950°C	For 3 hours
	Protocol W	Fire & Water	650°C	**Fire** for 15 minutes **Fire and water** for 15 minutes
	Protocol Z	Fire with Mechanical Shock	950°C	For 15 minutes, with 30 second hammer blows
SS299 : Part 1	Category C	Fire	950°C	For 3 hours
	Category W	Fire & Water	650°C	**Fire** for 15 minutes **Fire and water** for 15 minutes
	Category Z	Fire with Mechanical Shock	950°C	For 15 minutes, with 30 second hammer blows

Flame Propagation Tests

This test defines the ability of bunched cables to restrict vertical flame propagation when laid in trunking, cable trays or conduit. The test comprises of 4 categories each determined by the amount of combustible material in a 1 metre sample.

The cable samples are placed vertically next to one another on a vertical ladder where they are exposed to fire from a ribbon gas burner for the pre-arranged times.

After burning, the samples are cleaned to examine for char (the crumbling) on the cable surface. The charring should not have reached a height exceeding 2.5m above the bottom edge of the burner.

Standard	Single / Bunched	Standard & Category	Amount of Combustible Material in 1 metre Sample in Litres	Time of Exposure in Minutes
IEC	Single	60332-1-2	-	-
	Bunched	60332-3-22 Category A	7.0	40
	Bunched	60332-3-22 Category B	3.5	40
	Bunched	60332-3-24 Category C	1.5	20
	Bunched	60332-3-25 Category D	0.5	20
BS	Single	EN 60332-1-2	-	-
	Bunched	EN 60332-3-22 Category A	7.0	40
	Bunched	EN 60332-3-23 Category B	3.5	40
	Bunched	EN 60332-3-24 Category C	1.5	20
	Bunched	EN 60332-3-25 Category D	0.5	20

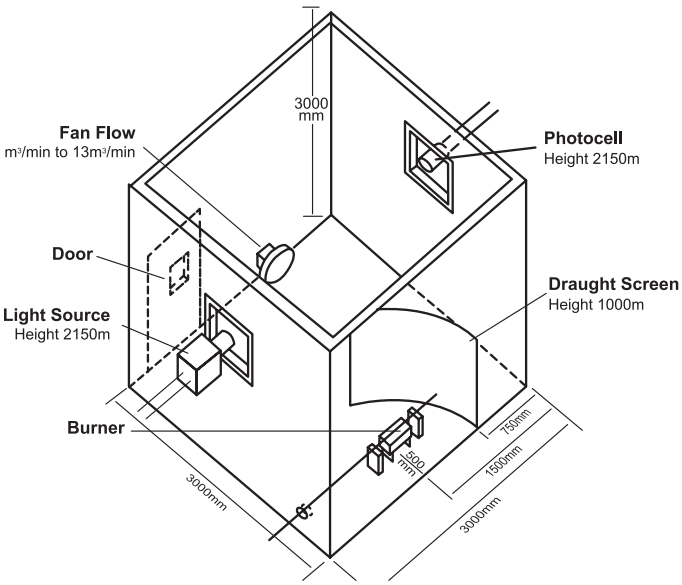
Corrosive & Acid Gas Emission Test

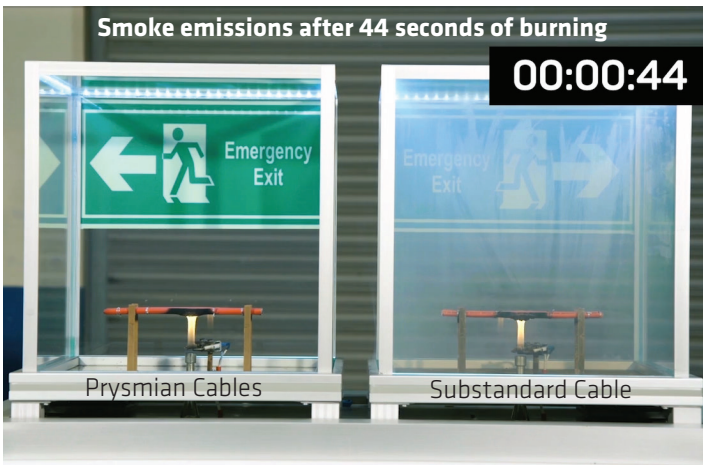
To address the concerns of toxic acid gases which could be produced when cables are burnt, this international test was developed to determine the amount of gas evolved by burning cables.

The recommended values of the test state that the weighted pH value should be more than 4.3, with relation of 1 litre of water. The weighted value of conductivity should not exceed 10µS/cm.

Standard	Test Item	Standard	Requirement
IEC	Acid Gas Emission	60754-1 60754-2	≤ 0.5% HCl
	Fluorine Content	60684-2	≤ 0.1%
	pH Conductivity	EN 60754-2	pH ≥ 4.3 Conductivity ≤ 10 µ S/mm
BS	Corrosive & Acid Gas	EN 60754-1 EN 60754-2	≤ 0.5% HCl

Smoke Emission Tests





The test is aimed at determining the density of smoke in the process of cable burning under defined conditions.

Standard	Standard	Requirement
IEC	61034-2	≥ 60%

FireTUF Classic MI SIFER (i)

0.6 / 1kV

Insulated, non-sheathed

Conductor
- Stranded Plain Annealed
- Class 2
- Circular or compact

Insulation
XLEVA Compound (OHLS)

Fire Barrier
Mica Glass Tape

Application & Features

These cables are designed for drawing into trucking and conduit in installation where a fire situation may pose a major hazard and the maintenance of circuit integrity is a requirement. To achieve optimum performance they should be installed in metal conduit.

Thermal Characteristics

Operating Temperature

-40°C to 110°C

Identification

Insulation colour

Optional Features

UV Resistance

Anti- Termite

Anti- Rodent

Other Sheath colours are available

Bending Radius

Minimum bending radius

8 x overall diameter

Performance Characteristics

Reference Standard:
IEC 60228
BS 6360 (Class 2)

Circuit Integrity:
IEC 60331
BS 6387, C, W & Z

Flame Retardant:
IEC 60332-1,
60332-3, A,
B, C

Acid Gas Emission:
IEC 60754

Smoke Emission:
IEC 61034

Cable Size	Insulation Thickness	Cable Overall Diameter	Cable Weight	Max Conductor Resistance at 20°C
mm²	mm	mm	kg/km	ohm/km
1x1.5	0.7	3.8	28	12.10
1x2.5	0.8	4.4	41	7.41
1x4	0.8	5.0	57	4.61
1x6	0.8	5.5	78	3.08
1x10	1.0	6.8	120	1.83
1x16	1.0	7.8	180	1.15
1x25	1.2	9.6	280	0.727
1x35	1.2	10.8	370	0.524
1x50	1.4	12.6	500	0.387
1x70	1.4	14.3	690	0.268
1x95	1.6	16.6	950	0.193
1x120	1.6	18.1	1100	0.153
1x150	1.8	20.2	1400	0.124
1x185	2.0	22.4	1800	0.0991
1x240	2.2	25.3	2300	0.0754
1x300	2.4	28.4	2900	0.0601
1x400	2.6	31.7	3700	0.047
1x500	2.8	35.3	4700	0.0366
1x630	2.8	39.1	6000	0.0283

FireTUF Classic MI SIFER (s)

0.6 / 1kV
Insulated, sheathed

Sheath
LSHF Compound

Insulation
XLEVA Compound (OHLS)

Fire Barrier
Mica Glass Tape

Conductor
- Stranded Plain Annealed
- Class 2
- Circular or compact

Application & Features

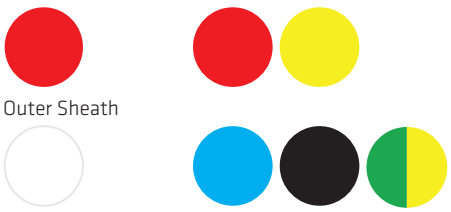
These cables are designed for surface wiring where there is little risk of mechanical damage, in installations where a fire situation may pose a major hazard and the maintenance of circuit integrity is a requirement. They are also suitable for installation in metal conduit or trunking where conditions are onerous.

Thermal Characteristics

Operating Temperature

-40°C to 110°C

Identification



Outer Sheath

Insulation

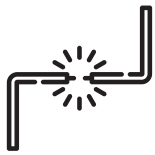
Core Colour

Optional Features

UV Resistance

Anti- Termite

Anti- Rodent



Other Sheath colours are available

Bending Radius

Minimum bending radius

8 x overall diameter

Performance Characteristics

Reference Standard:
IEC 60228
BS 6360 (Class 2)

Circuit Integrity:
IEC 60331
BS 6387, C, W & Z

Flame Retardant:
IEC 60332-1, 60332-3, A, B, C

Acid Gas Emission:
IEC 60754

Smoke Emission:
IEC 61034

Cable Size	Nominal Insulation Thickness	Nominal Insulation Thickness	Approx. Overall Diameter	Approx Weight	Max Conductor Resistance at 20°C	Insulation Resistance at 90°C
mm²	mm	mm	mm	kg/km	Ω/km	MΩ/km
1x1.5	0.7	1.4	6.6	66	12.1	0.0100
1x2.5	0.7	1.4	7.1	79	7.41	0.0090
1x4	0.7	1.4	7.6	100	4.61	0.0070
1x6	0.7	1.4	8.2	125	3.08	0.0065
1x10	0.7	1.4	9.2	177	1.83	0.0065
1x16	0.7	1.4	10.3	244	1.15	0.0050
1x25	0.9	1.4	12.0	357	0.727	0.0050
1x35	0.9	1.4	13.2	463	0.524	0.0040
1x50	1.0	1.4	14.7	599	0.387	0.0045
1x70	1.1	1.4	16.7	825	0.268	0.0035
1x95	1.1	1.5	18.8	1102	0.193	0.0035
1x120	1.2	1.5	20.6	1364	0.153	0.0032
1x150	1.4	1.6	22.7	1671	0.124	0.0032
1x185	1.6	1.7	25.2	2081	0.0991	0.0032
1x240	1.7	1.7	28.0	2670	0.0754	0.0032
1x300	1.8	1.8	30.9	3308	0.0601	0.0030
1x400	2.0	1.9	34.4	4190	0.047	0.0028
1x500	2.2	2.1	38.4	5256	0.0366	0.0028
1x630	2.4	2.2	42.9	6710	0.0283	0.0025

FireTUF Classic MI POWER

0.6/1kV, Unarmoured

Conductor
- Stranded Plain Annealed
- Class 2
- Circular or compact

Sheath
LSHF Compound

Insulation
XLEVA Compound

Fire Barrier
Mica Glass Tape

Application & Features

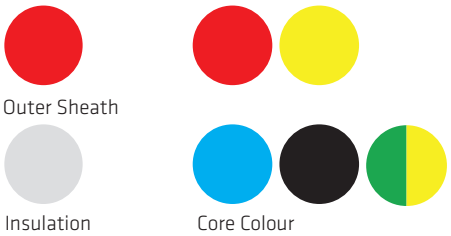
These cables offer the advantages of an unarmoured 600/1000 Volt rated, zero halogen, low smoke cable with enhanced circuit integrity. They are intended for use in installations where vital circuits are required to continue to operate in the event of an outbreak of fire. They are particularly suited for use in public buildings, such as hospitals, theatres, shopping developments, tunnels, mass transit utilities, oil & petrochemcial plants, power stations and computer installations where the danger to life, equipment and structures may be greatly increased in the event of a power failure due to fire.

Thermal Characteristics

Operating Temperature

-40°C to 110°C

Identification



Outer Sheath

Insulation

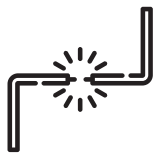
Core Colour

Optional Features

UV Resistance

Anti- Termite

Anti- Rodent



Other Sheath colours are available

Bending Radius

Minimum bending radius

8 x overall diameter

Performance Characteristics

Reference Standard:
IEC 60228
BS 6360 (Class 2)

Circuit Integrity:
IEC 60331
BS 6387, C, W & Z

Flame Retardant:
IEC 60332-1, 60332-3, A, B, C

Acid Gas Emission:
IEC 60754

Smoke Emission:
IEC 61034

Cable Size	Nominal Insulation Thickness	Nominal Sheath Thickness	Classic Enhanced: Approx. Overall Diameter	Classic Enhanced: Approx Weight	Max Conductor Resistance: DC at 20°C	Max Conductor Resistance: AC at 90°C	Reactance at 50Hz	Impedance AC at 90°C
mm²	mm	mm	mm	kg/km	Ω/km	Ω/km	Ω/km	Ω/km
2x1.5	0.7	1.8	11.3	183	12.1	15.428	0.104	15.428
2x2.5	0.7	1.8	12.1	222	7.41	9.448	0.101	9.448
2x4	0.7	1.8	13.2	279	4.61	5.878	0.099	5.878
2x6	0.7	1.8	14.3	347	3.08	3.927	0.094	3.928
2x10	0.7	1.8	16.5	431	1.83	2.333	0.093	2.335
2x16	0.7	1.8	18.6	589	1.15	1.466	0.088	1.469
2x25	0.9	1.8	22.1	863	0.727	0.927	0.082	0.930
2x35	0.9	1.8	24.5	1,112	0.524	0.668	0.077	0.673
2x50	1.0	1.8	27.4	1,438	0.387	0.494	0.076	0.500
2x70	1.1	1.8	31.4	1,967	0.268	0.342	0.075	0.349
2x95	1.1	2.0	35.6	2,629	0.193	0.247	0.074	0.258
2x120	1.2	2.1	39.4	3,265	0.153	0.196	0.072	0.209
2x150	1.4	2.2	43.5	3,990	0.124	0.160	0.073	0.176
2x185	1.6	2.3	48.3	4,952	0.0991	0.128	0.073	0.148
2x240	1.7	2.5	54.3	6,389	0.0754	0.099	0.072	0.122
2x300	1.8	2.6	59.8	7,873	0.0601	0.080	0.072	0.107
2x400	2.0	2.9	67.1	10,011	0.047	0.064	0.071	0.096

FireTUF Classic MI POWER

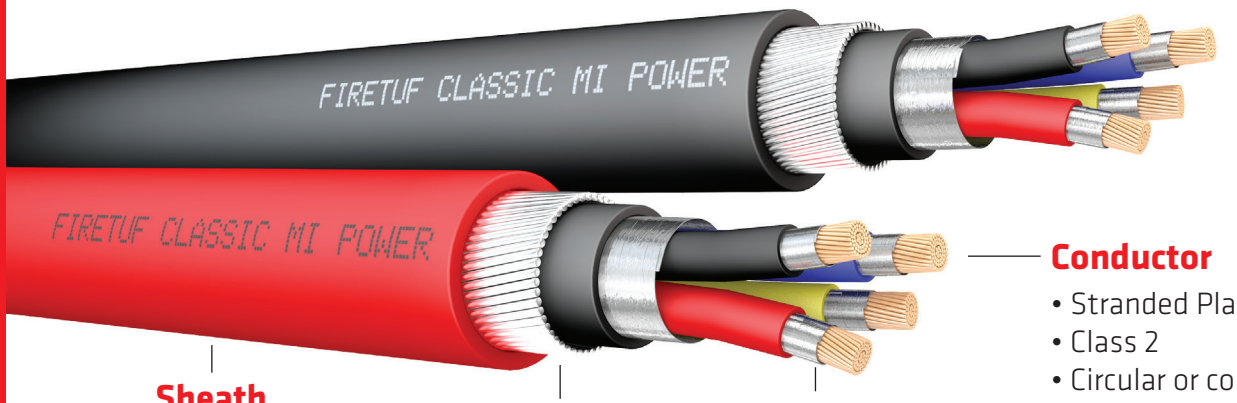
0.6/1kV, Unarmoured

Cable Size	Nominal Insulation Thickness	Nominal Sheath Thickness	Classic Enhanced: Approx. Overall Diameter	Classic Enhanced: Approx Weight	Max Conductor Resistance: DC at 20°C	Max Conductor Resistance: AC at 90°C	Reactance at 50Hz	Impedance AC at 90°C
mm²	mm	mm	mm	kg/km	Ω/km	Ω/km	Ω/km	Ω/km
3x1.5	0.7	1.8	11.9	211	12.1	15.428	0.104	15.428
3x2.5	0.7	1.8	12.8	260	7.41	9.448	0.101	9.448
3x4	0.7	1.8	13.9	322	4.61	5.878	0.099	5.878
3x6	0.7	1.8	15.2	420	3.08	3.927	0.094	3.928
3x10	0.7	1.8	17.6	534	1.83	2.333	0.093	2.335
3x16	0.7	1.8	19.8	746	1.15	1.466	0.088	1.469
3x25	0.9	1.8	23.5	1,099	0.727	0.927	0.082	0.930
3x35	0.9	1.8	26.2	1,430	0.524	0.668	0.077	0.673
3x50	1.0	1.8	29.3	1,940	0.387	0.494	0.076	0.500
3x70	1.1	1.9	33.8	2,698	0.268	0.342	0.075	0.349
3x95	1.1	2.0	38.1	3,594	0.193	0.247	0.074	0.258
3x120	1.2	2.1	42.3	4,471	0.153	0.196	0.072	0.209
3x150	1.4	2.3	46.8	5,498	0.124	0.160	0.073	0.176
3x185	1.6	2.4	52.0	6,838	0.0991	0.128	0.073	0.148
3x240	1.7	2.6	58.5	8,830	0.0754	0.099	0.072	0.122
3x300	1.8	2.8	64.5	10,949	0.0601	0.080	0.072	0.107
3x400	2.0	3.0	72.2	13,875	0.047	0.064	0.071	0.096

Cable Size	Nominal Insulation Thickness	Nominal Sheath Thickness	Classic Enhanced: Approx. Overall Diameter	Classic Enhanced: Approx Weight	Max Conductor Resistance: DC at 20°C	Max Conductor Resistance: AC at 90°C	Reactance at 50Hz	Impedance AC at 90°C
mm²	mm	mm	mm	kg/km	Ω/km	Ω/km	Ω/km	Ω/km
4x1.5	0.7	1.8	12.9	248	12.1	15.428	12.1	15.428
4x2.5	0.7	1.8	13.9	309	7.41	9.448	7.41	9.448
4x4	0.7	1.8	15.2	399	4.61	5.878	4.61	5.878
4x6	0.7	1.8	16.6	512	3.08	3.927	3.08	3.928
4x10	0.7	1.8	19.2	678	1.83	2.333	1.83	2.335
4x16	0.7	1.8	21.8	952	1.15	1.466	1.15	1.469
4x25	0.9	1.8	25.9	1,419	0.727	0.927	0.727	0.930
4x35	0.9	1.8	28.9	1,845	0.524	0.668	0.524	0.673
4x50	1.0	1.8	32.4	2,411	0.387	0.494	0.387	0.500
4x70	1.1	2.0	37.7	3,526	0.268	0.342	0.268	0.349
4x95	1.1	2.2	42.7	4,727	0.193	0.247	0.193	0.258
4x120	1.2	2.3	46.8	5,837	0.153	0.196	0.153	0.209
4x150	1.4	2.4	52.1	7,200	0.124	0.160	0.124	0.176
4x185	1.6	2.6	58.1	8,996	0.0991	0.128	0.0991	0.148
4x240	1.7	2.8	65.3	11,617	0.0754	0.099	0.0754	0.122
4x300	1.8	3.0	72.0	14,402	0.0601	0.080	0.0601	0.107
4x400	2.0	3.3	80.8	18,300	0.047	0.064	0.047	0.096

Cable Size	Nominal Insulation Thickness	Nominal Sheath Thickness	Classic Enhanced: Approx. Overall Diameter	Classic Enhanced: Approx Weight	Max Conductor Resistance: DC at 20°C	Max Conductor Resistance: AC at 90°C	Reactance at 50Hz	Impedance AC at 90°C
mm²	mm	mm	mm	kg/km	Ω/km	Ω/km	Ω/km	Ω/km
7x1.5	0.7	1.8	15.2	329	12.1	15.428	0.104	15.428
10x1.5	0.7	1.8	19.0	460	12.1	15.428	0.104	15.428
12x1.5	0.7	1.8	19.6	518	12.1	15.428	0.104	15.428
16x1.5	0.7	1.8	21.7	658	12.1	15.428	0.104	15.428
20x1.5	0.7	1.8	24.1	796	12.1	15.428	0.104	15.428
21x1.5	0.7	1.8	24.1	826	12.1	15.428	0.104	15.428
30x1.5	0.7	1.8	28.2	1,128	12.1	15.428	0.104	15.428
7x2.5	0.7	1.8	16.4	418	7.41	9.448	0.101	9.448
10x2.5	0.7	1.8	20.7	586	7.41	9.448	0.101	9.448
12x2.5	0.7	1.8	21.3	674	7.41	9.448	0.101	9.448
16x2.5	0.7	1.8	23.6	855	7.41	9.448	0.101	9.448
20x2.5	0.7	1.8	26.3	1,038	7.41	9.448	0.101	9.448
21x2.5	0.7	1.8	26.3	1,078	7.41	9.448	0.101	9.448
30x2.5	0.7	1.8	30.9	1,485	7.41	9.448	0.101	9.448

FireTUF Classic MI POWER
0.6/1kV, Armoured



Conductor
- Stranded Plain Annealed
- Class 2
- Circular or compact

Sheath
LSHF Compound

Insulation
XLEVA Compound

Fire Barrier
Mica Glass Tape

Application & Features

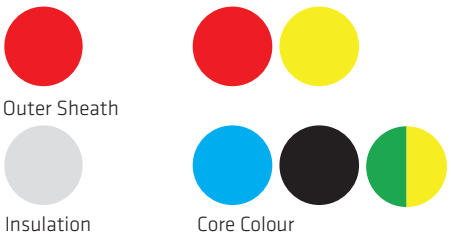
These cables offer the advantages of an unarmoured 600/1000 Volt rated, zero halogen, low smoke cable with enhanced circuit integrity. They are intended for use in installations where vital circuits are required to continue to operate in the event of an outbreak of fire. They are particularly suited for use in public buildings, such as hospitals, theatres, shopping developments, tunnels, mass transit utilities, oil & petrochemcial plants, power stations and computer installations where the danger to life, equipment and structures may be greatly increased in the event of a power failure due to fire.

Thermal Characteristics

Operating Temperature

-40°C to 110°C

Identification



Outer Sheath

Insulation

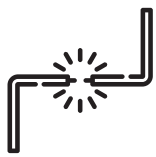
Core Colour

Optional Features

UV Resistance

Anti- Termite

Anti- Rodent



Other Sheath colours are available

Bending Radius

Minimum bending radius

10 x overall diameter

Performance Characteristics

Reference Standard:
IEC 60228
BS 6360 (Class 2)

Circuit Integrity:
IEC 60331
BS 6387, C, W & Z

Flame Retardant:
IEC 60332-1, 60332-3, A, B, C

Acid Gas Emission:
IEC 60754

Smoke Emission:
IEC 61034

Cable Size	Nominal Insulation Thickness	Nominal Bedding Thickness	Nominal Armour Wire Dia.	Nominal Sheath Thickness	Nominal Dia. under Armour	Approx. Overall Diameter	Approx Cable Weight	Max Conductor Resistance DC at 20°C	Max Conductor Resistance AC at 90°C	Reactance at 50Hz	Impedance AC at 90°C
mm²	mm	mm	mm	mm	mm	mm	kg/km	Ω/km	Ω/km	Ω/km	Ω/km
2x1.5	0.7	1.0	0.9	1.8	11.5	15.1	445	12.1	15.428	0.104	15.428
2x2.5	0.7	1.0	0.9	1.8	12.3	15.9	504	7.41	9.448	0.101	9.448
2x4	0.7	1.0	0.9	1.8	13.4	17.0	587	4.61	5.878	0.099	5.878
2x6	0.7	1.0	0.9	1.8	14.5	18.1	682	3.08	3.927	0.094	3.928
2x10	0.7	1.0	1.25	1.8	17.4	21.0	936	1.83	2.333	0.093	2.335
2x16	0.7	1.0	1.25	1.8	19.5	23.1	1,156	1.15	1.466	0.088	1.469
2x25	0.9	1.0	1.6	1.8	23.7	27.3	1,688	0.727	0.927	0.082	0.930
2x35	0.9	1.0	1.6	1.8	26.1	29.7	2,016	0.524	0.668	0.077	0.673
2x50	1.0	1.0	1.6	1.9	29.0	32.8	2,472	0.387	0.494	0.076	0.500
2x70	1.1	1.0	1.6	2.0	33.0	37.0	3,159	0.268	0.342	0.075	0.349
2x95	1.1	1.2	2.0	2.1	38.0	42.2	4,286	0.193	0.247	0.074	0.258
2x120	1.0	1.2	2.0	2.2	41.6	46.0	5,106	0.153	0.196	0.072	0.209
2x150	1.4	1.2	2.0	2.4	45.5	50.3	6,013	0.124	0.160	0.073	0.176
2x185	1.6	1.4	2.5	2.5	51.5	56.5	7,766	0.0991	0.128	0.073	0.148
2x240	1.7	1.4	2.5	2.7	57.1	62.5	9,540	0.0754	0.099	0.072	0.122
2x300	1.8	1.6	2.5	2.9	62.8	68.6	11,412	0.0601	0.080	0.072	0.107

FireTUF Classic MI POWER

0.6/1kV, Armoured

Cable Size	Nominal Insulation Thickness	Nominal Bedding Thickness	Nominal Armour Wire Dia.	Nominal Sheath Thickness	Nominal Dia. under Armour	Approx. Overall Diameter	Approx Cable Weight	Max Conductor Resistance DC at 20°C	Max Conductor Resistance AC at 90°C	Reactance at 50Hz	Impedance AC at 90°C
mm²	mm	mm	mm	mm	mm	mm	kg/km	Ω/km	Ω/km	Ω/km	Ω/km
3x1.5	0.7	1.0	0.9	1.8	12.1	15.7	492	12.1	15.428	0.104	15.428
3x2.5	0.7	1.0	0.9	1.8	13.0	16.6	560	7.41	9.448	0.101	9.448
3x4	0.7	1.0	0.9	1.8	14.1	17.7	660	4.61	5.878	0.099	5.878
3x6	0.7	1.0	0.9	1.8	16.1	19.7	889	3.08	3.927	0.094	3.928
3x10	0.7	1.0	1.25	1.8	18.5	22.1	1,075	1.83	2.333	0.093	2.335
3x16	0.7	1.0	1.25	1.8	20.7	24.3	1,349	1.15	1.466	0.088	1.469
3x25	0.9	1.0	1.25	1.8	25.1	28.7	1,965	0.727	0.927	0.082	0.930
3x35	0.9	1.0	1.6	1.8	27.8	31.4	2,392	0.524	0.668	0.077	0.673
3x50	1.0	1.0	1.6	1.9	30.9	34.7	3,035	0.387	0.494	0.076	0.500
3x70	1.1	1.0	1.6	2.1	36.4	40.6	4,310	0.268	0.342	0.075	0.349
3x95	1.1	1.2	2.0	2.2	40.5	44.9	5,394	0.193	0.247	0.074	0.258
3x120	1.0	1.2	2.0	2.3	44.5	49.1	6,458	0.153	0.196	0.072	0.209
3x150	1.4	1.2	2.5	2.5	50.0	55.0	8,220	0.124	0.160	0.073	0.176
3x185	1.6	1.4	2.5	2.6	55.0	60.2	9,846	0.0991	0.128	0.073	0.148
3x240	1.7	1.4	2.5	2.8	61.5	67.1	12,282	0.0754	0.099	0.072	0.122
3x300	1.8	1.6	2.5	3.0	67.1	73.1	14,744	0.0601	0.080	0.072	0.107

Cable Size	Nominal Insulation Thickness	Nominal Bedding Thickness	Nominal Armour Wire Dia.	Nominal Sheath Thickness	Nominal Dia. under Armour	Approx. Overall Diameter	Approx Cable Weight	Max Conductor Resistance DC at 20°C	Max Conductor Resistance AC at 90°C	Reactance at 50Hz	Impedance AC at 90°C
mm²	mm	mm	mm	mm	mm	mm	kg/km	Ω/km	Ω/km	Ω/km	Ω/km
4x1.5	0.7	1.0	0.9	1.8	13.1	16.7	550	12.1	15.428	0.104	15.428
4x2.5	0.7	1.0	0.9	1.8	14.1	17.7	636	7.41	9.448	0.101	9.448
4x4	0.7	1.0	1.25	1.8	16.1	19.7	868	4.61	5.878	0.099	5.878
4x6	0.7	1.0	1.25	1.8	17.5	21.1	1,018	3.08	3.927	0.094	3.928
4x10	0.7	1.0	1.25	1.8	20.1	23.7	1,268	1.83	2.333	0.093	2.335
4x16	0.7	1.0	1.6	1.8	23.4	27.0	1,759	1.15	1.466	0.088	1.469
4x25	0.9	1.0	1.6	1.8	27.5	31.1	2,379	0.727	0.927	0.082	0.930
4x35	0.9	1.0	1.6	1.9	30.5	34.3	2,921	0.524	0.668	0.077	0.673
4x50	1.0	1.0	1.6	2.1	34.8	39.0	3,918	0.387	0.494	0.076	0.500
4x70	1.1	1.0	2.0	2.2	40.1	44.5	5,297	0.268	0.342	0.075	0.349
4x95	1.1	1.2	2.0	2.3	44.7	49.3	6,694	0.193	0.247	0.074	0.258
4x120	1.0	1.2	2.0	2.5	50.4	55.4	8,649	0.153	0.196	0.072	0.209
4x150	1.4	1.2	2.5	2.7	55.1	60.5	10,239	0.124	0.160	0.073	0.176
4x185	1.6	1.4	2.5	2.8	61.1	66.7	12,404	0.0991	0.128	0.073	0.148
4x240	1.7	1.4	2.5	3.0	67.9	73.9	15,459	0.0754	0.099	0.072	0.122
4x300	1.8	1.6	2.5	3.2	74.2	80.6	18,594	0.0601	0.080	0.072	0.107

Cable Size	Nominal Insulation Thickness	Nominal Bedding Thickness	Nominal Armour Wire Dia.	Nominal Sheath Thickness	Nominal Dia. under Armour	Approx. Overall Diameter	Approx Cable Weight	Max Conductor Resistance DC at 20°C	Max Conductor Resistance AC at 90°C	Reactance at 50Hz	Impedance AC at 90°C
mm²	mm	mm	mm	mm	mm	mm	kg/km	Ω/km	Ω/km	Ω/km	Ω/km
7x1.5	0.7	1.0	1.25	1.8	16.1	19.7	798	12.1	15.428	0.104	15.428
10x1.5	0.7	1.0	1.25	1.8	19.9	23.5	1,039	12.1	15.428	0.104	15.428
12x1.5	0.7	1.0	1.25	1.8	20.5	24.1	1,120	12.1	15.428	0.104	15.428
16x1.5	0.7	1.0	1.6	1.8	23.3	26.9	1,465	12.1	15.428	0.104	15.428
20x1.5	0.7	1.0	1.6	1.8	25.7	29.3	1,681	12.1	15.428	0.104	15.428
21x1.5	0.7	1.0	1.6	1.8	25.7	29.3	1,711	12.1	15.428	0.104	15.428
30x1.5	0.7	1.0	1.6	1.9	29.8	33.6	2,184	12.1	15.428	0.104	15.428
7x2.5	0.7	1.0	1.25	1.8	17.3	20.9	923	7.41	9.448	0.101	9.448
10x2.5	0.7	1.0	1.25	1.8	22.3	25.9	1,355	7.41	9.448	0.101	9.448
12x2.5	0.7	1.0	1.6	1.8	22.9	26.5	1,462	7.41	9.448	0.101	9.448
16x2.5	0.7	1.0	1.6	1.8	25.2	28.8	1,738	7.41	9.448	0.101	9.448
20x2.5	0.7	1.0	1.6	1.8	27.9	31.5	2,017	7.41	9.448	0.101	9.448
21x2.5	0.7	1.0	1.6	1.8	27.9	31.5	2,058	7.41	9.448	0.101	9.448
30x2.5	0.7	1.0	1.6	1.9	32.5	36.3	2,638	7.41	9.448	0.101	9.448

MAX-FOH (i) 0.6/1kV
Insulated, non-sheathed

Conductor
- Plain annealed copper
- Class 2
- Circular or compact

Insulation
XLEVA Compound

Fire Barrier
Mica Glass Tape

Application & Features

For use in most power and control circuits. Halogen-free replacement for PVC insulation to reduce hazardous gas emission and secondary damage.

Thermal Characteristics

Operating Temperature	Installation Temperature	Short Circuit Temperature
-15°C to 110°C	**0°C to 50°C**	**250°C**

Identification

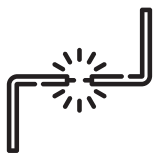
Insulation colour

Optional Features

UV Resistance


Anti- Termite


Anti- Rodent


Other Sheath colours are available

Bending Radius

Minimum bending radius

6 x overall diameter

Performance Characteristics

Reference Standard:
IEC 60502-1
BS 7211

Circuit Integrity:
IEC 60331
SS 299-1 Cat C, W, Z
BS 6387 -Cat C, W, Z

Flame Retardant:
IEC 60332-1, 60332-3

Halogen-free:
IEC 60754-1

Corrosive gas-free:
IEC 60754-2

Low Smoke Density:
IEC 61034-2

Cable Size	Insulation Thickness	Cable Overall Diameter	Cable Weight	Max Conductor Resistance at 20°C
mm²	mm	mm	kg/km	ohm/km
1x1.5	0.7	3.8	28	12.10
1x2.5	0.8	4.4	41	7.41
1x4	0.8	5.0	57	4.61
1x6	0.8	5.5	78	3.08
1x10	1.0	6.8	120	1.83
1x16	1.0	7.8	180	1.15
1x25	1.2	9.6	280	0.727
1x35	1.2	10.8	370	0.524
1x50	1.4	12.6	500	0.387
1x70	1.4	14.3	690	0.268
1x95	1.6	16.6	950	0.193
1x120	1.6	18.1	1100	0.153
1x150	1.8	20.2	1400	0.124
1x185	2.0	22.4	1800	0.0991
1x240	2.2	25.3	2300	0.0754
1x300	2.4	28.4	2900	0.0601
1x400	2.6	31.7	3700	0.047
1x500	2.8	35.3	4700	0.0366
1x630	2.8	39.1	6000	0.0283

MAX-FOH 0.6/1kV
Insulated, sheathed

Conductor
- Plain annealed copper
- Class 2
- Circular or compact

Sheath
LSHF Compound

Insulation
XLPE Compound

Fire Barrier
Mica Glass Tape

Application & Features

For use in most power and control circuits. Features XLPE Insulation for high operating temperatures, thermal short circuit rating and durability.

Thermal Characteristics

Operating Temperature	Installation Temperature	Short Circuit Temperature
-15°C to 90°C	**0°C to 50°C**	**250°C**

Identification

Outer Sheath

Insulation Colour

Optional Features

UV Resistance

Anti- Termite

Anti- Rodent

Other Sheath colours are available

Bending Radius

Minimum bending radius

6 x overall diameter

Performance Characteristics

Reference Standard:
IEC 60502-1

Circuit Integrity:
IEC 60331
SS 299-1 Cat C, W, Z
BS 6387 -Cat C, W, Z

Flame Retardant:
IEC 60332-1, 60332-3

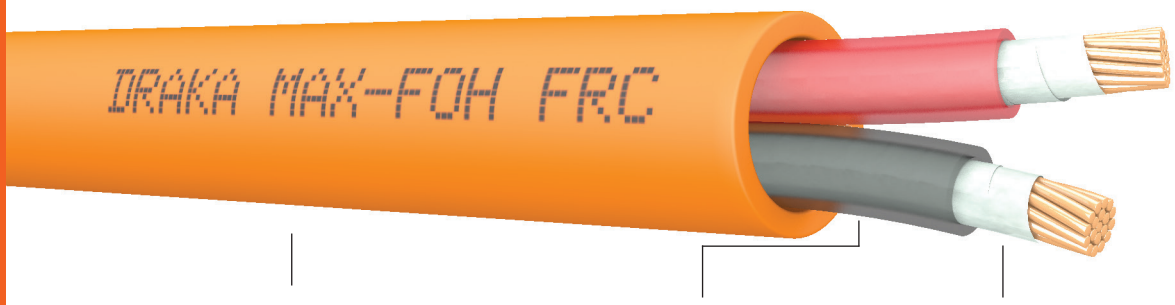
Halogen-free:
IEC 60754-1

Corrosive gas-free:
IEC 60754-2

Low Smoke Density:
IEC 61034-2

Cable Size	Insulation Thickness	Sheath Thickness	Cable Overall Diameter	Cable Weight	Max Conductor Resistance at 20°C
mm²	mm	mm	mm	kg/km	ohm/km
1x1.5	0.7	1.4	6.7	63	12.10
1x2.5	0.7	1.4	7.1	75	7.41
1x4	0.7	1.4	7.7	96	4.61
1x6	0.7	1.4	8.2	110	3.08
1x10	0.7	1.4	9.1	160	1.83
1x16	0.7	1.4	10.2	220	1.15
1x25	0.9	1.4	11.9	330	0.727
1x35	0.9	2.0	14.4	460	0.524
1x50	1.0	2.0	15.9	600	0.387
1x70	1.1	2.1	18.1	810	0.268
1x95	1.1	2.2	20.2	1000	0.193
1x120	1.2	2.3	22.0	1300	0.153
1x150	1.4	2.4	24.4	1600	0.124
1x185	1.6	2.5	26.7	1900	0.0991
1x240	1.7	2.6	29.6	2500	0.0754
1x300	1.8	2.7	31.7	3200	0.0601
1x400	2.0	2.9	36.4	4000	0.047
1x500	2.2	3.1	40.4	5000	0.0366
1x630	2.4	3.3	45.1	6400	0.0283

MAX-FOH 0.6/1kV, multi-core
Insulated, sheathed



Conductor
- Plain annealed copper
- Class 2
- Circular or compact

Sheath
LSHF Compound

Insulation
XLPE Compound

Fire Barrier
Mica Glass Tape

Application & Features

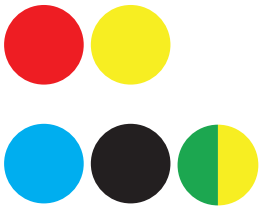
For use in most power and control circuits. Features XLPE Insulation for high operating temperatures, thermal short circuit rating and durability.

Thermal Characteristics

Operating Temperature	Installation Temperature	Short Circuit Temperature
-15°C to 90°C	**0°C to 50°C**	**250°C**

Identification


Outer Sheath

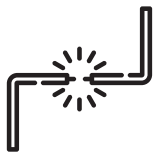

Core Colour

Optional Features

UV Resistance


Anti- Termite


Anti- Rodent


Other Sheath colours are available

Bending Radius

Minimum bending radius

8 x overall diameter

Performance Characteristics

Reference Standard:
IEC 60502-1

Circuit Integrity:
IEC 60331
SS 299-1 Cat C, W, Z
BS 6387 -Cat C, W, Z

Flame Retardant:
IEC 60332-1, 60332-3

Halogen-free:
IEC 60754-1

Corrosive gas-free:
IEC 60754-2

Low Smoke Density:
IEC 61034-2

Cable Size	Insulation Thickness	Sheath Thickness	Cable Overall Diameter	Cable Weight	Max Conductor Resistance at 20°C
mm²	mm	mm	mm	kg/km	ohm/km
2x1.5	0.7	1.8	11.3	170	12.10
2x2.5	0.7	1.8	12.1	200	7.41
2x4	0.7	1.8	13.2	260	4.61
2x6	0.7	1.8	14.3	320	3.08
2x10	0.7	1.8	16.2	370	1.83
2x16	0.7	1.8	18.3	510	1.15
2x25	0.9	1.8	21.8	740	0.727
2x35	0.9	2.5	25.8	990	0.524
2x50	1.0	2.6	29.0	1200	0.387
2x70	1.1	2.8	33.4	1700	0.268
2x95	1.1	3.0	37.8	2300	0.193
2x120	1.2	3.1	41.3	2800	0.153
2x150	1.4	3.3	46.0	3500	0.124
2x185	1.6	3.5	50.7	4300	0.0991
2x240	1.7	3.8	56.7	5600	0.0754
2x300	1.8	4.0	62.9	7000	0.0601
2x400	2.0	4.4	70.3	8800	0.047

MAX-FOH

0.6/1kV, multi-core
Insulated, sheathed

Cable Size	Insulation Thickness	Sheath Thickness	Cable Overall Diameter	Cable Weight	Max Conductor Resistance at 20°C
mm²	mm	mm	mm	kg/km	ohm/km
3x1.5	0.7	1.8	11.9	190	12.10
3x2.5	0.7	1.8	12.8	240	7.41
3x4	0.7	1.8	13.9	300	4.61
3x6	0.7	1.8	15.2	380	3.08
3x10	0.7	1.8	17.2	480	1.83
3x16	0.7	1.8	19.5	680	1.15
3x25	0.9	1.8	23.2	1000	0.727
3x35	0.9	2.6	27.6	1300	0.524
3x50	1.0	2.7	31.1	1800	0.387
3x70	1.1	2.9	35.9	2500	0.268
3x95	1.1	3.1	40.4	3300	0.193
3x120	1.2	3.3	44.4	4100	0.153
3x150	1.4	3.5	49.4	5000	0.124
3x185	1.6	3.7	54.4	6200	0.0991
3x240	1.7	4.0	60.9	8100	0.0754
3x300	1.8	4.2	67.5	10000	0.0601
3x400	2.0	4.6	75.4	12000	0.047

Cable Size	Insulation Thickness	Sheath Thickness	Cable Overall Diameter	Cable Weight	Max Conductor Resistance at 20°C
mm²	mm	mm	mm	kg/km	ohm/km
4x1.5	0.7	1.8	12.9	230	12.10
4x2.5	0.7	1.8	13.9	290	7.41
4x4	0.7	1.8	15.2	370	4.61
4x6	0.7	1.8	16.5	480	3.08
4x10	0.7	1.8	18.8	610	1.83
4x16	0.7	1.8	21.4	880	1.15
4x25	0.9	1.8	25.5	1300	0.727
4x35	0.9	2.7	30.4	1700	0.524
4x50	1.0	2.9	34.5	2300	0.387
4x70	1.1	3.1	39.8	3200	0.268
4x95	1.1	3.3	44.8	4300	0.193
4x120	1.2	3.5	49.2	5400	0.153
4x150	1.4	3.7	54.8	6700	0.124
4x185	1.6	4.0	60.6	8200	0.0991
4x240	1.7	4.3	67.7	10000	0.0754
4x300	1.8	4.6	75.3	13000	0.0601
4x400	2.0	5.0	84.1	16000	0.047

Cable Size	Insulation Thickness	Sheath Thickness	Cable Overall Diameter	Cable Weight	Max Conductor Resistance at 20°C
mm²	mm	mm	mm	kg/km	ohm/km
5x1.5	0.7	1.8	14.1	230	12.10
5x2.5	0.7	1.8	15.2	300	7.41
5x4	0.7	1.8	16.7	390	4.61
5x6	0.7	1.8	18.2	510	3.08
5x10	0.7	1.8	20.5	720	1.83
5x16	0.7	1.8	23.4	1000	1.15
5x25	0.9	1.8	28.0	1500	0.727
5x35	0.9	2.8	33.5	2200	0.524
5x50	1.0	3.0	38.3	2900	0.387
5x70	1.1	3.2	44.0	4000	0.268
5x95	1.1	3.5	49.7	5400	0.193
5x120	1.2	3.7	54.6	6800	0.153
5x150	1.4	4.0	61.0	8400	0.124

MAX-FOH (125) 0.6/1kV
Insulated, sheathed

Conductor
- Circular stranded copper
- Class 2
- Circular or compact

Fire Barrier
Mica Glass Tape

Insulation
XLEVA Compound

Sheath
LSHF Compound

Application & Features

For fixed installation in cable systems with improved fire performance and circuit integrity. Enhanced with XLEVA insulation for a high temperature rating.
Used for Fire Alarm & Detection circuits, Emergency signal/Control circuits, Fire fighting systems, Smoke Exhaust Systems.

Thermal Characteristics

Maximum operating temperature
110°C

Operating Temperature
-15°C to 110°C

Installation Temperature
0°C to 50°C

Short Circuit Temperature
250°C

Identification

Outer Sheath

Insulation

Optional Features

UV Resistance

Anti- Termite

Anti- Rodent

Other Sheath colours are available

Bending Radius

Minimum bending radius

8 x overall diameter

Performance Characteristics

Reference Standard:
IEC 60502-1

Circuit Integrity:
IEC 60331-21
SS 299-1 Cat C, W, Z
BS 6387 -Cat C, W, Z

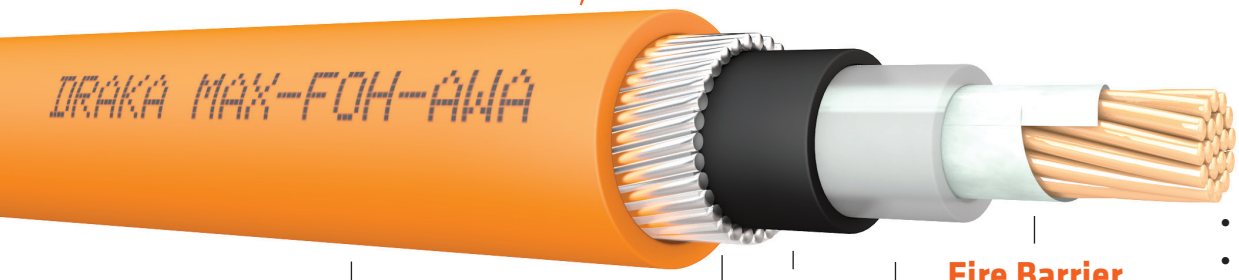
Flame Retardant:
IEC 60332-1,
60332-3-22,
60332-3-23,
60332-3-24

Halogen-free:
IEC 60754-1, 60754-2

Low Smoke Density:
IEC 61034-2

Cable Size	Nominal Insulation Thickness	Nominal Sheath Thickness	Approx Cable Overall Diameter	Approx Weight	Max Conductor Resistance at 20°C
mm²	mm	mm	mm	kg/km	ohm/km
1x1.5	0.7	1.4	6.7	68	12.10
1x2.5	0.7	1.4	7.1	81	7.41
1x4	0.7	1.4	7.7	100	4.61
1x6	0.7	1.4	8.2	120	3.08
1x10	0.7	1.4	9.1	170	1.83
1x16	0.7	1.4	10.2	230	1.15
1x25	0.9	1.4	11.9	350	0.727
1x35	0.9	2.0	14.4	480	0.524
1x50	1.0	2.0	15.9	620	0.387
1x70	1.1	2.1	18.1	840	0.268
1x95	1.1	2.2	20.2	1100	0.193
1x120	1.2	2.3	22.0	1300	0.153
1x150	1.4	2.4	24.4	1700	0.124
1x185	1.6	2.5	26.7	2000	0.0991
1x240	1.7	2.6	29.6	2600	0.0754
1x300	1.8	2.7	32.7	3300	0.0601
1x400	2.0	2.9	36.4	4100	0.047
1x500	2.2	3.1	40.4	5200	0.0366
1x630	2.4	3.3	45.1	6600	0.0283

MAX-FOH (AWA) 0.6/1kV, multi-core Insulated, armoured and sheathed



Conductor
- Plain annealed copper
- Class 2
- Circular or compact

Fire Barrier
Mica Glass Tape

Bedding
LSHF

Shealth
LSHF

Armouring
Aluminium Wire
AWA

Insulation
XLPE Compound

Application & Features

Features Aluminium Wire Armouring, whose non-magnetic properties prevents eddy currents, reducing chances of overheating in AC electrical systems.

Thermal Characteristics

Operating Temperature	Installation Temperature	Short Circuit Temperature
-15°C to 90°C	**0°C to 50°C**	**250°C**

Identification

Outer Sheath

Insulation Colour

Bedding Colour

Optional Features

UV Resistance

Anti- Termite

Anti- Rodent

Other Sheath colours are available

Bending Radius

Minimum bending radius

10 x overall diameter

Performance Characteristics

Reference Standard:
IEC 60502-1
BS 7846

Circuit Integrity:
IEC 60331
SS 299-1 Cat C, W, Z
BS 6387 -Cat C, W, Z

Flame Retardant:
IEC 60332-1, 60332-3

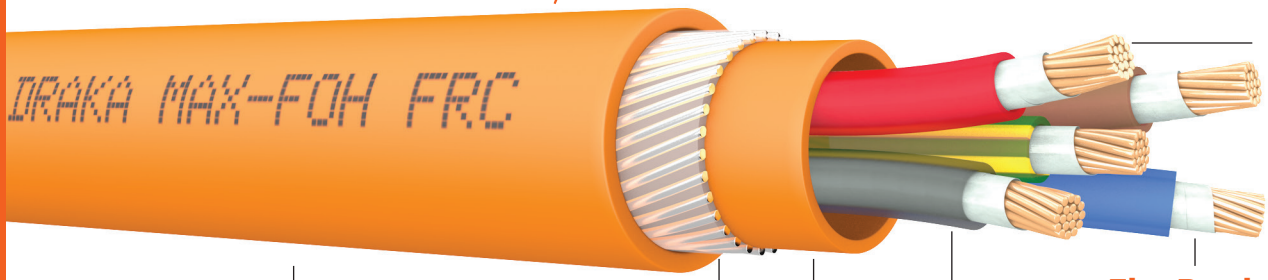
Halogen-free:
IEC 60754-1

Corrosive gas-free:
IEC 60754-2

Low Smoke Density:
IEC 61034-2

Cable Size	Insulation Thickness	Diameter After Bedding	Armour Wire Diameter	Diameter After Armour	Sheath Thickness	Cable Overall Diameter	Cable Weight	Max Electrical Resistance
mm²	mm	mm	mm	mm	mm	mm	kg/km	ohm/km
1x50	1.0	13.9	1.6	17.1	1.5	20.3	820	0.387
1x70	1.1	15.8	1.6	19.0	1.6	22.5	1000	0.268
1x95	1.1	17.7	1.6	20.9	1.6	24.5	1300	0.193
1x120	1.2	19.4	1.6	22.6	1.7	26.3	1600	0.153
1x150	1.4	21.5	1.6	24.7	1.7	28.5	1900	0.124
1x185	1.6	23.7	1.6	26.9	1.8	30.8	2300	0.0991
1x240	1.7	26.4	1.6	29.6	1.9	33.9	2900	0.0754
1x300	1.8	29.3	1.6	32.5	2.0	37.0	3600	0.0601
1x400	2.0	33.0	2.0	37.0	2.1	41.7	4600	0.047
1x500	2.2	36.6	2.0	40.6	2.2	45.5	5700	0.0366
1x630	2.4	40.8	2.0	44.8	2.3	50.0	7100	0.0283

MAX-FOH (SWA) 0.6/1kV, multi-core Insulated, armoured and sheathed



Conductor
- Plain annealed copper
- Class 2
- Circular or compact

Fire Barrier
Mica Glass Tape

Insulation
XLPE Compound

Bedding
LSHF Compound

Armouring
Galvanised Steel Wire

Shealth
LSHF

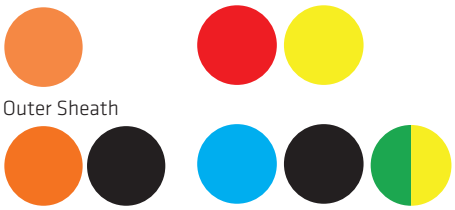
Application & Features

Features galvanised Steel Wire Armour, which enables cable to withstand high pulling loads. Commonly used in a whole range of industries including building and construction, rail and transport and particularly useful in external or underground projects.

Thermal Characteristics

Operating Temperature	Installation Temperature	Short Circuit Temperature
-15°C to 90°C	**0°C to 50°C**	**250°C**

Identification



Outer Sheath

Bedding Colour

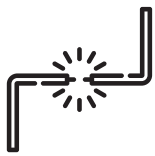
Core Colour

Optional Features

UV Resistance

Anti- Termite

Anti- Rodent



Other Sheath colours are available

Bending Radius

Minimum bending radius

10 x overall diameter

Performance Characteristics

Reference Standard:
IEC 60502-1
BS 7846

Circuit Integrity:
IEC 60331
SS 299-1 Cat C, W, Z
BS 6387 -Cat C, W, Z

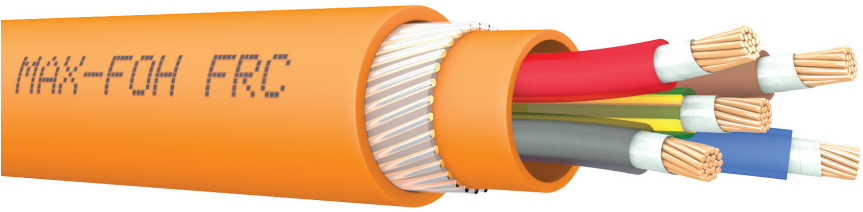
Flame Retardant:
IEC 60332-1, 60332-3

Halogen-free:
IEC 60754-1

Corrosive gas-free:
IEC 60754-2

Low Smoke Density:
IEC 61034-2

Cable Size	Insulation Thickness	Diameter After Bedding	Amour Wire Diameter	Diameter After Armour	Sheath Thickness	Cable Overall Diameter	Cable Weight	Max electrical resistance
mm²	mm	mm	mm	mm	mm	mm	kg/km	ohm/km
2x1.5	0.7	9.7	0.9	11.4	1.8	15.1	410	12.10
2x2.5	0.7	10.5	0.9	12.3	1.8	16.0	460	7.41
2x4	0.7	11.6	0.9	13.3	1.8	17.0	530	4.61
2x6	0.7	12.7	0.9	14.5	1.8	18.2	620	3.08
2x10	0.7	14.6	1.25	17.0	1.8	20.7	810	1.83
2x16	0.7	16.7	1.25	19.2	1.8	22.9	1000	1.15
2x25	0.9	20.2	1.6	23.3	1.8	27.0	1400	0.727
2x35	0.9	22.7	1.6	25.9	1.8	29.6	1800	0.524
2x50	1.0	25.8	1.6	28.9	1.9	32.9	2200	0.387
2x70	1.1	29.7	1.6	32.9	2.0	37.0	2800	0.268
2x95	1.1	34.1	2.0	38.0	2.1	42.4	3900	0.193
2x120	1.2	37.4	2.0	41.4	2.2	45.9	4600	0.153
2x150	1.4	41.7	2.0	45.7	2.4	50.6	5500	0.124
2x185	1.6	46.4	2.5	51.3	2.5	56.5	7000	0.0991
2x240	1.7	51.9	2.5	56.8	2.7	62.3	8600	0.0754
2x300	1.8	58.0	2.5	63.0	2.9	68.9	10000	0.0601
2x400	2.0	64.6	2.5	69.5	3.1	75.8	11000	0.047



MAX-FOH (SWA)

0.6/1kV, multi-core Insulated, armoured and sheathed

Cable Size	Insulation Thickness	Diameter After Bedding	Amour Wire Diameter	Diameter After Armour	Sheath Thickness	Cable Overall Diameter	Cable Weight	Max electrical resistance
mm²	mm	mm	mm	mm	mm	mm	kg/km	ohm/km
3x1.5	0.7	10.3	0.9	12.0	1.8	15.7	440	12.10
3x2.5	0.7	11.2	0.9	12.9	1.8	16.6	510	7.41
3x4	0.7	12.3	0.9	14.1	1.8	17.8	590	4.61
3x6	0.7	13.6	1.25	16.0	1.8	19.7	810	3.08
3x10	0.7	15.6	1.25	18.0	1.8	21.7	960	1.83
3x16	0.7	17.9	1.25	20.3	1.8	24.0	1200	1.15
3x25	0.9	21.6	1.6	24.7	1.8	28.4	1700	0.727
3x35	0.9	24.3	1.6	27.4	1.8	31.2	2200	0.524
3x50	1.0	27.6	1.6	30.7	1.9	34.7	2700	0.387
3x70	1.1	32.5	2.0	36.4	2.1	40.7	3900	0.268
3x95	1.1	36.5	2.0	40.5	2.2	45.0	4900	0.193
3x120	1.2	40.1	2.0	44.0	2.3	48.8	5800	0.153
3x150	1.4	45.2	2.5	50.1	2.5	55.2	7500	0.124
3x185	1.6	49.8	2.5	54.7	2.6	60.0	8800	0.0991
3x240	1.7	56.0	2.5	60.9	2.8	66.7	11000	0.0754
3x300	1.8	62.3	2.5	67.2	3.0	73.3	13000	0.0601
3x400	2.0	69.3	2.5	74.2	3.3	81.0	16000	0.047

Cable Size	Insulation Thickness	Diameter After Bedding	Amour Wire Diameter	Diameter After Armour	Sheath Thickness	Cable Overall Diameter	Cable Weight	Max electrical resistance
mm²	mm	mm	mm	mm	mm	mm	kg/km	ohm/km
4x1.5	0.7	11.3	0.9	13.0	1.8	16.7	500	12.10
4x2.5	0.7	12.3	0.9	14.0	1.8	17.7	570	7.41
4x4	0.7	13.6	1.25	16.0	1.8	19.7	790	4.61
4x6	0.7	14.9	1.25	17.4	1.8	21.1	930	3.08
4x10	0.7	17.2	1.25	19.6	1.8	23.3	1100	1.83
4x16	0.7	19.8	1.25	22.9	1.8	26.6	1500	1.15
4x25	0.9	23.9	1.6	27.1	1.8	30.8	2100	0.727
4x35	0.9	27.0	1.6	30.1	1.9	34.0	2600	0.524
4x50	1.0	31.1	1.6	35.0	2.1	39.3	3700	0.387
4x70	1.1	36.0	2.0	39.9	2.2	44.5	4700	0.268
4x95	1.1	40.6	2.0	44.5	2.3	49.3	6000	0.193
4x120	1.2	45.0	2.0	49.9	2.5	55.0	7800	0.153
4x150	1.4	50.2	2.5	55.1	2.7	60.6	9400	0.124
4x185	1.6	55.8	2.5	60.7	2.8	66.4	11000	0.0991
4x240	1.7	62.3	2.5	67.2	3	73.3	14000	0.0754
4x300	1.8	69.3	2.5	74.2	3.2	80.7	16000	0.0601
4x400	2.0	77.6	3.15	83.8	3.5	90.9	22000	0.047

Cable Size	Insulation Thickness	Diameter After Bedding	Amour Wire Diameter	Diameter After Armour	Sheath Thickness	Cable Overall Diameter	Cable Weight	Max electrical resistance
mm²	mm	mm	mm	mm	mm	mm	kg/km	ohm/km
5Gx1.5	0.7	12.5	0.9	14.2	1.8	17.9	530	12.10
5Gx2.5	0.7	13.6	1.25	16.1	1.8	19.8	720	7.41
5Gx4	0.7	15.1	1.25	17.5	1.8	21.2	850	4.61
5Gx6	0.7	16.6	1.25	19.0	1.8	22.7	1000	3.08
5Gx10	0.7	18.9	1.6	22.0	1.8	25.7	1400	1.83
5Gx16	0.7	21.8	1.6	24.9	1.8	28.6	1800	1.15
5Gx25	0.9	26.4	1.6	29.6	1.9	33.5	2500	0.727
5Gx35	0.9	29.9	1.6	33.0	2.0	37.2	3100	0.524
5Gx50	1.0	34.6	2.0	38.5	2.2	43.1	4300	0.387
5Gx70	1.1	39.9	2.0	43.9	2.3	48.6	5700	0.268
5Gx95	1.1	45.5	2.5	50.4	2.5	55.5	7800	0.193
5Gx120	1.2	50.0	2.5	54.9	2.7	60.4	9400	0.153
5Gx150	1.4	56.2	2.5	61.1	2.8	66.8	11000	0.124

Appendix

A. Introduction to Cable Materials
B. Selection of Cross-Sectional Area of Conductor
C. Current Ratings and Voltage Drop Table (Unarmoured Cables)
D. Current Ratings and Voltage Drop Table (Armoured Cables)
E. Short Circuit Ratings
F. Cables & Drum Handling and Storage Procedure
G. Identification of Cable Cores

Introduction to Cable Materials

Insulation

In the manufacture of electrical cables, safety and reliability are the biggest considerations. The materials that are selected must be stable, reliable, durable, able to withstand the environment and safe to use. Materials used as insulation for cables must meet the following:

1. Providing safe insulation of the line conductors with minimum loss in electrical energy.
2. Exhibiting stable mechanical properties under normal conditions.
3. Possessing consistent electrical and mechanical properties over long period of use and over wide temperature ranges.
4. Exhibiting inert chemical properties which make it resistant to most chemicals.

Extruded insulation can be classified into two categories, namely Thermoplastic materials and Thermoset materials.

Thermoplastic materials tend to lose their form with continuous heating, while thermoset materials tend to maintain their form. This means that cables with thermoset materials can operate at higher temperatures than thermoplastic cables.

Thermoplastic
Polyvinyl Chloride (PVC) & Polyethylene (PE)

Material	PVC	PE
Features	High Electrical Strength, Insulation Resistance	Excellent electrical insulating properties Stable mechanical characteristic
Resistance	Moisture, abrasions	Chemicals, Moisture
Temperature Ratings	- 60°C to 105°C	-60°C to 80°C
Behaviour in high heat environments	Emits smoke & Hydrochloric Acid	Changes shape and consistency, Softens in texture

PVC and PE display good characteristics for cable insulation, and are inherently tough and physically resistant to chemicals, moisture and abrasion. The problems with these materials are apparent when subjected to high and continuous heat:

1. PVC is known to emit smoke and form hydrochloric acid (a highly toxic and corrosive chemical) when they come in contact with water. As such, PVC-free cable insulation is frequently preferred in applications where smoke is a major hazard (notably in tunnels and rapid transit areas).

2. The PE polymer is made up of linear chains of independent PE molecules loosely held together by weak molecular bonds. These weak molecular bonds break when subjected to temperature above 70°C, causing the individual molecules to slide over one another.

The resultant PE polymer starts to change its shape and consistency and become soft and plastic-like in nature. For applications with operating temperatures higher than 70°C, cross-linked polyethylene (XLPE) is preferred.

Thermosets
Cross-linked Polyethylene (XLPE)

The thermoplastic nature of the PE can be converted into a thermally stable thermosetting compound by the process of cross-linking. In the process of cross-linking, perpendicular chemical bonds are formed between parallel chains of the PE molecules. The parallel, loose & twodimensional molecular structure is converted into a cellular, three-dimensional polymeric structure.

XLPE exhibits a durable and excellent insulating material which exhibits the following advantages over conventional PE:

- Suitable for continuous operating temperature up to 90°C.
- high thermal short circuit rating (250°C).
- Excellent electrical properties maintained over the full temperature range.
- Excellent water resistance and low permeability to water.
- Excellent chemical resistance to inorganic salts, oils, alkaline, acids ad organic solvents.
- High durability and long operation life.
- Halogen Free

Cross-linked Ethylene-vinyl Acetate (XLEVA)

Ethylene-vinyl acetate(EVA) is a polymer that has the softness and flexibility elastomeric materials, yet they can be processed like a thermoplastic. These properties are further enhanced to achieve thermal stability by the process of cross-linking to form a cellular three-dimensional polymeric structure.

The resultant XLEVA compound exhibits a more durable and excellent insulating material while maintaining its flexibility. Based on the specific formulation, XLEVA compound can withstand a temperature rating up to 110°C and display an excellent flame retardant capability. It contains no halogens and has a temperature index of more than 250°C, currently the highest among most insulation materials.

Table A1
Comparison for Insulation Materials

Property		Unit	Insulation Materials			
			PVC	PE	XLPE	XLEVA[A]
Chemical Name			Polyvinyl Chloride	Polyethylene	Cross-linked Polyethylene	Cross-linked Ethylene-vinyl Acetate
Max. Rated Temperature	Normal	°C	70	70	90	110[B]
	Short Circuit	°C	160	200	250	250
Density			1.2 - 1.4	0.92 - 0.94	0.92 - 0.95	1.5 - 1.55
Volume Resistivity		Ohm-cm	10E15	10E16	10E16	10E14
Dielectric Constant			3 - 5	2.0 - 2.3	2.3 - 2.5	4 - 6
Tensile Strength		N / mm^2	12 - 14	12 - 14	13 - 18	10 - 14
Elongation-at-break		%	200 - 450	500 - 650	200 - 350	110 - 200
Flame Retardant Property			++	+	+	+++
Water resistance			++	+++	+++	+++
Weather resistance			++	++	++	++
Ozone resistance			++	++	++	++
Solvent resistance			---	++	+	+
Resistance to oil			++	+++	+++	++
Resistance to heat deformation			---	+	+++	+++

Note:
A Named as LSHF for all non-sheathed cables.
B Normal type, high temperature rating available upon request.
--- Poor
+ Fair
++ Good
+++ Excellent

Conclusion
Based on the three salient qualities for fire performance cables, we find that XLPE and XLEVA are the better-performing choices for insulation, which also explains their preference for safety in the industry.

Bedding and Sheathing

Cable jackets, also known as sheaths, serve several purposes:
1. Mechanical, thermal, chemical, and environmental protection to the insulated conductors they enclose
2. Electrical insulation when used over shields or armour.
3. They ease installation and routing concerns by enclosing multiple insulated conductors.

Commonly used jacket materials for low voltage power cables include extrusions of PVC, High Density Polyethylene (HDPE), and Low Smoke Halogen Free (LSHF) materials.

These materials are applied using plastic extrusion lines that heat the compound to melting point and form it over the core. The material is then cooled in water trough and wound onto a reel.

Table A2
Comparison across Bedding and Sheathing Materials

Property	Unit	Bedding / Sheathing Materials		
		PVC	HDPE	LSHF
Chemical Name		Polyvinyl Chloride	High Density Polyethylene	Low Smoke Halogen Free
Density		1.35 - 1.5	0.94 - 0.95	1.4 - 1.6
Halogen Content		>20%	<0.5%	<0.5%
Halogen Free		No	Yes	Yes
Limiting Oxygen Index (LOI)		>22	≤22	>30
Smoke Generation		Dark and dense	Less Smoke	Least Smoke
Tensile Strength	N / mm^2	12 - 14	12 - 14	13 - 18
Elongation-at-break	%	200 - 450	500 - 650	200 - 350
Flame Retardant Property		++	---	+++
Water resistance		++	+++	+++
Weather resistance		++	++	++
Ozone resistance		++	++	++
Chemical resistance		++	+++	++
Solvent resistance		++	++	++
Resistance to crude oil		+++	++	+++
Resistance to heat deformation		---	+	+++

Note:
Refer to normal PVC that comply with IEC60332-1-2. Higher grade PVC available upon request.
Higher grade of PVC can achieve higher LOI reading.
--- Poor
+ Fair
++ Good
+++ Excellent

Conclusion
Looking on the five salient qualities for fire performance cables, we find that LSHF produces the least smoke, does not emit halogen gases when burnt and has excellent flame retardant ability, making it the best-performing choice for bedding and sheathing fire performance cables.

Selection Of Cross-Sectional Area Of Conductor

In order to choose the right power cable, one has to consider:

- the current rating
- the installation methods
- maximum safe length at short circuit
- the voltage drop
- the ambient temperature
- the short circuit ratio
- the frequency and harmonic current

Current Rating

When electric current flows through the conductor of a cable, the electrical resistance of the conductor generates heat. When a temperature greater than that allowed is reached by the cable due to heat generation, a larger conductor size (with lower electrical resistance) has to be selected. Other important considerations are methods of installation of the cable and ambient temperature.

Calculation which takes into account all criteria are described in IEC 60287 and are rather complex. In general, preferences is given to standard current rating tables which are issued by national standardization bureaus.

Voltage Drop

Another important factor for the determination of the conductor size is the voltage drop. The voltage drop of the cable at a given current is caused by losses in the cable. In case of a too high voltage drop, it is necessary to choose a bigger conductor size. The voltage drop in a cable demotes the difference in voltage at the beginning and at the end of the cable. It depends on:

- the current carried
- the power factor
- the length of the cable
- the resistance of the cable
- reactance of the cable

The permissible voltage drop is usually stated as a percentage of the circuit voltage.

According to CP5:1998 regulation 525-01-01, it is stipulated that the total voltage drop for any particular cable run must be such that the voltage drop in the circuit of which the cable forms a part does not exceed 4% of the nominal voltage of the supply.

Selection of Cable based on Voltage Drop and Current using Tables

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 values given in the tables are based on these assumptions.

The values of the voltage drop (Vd) are tabulated for a current of one Ampere for a 1 metre run, the value of voltage drop needs to be multiplied by the length of the run, in metre, and by the current, in Ampere that the cables are to carry.

$$\mathbf{V = V_{drop} \times I \times L}$$

Where
V = Voltage (V)
V_{drop} = Approx. Voltage drop (V/Am)
I = Current (A)
L = Route Length (m)

Guided example to using our Current Rating / Voltage Drop Tables

Given that the supply voltage is 415V, 3-phase 50Hz and that the cable used is a 4C MAX-FOH-SWA.

Required cable is to be installed direct in ground and to carry a 250A load per phase over a route length of 100m. Cable installation is to be in compliance with BS 7671-2008 regulation.

Maximum permissible voltage drop

Vmax = 4% of 415V
Vmax = 16.65V

Voltage drop

$$V_{drop} = \frac{Vmax}{I \times L} = \frac{16.6V}{250 \times 100} = \mathbf{0.66mV/Am}$$

Select the impedance value z from Table D4 (Voltage Drop for Multi-core Armoured cables) such that the z is equal to, or less than V_{drop} 0.66mV/Am.

It will be seen that the closest value is z(4-core cable) = 0.60 mV/Am, therefore arriving at a required conductor size of 70mm^2.

Current Ratings And Voltage Drop Table (Unarmoured Cables)

Single-core cables

Conditions

These tables apply to cables that meet these construction and environment conditions:

Construction	Environment
Thermosetting (XLPE) insulation	Ambient Temperature: 30°C
With or without LSHF sheathing	Conductor Operating Temperature: 90°C

Table C1

Current Rating - Single-core Unarmoured

CURRENT-CARRYING CAPACITY (amperes):

Conductor cross-sectional area	Reference Method A (enclosed in conduit in thermally insulating wall etc.)		Reference Method B (enclosed in conduit on a wall or in trucking etc.)		Reference Method C (clipped direct)		Reference Method F (in free air or on a perforated cable tray etc horizontal or vertical etc) Touching			Reference Method G (in free air) Spaced by one cable diameter	
	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.e. flat	3 cables, three phase a.c. flat	3 cables, three phase a.c. trefoil	2 cables, single-phase a.c. or d.c. or 3 cables three phase a.e. flat	
										Horizontal	Vertical
1	2	3	4	5	6	7	8	9	10	11	12
(mm^2)	(A)	(A)	(A)	(A)	(A)	(A)	(A)	(A)	(A)	(A)	(A)
1	14	13	17	15	19	17.5	-	-	-	-	-
1.5	19	17	23	20	25	23	-	-	-	-	-
2.5	26	23	31	28	34	31	-	-	-	-	-
4	35	31	42	37	46	41	-	-	-	-	-
6	45	40	54	48	59	54	-	-	-	-	-
10	61	54	75	66	81	74	-	-	-	-	-
16	81	73	100	88	109	99	-	-	-	-	-
25	106	95	133	117	143	130	161	141	135	182	161
35	131	117	164	144	176	161	200	176	169	226	201
50	158	141	198	175	228	209	242	216	207	275	246
70	200	179	253	222	293	268	310	279	268	353	318
95	241	216	306	269	355	326	377	342	328	430	389
120	278	249	354	312	413	379	437	400	383	500	454
150	318	285	393	342	476	436	504	464	444	577	527
185	362	324	449	384	545	500	575	533	510	661	605
240	424	380	528	450	644	590	679	634	607	781	719
300	486	435	603	514	743	681	783	736	703	902	833
400	-	-	683	584	868	793	940	868	823	1085	1008
500	-	-	783	666	990	904	1083	998	946	1253	1169
630	-	-	900	764	1130	1033	1254	1151	1088	1454	1362
800	-	-	-	-	1288	1179	1358	1275	1214	1581	1485
1000	-	-	-	-	1323	1323	1520	1435	1349	1775	1671

Current Ratings And Voltage Drop Table (Unarmoured Cables)

Table C2

Voltage Drop - Single-core Unarmoured

VOLTAGE DROP (per ampere per metre):

Conductor cross-sectional area	2 cables, d.c.	Reference Methods A & B (enclosed in conduit or trunking)			Reference Methods C, F & G (clipped direct on tray or in free air)						Reference Methods A & B (enclosed in conduit or trunking)			Reference Methods C, F & G (clipped direct on tray or in free air)								
					Cables touching			Cables spaced*						Cables touching, Trefoil			Cables touching, Flat			Cables spaced*, Flat		
1	2	3			4			5			6			7			8			9		
(mm²)	(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	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			2.5			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	0.31	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	0.175	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

Current Ratings And Voltage Drop Table (Unarmoured Cables)

Multi-core cables

These tables apply to cables that meet these construction and environment conditions:

Construction	Environment
Thermosetting (XLPE) insulation	Ambient Temperature: 30°C
With or without LSHF sheathing	Conductor Operating Temperature: 90°C

Table C3

Current Rating - Multi-core Unarmoured

CURRENT-CARRYING CAPACITY (amperes):

Conductor cross-sectional area	Reference Method A (enclosed in conduit in thermally insulating wall etc.)		Reference Method B (enclosed in conduit on a wall or in trucking etc.)		Reference Method C (clipped direct)		Reference Method E (in free air or on a perforated cable tray etc horizontal or vertical etc)	
	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.	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.
1	2	3	4	5	6	7	8	9
(mm^2)	(A)	(A)	(A)	(A)	(A)	(A)	(A)	(A)
1	14.5	13	17	15	19	17	21	18
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 a protective conductor

Current Ratings And Voltage Drop Table (Unarmoured Cables)

Table C4

Voltage Drop - Multi-core Unarmoured

VOLTAGE DROP (per ampere per metre):

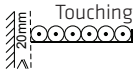
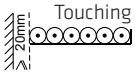
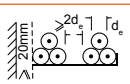
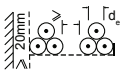
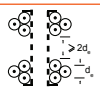
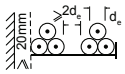
Conductor cross-sectional area	Two-core cable, d.c.	Two-core cable, single phase a.c.			Three- or four-core cable, three-phase a.c.		
1	2	3			4		
(mm^2)	(mV / A / m)	(mV / A / m)			(mV / A / m)		
1	46	46			40		
1.5	31	31			27		
2.5	19	19			16		
4	12	12			10		
6	7.9	7.9			6.8		
10	4.7	4.7			4.0		
16	2.9	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

Correction Factors

These tables are to supplement current ratings for Tables C1 and C3.

Table C5

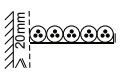
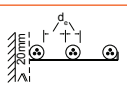
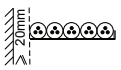
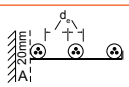
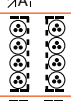
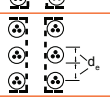
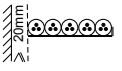
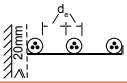
Correction factors for multiple single core cables installed in free air

Installation method (See Note 1)			Number of three-phase circuits (Note 4)				Use as a multiplier to rating for
			Number of trays	1	2	3	
Unperforated trays (Note 2)	H	 Touching	1 2 3	0.95 0.92 0.90	0.90 0.85 0.80	0.85 0.80 0.75	Three cables in horizontal formation
Perforated trays (Note 2)	J	 Touching	1 2 3	0.95 0.95 0.90	0.90 0.85 0.85	0.85 0.80 0.80	
Vertical perforated trays (Note 3)	K	 Touching	1 2	0.95 0.90	0.85 0.85	--- ---	Three cables in vertical formation
Ladder support cleats, etc (Note 2)	L	 Touching	1 2 3	1.00 0.95 0.95	0.95 0.90 0.90	0.95 0.90 0.85	Three cables in horizontal formation
Unperforated trays (Note 2)	H		1 2 3	1.00 0.95 0.95	0.95 0.90 0.90	0.95 0.85 0.85	Three cables in trefoil formation
Perforated trays (Note 2)	J		1 2 3	1.00 0.95 0.95	1.00 0.95 0.90	0.95 0.90 0.85	
Vertical perforated trays (Note 3)	K		1 2	1.00 1.00	0.90 0.90	0.90 0.85	
Ladder supports, cleats, etc (Note 2)	L		1 2 3	1.00 0.95 0.95	1.00 0.95 0.95	1.00 0.95 0.90	

Notes:
1. Factors are given for single layers of cables (for trefoil groups) as shown in the tables and DO NOT apply when cables are installed in more than one layer touching each other. Values for such installations may be significantly lower and must be determined by an appropriate method.
2. Values are given for a vertical spacing between trays of 300mm. For closer spacing the factors should be reduced.
3. Values are given for a horizontal spacing between trays of 255mm with tray mounted back to back. For closer spacing the factors should be reduced.
4. For circuits having more than one cable in parallel per phase, each set of three conductors should be considered as a circuit for the purposes of this table.

Table C6

Correction factors for multiple multi-core cables

Installation Method			Number of trays	Number of cables					
				1	2	3	4	6	9
Unperforated trays (Note 2)	M	 Touching	1 2 3	0.95 0.95 0.95	0.85 0.85 0.85	0.80 0.75 0.75	0.75 0.75 0.70	0.70 0.70 0.65	0.70 0.65 0.60
		 Spaced	1 2 3	1.00 0.95 0.95	0.95 0.95 0.95	0.95 0.90 0.90	0.95 0.90 0.90	0.90 0.85 0.85	- - -
Perforated trays (Note 2)	N	 Touching	1 2 3	1.00 1.00 1.00	0.90 0.85 0.85	0.80 0.80 0.80	0.80 0.75 0.75	0.75 0.75 0.70	0.75 0.70 0.65
		 Spaced	1 2 3	1.00 1.00 1.00	1.00 1.00 1.00	1.00 0.95 0.95	0.95 0.90 0.90	0.90 0.85 0.85	- - -
Vertical perforated trays (Note 3)	O	 Touching	1 2	1.00 1.00	0.90 0.90	0.80 0.80	0.75 0.75	0.75 0.70	0.70 0.70
		 Spaced	1 2	1.00 1.00	0.90 0.90	0.90 0.90	0.90 0.85	0.85 0.85	- -
Ladder supports cleats, etc. (Note 2)	P	 Touching	1 2 3	1.00 1.00 1.00	0.85 0.85 0.85	0.80 0.80 0.80	0.80 0.80 0.75	0.80 0.75 0.75	0.80 0.75 0.70
		 Spaced	1 2 3	1.00 1.00 1.00	1.00 1.00 1.00	1.00 1.00 0.95	1.00 0.95 0.95	1.00 0.95 0.95	- - -

Notes:
1. Factors apply to single layer groups of cables as shown above and do NOT apply when cables are installed in more than one layer touching each other. Values for such installations may be significantly lower and must be determined by an appropriate method.
2. Values are given for a vertical spacing between trays of 300mm. For closer vertical spacing the factors should be reduced.
3. Values are given for horizontal spacing between trays of 225mm with trays mounted back to back. For closer spacing the factors should be reduced.

Table C7

Correction factors for cables in conduit and trunking, and bunched cables on a surface

Item	Arrangement of Cables		Correction factors													
			Number of circuits or multicore cables													
			1	2	3	4	5	6	7	8	9	10	12	14	16	18	20
1	Bunched on a surface or enclosed in condult or trunking		1.00	0.80	0.70	0.65	0.60	0.55	0.55	0.50	0.50	0.50	0.45	0.45	0.40	0.40	0.40
2	Single-layer wall or floor	Touching	1.00	0.85	0.80	0.75	0.75	0.70	0.70	0.70	0.70	0.70	0.70	0.70	0.65	0.65	0.65
3		Spaced	1.00	0.85	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
4	Single-layer under ceiling	Touching	0.95	0.80	0.70	0.70	0.65	0.65	0.65	0.60	0.60	0.60	0.60	0.60	0.55	0.55	0.55
5		Spaced	0.95	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85

Notes:
1. These factors are applicable to uniform groups of cables, equally loaded.
2. Where horizontal clearance between adjacent cables exceeds twice their overall diameter, no reduction factor need to be applied.
3. "Spaced" cables means a clearance between adjacent surfaces of one cable diameter.
4. The same correction factors are applied to:
 - groups of two or three single-core cables;
 - multicore cables.
5. if a system consists of both two and three core cables, the total number of cables is taken as the number of circuits, and the corresponding correction factor is applied to the tables for two loaded conductors for the two-core cables, and to the tables for three loaded conductors for the three-core cables.
6. If a group consists of n loaded single-core cables it may either be considered as n/2 circuits of two loaded conductors or n/3 circuits of three loaded conductors.

Table C8

Correction factors for ambient air temperature other than 30°C

Ambient temperature°C	10	15	20	25	35	40	45	50	55	60	65	70	75	80
Correction factors	1.15	1.12	1.08	1.04	0.96	0.91	0.87	0.82	0.76	0.71	0.65	0.58	0.50	0.41

Current Ratings And Voltage Drop Table (Armoured Cable)

Single-core cables

Conditions

These tables apply to cables that meet these construction and environment conditions:

Construction	Environment
Thermosetting (XLPE) insulation	Ambient Temperature: 30°C
With or without LSHF sheathing	Conductor Operating Temperature: 90°C
Non-Magnectic Armour	

Table D1

Current Rating - Single-core Armoured

CURRENT-CARRYING CAPACITY (amperes):

Conductor cross-sectional area	Reference Method C (clipped firect)		Reference Method F (in free air or on a perforated cable tray, horizontal or vertical)								
	Touching		Touching			Spaced by one cable diameter					
	2 cables, single phase a.c. or d.c. flat	3 or 4 cables, single phase a.c. or d.c. flat	2 cables, single phase a.c. or d.c. flat	3 or 4 cables, single phase a.c. or d.c. flat	3 cables, three phase a.c. trefoil	2 cables, d.c.		2 cables, single phase a.c.		3 or 4 cables, three phase a.c.	
						Horizontal	Vertical	Horizontal	Vertical	Horizontal	Vertical
1	2	3	4	5	6	7	8	9	10	11	12
(mm²)	(A)	(A)	(A)	(A)	(A)	(A)	(A)	(A)	(A)	(A)	(A)
50	237	220	253	232	222	284	270	282	266	288	266
70	303	277	322	293	285	356	349	357	337	358	331
95	367	333	389	352	346	446	426	436	412	425	393
120	425	383	449	405	402	519	497	504	477	485	449
150	488	437	516	462	463	600	575	566	539	549	510
185	557	496	587	524	529	688	660	643	614	618	574
240	656	579	689	612	625	815	782	749	714	715	666
300	755	662	792	700	720	943	906	842	805	810	755
400	853	717	899	767	815	1137	1094	929	889	848	797
500	962	791	1016	851	918	1314	1266	1032	989	923	871
630	1082	861	1146	935	1027	1528	1474	1139	1092	992	940
800	1170	904	1246	987	1119	1809	1744	1204	1155	1042	978
1000	1261	961	1345	1055	1214	2100	2026	1289	1238	1110	1041

Current Ratings And Voltage Drop Table (Armoured Cable)

Table D2

Voltage Drop - Single-core Armoured

VOLTAGE DROP (per ampere per metre):

Conductor cross-sectional area	2 cables, d.c.	Reference Methods C & F (clipped direct, on tray or in free air)														
		2 cables, single-phase a.c.						3 or 4 cables, three-phase a.c.								
		touching			spaced*			trefoil & touching			flat & touching			flat & spaced*		
1	2	3			4			5			6			7		
(mm^2)	(mV / A / m)	(mV / A / m)			(mV / A / m)			(mV / A / m)			(mV / A / m)			(mV / A / m)		
		r	x	z	r	x	z	r	x	z	r	x	z	r	x	z
50	0.98	0.99	0.21	1.00	0.98	0.29	1.00	0.86	0.180	0.87	0.84	0.25	0.88	0.84	0.155	0.90
70	0.67	0.68	0.200	0.71	0.69	0.29	0.75	0.59	0.170	0.62	0.60	0.25	0.65	0.62	0.150	0.70
95	0.49	0.51	0.195	0.55	0.53	0.28	0.60	0.44	0.170	0.47	0.46	0.24	0.52	0.49	0.145	0.58
120	0.39	0.41	0.190	0.45	0.43	0.27	0.51	0.35	0.165	0.39	0.38	0.24	0.44	0.41	0.140	0.51
150	0.31	0.33	0.185	0.38	0.36	0.27	0.45	0.29	0.160	0.33	0.31	0.23	0.39	0.34	0.140	0.45
185	0.25	0.27	0.185	0.33	0.30	0.26	0.40	0.23	0.160	0.28	0.26	0.23	0.34	0.29	0.140	0.41
240	0.195	0.21	0.180	0.28	0.24	0.26	0.35	0.180	0.155	0.24	0.21	0.22	0.30	0.24	0.140	0.37
300	0.155	0.170	0.175	0.25	0.193	0.25	0.32	0.145	0.150	0.21	0.170	0.22	0.28	0.20	0.140	0.34
400	0.115	0.145	0.170	0.22	0180	0.24	0.30	0.125	0.150	0.195	0.160	0.21	0.27	0.20	0.135	0.33
500	0.093	0.125	0.170	0.21	0.165	0.24	0.29	0.105	0.145	0.180	0.145	0.20	0.25	0.190	0.135	0.31
630	0.073	0.105	0.165	0.195	0.150	0.23	0.27	0.092	0.145	0.170	0.135	0.195	0.24	0.074	0.175	0.29
800	0.056	0.090	0.160	0.190	0.145	0.23	0.27	0.086	0.140	0.165	0.130	0.180	0.23	0.062	0.175	0.26
1000	0.045	0.092	0.155	0.180	0.140	0.21	0.25	0.080	0.135	0.155	0.125	0.170	0.21	0.055	0.165	0.24

Multi-Core Cable

Conditions

These tables apply to cables that meet these construction and environment conditions:

Construction	Environment
Thermosetting (XLPE) insulation	Ambient Temperature: 30°C
With or without LSHF sheathing	Ground ambient temperature: 20°C
	Conductor Operating Temperature: 90°C

Table D3

Current Rating - Multi-core Armoured

CURRENT-CARRYING CAPACITY (amperes):

Conductor cross-sectional area	Reference Method C (clipped firect)		Reference Method E (in free air or on a perforated cable tray etc, horizontal or vertical)		Reference Method D (direct in ground or in ducing in ground, in or around buildings)	
	two-core cable, single phase a.c. or d.c.	three- or four-core cable, three phase a.c.	two-core cable, single phase a.c. or d.c.	three- or four-core cable, three phase a.c.	two-core cable, single phase a.c. or d.c.	three- or four-core cable, three phase a.c.
1	2	3	4	5	6	7
(mm^2)	(A)	(A)	(A)	(A)	(A)	(A)
1.5	27	23	29	25	25	21
2.5	36	31	39	33	33	28
4	49	42	52	44	43	36
6	62	53	66	56	53	44
10	85	73	90	78	71	58
16	110	94	115	99	91	75
25	146	124	152	131	116	96
35	180	154	188	162	139	115
50	219	187	228	197	164	135
70	279	238	291	251	203	167
95	338	289	354	304	239	197
120	392	335	410	353	271	223
150	451	386	472	406	306	251
185	515	441	539	463	343	281
240	607	520	636	546	395	324
300	698	599	732	628	446	365
400	787	673	847	728	-	-

Table D4
Voltage Drop - Multi-core Armoured

VOLTAGE DROP (per ampere per metre):

Conductor cross-sectional area	Two-core cable, d.c.	Two-core cable, single phase a.c.			Three- or four-core cable, three phase a.c.		
1	2	3			4		
(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	0.20	0.140	0.24	0.175	0.125	0.21
300	0.155	0.16	0.140	0.21	0.140	0.120	0.185
400	0.120	0.13	0.140	0.190	0.115	0.120	0.165

Correction Factors

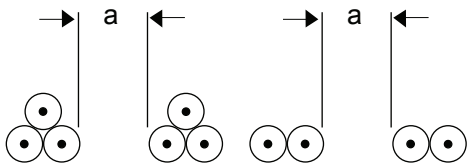
These correction factors are to supplement Table D1 and D3.

Table D5

Correction factors for more than one circuit, cables laid directly in the ground

Number of circuits	Cable to cables clearance (a)				
	Nil (cables touching)	One cable diameter	0.215m	0.25m	0.5m
2	0.75	0.80	0.85	0.90	0.90
3	0.65	0.70	0.15	0.80	0.85
4	0.60	0.60	0.70	0.75	0.80
5	0.55	0.55	0.65	0.70	0.80
6	0.50	0.55	0.60	0.70	0.80

Single-core cables



Multicore cables

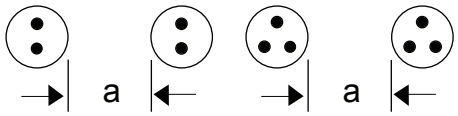


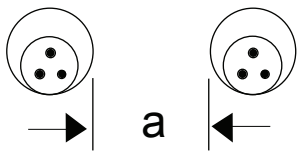
Table D6

Correction factors for more than one circuit, cables laid directly in ducts in the ground

A - Multicore cables in single-way ducts

Number of cables	Duct to duct clearance (a)			
	Nil (cables touching)	0.25m	0.5m	1.0m
2	0.85	0.90	0.95	0.95
3	0.75	0.85	0.90	0.95
4	0.70	0.80	0.85	0.90
5	0.65	0.80	0.85	0.90
6	0.60	0.80	0.80	0.90

Multicore cables



B - Single-core cables in single-way ducts

Number of single-core circuits of two or three cables	Duct to duct clearance (a)			
	Nil (cables touching)	0.25m	0.5m	1.0m
2	0.80	0.90	0.90	0.95
3	0.70	0.80	0.85	0.90
4	0.65	0.75	0.80	0.90
5	0.60	0.70	0.80	0.90
6	0.60	0.70	0.80	0.90

Single-core cables

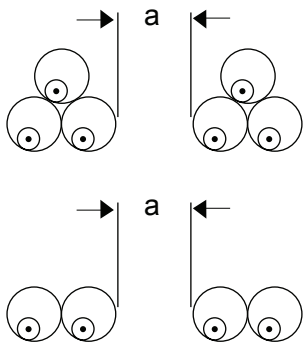


Table D7
Maximum conductor resistance

Cross Section Area (S) (mm^2)	Conductor for fixed wiring Class 1 (solid) Class 2 (stranded) ohm/km at 20°C
0.50	36.0
0.75	24.5
1.00	18.1
1.50	12.1
2.50	7.41
4	4.61
6	3.08
10	1.83
16	1.15
25	0.727
35	0.524
50	0.387
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 D8
Electrical Characteristics

Conductor Resistance Temperature Correction Factors			
Temp°C	Factor	Temp°C	Factor
10	0.961	25	1.020
11	0.965	30	1.039
12	0.969	35	1.059
13	0.972	40	1.079
14	0.976	45	1.098
15	0.980	50	1.118
16	0.984	55	1.138
17	0.988	60	1.157
18	0.992	65	1.177
19	0.996	70	1.196
20	1.000	75	1.216
21	1.004	80	1.236
22	1.008	80	1.255
23	1.012	90	1.275
24	1.016	-	-

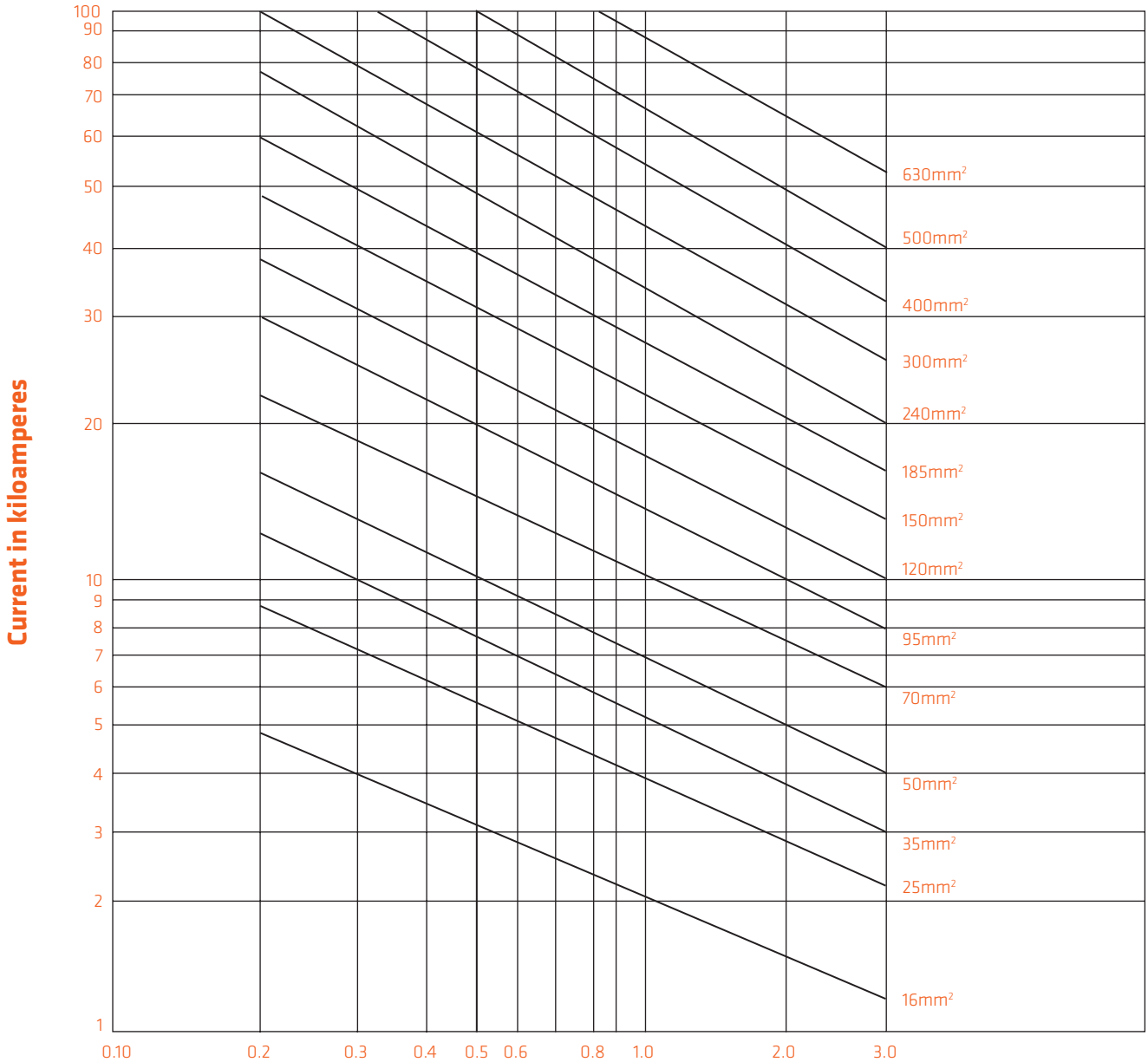
Short Circuit Ratings

Another important factor for determining the right conductor size is the maximum allowable current during a short circuit, when the maximum allowable conductor temperature is higher than during normal operation. The maximum permissible short circuit current of XLPE cables up to 1 kV with copper conductors can be calculated with following formula:

$$1k = \frac{S}{\sqrt{t}} \cdot K$$

1k = Maximum permissible short circuit current (A)
S = Conductor area (mm²)
t = Duration of short circuit process (s). Maximum value for t is 5 seconds
K = Constant of 143 for copper conductors and temperature rising 90°C to 250°C

Cooper Conductors



Cables & Drum Handling and Storage Procedure

Minimum bending radius

Types of cable	Unarmoured		Armoured
Number of cores	Single core	Multicore	
300 / 500V and 600 / 1000V cable	8⌀	6⌀	10⌀

Calculating side wall pressure to cable

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

$$\text{Side wall pressure to cable} = \frac{\text{Pulling tension (kgf)}}{\text{Bending radius (m)}} = \frac{T}{R}$$

Permissable maximum pulling tension **T** for copper conductor cables:

T = 7 x (# of cores) x (conductor cross-sectional area)

Drum handling

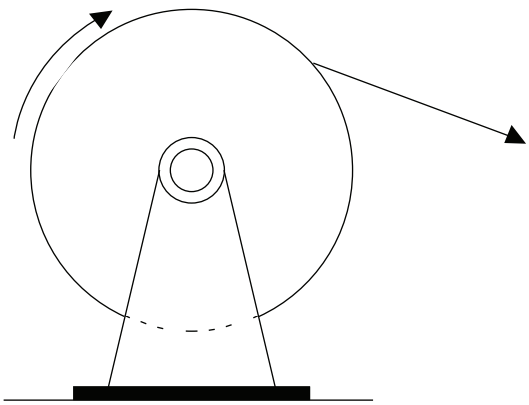
Always handle the drums with care. Here are two points how:

1. Always use a fork-lift truck or crane when removing drums from the vehicle.
2. Always take care to lower the drums into an upright position on their flanges.

Unwinding Cables

DO:

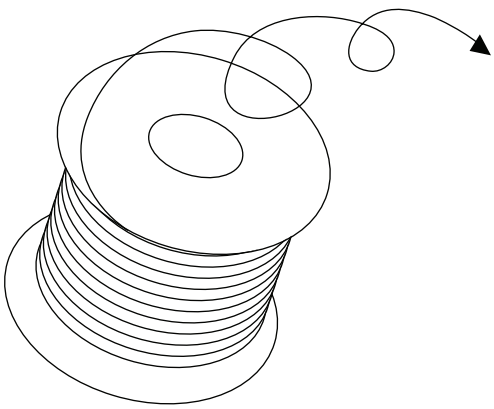
Unwind from the top of the drum.



Right!

DON'T:

Pulling like this causes kinking and possible damage to drum and cable.



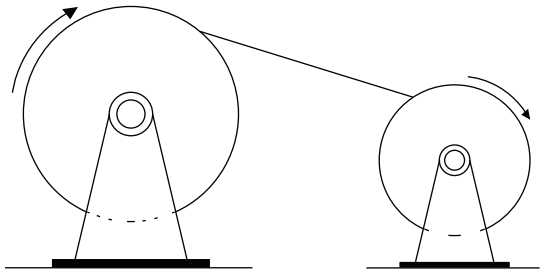
Wrong!

Rewinding Cables / Changing Drums

Rewinding

DO:

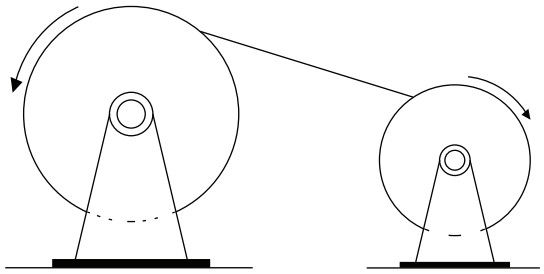
Wind the top part between drums.



Right!

DON'T:

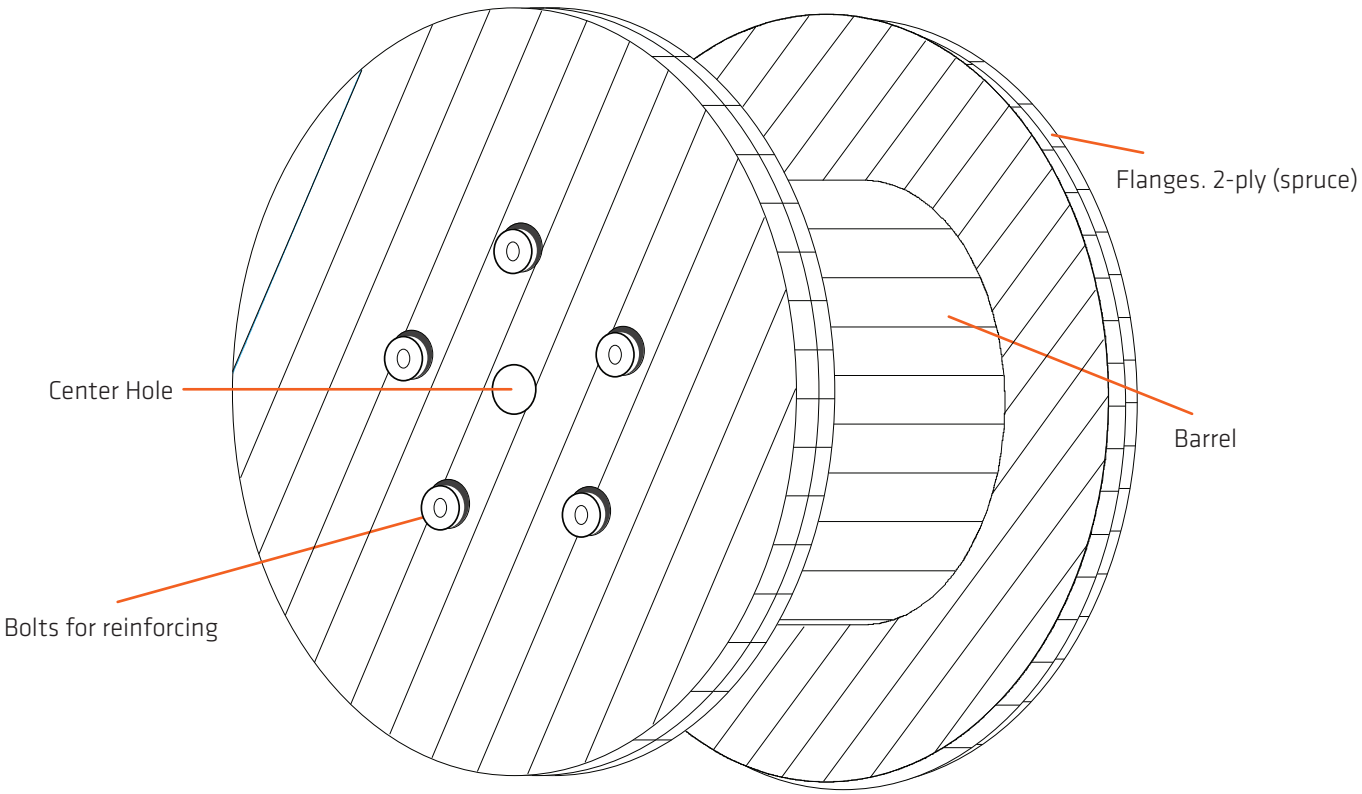
Wind from top to bottom between drums.



Wrong!

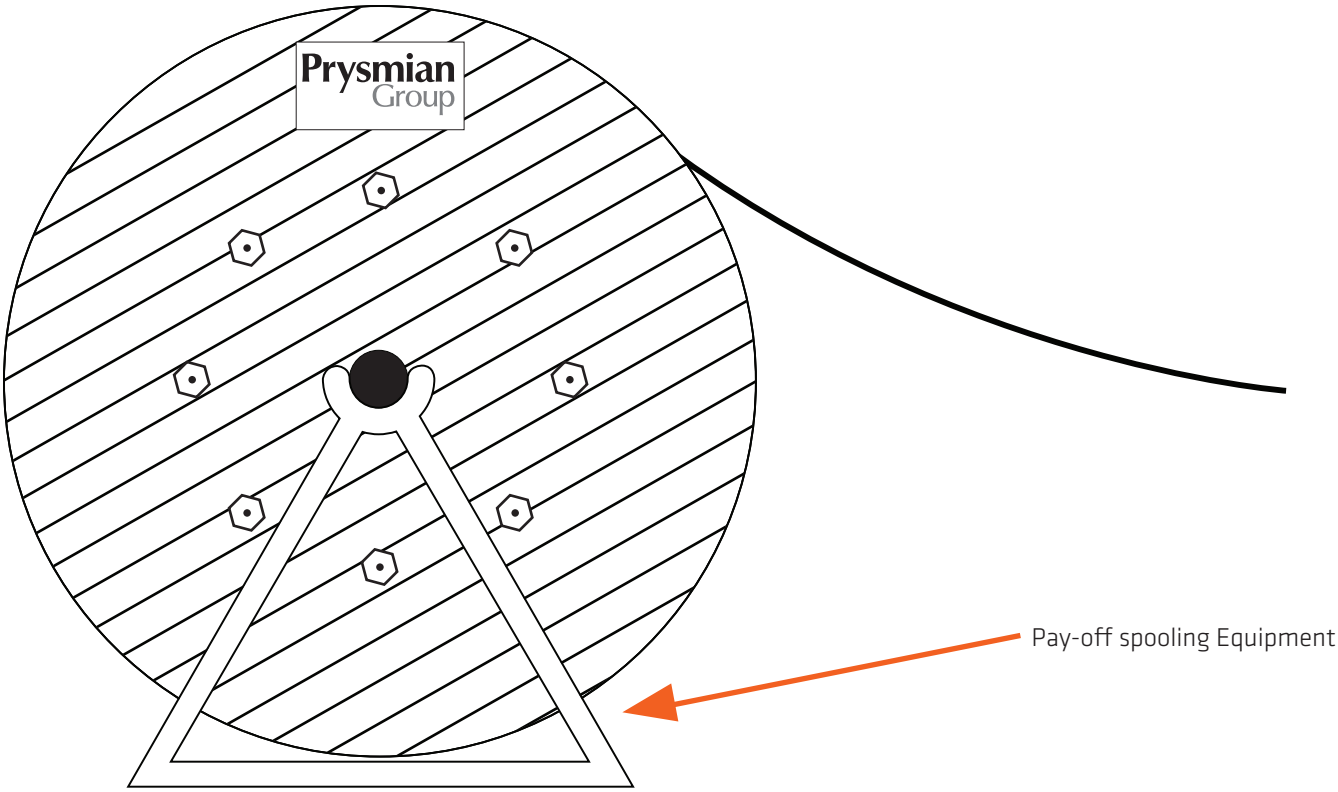
Tightening Drum Flanges

Due to changing weather conditions, wooden drums may slightly shrink or loosen, which requires retightening on the flange bolts, show in diagram.



Proper Spooling Equipment

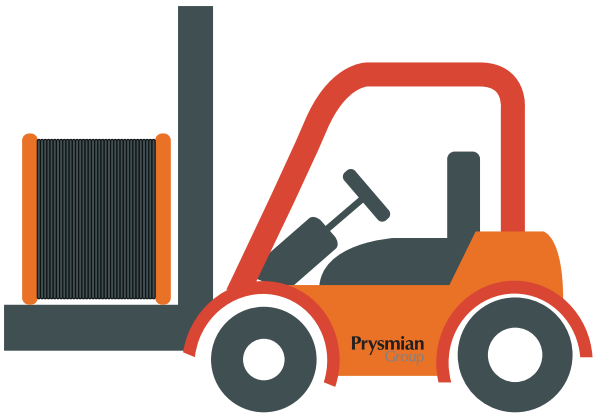
Although cables are generally tough, they can still be damaged by impact, pinching or abrasion. Pay-off spooling makes for an easy operation. Through faulty handling, cables may slide or "crawl". This can result in pinching or locking, which causes damage.



Handling with a forklift

DO:

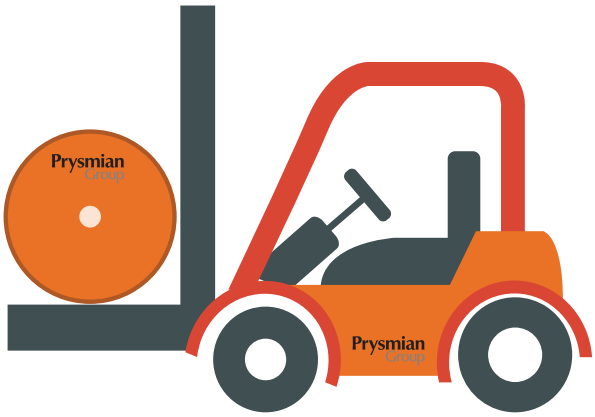
Face the fork towards the drum front view and across both flanges. (See picture 1a)



Picture 1a

DON'T:

Fork the drum from the side, as it will cause damage to the cables. (See picture 1b)

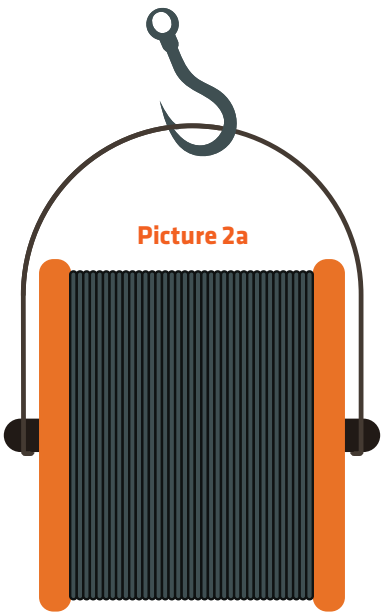


Picture 1b

Handling with a hoist

DO:

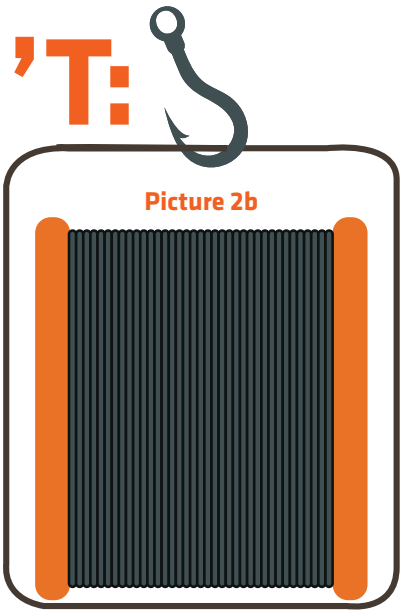
Use a hoist to lift the cable drums, with a steel pipe across the drum centre and a certified sling belt or wire rope.
(See picture 2a)



Picture 2a

DON'T:

Lay the sling belts over the wood battens, causing damage to both wood battens and cable.
(See picture 2b)

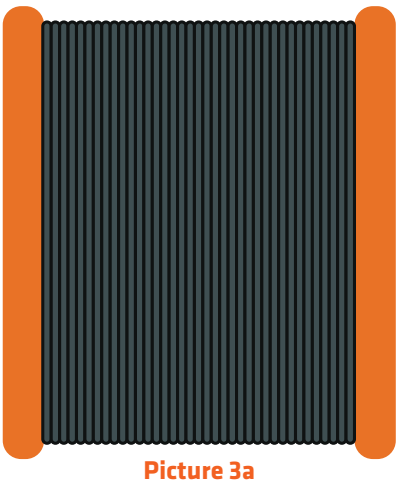


Picture 2b

Storage

1. Cables coiled in the drum must have a minimum 2 inch gap from the flange edge,
2. For open storage, black PVC sheet must be used to wrap and protect the cables.
3. Cable drums must be stored in an upright position.

DO: Cable drum in upright position, with 2 inch gap from crum flange edge (See picture 3a)



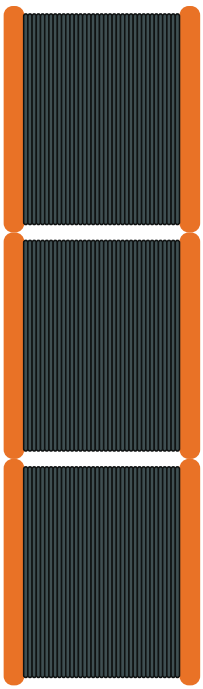
Picture 3a

DON'T: Cable drum laid on one flange side, causing cable sag. (See picture 3b)

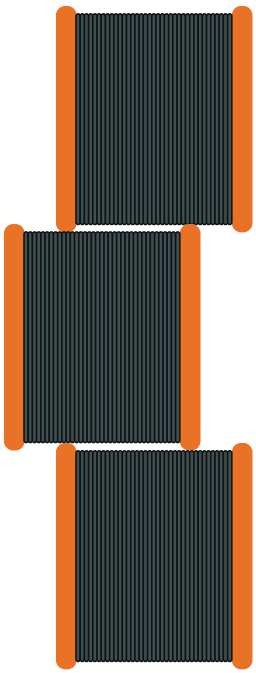
Picture 3b

4. Wood chokes should be placed under the flanges to prevent accidental rolling

5. In vertical storage, drum flanges must be aligned (Picture 4a). Misaligned flanges will come into contact with cables, causing damage. (Picture 4b)



Picture 4a



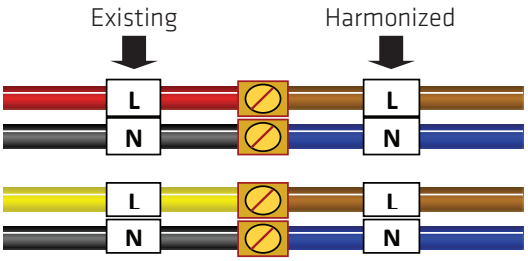
Picture 4b

Identification of Cores in Cables

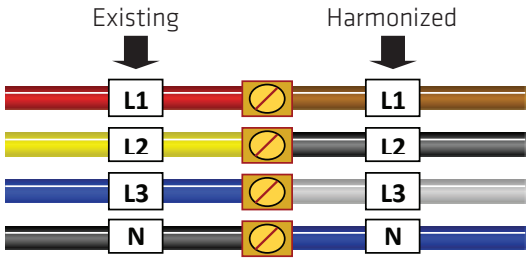
In March 2004, the Amendment No.2: AMD 14905 to BS7671: 2001 (IEE Wiring Rgulations Sixteenth Edition) has been harmonized with the CENELEC Standard HD 384.5.514: Identification including 514.3: Identification of conductor and with CENELEC Harmonization Document HD 308 S2: 2001 Identification of cores in cables and flexible cords.

The change in cable core colours is a major development that will affect the way wiring cable colours are distinguished and installed. Currently, for three phase fixed electrical installations, the wiring cable colours for "line" connections are red, yellow and blue respectively. The new three phase harmonized cable core colours will be brown, black and grey, following that of the new BS 7671: 2008 Requirements for electrical installations, IEE Wiring Regulations, 17th edition. A number of countries in the European Union as well as Hong Kong and Singapore are implementing these harmonized cable core colours.

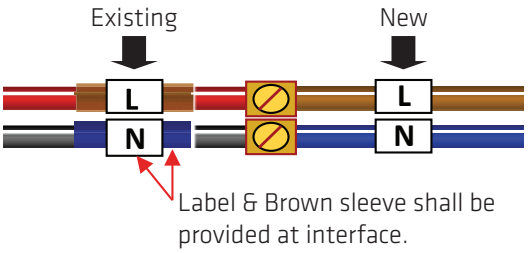
SINGLE-PHASE CIRCUITS



THREE-PHASE CIRCUITS



For any new electrical installation that involved extension from existing wiring system, BS7671 has been modified to align with these cable core colours where suitable marking/ labelling method eg. colour tapes, sleeves, discs, or by alphanumerics (letters and/or numbers) is allowed. See below figure:-



Cable cores colour code

Function	Alpha-numeric	Existing Core Colour	New Harmonized Core Colour
Protective conductor		Green / Yellow	Green / Yellow
Functional earthing conductor		Cream	Cream
AC Power Circuit			
- Phase	L	Red	Brown
- Neutral	N	Black	Blue
Three Phase Circuit			
- Phase 1	L1	Red	Brown
- Phase 2	L2	Yellow	Black
- Phase 3	L3	Blue	Grey
- Neutral	N	Black	Blue
DC Two-Wire Unearthed Circuit			
- Positive	L+	Red	Brown
- Negative	L-	Black	Grey
DC Two-Wire Earthed Circuit			
- Positive (of negative earth)	L+	Red	Brown
- Negative (of negative earth)	M	Black	Blue
- Positive (of positive earth)	M	Black	Blue
- Negative (of positive earth)	L-	Blue	Grey
DC Three-Wire Circuit			
- Positive	L+	Red	Brown
- Mid-wire (may be earthed)	M	Black	Blue
- Negative	L-	Blue	Grey

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BRUNEI

7000 Units Housing Development
Balai Bomba At Perumahan Kg Bt Beruang, Tutong
Balai Bomba Dan Perumahan Kampong Mentiri
BLNG / Refinery CCTV
BLNG Cooling Tower
BLNG Power Plant
Brunei Methanol Plant
BSP CER (Containerised Equipment Room)
BSP DATA Centre
BSP Magpie Platform
BSP Mampak Platform
BSP Seria North Flank
BSP Supplies
BSP Tank Major Repair
Centre Point Hotel updraging
DES Supplies
DES Supply
Empire Hotel upgrading
Kg Kilanas Mosque
Kiulap Mall
Light Industry Shop at Kg Katimahar, Sengkurong
Magistrate Court
Maraburong Prison
Naval Base
New Building For Brunei Muara District
Radio TV Brunei
RTB (Radio TV Brunei)
SCOT Rejuvenisation
Shell Brunei Refinery
Tutong Street Lighting

INDONESIA

Australia Embassy
British Embassy
Ciputra World
DATA Centre at Surabaya
Kemang Village Apt
Kuningan City
Life Style Kuta Bali
LOTTE Mart Bintaro
Mall Summarecon
Mayapada Hospital
SILOAM Hospital
ST Moritz
TANG City Mall
TEMPO Scan
TRANS Studio Bandung

MALAYSIA

ALAM DAMAI
BANK NEGARA
Bank Negara Malaysia, Cyberjaya
BASF Gebeng, Petronas
CAPITAL SQUARE KL
Customs Kelantan
CX5
CYBERJAYA PRIMA 9 & 10
CYGAL PROPERTIES
Good Wood Hotel, JB
GOOGLE DATA CENTER
HONG LEONG DATA CENTER
Jaya Jusco, Bukit Indah, JB
JB PROJECT
KINRARA MAS PUCHONG
KLIA 2 - MOV COMMUNICATION
KLIA SPUR LINE
Kuantan & Segamat Compressor
Expansion Project
LHDNM - CYBERJAYA
Light Rail Transit Station
LOT C, KLCC
LYNAS
Expansion Project
LHDNM - CYBERJAYA
Light Rail Transit Station
LOT C, KLCC
LYNAS
MCOT Petronas
Megasteel
MELODY HOME PROJECT
MEMC
Midvalley Megamall
MLNG – Fire & Gas System, Metering Station 1
MyDin Hypermarket
PACIFIC FOOD
PAHLAWAN
PAJAM, SOLAR FARM
PEMBINAAN PEJABAT TANAH & GALIAN PAHANG
Petronas Refinery Melaka
Petronas Twin Towers
RAUB AUSTRALIAN GOLD MINE PROJECT
S-COGENERATION Project
SGL CARBON BANTING
Shell offshore Platform B11, F6, F26
SMART Tunnel Project
SPMY - HK SL SUNPOWER
SUBANG AVENUE
SUNPOWER PROJECT SITE (SPMY-HK 8L)
Tawakai Hospital
Teluk Salut, Ranhill Power
Tenaga National Berhad SCADA System
TNB
TNB SCADA System
UOA Holding Berhad - 2 Block Condominium at Bangsar South
UTUSAN MALAYSIA
Wisma Lee Rubber
WISMA PERSEKUTUAN AT MITC MELAKA
WTP

SINGAPORE

A'Posh Bizhub
Alstom Metropolis C830
Anchor Handling Tug/Supply AHTS – Ice Class
Baywater Condo, The
Breadtalk HQ
Civil Aviation Authority of Singapore - Changi Airport T3
Changi Airport Group
Changi Naval Base
Changi PMS Electrical Works
Changi Prison Complex
Changi Prison HQ
Changi Water Reclamation Plant
Circle Line Stage 3 (Mechancial)
Circle Line Stage 3,4,5 (Electrical)
Circle Line C830, C414
Common Service Tunnel - Marina
Creek Condo
Credit Suisse Data Center
DBSS Tampines
DBSS - Yishun
Deutsche Bank @ Mapletree Business City
DHL @ Greenwich Drive Tampines Logispark
Downtown line signal package, C955, C956, C960, C961
Downtown Line Stage 1
Downtown Line Stage 2
Downtown Line Stage 3
Exxon Mobile Singapore Parallel Trains 1 & 2, Jurong Island
Formula One - Singapore GP
Gardens by the Bay
HDB - Commercial, Industrial & Residential Projects
ION Orchard
Islamic Hub
Kallang Paya Lebar Expressway C415
Management Development Institute of Singapore
Marina Coastal Expressway C461, C466
Marina Bay Sands Integrated Resort
McDermott Deep Sea Pipe Laying Vessel
Mermaid Marine Platform Supply Vessel
MSD Pharmaceutical Facility
National Centre For Infectious Diseases
National University Hospital
North Point City
North South Line Extension (Electrical), C1565
North South Line Extension (Mechanical), C1563
North, South, East, West Re-signaling Project
Okio Condominum
One Riverside Development
Orchard Gateway
OTS10 (Oil Tanking) Project
Oxley Bizhub 1 & 2
Penjuru Terminal
Istana CCTV
PSA Corporation Harbor projects
Regal Theatre
Renewable Energy Consortium
Republic of Singapore Navy Littoral Mission Vessels
Savvis Datacenter
SBM Shell Stones FPSO
Schering Plough Expansion
Serangoon Nursing Home
SG2 Equinox Datacentre
Singapore General Hospital Heart Center
Singapore General Hospital Pathology Center
Shell Bukom C2 Jetty
Shell Houdini, Bukom Refinery
Shell MEG Air Liquide Project
Singapore Sports Hub
St James Power Station
Tampines Town Hub BQ
The Pier @ Robertson Quay
The Pinnacle Collection, Sentosa Cove
The Sail Condo
Transhub Cold Hub 2
Tuas Depot
Tuas Incineration Plant
Tuas Undersea Tunnel
Tuas West Extension
UE Bizhub East @ Changi Business Park
Vopak Horizon Project PII & PIII
Woodlands MRT
Yamal Substation and SKID supply
Yen San Building, Orchard
Yishun Hospital
Yong Loo Lin School of Medicine
Zion Bishan Bible - Presbyterian Church

THAILAND

Airport Rail Link
Ban Rachaprasong Rachadomri
Bangchat Combine Heat & Power Plant
Bangkok Bank Building
Bangkok Metropolitan Administration
Bangkok Transit Systems (BTS)
Bangsui Waterteastment
Baromchonranee Tunnel Road
BNC
Chulalongkorn University
Expressway Thailand Authority
Glow Power 115 MW CFB#3
Honda New Factory - 3
Jasmine Telecom
KLT - 8
Love Beach Hotal
LP Hospitality
Mahidol University (Dentistry Department)
Maneeya
Mass Rapid Transit System (MTRA –Blue Line)
MEA 230 KV Transmission Tunnel
MEA 230kV Underground Transmission Line Between Bangkapi and Chidlom
MEA PM2-0030-WBA Modification Of 69 Kv Circuit Breaker 9 Substations.
Novetel Airport Hotel
Pre Clinic Siriraj Hospital
Prin Narathiwas, Prin Ratchaprarob
PTT ESP & GSP#6 Plant
PTT Phenol Plant
Puric Latic Acid Refinery Plant
Ramkamkhang University
Ricoh (RMT) New Factory
Samart Ministry of Defense Southern
Provinces CCTV
SCB Data Center
Siam Cement Group Chemicals _ THPP#3
Suvanabhumi International Airport (SBIA)
Thammasat University Rangsit
Thappline – Ethanol & Gasohol
The Room Radchada
Triple T Broadband Project
True Multimedia
United International Highway

VIETNAM

Ca Mau Pipeline
Bk Thien Ung Wellhead Platform
Can Tho Airport
Cat Bi Airport
Cat Bi International Airport
CCP Platform
Co Chien Bridge
Damen Shipyard
Dinh Co Gas Processing Plant
Dung Quat Oil Refinery
Dung Quat Refinery's Sulfur Recovery Unit 2 (Sru2)
Fideco Building, HCMC
Gemadept Tower
Hanoi Museum
Holcim Plant
HRD Platform
Hyatt Hotel
IndoChina Plaza Hanoi
Lpg Dinh Vu
MDF Factory
Ministry of Defense Vietnam - Naval Base Power Supply
MSP6 Platform
Nam Con Son Gas Pipelines
Noi Bai Airport – Terminal 2
Park Hyatt HCM
Radio Frequency Office Building
RMIT University HCM
Saigon Pearl Condominium
Tan Son Nhat International Airport – Upgrading
Tan Son Nhat Oil Storage
Thai Binh - Ham Rong Gas Pipelines
Thai Binh – Ham Rong Gas Distribution & Gathering System
Thi Vai LPG Storage Tanks Development
Vietcombank Tower HCM
Vietnam National Assembly House
White Lion – Ehouse Stt

Certification Partners

Linking fire safety to reliable connectivity

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