



Fire Resistant & Flame Retardant Cables

Product Catalogue



Tai Sin[®]

The Electric Solutions Specialist For Asia Since 1958



Since its incorporation in 1980 as Tai Sin Electric Cables Manufacturer Limited, the Company has expanded and diversified over the past two decades to establish itself as the present Tai Sin Electric Limited ("Tai Sin"). Listed on the Stock Exchange of Singapore Catalist (formerly known as SESDAQ) in 1998, the Group's exceptional growth and operational excellence was rewarded with a transfer to the SGX Main Board in 2005.

Over time, the Tai Sin Group of Companies has built strong business competencies that has served as a solid foundation for the exponential growth that saw it expand into many new markets. Today, it is only one of a few enterprises that combine the manufacturing of cables, switchboards and lamps, with a successful network distributing electrical and control products, devices and accessories. This fast growing network is beginning to exert a global reach, with subsidiaries and offices strengthening existing businesses and exploring new opportunities in Singapore, Malaysia, Brunei, Vietnam, New Zealand and the UAE.

Tai Sin's Cable business builds its success on the aggressive development and marketing of a comprehensive range of high quality cables through a distribution network serving a diverse range of industries, while maintaining strong partnerships with reputed consultants and main contractors. Working together, we provide competitive electrical cabling and wiring solutions for both the private and public sectors in all categories of industrial, commercial, residential, offshore and marine projects.

To cater for the robust growth in the regional market, Tai Sin now operates three cable manufacturing plants. They are located in Singapore, Malaysia and Vietnam, all of which are fully equipped with the latest manufacturing facilities and technologies to meet increasing demands.

Tai Sin is strongly committed to making continual advancements in technology and innovation, both of which are our greatest strengths. Our ISO 9001 certification and conformance with various world-class quality test bodies are solid testimonies to our untiring efforts to achieve excellent quality in both our manufacturing process and our end products.

For more than 25 years, we have grown steadily based on a sound business philosophy of providing quality products using leading edge technology, backed by unflinching excellence in customer service and faster turnaround time to maintain customer loyalty. These are the beliefs and values that give us the strength and confidence to continue to grow, excel and succeed in the exciting years ahead.



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Fight Fires Before They Even Start

Fire safety is clearly one of the top priorities in safety infrastructure for modern buildings of any category. A fire, once spread out of control, can quickly cause extensive damage to property and ultimately to human lives. Ideally, all measures should be in place to ensure that a fire never ever occurs, but in the event that a fire's been ignited, every precaution should already be in place to ensure that it is contained quickly. And that's where fire-resistant and flame-retardant cables come into play.

Conventional fire resistant cables largely make use of polyvinyl chloride (PVC) in their construction, and this could turn out to be a lethal flaw when a bigger fire breaks out. PVC coatings, once exposed to intense heat, produce large amounts of smoke and poisonous gases, paradoxically creating a potentially fatal situation that makes safe escape from a fire difficult and dangerous.

With increased safety awareness and more stringent safety requirements, it is timely to switch to the new generation of low smoke, zero halogen fire resistant cables that are designed to stand up to the test even when major fires erupt. They are also now mandatory for certain safety applications including:

- Fire alarm systems
- Sprinklers
- Smoke detection and extraction equipment
- Emergency lighting and evacuation systems

It is also recommended that they be used extensively in other routine electrical installations throughout buildings, thus adding significantly to the safety margin and helping save lives and properties when a fire emergency arises.

Fire Resistant Tests

BS 6387, SS 299, *IEC 60331

Specification for performance requirements for cables required to maintain circuit integrity under fire conditions.

Residents, owners and regulatory authorities of buildings are now, more than ever, protected by stringent safety requirements. Electrical installations – particularly fire alarm systems, sprinklers, smoke detection and extraction equipment, emergency lighting and evacuation systems – all merge to prevent harm to people and damage to buildings and equipment.

The wiring behind the systems prove to be an important factor in preventing fires from spreading, and stopping smoke from choking off exit points and allowing a safe rescue. If the wiring is adversely affected, the systems themselves will have no power to provide their own critical functions.

Stringent tests – including IEC 60331, BS 6387 and SS 299 – are performed to ensure that such cables are fire-resistant.

Resistance to fire alone (*IEC 60331, BS 6387, SS 299)

Category A - Cables are subjected to fire at 650°C for 3 hours.

Category B - Cables are subjected to fire at 750°C for 3 hours.

Category C - Cables are subjected to fire at 950°C for 3 hours.

*** In accordance to IEC 60331, cables are subjected to fire at 750°C for 3 hours. In not less than twelve hours after the test, the cable shall again be energized, and there shall not be any breakdown.**

Resistance to fire with water (BS 6387, SS 299)

Category W - Cables are subjected to fire at 650°C for 15 minutes, then at 650°C with water spray for a further 15 minutes.

Resistance to fire with mechanical shock (BS 6387, SS 299)

Category X - Cables are subjected to fire at 650°C with mechanical shock for 15 minutes.

Category Y - Cables are subjected to fire at 750°C with mechanical shock for 15 minutes.

Category Z - Cables are subjected to fire at 950°C with mechanical shock for 15 minutes.

During the test, the flame and test voltage shall be applied continuously for a period of 3 hours and no fuse shall be ruptured nor any lamp extinguished.

Flame Propagation Tests

IEC 60332-3, BS 4066-3, BS EN 50266-2

Tests on electric cables under fire conditions.

IEC 60332-3 Part 1: Tests on a single vertical insulated wire or cable.

IEC 60332-3 Part 3: Tests on bunched wires and cables under fire condition.

Cables form a complex matrix in every building, traversing walls and ceilings to create a web of electrical power. Unfortunately, these cables also act as conduits for fire and heat, so cables must be fashioned of inflammable and self-extinguishing components. This can be achieved by utilizing a protective material containing aluminum hydroxide. In the event of fire, the material releases water crystals, and at the same time produces water vapour, which stops the entrance of oxygen and snuffs out the flame.

The IEC 60332-3 specification creates a realistic fire situation, and specifies methods for assessing the flame retardance of bunched cables with varying densities of combustible material.

This technical report gives details of a test where a number of cables are bunched together to form various test sample installations.

3 test categories to test different amount of combustible material contained in a bundle of cable.

IEC 60332-3-22 (Former IEC 332-3A) - The number of test pieces required to provide a total volume of 7 litres of non-metallic material shall be bunched on a ladder exposed to flame for 40 minutes.

IEC 60332-3-23 (Former IEC 332-3B) - The number of test pieces required to provide a total volume of 3.5 litres of non-metallic material shall be bunched on a ladder exposed to flame for 40 minutes.

IEC 60332-3-24 (Former IEC 332-3C) - The number of test pieces required to provide a total volume of 1.5 litres of non-metallic material shall be bunched on a ladder exposed to flame for 20 minutes.

The cable specimens are placed vertically next to each other and then exposed to the flame for a specified duration. After the burning has ceased, the charred or affected portion should not exceed a height of 2.5 meters.

Acid Gas Emission Tests

IEC 60754-2, BS 6425-2, BS EN 50267-2-2

Test on gases evolved during combustion of electric cables.

A fire can produce corrosive halogen gases, generated by burning PVC or chlorine containing material. HCl gas combines with the water in the eyes, mouth, throat, nose and lungs to form hydrochloric acid, which contributes to loss of co-ordination and orientation. This in turn can lead to a feeling of panic and inability to exit the building, thus increasing potential fatalities by inhalation of carbon monoxide and oxygen depletion.

Additional dangers exist in a fire situation. Chlorine, bromine or fluorine, found in building materials, can combine with the condensation on all metallic materials in the proximity of a fire thus resulting in high levels of corrosion which will damage computers and office machines. Structural ferrous metals can be so corroded that the building has to be demolished.

IEC 60754-2 specifies a method in determining the degree of acidity of gases evolved during the combustion of materials taken from electric cables by measuring pH and conductivity. This standard requires the weighted pH value of not less than 4.3 when related to 1 litre of water, and the weighted value of conductivity should not exceed 10µS/mm.

Smoke Emission Tests

IEC 61034-2, BS 7622-2, BS EN 61034-2

Measurement of smoke density of electric cables burning under defined conditions.

Smoke hinders fire-fighting efforts and prevents safe evacuation from the building. Smoke extraction equipment helps, but low smoke products can stop the problem before it starts. Conventional insulation and sheathing material such as polyvinyl chloride (PVC) can produce large volumes of smoke when burned, thus contributing to disorientation and smoke inhalation damage.

Measuring the density of smoke by burning cables is important as it is related to the evacuation of people and accessibility for fire fighting.

The "3 meter cube test" (also known as IEC 61043) measures the amount of smoke created by cables in the event of a fire. A one-meter length of cable is placed in a 3m³ enclosure, and exposed to a beam of light through a clear window. This light travels across the enclosure to a photocell connected to recording equipment in the window on the other end. A fire is then generated within the container and the minimum light transmission recorded. A minimum light transmission value greater than 60% is acceptable.

Limiting Oxygen Index

ASTM D 2863

Measuring the minimum oxygen concentration to support candle-like combustion of plastics.

Oxygen index (limiting oxygen index) is the most widely used fire parameter in the assessment of materials. The index is the minimum concentration of oxygen in an oxygen/nitrogen mixture in which the material will burn.

Air contains 21% oxygen and it is often stated that material with an oxygen index greater than 28% will be self-extinguishing. Low Smoke Zero Halogen Flame Retardant material used by Tai Sin is greater than 34%.

THE ULTIMATE PROTECTION, WHATEVER THE APPLICATION

Tai Sin stocks the widest range of fire resistant cables for use in all areas of electrical installation for commercial, industrial and residential projects.

Depending on the potential fire risks, the choice of cables includes single core to multi-cores and pairs, and comes in armoured or unarmoured versions. But whatever your choice, you can enjoy peace of mind knowing that your property will be protected by the best. These cables have been put through the most stringent of control tests, and have surpassed industry standards in all parameters including fire resistance, flame propagation, gas emission, smoke emission and oxygen index.

Be safe, not sorry. Tai Sin offers you complete peace of mind with the best protection money can buy!

Applicable Standards

IEC 60502-1

Power cables with extruded insulation and their accessories for rated voltages from 1kV up to 30kV.

Part 1 – Cables for rated voltages of 1kV and 3kV.

BS 7846

600 / 1000V armoured fire-resistant electric cables having low emission of smoke and corrosive gases when affected by fire.

BS 6724

600 / 1000V armoured electric cables having thermosetting insulation and low emission of smoke and corrosive gases when affected by fire.

BS 7211

Thermosetting insulated cables (unarmoured) for electric power and lighting with low emission of smoke and corrosive gases when affected by fire.

BS 7629-1

300 / 500V fire-resistant screened cables having low emission of smoke and corrosive gases when affected by fire.

Part 1 – Multicore and multi-pair cables.

BS EN 50288-7

Multi-element metallic cables used in analogue and digital communication and control.

Part 7 – Sectional specification for instrumentation and control cables.

BS 5308-1

Instrumentation cables.

Part 1 – Specification for polyethylene insulated cables.

BS 6387 / SS 299

Performance requirements for cables required to maintain circuit integrity under fire conditions.

IEC 60331

Fire-resisting characteristics of electric cables.

IEC 60332-1 / BS 4066-1 / BS EN 50266-1

Tests on electric cables under fire conditions.

Part 1 – Method of test on a single vertical insulated wire or cable.

IEC 60332-3 / BS 4066-3 / BS EN 50266-2

Tests on electric cables under fire conditions.

Part 3 – Method of classification of flame propagation characteristics of bunched cables.

IEC 60754-1 / BS 6425-1 / BS EN 50267-2-1

Test on gases evolved during the combustion of materials from cables.

Part 1 – Method of determination of amount of halogen acid gas evolved during combustion of polymeric materials taken from cables.

IEC 60754-2 / BS 6425-2 / BS EN 50267-2-2

Test on gases evolved during the combustion of materials from cables.

Part 2 – Determination of degree of acidity (corrosivity) of gases by measuring pH and conductivity.

IEC 61034-2 / BS 7622-2 / BS EN 61034-2

Measurement of smoke density of electric cables burning under defined conditions.

Part 2 – Test procedure and requirements.

ASTM D 2863

Measuring the minimum oxygen concentration to support candle-like combustion of plastic (oxygen index).

User Guide and Disclaimer

Tai Sin's electric wire and cables are manufactured under strict quality control and designed to perform within fix parameters of electrical, mechanical and environmental tolerances. If used with care, under guidance and supervision of qualified personnel and in conformance to established guidelines and Tai Sin's recommendations, the products will not present a safety hazard. Attention is however drawn to the possibility of secondary hazard resulting from bending, flexing, terminating, transporting, exposure to physical pressure and knocks, chemical and solvents.

Whilst every possible effort has been made to ensure that the information contained in this publication is correct and current at the time of printing, Tai Sin is not responsible for any misrepresentation, error or omission of fact and/or information contained therein. Tai Sin reserves the right to change the information and/or specifications at any time without prior notice in light of technical developments or revisions.

Reference to or extracts from the Singapore Standards (SS), British Standards (BS), International Electrotechnical Commission Standards (IEC), Singapore Productivity & Standards Board (PSB) CP5: 1998 manual, current IEE Wiring Regulations or other regulatory bodies are made with the belief that they are true and accurate. Users are recommended to verify such claims with the respective organizations independently.

FR-H SINGLE CORE



FR-XH SINGLE CORE



FR-XAH SINGLE CORE



FR-H single core

FR-XH single core

FR-XAH single core

<p>Conductor : Fire Barrier : Insulation :</p> <p>Bedding : Armouring : Sheath : Colour :</p> <p>Reference Standard : Test Standard :</p> <p>Voltage U₀/U : Conductor Stranding : Operating Temperature :</p> <p>Minimum Bending Radius :</p>	<p>Plain Annealed Copper Mica Tape (a) XL-LSZH Compound or (b) XLEVA Compound</p> <p>Insulation: Various</p> <p>BS 7211 / In-House IEC 60331 BS 6387 (C, W, Z), SS 299 (C) IEC 60332-3, BS 4066-3, BS EN 50266-2-2 IEC 60754-1, BS 6425-1, BS EN 50267-2-1 IEC 60754-2, BS 6425-2, BS EN 50267-2-2 IEC 61034-2, BS 7622-2, BS EN 61034-2 450 / 750V, 600 / 1000V Class 2 (a) Max 90°C for XL-LSZH Compound (b) Max 110°C for XLEVA 8D for unarmoured cable</p>	<p>Plain Annealed Copper Mica Tape (a) XLPE Compound or (b) XLEVA Compound</p> <p>LSZH Compound Insulation: Natural Sheath - Orange IEC 60502 IEC 60331 BS 6387 (C, W, Z), SS 299 (C) IEC 60332-3, BS 4066-3, BS EN 50266-2-2 IEC 60754-1, BS 6425-1, BS EN 50267-2-1 IEC 60754-2, BS 6425-2, BS EN 50267-2-2 IEC 61034-2, BS 7622-2, BS EN 61034-2 600 / 1000V Class 2 (a) Max 90°C for XLPE (b) Max 110°C for XLEVA 8D for unarmoured cable</p>	<p>Plain Annealed Copper Mica Tape (a) XLPE Compound or (b) XLEVA Compound LSZH Compound Aluminium Wire LSZH Compound Insulation: Natural Sheath - Orange IEC 60502 / BS 7846 IEC 60331 BS 6387 (C, W, Z), SS 299 (C,W,Z) IEC 60332-3, BS 4066-3, BS EN 50266-2-2 IEC 60754-1, BS 6425-1, BS EN 50267-2-1 IEC 60754-2, BS 6425-2, BS EN 50267-2-2 IEC 61034-2, BS 7622-2, BS EN 61034-2 600 / 1000V Class 2 (a) Max 90°C for XLPE (b) Max 110°C for XLEVA 10D for armoured cable</p>
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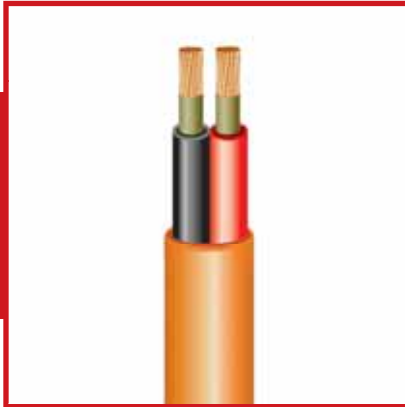
Fire Resistant Cables FR-H, FR-XH, FR-XAH

Table 1

SIZE		FR-H			FR-XH			FR-XAH			
Nominal Conductor Area (mm ²)	No. and Diameter of Wires (no./mm)	Radial Thickness of Insulation (mm)	Insulated, Non-Sheathed		Radial Thickness of Insulation (mm)	Unarmoured		Armoured			
			Cable Overall Diameter (mm)	Approx. Weight (kg/km)		Cable Overall Diameter (mm)	Approx. Weight (kg/km)	Diameter Under Armour (mm)	Armour Wire Diameter (mm)	Cable Overall Diameter (mm)	Approx. Weight (kg/km)
1 x 1.5	7 / 0.53	0.7	4.1	30	0.7	6.4	54	-	-	-	-
1 x 2.5	7 / 0.67	0.8	4.5	41	0.7	6.8	67	-	-	-	-
1 x 4	7 / 0.85	0.8	5.0	58	0.7	7.4	86	-	-	-	-
1 x 6	7 / 1.04	0.8	5.6	79	0.7	7.9	109	-	-	-	-
1 x 10	7 / 1.35	1.0	6.9	127	0.7	8.9	155	-	-	-	-
1 x 16	7 / 1.70	1.0	8.0	187	0.7	9.9	219	-	-	-	-
1 x 25	7 / 2.14	1.2	9.6	289	0.9	11.6	324	-	-	-	-
1 x 35	7 / 2.52	1.2	10.8	387	0.9	12.8	424	-	-	-	-
1 x 50	19 / 1.78	1.4	12.7	520	1.0	14.3	554	13.6	1.25	19.7	800
1 x 70	19 / 2.14	1.4	14.4	726	1.1	16.3	770	15.6	1.25	21.7	1045
1 x 95	19 / 2.52	1.6	16.7	996	1.1	18.4	1038	17.5	1.25	23.6	1336
1 x 120	37 / 2.03	1.6	18.2	1237	1.2	20.2	1292	18.6	1.6	25.4	1618
1 x 150	37 / 2.25	1.8	20.1	1517	1.4	22.4	1582	21.3	1.6	28.1	1984
1 x 185	37 / 2.52	2.0	22.4	1896	1.6	24.7	1961	23.6	1.6	30.4	2404
1 x 240	61 / 2.25	2.2	25.4	2472	1.7	27.7	2543	26.4	1.6	33.4	3033
1 x 300	61 / 2.52	2.4	28.0	3086	1.8	30.5	3160	29.2	1.6	36.6	3732
1 x 400	61 / 2.85	2.6	31.3	3921	2.0	34.1	4011	32.6	2.0	41.0	4745
1 x 500	61 / 3.20	2.8	34.8	4915	2.2	37.8	5021	36.2	2.0	44.7	5826
1 x 630	127 / 2.52	2.8	38.6	6266	2.4	42.6	6447	41.0	2.0	49.7	7378
1 x 800	127 / 2.85	-	-	-	2.6	47.5	8179	45.7	2.5	55.8	9406
1 x 1000	127 / 3.20	-	-	-	2.8	52.6	10239	51.0	2.5	61.5	11682

Note: For FR-H cables, Cross-Linked LSZH Compound will be used as the insulation material.

FR-XH 2-4 cores & multi-core



FR-XSH 2-4 cores & multi-core



FR-XH & FR-XSH 2-4 cores

FR-XH & FR-XSH multi-core

Conductor :
Fire Barrier :
Insulation :

Bedding :
Armouring :
Sheath :
Colour :

Reference Standard :
Test Standard :

Voltage U₀/U :
Conductor Stranding :
Operating Temperature :

Minimum Bending Radius :

Plain Annealed Copper
Mica Tape
(a) XLPE Compound or
(b) XLEVA Compound
LSZH Compound
Galvanized Steel Wire
LSZH Compound
Insulation: 2 Cores - Red & Black or Brown & Blue
3 Cores - Red, Yellow & Blue or Brown, Black & Grey
4 Cores - Red, Yellow, Blue & Black or Brown, Black, Grey & Blue

IEC 60502 / BS 7846
IEC 60331
BS 6387 (C, W, Z), SS 299 (C, W, Z)
IEC 60332-3, BS 4066-3, BS EN 50266-2-2
IEC 60754-1, BS 6425-1, BS EN 50267-2-1
IEC 60754-2, BS 6425-2, BS EN 50267-2-2
IEC 61034-2, BS 7622-2, BS EN 61034-2
600 / 1000V
Class 2
(a) Max 90°C for XLPE
(b) Max 110°C for XLEVA
8D for unarmoured cable
10D for armoured cable

Plain Annealed Copper
Mica Tape
(a) XLPE Compound or
(b) XLEVA Compound
LSZH Compound
Galvanized Steel Wire
LSZH Compound
Insulation: White with Black numberings

Sheath - Orange
IEC 60502 / BS 7846
IEC 60331
BS 6387 (C, W, Z), SS 299 (C, W, Z)
IEC 60332-3, BS 4066-3, BS EN 50266-2-2
IEC 60754-1, BS 6425-1, BS EN 50267-2-1
IEC 60754-2, BS 6425-2, BS EN 50267-2-2
IEC 61034-2, BS 7622-2, BS EN 61034-2
600 / 1000V
Class 2
(a) Max 90°C for XLPE
(b) Max 110°C for XLEVA
8D for unarmoured cable
10D for armoured cable

Fire Resistant Cables FR-XH, FR-XSH

Table 2

SIZE		Radial Thickness of Insulation (mm)	FR-XH		FR-XSH			
Nominal Conductor Area (mm ²)	No. and Diameter of Wires (no./mm)		Unarmoured		Armoured			
			Cable Overall Diameter (mm)	Approx. Weight (kg/km)	Diameter Under Armour (mm)	Armour Wire Diameter (mm)	Cable Overall Diameter (mm)	Approx. Weight (kg/km)
2 X 1.5	7 / 0.53	0.7	11.8	150	9.3	0.9	14.7	398
2 X 2.5	7 / 0.67	0.7	12.2	184	10.2	0.9	15.6	451
2 X 4	7 / 0.85	0.7	13.0	234	11.2	0.9	16.6	522
2 X 6	7 / 1.04	0.7	13.8	295	12.4	0.9	17.8	610
2 X 10	7 / 1.35	0.7	15.6	414	14.2	1.25	20.3	880
2 X 16	7 / 1.70	0.7	17.7	575	16.3	1.25	22.4	1102
2 X 25	7 / 2.14	0.9	21.2	849	19.1	1.6	25.9	1483
2 X 35	7 / 2.52	0.9	23.5	1100	22.1	1.6	28.9	1971
3 X 1.5	7 / 0.53	0.7	12.5	172	9.9	0.9	15.3	434
3 X 2.5	7 / 0.67	0.7	13.2	215	10.8	0.9	16.2	502
3 X 4	7 / 0.85	0.7	13.9	280	12.0	0.9	17.4	588
3 X 6	7 / 1.04	0.7	15.6	359	13.2	1.25	19.3	802
3 X 10	7 / 1.35	0.7	16.6	515	15.2	1.25	21.3	1018
3 X 16	7 / 1.70	0.7	18.9	729	17.5	1.25	23.6	1293
3 X 25	7 / 2.14	0.9	22.6	1090	21.2	1.6	28.0	1926
3 X 35	7 / 2.52	0.9	25.0	1427	23.8	1.6	30.6	2371
3 X 50	19 / 1.78	1.0	28.4	1876	27.2	1.6	34.2	2968
3 X 50 (S)	19 / 1.78	1.0	27.2	1638	24.8	1.6	33.0	2756
3 X 70	19 / 2.14	1.1	32.9	2623	30.9	2.0	38.9	3892
3 X 70 (S)	19 / 2.14	1.1	30.9	2286	28.6	2.0	37.9	3817
3 X 95	19 / 2.52	1.1	37.2	3519	35.6	2.0	44.0	5240
3 X 95 (S)	19 / 2.52	1.1	34.3	3078	31.7	2.0	41.5	4865
3 X 120	37 / 2.03	1.2	41.3	4402	39.7	2.0	48.3	6351
3 X 120 (S)	37 / 2.03	1.2	37.6	3836	34.7	2.0	44.8	5849
3 X 150	37 / 2.25	1.4	45.9	5412	43.7	2.5	53.7	7964
3 X 150 (S)	37 / 2.25	1.4	41.7	4677	38.8	2.5	50.3	7311
3 X 185	37 / 2.52	1.6	51.0	6739	48.8	2.5	59.0	9590
3 X 185 (S)	37 / 2.52	1.6	46.1	6172	42.8	2.5	54.8	9104
3 X 240	61 / 2.25	1.7	57.5	8734	54.9	2.5	65.5	11948
3 X 240 (S)	61 / 2.25	1.7	51.4	7567	47.5	2.5	59.8	10922
3 X 300	61 / 2.52	1.8	63.4	10817	60.6	2.5	71.6	14382
3 X 300 (S)	61 / 2.52	1.8	55.3	9383	51.5	2.5	64.4	13151
3 X 400 (S)	61 / 2.85	2.0	70.6	13744	68.0	2.5	79.5	17810
3 X 500 (S)	61 / 3.20	2.2	78.5	17194	75.9	3.15	89.3	22822

2 Cores

3 Cores

Note: (s) - Sectoral Stranded Conductors.

Fire Resistant Cables FR-XH, FR-XSH

Table 3

SIZE			FR-XH		FR-XSH			
Nominal Conductor Area (mm ²)	No. and Diameter of Wires (no./mm)	Radial Thickness of Insulation (mm)	Unarmoured		Armoured			
			Cable Overall Diameter (mm)	Approx. Weight (kg/km)	Diameter Under Armour (mm)	Armour Wire Diameter (mm)	Cable Overall Diameter (mm)	Approx. Weight (kg/km)
4 x 1.5	7 / 0.53	0.7	13.4	202	10.8	0.9	16.2	490
4 x 2.5	7 / 0.67	0.7	14.4	255	11.8	0.9	17.2	571
4 x 4	7 / 0.85	0.7	15.7	336	13.8	0.9	19.2	780
4 x 6	7 / 1.04	0.7	17.1	437	14.5	1.25	20.6	930
4 x 10	7 / 1.35	0.7	18.1	635	16.7	1.25	22.8	1193
4 x 16	7 / 1.70	0.7	20.7	908	19.3	1.6	26.1	1693
4 x 25	7 / 2.14	0.9	24.9	1365	23.5	1.6	30.3	2332
4 x 35	7 / 2.52	0.9	27.6	1797	26.2	1.6	33.2	2885
4 x 50	19 / 1.78	1.0	31.3	2369	29.9	1.6	37.1	3624
4 x 50 (S)	19 / 1.78	1.0	31.0	2173	28.2	1.6	36.7	3427
4 x 70	19 / 2.14	1.1	36.6	3341	34.8	2.0	43.2	5100
4 x 70 (S)	19 / 2.14	1.1	34.8	3032	32.2	2.0	42.0	4788
4 x 95	19 / 2.52	1.1	41.4	4492	39.4	2.0	48.0	6510
4 x 95 (S)	19 / 2.52	1.1	38.9	4105	35.8	2.0	45.9	6117
4 x 120	37 / 2.03	1.2	46.2	5647	43.8	2.5	53.8	8357
4 x 120 (S)	37 / 2.03	1.2	42.4	5110	39.4	2.5	51.1	7784
4 x 150	37 / 2.25	1.4	51.0	6911	48.4	2.5	58.6	9880
4 x 150 (S)	37 / 2.25	1.4	47.2	6209	43.8	2.5	55.8	9262
4 x 185	37 / 2.52	1.6	57.0	8637	54.0	2.5	64.6	11965
4 x 185 (S)	37 / 2.52	1.6	52.1	8223	48.2	2.5	60.8	11522
4 x 240	61 / 2.25	1.7	64.2	11199	60.8	2.5	71.8	14990
4 x 240 (S)	61 / 2.25	1.7	58.0	10076	53.9	2.5	67.1	14018
4 x 300	61 / 2.52	1.8	71.0	13914	67.2	2.5	78.6	18124
4 x 300 (S)	61 / 2.52	1.8	63.2	12522	58.8	2.5	72.3	16865
4 x 400 (S)	61 / 2.85	2.0	79.0	17680	76.3	3.15	90.0	23368
4 x 500 (S)	61 / 3.20	2.2	87.8	22119	84.7	3.15	99.0	28436
5 x 1.5	7 / 0.53	0.7	13.2	218	11.8	0.9	16.4	500
7 x 1.5	7 / 0.53	0.7	14.3	265	12.9	0.9	17.5	576
10 x 1.5	7 / 0.53	0.7	18.3	404	16.5	1.25	22.0	901
12 x 1.5	7 / 0.53	0.7	18.9	459	17.1	1.25	22.6	977
19 x 1.5	7 / 0.53	0.7	22.3	649	19.5	1.6	25.9	1249
27 x 1.5	7 / 0.53	0.7	27.0	870	24.5	1.6	31.3	1808
37 x 1.5	7 / 0.53	0.7	30.3	1183	27.6	1.6	34.6	2224
48 x 1.5	7 / 0.53	0.7	34.8	1500	31.7	1.6	38.8	2706
5 x 2.5	7 / 0.67	0.7	14.5	297	12.8	0.9	17.6	588
7 x 2.5	7 / 0.67	0.7	15.8	378	14.0	0.9	18.8	691
10 x 2.5	7 / 0.67	0.7	20.2	547	18.2	1.25	23.9	1080
12 x 2.5	7 / 0.67	0.7	20.8	625	18.9	1.25	24.6	1178
19 x 2.5	7 / 0.67	0.7	24.6	896	22.7	1.6	29.3	1734
27 x 2.5	7 / 0.67	0.7	29.6	1236	27.1	1.6	34.1	2235
37 x 2.5	7 / 0.67	0.7	33.3	1645	30.5	1.6	37.7	2745
48 x 2.5	7 / 0.67	0.7	38.2	2089	37.7	2.0	46.0	3903
5 x 4	7 / 0.85	0.7	16.0	394	14.2	1.25	19.9	830
7 x 4	7 / 0.85	0.7	17.4	508	15.6	1.25	21.3	977
10 x 4	7 / 0.85	0.7	22.3	736	20.6	1.25	26.5	1360
12 x 4	7 / 0.85	0.7	23.1	848	21.3	1.6	27.9	1654
19 x 4	7 / 0.85	0.7	27.3	1230	25.2	1.6	32.0	2163
27 x 4	7 / 0.85	0.7	32.9	1706	30.4	1.6	37.6	2834
37 x 4	7 / 0.85	0.7	37.1	2283	34.7	2.0	42.9	3797
48 x 4	7 / 0.85	0.7	42.6	2910	42.1	2.0	50.6	4952

4 Cores

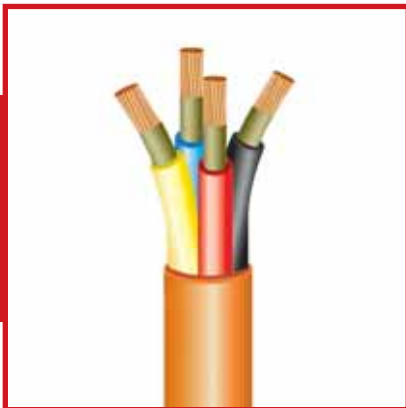
Multi-Core

Note: Other conductor sizes & core configurations are available upon request.

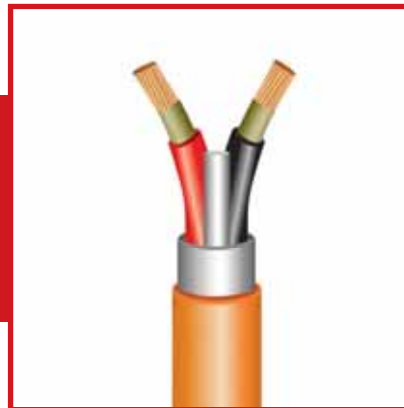
: Braided Armoured Cables are available upon request.

: (S) - Sectoral Stranded Conductors.

**FR-XL
1-4 Cores**



**FRA-XOL
2-4 Cores**



**FR-XL
1-4 cores**

**FRA-XOL
2-4 cores**

<p>Conductor : Fire Barrier : Insulation :</p> <p>Overall Screen :</p> <p>Bedding : Armouring : Sheath : Colour :</p> <p>Reference Standard : Test Standard :</p> <p>Voltage Uo/U : Conductor Stranding : Operating Temperature :</p> <p>Minimum Bending Radius :</p>	<p>Plain Annealed Copper Mica Tape (a) XLPE Compound or (b) XLEVA Compound</p> <p>LSZH Compound Insulation: 1 Core - Natural 2 Cores - Red & Black / Brown & Blue 3 Cores - Red, Yellow & Blue / Brown, Black & Grey 4 Cores - Red, Yellow, Blue & Black / Brown, Black, Grey & Blue</p> <p>Sheath - Orange BS 6004 / In-house IEC 60331 BS 6387 (C, W, Z), SS 299 (C, W, Z) IEC 60332-3, BS 4066-3, BS EN 50266-2-2 IEC 60754-1, BS 6425-1, BS EN 50267-2-1 IEC 60754-2, BS 6425-2, BS EN 50267-2-2 IEC 61034-2, BS 7622-2, BS EN 61034-2 300 / 500V Class 2 (a) Max 90°C for XLPE (b) Max 110°C for XLEVA 6D for unarmoured cable</p>	<p>Plain Annealed Copper Mica Tape (a) XLPE Compound or (b) XLEVA Compound Aluminium / Polyester Tape with full size tinned annealed copper circuit protective conductor</p> <p>LSZH Compound Insulation: 2 Cores - Red & Black / Brown & Blue 3 Cores - Red, Yellow & Blue / Brown, Black & Grey 4 Cores - Red, Yellow, Blue & Black / Brown, Black, Grey & Blue</p> <p>Sheath - Orange BS7629-1 / In-house IEC 60331 BS 6387 (C, W, Z), SS 299 (C, W, Z) IEC 60332-3, BS 4066-3, BS EN 50266-2-2 IEC 60754-1, BS 6425-1, BS EN 50267-2-1 IEC 60754-2, BS 6425-2, BS EN 50267-2-2 IEC 61034-2, BS 7622-2, BS EN 61034-2 300 / 500V Class 1 or Class 2 (a) Max 90° C for XLPE (b) Max 110° C for XLEVA 6D for unarmoured cable</p>
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Fire Resistant Cables FR-XL, FRA-XOL

Table 4

SIZE		Radial Thickness of Insulation (mm)	FR-XL		No. and Diameter of Wires (no./mm)	Radial Thickness of Insulation (mm)	FRA-XOL		
Nominal Conductor Area (mm ²)	No. and Diameter of Wires (no./mm)		Unarmoured				Unarmoured		
			Cable Overall Diameter (mm)	Approx. Weight (kg/km)			Cable Overall Diameter (mm)	Approx. Weight (kg/km)	
1 x 1.5	7 / 0.53	0.6	5.4	41	-	-	-	-	1 Core
1 x 2.5	7 / 0.67	0.7	5.9	54	-	-	-	-	
1 x 4	7 / 0.85	0.7	6.6	75	-	-	-	-	
2 x 1.0	-	-	-	-	1 / 1.13	0.6	8.7	82	2 Cores
2 x 1.5	7 / 0.53	0.6	9.7	87	1 / 1.38	0.7	9.5	103	
2 x 2.5	7 / 0.67	0.7	10.9	120	1 / 1.78	0.8	10.9	146	
2 x 4	7 / 0.85	0.7	12.0	157	7 / 0.85	0.8	12.7	208	
3x 1.0	-	-	-	-	1 / 1.13	0.6	9.2	101	3 Cores
3 x 1.5	7 / 0.53	0.6	10.3	113	1 / 1.38	0.7	10.2	129	
3 x 2.5	7 / 0.67	0.7	11.6	158	1 / 1.78	0.8	11.6	184	
3 x 4	7 / 0.85	0.7	12.8	210	7 / 0.85	0.8	13.5	264	
4 x 1.0	-	-	-	-	1 / 1.13	0.6	10.3	126	4 Cores
4 x 1.5	7 / 0.53	0.6	11.3	141	1 / 1.38	0.7	11.3	162	
4 x 2.5	7 / 0.67	0.7	12.8	198	1 / 1.78	0.8	13.0	231	
4 x 4	7 / 0.85	0.7	14.3	273	7 / 0.85	0.8	15.1	330	

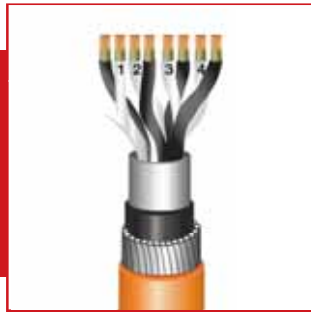
Note: Other conductor sizes & core configurations are available upon request.
: Braided Armoured Cables are available upon request.

FR-XOL, FR-XOSL

FR-XOL single & multi-pair



FR-XOSL single & multi-pair



FR-XOL multi-core



FR-XOSL multi-core



FR-XOL single & multi-pair

FR-XOSL single & multi-pair

FR-XOL multi-core

FR-XOSL multi-core

<p>Conductor : Fire Barrier : Insulation :</p> <p>Overall Screen :</p> <p>Bedding : Armouring : Sheath : Colour :</p> <p>Reference Standard : Test Standard :</p> <p>Voltage U₀/U : Conductor Stranding : Operating Temperature :</p> <p>Minimum Bending Radius :</p>	<p>Plain Annealed Copper Mica Tape (a) XLPE Compound or (b) XLEVA Compound Aluminium / Polyester Tape with 0.5mm² (7/0.3mm) Tinned Drain Wire</p> <p>LSZH Compound Insulation: White and Black with numberings</p> <p>Sheath - Orange BS 5308 / BS EN 50288-7 / BS 7629-1 IEC 60331 BS 6387 (C, W, Z), SS 299 (C, W, Z) IEC 60332-3, BS 4066-3, BS EN 50266-2-2 IEC 60754-1, BS 6425-1, BS EN 50267-1 IEC 60754-2, BS 6425-2, BS EN 50267-2 IEC 61034-2, BS 7622-2, BS EN 61034-2 300 / 500V Class 2 (a) Max 90°C for XLPE (b) Max 110°C for XLEVA 8D for unarmoured cable</p>	<p>Plain Annealed Copper Mica Tape (a) XLPE Compound or (b) XLEVA Compound Aluminium / Polyester Tape with 0.5mm² (7/0.3mm) Tinned Drain Wire LSZH Compound Galvanized Steel Wire LSZH Compound Insulation: White and Black with numberings</p> <p>Sheath - Orange BS 5308 / BS EN 50288-7 IEC 60331 BS 6387 (C, W, Z), SS 299 (C, W, Z) IEC 60332-3, BS 4066-3, BS EN 50266-2-2 IEC 60754-1, BS 6425-1, BS EN 50267-1 IEC 60754-2, BS 6425-2, BS EN 50267-2 IEC 61034-2, BS 7622-2, BS EN 61034-2 300 / 500V Class 2 (a) Max 90°C for XLPE (b) Max 110°C for XLEVA 10D for armoured cable</p>	<p>Plain Annealed Copper Mica Tape (a) XLPE Compound or (b) XLEVA Compound Aluminium / Polyester Tape with 0.5mm² (7/0.3mm) Tinned Drain Wire</p> <p>LSZH Compound Insulation: White with Black numberings</p> <p>Sheath - Orange BS 5308 / BS EN 50288-7 / BS 7629-1 IEC 60331 BS 6387 (C, W, Z), SS 299 (C, W, Z) IEC 60332-3, BS 4066-3, BS EN 50266-2-2 IEC 60754-1, BS 6425-1, BS EN 50267-1 IEC 60754-2, BS 6425-2, BS EN 50267-2 IEC 61034-2, BS 7622-2, BS EN 61034-2 300 / 500V Class 2 (a) Max 90°C for XLPE (b) Max 110°C for XLEVA 8D for unarmoured cable</p>	<p>Plain Annealed Copper Mica Tape (a) XLPE Compound or (b) XLEVA Compound Aluminium / Polyester Tape with 0.5mm² (7/0.3mm) Tinned Drain Wire LSZH Compound Galvanized Steel Wire LSZH Compound Insulation: White with Black numberings</p> <p>Sheath - Orange BS 5308 / BS EN 50288-7 IEC 60331 BS 6387 (C, W, Z), SS 299 (C, W, Z) IEC 60332-3, BS 4066-3, BS EN 50266-2-2 IEC 60754-1, BS 6425-1, BS EN 50267-1 IEC 60754-2, BS 6425-2, BS EN 50267-2 IEC 61034-2, BS 7622-2, BS EN 61034-2 300 / 500V Class 2 (a) Max 90°C for XLPE (b) Max 110°C for XLEVA 10D for armoured cable</p>
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Fire Resistant Instrumentation Cables FR-XOL, FR-XOSL

Table 5

SIZE		Radial Thickness of Insulation (mm)	FR-XOL		FR-XOSL				
Nominal Conductor Area (mm ²)	No. & Diameter of Wires (no./mm)		Unarmoured		Armoured				
			Cable Overall Diameter (mm)	Approx. Weight (kg/km)	Diameter Under Armour (mm)	Armour Wire Diameter (mm)	Cable Overall Diameter (mm)	Approx. Weight (kg/km)	
1P x 1.0	7 / 0.43	0.6	8.0	76	8.0	0.90	12.4	281	1 Pair
1P x 1.5	7 / 0.53	0.7	8.5	94	8.5	0.90	13.1	332	
1P x 2.5	7 / 0.67	0.8	10.5	130	10.5	0.90	15.1	401	
2P x 1.0	7 / 0.43	0.6	12.4	120	12.4	0.90	17.4	370	2 Pairs
2P x 1.5	7 / 0.53	0.7	14.0	160	14.0	0.90	18.4	450	
2P x 2.5	7 / 0.67	0.8	16.0	230	16.0	0.90	20.5	550	
5P x 1.0	7 / 0.43	0.6	16.5	276	16.5	1.25	22	854	5 Pairs
5P x 1.5	7 / 0.53	0.7	20.5	368	20.5	1.25	26.2	1023	
5P x 2.5	7 / 0.67	0.8	23.0	518	23.0	1.25	28.9	1276	
10P x 1.0	7 / 0.43	0.6	20.5	501	20.5	1.25	26.4	1271	10 Pairs
10P x 1.5	7 / 0.53	0.7	26.0	673	26.0	1.60	32.8	1742	
10P x 2.5	7 / 0.67	0.8	29.5	971	29.5	1.60	36.5	2205	
20P x 1.0	7 / 0.43	0.6	26.5	917	26.5	1.60	33.3	2197	20 Pairs
20P x 1.5	7 / 0.53	0.7	34.0	1258	34.0	1.60	41.2	2705	
20P x 2.5	7 / 0.67	0.8	38.5	1830	38.5	2.00	46.7	3836	

Note: Other conductor sizes & core configurations are available upon request.
: Braided Screen and / or armoured cables are available upon request.

Fire Resistant Instrumentation Cables FR-XOL, FR-XOSL

Table 6

SIZE	Nominal Conductor Area (mm ²)	No. & Diameter of Wires (no./mm)	Radial Thickness of Insulation (mm)	FR-XOL		FR-XOSL			
				Unarmoured		Armoured			
				Cable Overall Diameter (mm)	Approx. Weight (kg/km)	Diameter Under Armour (mm)	Armour Wire Diameter (mm)	Cable Overall Diameter (mm)	Approx. Weight (kg/km)
2 x 1.0	7 / 0.43	0.6	8.0	82	8.0	0.90	12.4	288	2 Cores
2 x 1.5	7 / 0.53	0.7	8.5	101	8.5	0.90	13.1	342	
2 x 2.5	7 / 0.67	0.8	10.5	137	10.5	0.90	15.1	419	
2 x 4	7 / 0.85	0.8	12.5	180	12.5	0.90	17.1	484	
3 x 1.0	7 / 0.43	0.6	8.0	100	8.0	0.90	12.4	324	3 Cores
3 x 1.5	7 / 0.53	0.7	9.5	127	9.5	0.90	14.1	383	
3 x 2.5	7 / 0.67	0.8	12.0	176	12.0	0.90	16.6	466	
3 x 4	7 / 0.85	0.8	13.5	236	13.5	0.90	18.1	560	
4 x 1.0	7 / 0.43	0.6	9.0	127	9.0	0.90	13.6	383	4 Cores
4 x 1.5	7 / 0.53	0.7	10.5	161	10.5	0.90	15.1	445	
4 x 2.5	7 / 0.67	0.8	13.0	224	13.0	0.90	17.6	548	
4 x 4	7 / 0.85	0.8	15.0	302	15.0	1.25	20.5	772	
7 x 1.0	7 / 0.43	0.6	11.0	187	11.0	0.90	15.6	485	7 Cores
7 x 1.5	7 / 0.53	0.7	12.5	250	12.5	0.90	17.3	597	
7 x 2.5	7 / 0.67	0.8	15.0	354	15.0	1.25	20.5	862	
12 x 1.5	7 / 0.53	0.7	16.0	402	16.0	1.25	21.7	997	12 Cores
12 x 2.5	7 / 0.67	0.8	20.0	585	20.0	1.60	26.4	1421	
19 x 1.5	7 / 0.53	0.7	19.0	597	19.0	1.60	25.6	1465	19 Cores
19 x 2.5	7 / 0.67	0.8	24.0	873	24.0	1.60	30.6	1837	

Note: Other conductor sizes & core configurations are available upon request.
 : Braided Screen and / or armoured cables are available upon request.

FR-XIOL
multi-pairFR-XIOSL
multi-pairFR-XIOL
multi-pairFR-XIOSL
multi-pair

Conductor :
Fire Barrier :
Insulation :

Individual Screen:

Overall Screen :

Bedding :
Armouring :
Sheath :
Colour :

Reference Standard :
Test Standard :

Voltage U_o/U :
Conductor Stranding :
Operating Temperature :

Minimum Bending Radius :

Plain Annealed Copper
Mica Tape
(a) XLPE Compound or
(b) XLEVA Compound
Aluminium / Polyester Tape with 0.5mm²
(7/0.3mm) Tinned Drain Wire
Aluminium / Polyester Tape with 0.5mm²
(7/0.3mm) Tinned Drain Wire
LSZH Compound
Insulation: White and Black with numberings
Sheath - Orange
BS 5308 / BS EN 50288-7
IEC 60331
BS 6387 (C, W, Z), SS 299 (C, W, Z)
IEC 60332-3, BS 4066-3, BS EN 50266-2-2
IEC 60754-1, BS 6425-1, BS EN 50267-2-1
IEC 60754-2, BS 6425-2, BS EN 50267-2-2
IEC 61034-2, BS 7622-2, BS EN 61034-2
300 / 500V
Class 2
(a) Max 90°C for XLPE
(b) Max 110°C for XLEVA
8D for unarmoured cable

Plain Annealed Copper
Mica Tape
(a) XLPE Compound or
(b) XLEVA Compound
Aluminium / Polyester Tape with 0.5mm²
(7/0.3mm) Tinned Drain Wire
Aluminium / Polyester Tape with 0.5mm²
(7/0.3mm) Tinned Drain Wire
LSZH Compound
Galvanized Steel Wire
LSZH Compound
Insulation: White and Black with numberings
Sheath - Orange
BS 5308 / BS EN 50288-7
IEC 60331
BS 6387 (C, W, Z), SS 299 (C, W, Z)
IEC 60332-3, BS 4066-3, BS EN 50266-2-2
IEC 60754-1, BS 6425-1, BS EN 50267-2-1
IEC 60754-2, BS 6425-2, BS EN 50267-2-2
IEC 61034-2, BS 7622-2, BS EN 61034-2
300 / 500V
Class 2
(a) Max 90°C for XLPE
(b) Max 110°C for XLEVA
10D for armoured cable

Fire Resistant Instrumentation Cables FR-XIOL, FR-XIOSL

Table 7

SIZE		Radial Thickness of Insulation (mm)	FR-XIOL		FR-XIOSL				
Nominal Conductor Area (mm ²)	No. & Diameter of Wires (no./mm)		Unarmoured		Armoured				
			Cable Overall Diameter (mm)	Approx. Weight (kg/km)	Diameter Under Armour (mm)	Armour Wire Diameter (mm)	Cable Overall Diameter (mm)	Approx. Weight (kg/km)	
2P x 1.0	7 / 0.43	0.6	15.2	166	15.2	0.90	20.0	555	2 Pairs
2P x 1.5	7 / 0.53	0.7	17.0	205	17.0	1.25	22.7	769	
2P x 2.5	7 / 0.67	0.8	19.2	350	19.2	1.25	24.9	938	
5P x 1.0	7 / 0.43	0.6	17.5	335	17.5	1.25	23.2	1000	5 Pairs
5P x 1.5	7 / 0.53	0.7	21.5	433	21.5	1.60	28.1	1352	
5P x 2.5	7 / 0.67	0.8	24.0	592	24.0	1.60	30.8	1665	
10P x 1.0	7 / 0.43	0.6	22.5	626	22.5	1.60	29.3	1800	10 Pairs
10P x 1.5	7 / 0.53	0.7	28.0	811	28.0	1.60	35.0	2165	
10P x 2.5	7 / 0.67	0.8	31.5	1132	31.5	2.00	39.5	3007	
20P x 1.0	7 / 0.43	0.6	30.5	1143	30.5	2.00	38.5	3019	20 Pairs
20P x 1.5	7 / 0.53	0.7	38.0	1509	38.0	2.00	46.2	3684	
20P x 2.5	7 / 0.67	0.8	42.5	2112	42.5	2.50	51.9	5107	

Note: Other conductor sizes & core configurations are available upon request.
 : Braided Screen and / or armoured cables are available upon request.

**FRT-H
SINGLE CORE**



**FRT-XH
SINGLE CORE**



**FRT-XAH
SINGLE CORE**



**FRT-H
single core**

**FRT-XH
single core**

**FRT-XAH
single core**

<p>Conductor :</p> <p>Insulation :</p> <p>Bedding :</p> <p>Armouring :</p> <p>Sheath :</p> <p>Colour :</p> <p>Reference Standard :</p> <p>Test Standard :</p> <p>Voltage U₀/U :</p> <p>Conductor Stranding :</p> <p>Operating Temperature :</p> <p>Minimum Bending Radius :</p>	<p>Plain Annealed Copper (a) XL-LSZH Compound or (b) XLEVA Compound</p> <p>Insulation: Various</p> <p>BS 7211 / In-house IEC 60332-3, BS 4066-3, BS EN 50266-2-2 IEC 60754-1, BS 6425-1, BS EN 50267-2-1 IEC 60754-2, BS 6425-2, BS EN 50267-2-2 IEC 61034-2, BS 7622-2, BS EN 61034-2 400 / 750V, 600 / 1000V Class 2 (a) Max 90°C for XL-LSZH (b) Max 110°C for XLEVA 8D for unarmoured cable</p>	<p>Plain Annealed Copper (a) XLPE Compound or (b) XLEVA Compound</p> <p>LSZH Compound Insulation: Natural Sheath - Black IEC 60502 IEC 60332-3, BS 4066-3, BS EN 50266-2-2 IEC 60754-1, BS 6425-1, BS EN 50267-2-1 IEC 60754-2, BS 6425-2, BS EN 50267-2-2 IEC 61034-2, BS 7622-2, BS EN 61034-2 600 / 1000V Class 2 (a) Max 90°C for LSZH / XLPE (b) Max 110°C for XLEVA 8D for unarmoured cable</p>	<p>Plain Annealed Copper (a) XLPE Compound or (b) XLEVA Compound LSZH Compound Aluminium Wire LSZH Compound Insulation: Natural Sheath - Black IEC 60502 / BS 6724 IEC 60332-3, BS 4066-3, BS EN 50266-2-2 IEC 60754-1, BS 6425-1, BS EN 50267-2-1 IEC 60754-2, BS 6425-2, BS EN 50267-2-2 IEC 61034-2, BS 7622-2, BS EN 61034-2 600 / 1000V Class 2 (a) Max 90°C for LSZH / XLPE (b) Max 110°C for XLEVA 10D for armoured cable</p>
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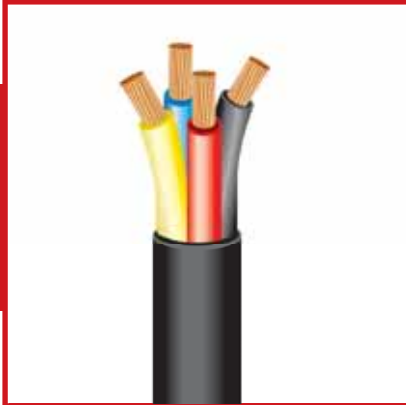
Flame Retardant Cables FRT-H, FRT-XH, FRT-XAH

Table 8

SIZE		FRT-H			FRT-XH			FRT-XAH			
Nominal Conductor Area (mm ²)	No. & Diameter of Wires (no./mm)	Radial Thickness of Insulation (mm)	Insulated, Non-Sheathed		Radial Thickness of Insulation (mm)	Unarmoured		Armoured			
			Cable Overall Diameter (mm)	Approx. Weight (kg/km)		Cable Overall Diameter (mm)	Approx. Weight (kg/km)	Diameter Under Armour (mm)	Armour Wire Diameter (mm)	Cable Overall Diameter (mm)	Approx. Weight (kg/km)
1 x 1.5	7 / 0.53	0.7	3.1	22	0.7	6.0	48	-	-	-	-
1 x 2.5	7 / 0.67	0.8	3.7	34	0.7	6.4	63	-	-	-	-
1 x 4	7 / 0.85	0.8	4.3	50	0.7	7.0	78	-	-	-	-
1 x 6	7 / 1.04	0.8	4.8	70	0.7	7.5	105	-	-	-	-
1 x 10	7 / 1.35	1.0	6.2	116	0.7	8.5	151	-	-	-	-
1 x 16	7 / 1.70	1.0	7.2	174	0.7	9.5	211	-	-	-	-
1 x 25	7 / 2.14	1.2	9.0	276	0.9	11.2	315	-	-	-	-
1 x 35	7 / 2.52	1.2	10.0	366	0.9	12.4	416	-	-	-	-
1 x 50	19 / 1.78	1.4	11.9	502	1.0	14.0	569	-	-	-	-
1 x 70	19 / 2.14	1.4	13.7	706	1.1	16.0	792	15.4	1.25	21.5	960
1 x 95	19 / 2.52	1.6	16.0	974	1.1	18.0	1068	17.3	1.25	23.4	1240
1 x 120	37 / 2.03	1.6	17.6	1213	1.2	20.0	1325	19.1	1.6	25.9	1650
1 x 150	37 / 2.25	1.8	19.6	1492	1.4	22.0	1627	21.1	1.6	27.9	1970
1 x 185	37 / 2.52	2.0	21.8	1868	1.6	24.4	2021	23.2	1.6	30.1	2390
1 x 240	61 / 2.25	2.2	24.4	2443	1.7	27.5	2617	26.2	1.6	33.2	3040
1 x 300	61 / 2.52	2.4	27.7	3055	1.8	30.3	3252	28.8	1.6	35.8	3790
1 x 400	61 / 2.85	2.6	31.1	3888	2.0	33.9	4131	32.7	2.0	40.9	4790
1 x 500	61 / 3.20	2.8	34.6	4880	2.2	37.6	5175	36.2	2.0	44.6	5880
1 x 630	127 / 2.52	2.8	38.6	6229	2.4	42.4	6631	40.6	2.0	49.2	7400
1 x 800	127 / 2.85	-	-	-	2.6	47.3	8412	45.7	2.5	55.7	9500
1 x 1000	127 / 3.20	-	-	-	2.8	52.4	10530	50.6	2.5	61.0	11750

Note: For FRT-H cables, Cross-Linked LSZH Compound will be used as the insulation material.

FRT-XH 2-4 cores & multi-core



FRT-XSH 2-4 cores & multi-core



FRT-XH & FRT-XSH 2-4 cores

FRT-XH & FRT-XSH multi-core

<p>Conductor : Insulation :</p> <p>Bedding : Armouring : Sheath : Colour :</p> <p>Reference Standard : Test Standard :</p> <p>Voltage U₀/U : Conductor Stranding : Operating Temperature :</p> <p>Minimum Bending Radius :</p>	<p>Plain Annealed Copper (a) XLPE Compound or (b) XLEVA Compound LSZH Compound Galvanized Steel Wire LSZH Compound Insulation: 2 Cores - Red & Black or Brown & Blue 3 Cores - Red, Yellow & Blue or Brown, Black & Grey 4 Cores - Red, Yellow, Blue & Black or Brown, Black, Grey & Blue</p> <p>Sheath - Black IEC 60502 / BS 6724 IEC 60332-3, BS 4066-3, BS EN 50266-2-2 IEC 60754-1, BS 6425-1, BS EN 50267-2-1 IEC 60754-2, BS 6425-2, BS EN 50267-2-2 IEC 61034-2, BS 7622-2, BS EN 61034-2 600 / 1000V Class 2 (a) Max 90°C for XLPE (b) Max 110°C for XLEVA 8D for unarmoured cable 10D for armoured cable</p>	<p>Plain Annealed Copper (a) XLPE Compound or (b) XLEVA Compound LSZH Compound Galvanized Steel Wire LSZH Compound Insulation: White with Black numberings</p> <p>Sheath - Black IEC 60502 / BS 6724 IEC 60332-3, BS 4066-3, BS EN 50266-2-2 IEC 60754-1, BS 6425-1, BS EN 50267-2-1 IEC 60754-2, BS 6425-2, BS EN 50267-2-2 IEC 61034-2, BS 7622-2, BS EN 61034-2 600 / 1000V Class 2 (a) Max 90°C for XLPE (b) Max 110°C for XLEVA 8D for unarmoured cable 10D for armoured cable</p>
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Flame Retardant Cables FRT-XH, FRT-XSH

Table 9

SIZE	Nominal Conductor Area (mm ²)	No. & Diameter of Wires (no./mm)	Radial Thickness of Insulation (mm)	FRT-XH		FRT-XSH			
				Unarmoured		Armoured			
				Cable Overall Diameter (mm)	Approx. Weight (kg/km)	Diameter Under Armour (mm)	Armour Wire Diameter (mm)	Cable Overall Diameter (mm)	Approx. Weight (kg/km)
2 x 1.5	7 / 0.53	0.7	10.0	126	8.5	0.9	13.9	350	2 Cores
2 x 2.5	7 / 0.67	0.7	10.8	158	9.3	0.9	14.7	400	
2 x 4	7 / 0.85	0.7	11.9	205	10.4	0.9	15.8	475	
2 x 6	7 / 1.04	0.7	13.0	264	11.5	0.9	16.9	560	
2 x 10	7 / 1.35	0.7	14.9	378	13.4	1.25	19.5	810	
2 x 16	7 / 1.70	0.7	17.0	534	15.5	1.25	21.6	980	
2 x 25	7 / 2.14	0.9	20.4	650	18.9	1.6	25.7	1410	
2 x 35	7 / 2.52	0.9	22.7	880	21.2	1.6	28.0	1930	
3 x 1.5	7 / 0.53	0.7	10.5	145	9.0	0.9	14.4	390	3 Cores
3 x 2.5	7 / 0.67	0.7	11.4	185	9.9	0.9	15.3	450	
3 x 4	7 / 0.85	0.7	12.5	247	11.0	0.9	16.4	540	
3 x 6	7 / 1.04	0.7	13.8	323	11.6	1.25	17.7	745	
3 x 10	7 / 1.35	0.7	15.8	474	14.3	1.25	20.4	950	
3 x 16	7 / 1.70	0.7	18.0	682	16.5	1.25	23.0	1250	
3 x 25	7 / 2.14	0.9	21.7	910	20.2	1.6	27.0	1840	
3 x 35	7 / 2.52	0.9	24.0	1180	22.4	1.6	29.2	2050	
3 x 50 (S)	19 / 1.78	1.0	25.5	1600	24.2	1.6	31.2	2590	
3 x 70 (S)	19 / 2.14	1.1	29.0	2240	28.2	2.0	36.2	3560	
3 x 95 (S)	19 / 2.52	1.1	33.5	3050	31.7	2.0	40.1	4590	
3 x 120 (S)	37 / 2.03	1.2	37.5	3800	36.0	2.0	44.6	5810	
3 x 150 (S)	37 / 2.25	1.4	40.5	4640	39.5	2.5	49.5	6920	
3 x 185 (S)	37 / 2.52	1.6	45.0	5870	43.3	2.5	53.5	8340	
3 x 240 (S)	61 / 2.25	1.7	50.5	7670	48.4	2.5	59.0	10450	
3 x 300 (S)	61 / 2.52	1.8	57.0	9460	54.4	2.5	65.4	12700	
3 x 400 (S)	61 / 2.85	2.0	63.0	11945	57.8	2.5	70.0	15326	
4 x 1.5	7 / 0.53	0.7	11.3	169	10.0	0.9	15.4	430	4 Cores
4 x 2.5	7 / 0.67	0.7	12.3	220	10.8	0.9	16.2	505	
4 x 4	7 / 0.85	0.7	13.6	297	12.1	0.9	17.5	710	
4 x 6	7 / 1.04	0.7	15.0	392	13.5	1.25	19.6	855	
4 x 10	7 / 1.35	0.7	17.2	585	15.7	1.25	21.8	1120	
4 x 16	7 / 1.70	0.7	19.7	851	18.2	1.6	25.0	1600	
4 x 25	7 / 2.14	0.9	23.9	1200	22.4	1.6	29.2	2160	
4 x 35	7 / 2.52	0.9	25.0	1600	24.4	1.6	31.4	2560	
4 x 50 (S)	19 / 1.78	1.0	28.0	2200	28.0	1.6	35.2	3180	
4 x 70 (S)	19 / 2.14	1.1	32.0	3050	32.2	2.0	40.6	4490	
4 x 95 (S)	19 / 2.52	1.1	37.0	4070	36.0	2.0	44.6	5725	
4 x 120 (S)	37 / 2.03	1.2	42.0	5915	38.0	2.5	50.0	7550	
4 x 150 (S)	37 / 2.25	1.4	46.0	6350	42.8	2.5	53.0	8555	
4 x 185 (S)	37 / 2.52	1.6	50.0	7890	48.4	2.5	59.0	10560	
4 x 240 (S)	61 / 2.25	1.7	57.0	10400	55.0	2.5	66.0	13180	
4 x 300 (S)	61 / 2.52	1.8	63.0	12810	59.6	2.5	71.0	16100	
4 x 400 (S)	61 / 2.85	2.0	71.0	15869	66.1	3.15	79.4	20715	
4 x 500 (S)	61 / 3.20	2.2	78.0	20300	74.6	3.15	88.5	25347	

(S) - Sectoral Stranded Conductors

Flame Retardant Cables FRT-XH, FRT-XSH

Table 10

SIZE			FRT-XH		FRT-XSH			
Nominal Conductor Area (mm ²)	No. & Diameter of Wires (no./mm)	Radial Thickness of Insulation (mm)	Unarmoured		Armoured			
			Cable Overall Diameter (mm)	Approx. Weight (kg/km)	Diameter Under Armour (mm)	Armour Wire Diameter (mm)	Cable Overall Diameter (mm)	Approx. Weight (kg/km)
5 x 1.5	7 / 0.53	0.7	11.3	184	9.9	0.9	14.5	402
7 x 1.5	7 / 0.53	0.7	12.4	225	11.2	0.9	16.0	490
10 x 1.5	7 / 0.53	0.7	15.6	325	14.3	1.25	20.0	761
12 x 1.5	7 / 0.53	0.7	16.2	370	14.8	1.25	20.5	827
19 x 1.5	7 / 0.53	0.7	19.0	516	17.4	1.6	24.0	1186
27 x 1.5	7 / 0.53	0.7	22.7	712	21.3	1.6	28.1	1537
37 x 1.5	7 / 0.53	0.7	25.5	941	23.9	1.6	30.7	1856
48 x 1.5	7 / 0.53	0.7	29.0	1186	27.5	1.6	34.6	2276
5 x 2.5	7 / 0.67	0.7	12.8	237	11.2	0.9	15.8	496
7 x 2.5	7 / 0.67	0.7	13.8	303	12.4	0.9	17.2	602
10 x 2.5	7 / 0.67	0.7	17.5	426	15.9	1.25	21.8	943
12 x 2.5	7 / 0.67	0.7	18.1	489	16.5	1.25	22.4	1020
19 x 2.5	7 / 0.67	0.7	21.3	725	19.9	1.6	26.7	1498
27 x 2.5	7 / 0.67	0.7	25.5	1004	23.9	1.6	30.9	1933
37 x 2.5	7 / 0.67	0.7	28.7	1334	26.9	1.6	33.9	2372
48 x 2.5	7 / 0.67	0.7	32.9	1706	31.3	2.0	39.6	3252
5 x 4	7 / 0.85	0.7	14.2	324	12.6	1.25	18.2	712
7 x 4	7 / 0.85	0.7	15.5	422	14.1	1.25	19.8	871
10 x 4	7 / 0.85	0.7	19.7	597	18.5	1.25	24.4	1213
12 x 4	7 / 0.85	0.7	20.3	690	19.1	1.6	25.7	1462
19 x 4	7 / 0.85	0.7	24.0	1037	22.6	1.6	29.4	1931
27 x 4	7 / 0.85	0.7	28.8	1445	27.2	1.6	34.4	2532
37 x 4	7 / 0.85	0.7	32.5	1932	31.1	2.0	39.3	3448
48 x 4	7 / 0.85	0.7	37.3	2479	35.7	2.0	44.2	4273

Multi-core

Note: Other conductor sizes & core configurations are available upon request.
: Braided Armoured Cables are available upon request.

**FRT-XOL
Single &
multi-pair**



**FRT-XOSL
Single &
multi-pair**



**FRT-XOL
multi-core**



**FRT-XOSL
multi-core**



**FRT-XOL
single & multi-pair**

**FRT-XOSL
single & multi-pair**

**FRT-XOL
multi-core**

**FRT-XOSL
multi-core**

Conductor :
Insulation :

Individual Screen :
Overall Screen :

Bedding :
Armouring :
Sheath :
Colour :

Reference Standard :
Test Standard :

Voltage U₀/U :
Conductor Stranding :
Operating Temperature :

Minimum Bending Radius :

Plain Annealed Copper
(a) XLPE Compound or
(b) XLEVA Compound

Aluminium / Polyester Tape with 0.5mm²
(7/0.3mm) Tinned Drain Wire

LSZH Compound
Insulation: White and Black with
numberings

Sheath - Black
BS 5308 / BS EN 50288-7
IEC 60332-3, BS 4066-3,
BS EN 50266-2-2
IEC 60754-1, BS 6425-1,
BS EN 50267-2-1
IEC 60754-2, BS 6425-2,
BS EN 50267-2-2
IEC 61034-2, BS 7622-2, BS EN 61034-2
300 / 500V

Class 2 or Class 5
(a) Max 90°C for XLPE
(b) Max 110°C for XLEVA
8D for unarmoured cable

Plain Annealed Copper
(a) XLPE Compound or
(b) XLEVA Compound

Aluminium / Polyester Tape with 0.5mm²
(7/0.3mm) Tinned Drain Wire

LSZH Compound
Galvanized Steel Wire
LSZH Compound
Insulation: White and Black with
numberings

Sheath - Black
BS 5308 / BS EN 50288-7
IEC 60332-3, BS 4066-3,
BS EN 50266-2-2
IEC 60754-1, BS 6425-1,
BS EN 50267-2-1
IEC 60754-2, BS 6425-2,
BS EN 50267-2-2
IEC 61034-2, BS 7622-2, BS EN 61034-2
300 / 500V

Class 2 or Class 5
(a) Max 90°C for XLPE
(b) Max 110°C for XLEVA
10D for armoured cable

Plain Annealed Copper
(a) XLPE Compound or
(b) XLEVA Compound

Aluminium / Polyester Tape with 0.5mm²
(7/0.3mm) Tinned Drain Wire

LSZH Compound
Insulation: White with Black numberings

Sheath - Black
BS 5308 / BS EN 50288-7
IEC 60332-3, BS 4066-3,
BS EN 50266-2-2
IEC 60754-1, BS 6425-1,
BS EN 50267-2-1
IEC 60754-2, BS 6425-2,
BS EN 50267-2-2
IEC 61034-2, BS 7622-2, BS EN 61034-2
300 / 500V

Class 2 or Class 5
(a) Max 90°C for XLPE
(b) Max 110°C for XLEVA
8D for unarmoured cable

Plain Annealed Copper
(a) XLPE Compound or
(b) XLEVA Compound

Aluminium / Polyester Tape with 0.5mm²
(7/0.3mm) Tinned Drain Wire

LSZH Compound
Galvanized Steel Wire
LSZH Compound
Insulation: White with Black numberings

Sheath - Black
BS 5308 / BS EN 50288-7
IEC 60332-3, BS 4066-3, BS EN
50266-2-2
IEC 60754-1, BS 6425-1, BS EN
50267-2-1
IEC 60754-2, BS 6425-2, BS EN
50267-2-2
IEC 61034-2, BS 7622-2, BS EN 61034-2
300 / 500V

Class 2 or Class 5
(a) Max 90°C for XLPE
(b) Max 110°C for XLEVA
10D for armoured cable

Flame Retardant Instrumentation Cables FRT-XOL, FRT-XOSL

Table 11

SIZE	Nominal Conductor Area (mm ²)	No. & Diameter of Wires (no./mm)	Radial Thickness of Insulation (mm)	FRT-XOL		FRT-XOSL			
				Unarmoured		Armoured			
				Cable Overall Diameter (mm)	Approx. Weight (kg/km)	Diameter Under Armour (mm)	Armour Wire Diameter (mm)	Cable Overall Diameter (mm)	Approx. Weight (kg/km)
1P x 0.5	16 / 0.20	0.6	7.0	56	7.0	0.90	11.4	230	
1T x 0.5	16 / 0.20	0.6	7.4	60	7.4	0.90	11.7	252	
2P x 0.5	16 / 0.20	0.6	10.5	80	10.5	0.90	15.2	350	
5P x 0.5	16 / 0.20	0.6	13.1	170	13.1	0.90	17.9	500	
10P x 0.5	16 / 0.20	0.6	17.2	280	17.2	1.25	22.9	830	
15P x 0.5	16 / 0.20	0.6	19.8	385	19.8	1.60	26.4	1150	
20P x 0.5	16 / 0.20	0.6	22.3	480	22.3	1.60	29.1	1360	
30P x 0.5	16 / 0.20	0.6	26.9	690	26.9	1.60	33.9	1750	
50P x 0.5	16 / 0.20	0.6	33.9	1080	33.9	2.00	42.1	2730	
1P x 1.0	7 / 0.43	0.6	7.4	68	7.4	0.90	11.8	250	
1T x 1.0	7 / 0.43	0.6	8.2	81	8.2	0.90	12.8	302	
2P x 1.0	7 / 0.43	0.6	12.0	105	12.0	0.90	17.0	360	
5P x 1.0	7 / 0.43	0.6	14.2	230	14.2	1.25	19.7	680	
10P x 1.0	7 / 0.43	0.6	18.4	385	18.4	1.25	24.3	980	
15P x 1.0	7 / 0.43	0.6	21.3	540	21.3	1.60	28.1	1380	
20P x 1.0	7 / 0.43	0.6	24.4	705	24.4	1.60	31.2	1650	
30P x 1.0	7 / 0.43	0.6	29.0	995	29.0	1.60	36.2	2150	
50P x 1.0	7 / 0.43	0.6	37.3	1630	37.3	2.00	45.7	3430	
1P x 1.5	7 / 0.53	0.6	8.3	85	8.3	0.90	12.9	290	
1T x 1.5	7 / 0.53	0.6	8.9	106	8.9	0.90	13.5	345	
2P x 1.5	7 / 0.53	0.6	13.5	145	13.5	0.90	18.0	450	
5P x 1.5	7 / 0.53	0.6	16.4	315	16.4	1.25	22.1	840	
10P x 1.5	7 / 0.53	0.6	21.6	550	21.6	1.60	28.4	1410	
15P x 1.5	7 / 0.53	0.6	25.2	790	25.2	1.60	32.2	1790	
20P x 1.5	7 / 0.53	0.6	28.5	1000	28.5	1.60	35.7	2150	
30P x 1.5	7 / 0.53	0.6	34.3	1460	34.3	2.00	42.5	3100	
50P x 1.5	7 / 0.53	0.6	43.6	2340	43.6	2.00	53.4	4920	

Note: Other conductor sizes & core configurations are available upon request.
 : Braided Screen and / or armoured cables are available upon request.

Flame Retardant Instrumentation Cables FRT-XOL, FRT-XOSL

Table 12

SIZE			FRT-XOL		FRT-XOSL			
Nominal Conductor Area (mm ²)	No. & Diameter of Wires (no./mm)	Radial Thickness of Insulation (mm)	Unarmoured		Armoured			
			Cable Overall Diameter (mm)	Approx. Weight (kg/km)	Diameter Under Armour (mm)	Armour Wire Diameter (mm)	Cable Overall Diameter (mm)	Approx. Weight (kg/km)
2 x 0.5	16 / 0.20	0.6	7.0	50	7.0	0.90	11.4	237
3 x 0.5	16 / 0.20	0.6	7.3	59	7.3	0.90	11.7	254
4 x 0.5	16 / 0.20	0.6	7.9	69	7.9	0.90	12.3	278
6 x 0.5	16 / 0.20	0.6	9.3	94	9.3	0.90	13.9	345
10 x 0.5	16 / 0.20	0.6	11.9	147	11.9	0.90	16.7	470
20 x 0.5	16 / 0.20	0.6	14.9	253	14.9	1.25	20.6	759
40 x 0.5	16 / 0.20	0.6	20.1	444	20.1	1.60	26.7	1229
2 x 0.75	24 / 0.20	0.6	7.3	57	7.3	0.90	11.7	251
3 x 0.75	24 / 0.20	0.6	7.7	68	7.7	0.90	12.1	272
4 x 0.75	24 / 0.20	0.6	8.3	81	8.3	0.90	12.9	310
6 x 0.75	24 / 0.20	0.6	9.9	114	9.9	0.90	14.5	379
10 x 0.75	24 / 0.20	0.6	12.7	179	12.7	0.90	17.5	522
20 x 0.75	24 / 0.20	0.6	16.0	311	16.0	1.25	21.7	858
40 x 0.75	24 / 0.20	0.6	21.7	555	21.7	1.60	28.5	1420
2 x 1.5	7 / 0.53	0.6	8.3	78	8.3	0.90	12.9	300
3 x 1.5	7 / 0.53	0.6	8.9	103	8.9	0.90	13.5	345
4 x 1.5	7 / 0.53	0.6	9.7	125	9.7	0.90	14.3	377
6 x 1.5	7 / 0.53	0.6	11.7	163	11.7	0.90	16.3	490
10 x 1.5	7 / 0.53	0.6	14.7	285	14.7	1.25	20.4	773
20 x 1.5	7 / 0.53	0.6	18.7	504	18.7	1.25	25.3	1262
40 x 1.5	7 / 0.53	0.6	24.6	935	24.6	1.60	31.6	1968

Note: Other conductor sizes & core configurations are available upon request.
 : Braided Screen and / or armoured cables are available upon request.

FRT-XIOL multi-pair



FRT-XIOSL multi-pair



FRT-XIOL multi-pair

FRT-XIOSL multi-pair

<p>Conductor :</p> <p>Insulation :</p> <p>Individual Screen :</p> <p>Overall Screen :</p> <p>Bedding :</p> <p>Armouring :</p> <p>Sheath :</p> <p>Colour :</p> <p>Reference Standard :</p> <p>Test Standard :</p> <p>Voltage Uo/U :</p> <p>Conductor Stranding :</p> <p>Operating Temperature :</p> <p>Minimum Bending Radius :</p>	<p>Plain Annealed Copper (a) XLPE Compound or (b) XLEVA Compound Aluminium / Polyester Tape with 0,5mm² (7/0,3mm) Tinned Drain Wire Aluminium / Polyester Tape with 0,5mm² (7/0,3mm) Tinned Drain Wire</p> <p>LSZH Compound Insulation: White and Black with numberings Sheath - Black BS 5308 / BS EN 50288-7 IEC 60332-3, BS 4066-3, BS EN 50266-2-2 IEC 60754-1, BS 6425-1, BS EN 50267-2-1 IEC 60754-2, BS 6425-2, BS EN 50267-2-2 IEC 61034-2, BS 7622-2, BS EN 61034-2 300 / 500V Class 2 or Class 5 (a) Max 90°C for XLPE (b) Max 110°C for XLEVA 8D for unarmoured cable</p>	<p>Plain Annealed Copper (a) XLPE Compound or (b) XLEVA Compound Aluminium / Polyester Tape with 0,5mm² (7/0,3mm) Tinned Drain Wire Aluminium / Polyester Tape with 0,5mm² (7/0,3mm) Tinned Drain Wire LSZH Compound Galvanized Steel Wire LSZH Compound Insulation: White and Black with numberings Sheath - Black BS 5308 / BS EN 50288-7 IEC 60332-3, BS 4066-3, BS EN 50266-2-2 IEC 60754-1, BS 6425-1, BS EN 50267-2-1 IEC 60754-2, BS 6425-2, BS EN 50267-2-2 IEC 61034-2, BS 7622-2, BS EN 61034-2 300 / 500V Class 2 or Class 5 (a) Max 90°C for XLPE (b) Max 110°C for XLEVA 10D for armoured cable</p>
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Flame Retardant Instrumentation Cables FRT-XIOL, FRT-XIOSL

Table 13

SIZE		Radial Thickness of Insulation (mm)	FRT-XIOL		FRT-XIOSL			
Nominal Conductor Area (mm ²)	No. & Diameter of Wires (no./mm)		Unarmoured		Armoured			
			Cable Overall Diameter (mm)	Approx. Weight (kg/km)	Diameter Under Armour (mm)	Armour Wire Diameter (mm)	Cable Overall Diameter (mm)	Approx. Weight (kg/km)
2P x 0.5	16 / 0.20	0.6	12.0	130	12.0	0.90	16.8	430
5P x 0.5	16 / 0.20	0.6	15.2	230	15.2	1.25	20.9	720
10P x 0.5	16 / 0.20	0.6	21.1	400	21.1	1.60	27.9	1240
15P x 0.5	16 / 0.20	0.6	24.5	560	24.5	1.60	31.3	1530
20P x 0.5	16 / 0.20	0.6	27.3	690	27.3	1.60	34.3	1770
30P x 0.5	16 / 0.20	0.6	32.3	990	32.3	2.00	40.5	2550
50P x 0.5	16 / 0.20	0.6	41.7	1610	41.7	2.50	51.5	4080
2P x 1.0	7 / 0.43	0.6	12.8	155	12.8	0.90	17.6	480
5P x 1.0	7 / 0.43	0.6	16.2	285	16.2	1.25	21.9	800
10P x 1.0	7 / 0.43	0.6	22.6	500	22.6	1.60	29.4	1400
15P x 1.0	7 / 0.43	0.6	26.2	720	26.2	1.60	33.2	1760
20P x 1.0	7 / 0.43	0.6	29.8	930	29.8	2.00	37.8	2350
30P x 1.0	7 / 0.43	0.6	35.4	1350	35.4	2.00	43.8	3060
50P x 1.0	7 / 0.43	0.6	44.9	2130	44.9	2.50	54.9	4800
2P x 1.5	7 / 0.53	0.6	14.7	210	14.7	1.25	20.4	670
5P x 1.5	7 / 0.53	0.6	18.8	380	18.8	1.60	25.4	1110
10P x 1.5	7 / 0.53	0.6	26.5	690	26.5	1.60	33.5	1750
15P x 1.5	7 / 0.53	0.6	30.8	990	30.8	2.00	38.8	2460
20P x 1.5	7 / 0.53	0.6	34.4	1240	34.4	2.00	42.6	2910
30P x 1.5	7 / 0.53	0.6	41.0	1820	41.0	2.50	50.8	4250
50P x 1.5	7 / 0.53	0.6	52.2	2890	52.2	2.50	62.6	6040

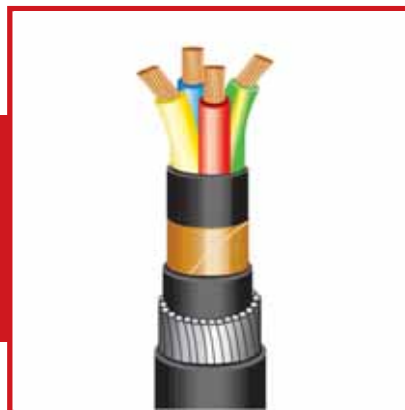
Note: Other conductor sizes & core configurations are available upon request.
 : Braided Screen and / or armoured cables are available upon request.

single core,
3 cores + 3E & 4 cores

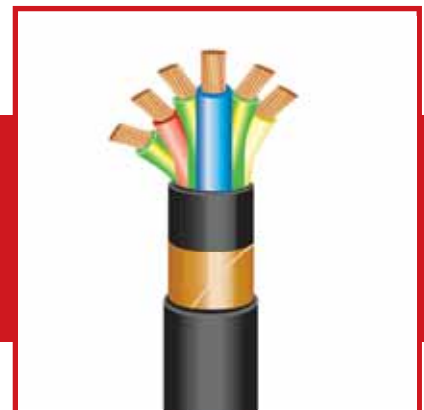
FRT-XCAH single core



FRT-XCSH 4 cores



FRT-XCH 3 cores + 3E



FRT-XCAH single core

FRT-XCSH 4 cores

FRT-XCH 3 cores + 3E

Conductor :
Insulation :
Bedding :
Screen :
Bedding :
Armouring :
Sheath :
Colour :

Plain Annealed Copper
XLPE Compound
LSZH Compound
Copper Tapes
LSZH Compound
Aluminium Wire
LSZH Compound
Insulation: Natural

Sheath - Black
EC 60502
IEC 60332-3, BS 4066-3, BS EN 50266-2-2
IEC 60754-1, BS 6425-1, BS EN 50267-2-1
IEC 60754-2, BS 6425-2, BS EN 50267-2-2
IEC 61034-2, BS 7622-2, BS EN 61034-2

Voltage U₀/U :
Conductor Stranding :
Operating Temperature :
Minimum Bending Radius :

Class 2
(a) Max 90°C for XLPE
(b) Max 110°C for XLEVA
12D for 70mm² to 1000mm²

Plain Annealed Copper
XLPE Compound
LSZH Compound
Copper Tapes
LSZH Compound
Galvanised Steel Wire
LSZH Compound
Insulation: Red, Yellow, Blue & Green / Yellow or Brown, Black, Grey & Green / Yellow

Sheath - Black
IEC 60502
EC 60332-3, BS 4066-3, BS EN 50266-2-2
IEC 60754-1, BS 6425-1, BS EN 50267-2-1
IEC 60754-2, BS 6425-2, BS EN 50267-2-2
IEC 61034-2, BS 7622-2, BS EN 61034-2

600 / 1000V
Class 2
(a) Max 90°C for XLPE
(b) Max 110°C for XLEVA
12D for 1.5mm² to 300mm²

Plain Annealed Copper
XLPE Compound
LSZH Compound
Copper Tapes

LSZH Compound
Insulation: Red, Yellow, Blue & Green / Yellow (x3) or Brown, Black, Grey & Green / Yellow (x3)

Sheath - Black
IEC 60502
EC 60332-3, BS 4066-3, BS EN 50266-2-2
IEC 60754-1, BS 6425-1, BS EN 50267-2-1
IEC 60754-2, BS 6425-2, BS EN 50267-2-2
IEC 61034-2, BS 7622-2, BS EN 61034-2

600 / 1000V
Class 2
(a) Max 90°C for XLPE
(b) Max 110°C for XLEVA
10D for unarmoured cable

Flame Retardant Screened Cables FRT-XCAH

Table 14

SIZE				FRT-XCAH				
Nominal Conductor Area (mm ²)	No. & Diameter of Wires (no./mm)	Radial Thickness of Insulation (mm)	Radial Thickness of Sheath (mm)	Armoured				
				Diameter Under Screen (mm)	Diameter Over Bedding (mm)	Armour Wire Diameter (mm)	Cable Overall Diameter (mm)	Approx. Weight (kg/km)
70	19 / 2.14	1.1	1.8	15.2	17.6	20.10	23.9	1400
95	19 / 2.52	1.1	1.8	17.1	19.5	22.00	25.8	1700
120	37 / 2.03	1.2	1.8	19.0	20.8	24.00	27.8	2000
150	37 / 2.25	1.4	1.8	21.0	22.8	26.00	29.8	2400
185	37 / 2.52	1.6	1.8	23.2	25.0	28.20	32.0	2800
240	61 / 2.25	1.7	1.9	26.1	27.9	31.10	35.1	3500
300	61 / 2.52	1.8	2.0	28.7	30.5	33.70	37.9	4200
400	61 / 2.85	2.0	2.1	32.5	34.3	38.30	42.7	5400
500	61 / 3.20	2.2	2.2	36.0	37.8	41.80	46.4	6500
630	127 / 2.52	2.4	2.3	40.4	42.2	46.20	51.0	8200
800	127 / 2.85	2.6	2.5	45.5	47.3	52.30	57.5	10400
1000	127 / 3.20	2.8	2.7	50.4	52.2	57.20	62.4	13000

This range of screened cables drastically reduce interferences from electrical noise, especially in Variable Speed Drive (VSD) applications and are manufactured with fixed conductors.

An additional trait of these cables are that they are designed to be Low Smoke, Zero Halogen and Flame Retardant. Applicable standards include IEC 60754, IEC 60332-3 and IEC 61034.

Flame Retardant Screened Cables FRT-XCSH

Table 15

SIZE		FRT-XCSH						
Nominal Conductor Area (mm ²)	No. & Diameter of Wires (no./mm)	Radial Thickness of Insulation (mm)	Radial Thickness of Sheath (mm)	Armoured				
				Diameter Under Screen (mm)	Diameter Over Bedding (mm)	Armour Wire Diameter (mm)	Cable Overall Diameter (mm)	Approx. Weight (kg/km)
4 x 1.5	7 / 0.53	0.7	1.8	9.7	12.1	13.90	17.7	640
4 x 2.5	7 / 0.67	0.7	1.8	10.7	13.1	14.90	18.7	730
4 x 4	7 / 0.85	0.7	1.8	12.0	14.4	16.20	20.0	870
4 x 6	7 / 1.04	0.7	1.8	13.4	15.8	18.30	22.1	1180
4 x 10	7 / 1.35	0.7	1.8	15.6	18.0	20.50	24.3	1490
4 x 16	7 / 1.70	0.7	1.8	18.1	20.5	23.70	27.5	2070
4 x 25	7 / 2.14	0.9	1.8	22.3	24.1	27.30	31.1	2790
4 x 35	7 / 2.52	0.9	1.8	25.0	26.8	30.00	33.8	2940
4 x 50 (S)	19 / 1.78	1.0	2.0	27.8	29.6	32.80	37.0	3500
4 x 70 (S)	19 / 2.14	1.1	2.2	31.6	33.4	37.40	42.0	5000
4 x 95 (S)	19 / 2.52	1.1	2.3	35.4	37.2	41.20	46.0	6300
4 x 120 (S)	37 / 2.03	1.2	2.5	39.0	40.8	45.80	51.0	8200
4 x 150 (S)	37 / 2.25	1.4	2.6	42.0	43.8	48.80	54.2	9600
4 x 185 (S)	37 / 2.52	1.6	2.8	47.8	49.6	54.60	60.4	11500
4 x 240 (S)	61 / 2.25	1.7	3.0	54.0	55.8	60.80	67.0	14400
4 x 300 (S)	61 / 2.52	1.8	3.0	58.0	59.8	64.80	71.4	17200

(S): Sectoral Stranded Conductors.

These cables are designed specifically to suit the broad spectrum of requirements of Variable Speed Drives and also include features for reducing the transmission of electromagnetic interference.

This range of screened cables drastically reduce interferences from electrical noise, especially in Variable Speed Drive (VSD) applications and are manufactured with fixed conductors.

With shield conductivity of 1/10th of phase conductor conductivity, this range of VSD cables effectively restrain radiated and conducted radio-frequency emissions.

An additional trait of these cables are that they are designed to be Low Smoke, Zero Halogen and Flame Retardant. Applicable standards include IEC 60754, IEC 60332-3 and IEC 61034.

Flame Retardant Screened Cables FRT-XCH

Table 16

SIZE					FRT-XCH	
Nominal Conductor Area (mm ²)	No. & Diameter of Wires (no./mm)	Combined Earth Size (mm ²)	Radial Thickness of Insulation (mm)	Radial Thickness of Sheath (mm)	Unarmoured	
					Cable Overall Diameter (mm)	Approx. Weight (kg/km)
3 x 1.5	7 / 0.53	4.5 (3 x 1.5)	0.7	1.8	13.6	325
3 x 2.5	7 / 0.67	4.5 (3 x 1.5)	0.7	1.8	14.8	380
3 x 4	7 / 0.85	4.5 (3 x 1.5)	0.7	1.8	15.8	440
3 x 6	7 / 1.04	7.5 (3 x 2.5)	0.7	1.8	16.9	550
3 x 10	7 / 1.35	12 (3 x 4)	0.7	1.8	18.6	750
3 x 16	7 / 1.70	18 (3 x 6)	0.7	1.8	20.8	1000
3 x 25	7 / 2.14	30 (3 x 10)	0.9	1.8	24.0	1470
3 x 35	7 / 2.52	30 (3 x 10)	0.9	1.8	25.6	1890
3 x 50	19 / 1.78	30 (3 x 10)	1.0	1.9	31.1	2300
3 x 70	19 / 2.14	48 (3 x 16)	1.1	2.0	34.6	3200
3 x 95	19 / 2.52	48 (3 x 16)	1.1	2.2	39.3	4200
3 x 120	37 / 2.03	75 (3 x 25)	1.2	2.3	44.0	5400
3 x 150	37 / 2.25	75 (3 x 25)	1.4	2.5	49.0	6400
3 x 185	37 / 2.52	105 (3 x 35)	1.6	2.6	54.0	7900
3 x 240	61 / 2.25	150 (3 x 50)	1.7	2.8	61.0	10200
3 x 300	61 / 2.52	150 (3 x 50)	1.8	3.0	67.0	12300

These cables are designed specifically to suit the broad spectrum of requirements of Variable Speed Drives and also include features for reducing the transmission of electromagnetic interference. These range of cables are able to reduce capacitance of power conductors and have an electrically balanced construction which includes split earths and a copper screen.

This range of screened cables drastically reduce interferences from electrical noise, especially in Variable Speed Drive (VSD) applications and are manufactured with fixed conductors.

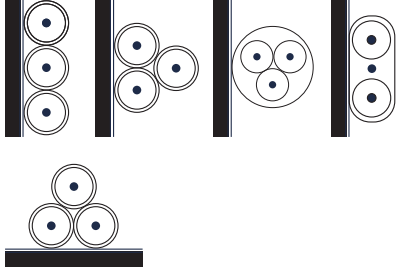
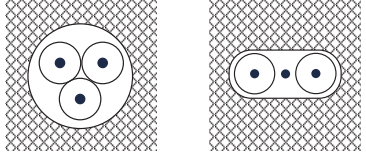
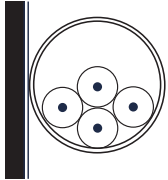
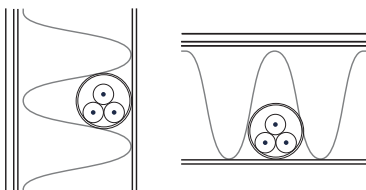
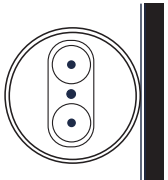
With shield conductivity of 1/10th of phase conductor conductivity, this range of VSD cables effectively restrain radiated and conducted radio-frequency emissions.

An additional trait of this cables are that they are designed to be Low Smoke, Zero Halogen and Flame Retardant. Applicable standards include IEC 60754, IEC 60332-3 and IEC 61034.

Schedule of Installation Methods of Cables

(including reference method)

Schedule of Installation Methods of Cables (including Reference Method) Technical Table 1.1

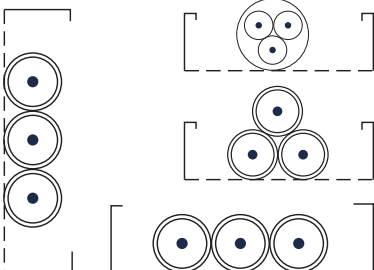
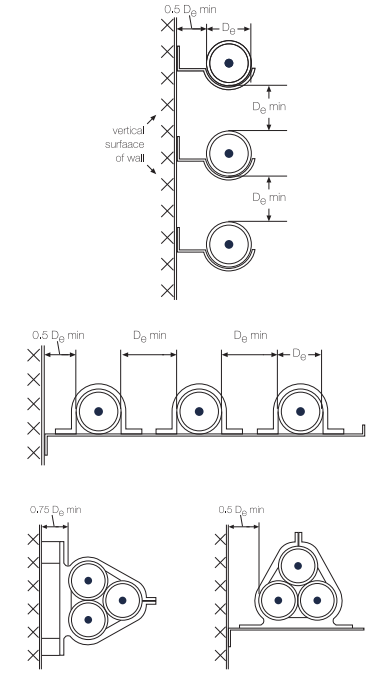
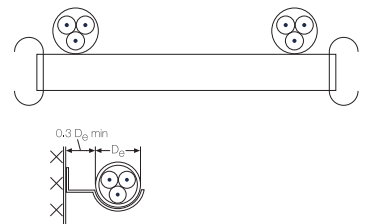
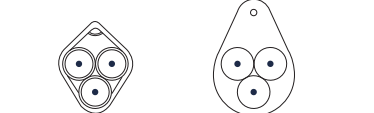
Installation Method	Examples	Appropriate Reference Method for Determining Current-Carrying Capacity
Description		
OPEN AND CLIPPED DIRECT:		
<p>Sheathed cables clipped direct to or lying on a non-metallic surface.</p>		<p>Method 1</p>
CABLES EMBEDDED DIRECT IN BUILDING MATERIALS:		
<p>Sheathed cables embedded directly in masonry, brickwork, concrete, plaster or the like (other than thermally insulating materials).</p>		<p>Method 1</p>
IN CONDUIT:		
<p>Single core non-sheathed cables in metallic or non-metallic conduit on a wall or ceiling.</p>		<p>Method 3</p>
<p>† Single core non-sheathed cables in metallic or non-metallic conduit in a thermally insulating wall or above a thermally insulating ceiling, the conduit being in contact with a thermally conductive surface on one side.</p>		<p>Method 4</p>
<p>Multi core cables having non-metallic sheath, in metallic or non-metallic conduit on a wall or ceiling.</p>		<p>Method 3</p>

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

Schedule of Installation Methods of Cables

(including reference method)

Schedule of Installation Methods of Cables (including Reference Method) Technical Table 1.2

Installation Method	Examples	Appropriate Reference Method for Determining Current-Carrying Capacity
Description		
ON TRAYS:		
<p>Sheathed cables on a perforated cable tray, bunched and unenclosed. A perforated cable tray is considered as a tray in which the holes occupy at least 30% of the surface area.</p>		Method 11
IN FREE AIR, ON CLEATS, BRACKETS OR A LADDER:		
<p>Sheathed single-core cables in free air (any supporting metalwork under the cables occupying less than 10% of the plan area):</p> <p>Two or three cables vertically one above the other, minimum distance between cable surfaces equal to the overall cable diameter (D_o); distance from the wall not less than $0.5 D_o$.</p> <p>Two or three cables horizontally, with spacings as above.</p> <p>Three cables in trefoil, distance between wall and surface of nearest cable $0.5D_o$ or nearest cables $0.75D_o$.</p>		Method 12
<p>Sheathed multicore cables on ladder or brackets, separation greater than $2D_o$.</p> <p>Sheathed multicore cables in free air distance between wall and cable surface not less than $0.3D_o$.</p> <p>Any supporting metalwork under the cables occupying less than 10% of the plan area.</p>		Method 13
<p>Cables suspended from or incorporating a catenary wire.</p>		Method 12 or 13, as appropriate

Correction Factors for Ambient Temperature & Group Installation

For Ambient Temperature														Technical Table 2.1		
For Ambient Temperature	15	20	25	30	35	40	45	50	55	60	65	70	75	80	85	
In Air			1.02	1.00	0.96	0.91	0.87	0.82	0.76	0.71	0.65	0.58	0.50	0.41	0.29	
In Ground	1.00	0.97	0.93	0.89	0.86	0.82	0.77	0.73								

Notes: Conductor Temperature 90°

For Group														Technical Table 2.2		
For Group	Correction Factor (C _g)															
	Reference Methods of Installation	Number of Circuits or Multi-Core Cables														
		2	3	4	5	6	7	8	9	10	12	14	16	18	20	
Enclosed (Method 3 or 4) or bunched and clipped direct to a non-metallic surface (Method1)	0.80	0.70	0.65	0.60	0.57	0.54	0.52	0.50	0.48	0.45	0.43	0.41	0.39	0.38		
Single layer clipped to a non-metallic surface (Method 1)	Touching	0.85	0.79	0.75	0.73	0.72	0.72	0.71	0.70	-	-	-	-	-		
	Spaced*	0.94	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90		
Single layer multi-cores on a perforated metal cable tray, vertical or horizontal (Method 11)	Touching	0.86	0.81	0.77	0.75	0.74	0.73	0.73	0.72	0.71	0.70	-	-	-		
	Spaced*	0.91	0.89	0.88	0.87	0.87	-	-	-	-	-	-	-	-		
Single layer single core on a perforated metal cable tray, touching (Method 11)	Horizontal	0.90	0.85	-	-	-	-	-	-	-	-	-	-	-		
	Vertical	0.85	-	-	-	-	-	-	-	-	-	-	-	-		
Single layer multi-cores touching on ladder supports (Method 13)	0.86	0.82	0.80	0.79	0.78	0.78	0.78	0.77	-	-	-	-	-			

* 'Spaced' means a clearance between adjacent surfaces of at least one cable diameter (D_e).

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

For example, a group of N loaded cables would normally require a group reduction factor of C_g applied to the tabulated I_t. However, if M cables in the group carry loads which are not greater than 0.3 C_g x I_t amperes, the other cables can be sized by using the group rating factor corresponding to (N-M) cables.
 - When cables having differing conductor operating temperatures are grouped together, the current rating shall be based on the lowest operating temperature of any cable in the group.
 - Where the horizontal clearance between adjacent cables exceeds 2 x D_e, no correction factor need be applied.

Technical Table 3.1 & 3.2 – 1-Core Cables having XLPE or LSZH Insulation, Unarmoured, With or Without Sheath (Copper Conductor) 450/750V or 600/1000V

Current-Carrying Capacities (Amp)

Technical Table 3.1

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

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

Voltage Drop (Per Amp Per Meter)

Technical Table 3.2

Size of Conductor	2 Cables dc	2 Cables, 1-phase ac						3 or 4 Cables, 3-phase ac								
		Reference Methods 3 & 4 (enclosed in conduit etc, in or on a wall)			Reference Methods 1 & 11 (clipped direct or on trays touching)			Reference Methods 3 & 4 (enclosed in conduit etc, in or on a wall)			Reference Methods 1, 11 & 12 (in trefoil)			Reference Methods 1 & 11 (flat and touching)		
		3 mV/A/m			4 mV/A/m			5 mV/A/m			6 mV/A/m			7 mV/A/m		
1 mm ²	2															
1.5	31			31			31			27			27			27
2.5	19			19			19			16			16			16
4	12			12			12			10			10			10
6	7.9			7.9			7.9			6.8			6.8			6.8
10	4.7			4.7			4.7			4.0			4.0			4.0
16	2.9			2.9			2.9			2.5			2.5			2.5
		r	x	z	r	x	z	r	x	z	r	x	z	r	x	z
25	1.85	1.85	0.31	1.90	1.85	0.19	1.85	1.60	0.27	1.65	1.60	0.165	1.60	1.60	0.19	1.60
35	1.35	1.35	0.29	1.35	1.35	0.18	1.35	1.15	0.25	1.15	1.15	0.155	1.15	1.15	0.18	1.15
50	0.99	1.00	0.29	1.05	0.99	0.18	1.00	0.87	0.25	0.90	0.86	0.155	0.87	0.86	0.18	0.87
70	0.68	0.70	0.28	0.75	0.68	0.175	0.71	0.60	0.24	0.65	0.59	0.150	0.61	0.59	0.175	0.62
95	0.49	0.51	0.27	0.58	0.49	0.170	0.52	0.44	0.23	0.50	0.43	0.145	0.45	0.43	0.170	0.46
120	0.39	0.41	0.26	0.48	0.39	0.165	0.43	0.35	0.23	0.42	0.34	0.140	0.37	0.34	0.165	0.38
150	0.32	0.33	0.26	0.43	0.32	0.165	0.36	0.29	0.23	0.37	0.28	0.140	0.31	0.28	0.165	0.32
185	0.25	0.27	0.26	0.37	0.26	0.165	0.30	0.23	0.23	0.32	0.22	0.140	0.26	0.22	0.165	0.28
240	0.19	0.21	0.26	0.33	0.20	0.160	0.25	0.185	0.22	0.29	0.17	0.140	0.22	0.17	0.165	0.24
300	0.155	0.175	0.25	0.31	0.16	0.160	0.22	0.15	0.22	0.27	0.14	0.140	0.195	0.135	0.160	0.21
400	0.12	0.14	0.25	0.29	0.13	0.155	0.20	0.125	0.22	0.25	0.11	0.135	0.175	0.110	0.160	0.195
500	0.093	0.12	0.25	0.28	0.105	0.155	0.185	0.100	0.22	0.24	0.09	0.135	0.160	0.088	0.160	0.180
630	0.072	0.10	0.25	0.27	0.086	0.155	0.175	0.088	0.21	0.23	0.074	0.135	0.150	0.071	0.160	0.170
800	0.056	-	-	-	0.072	0.150	0.170	-	-	-	0.062	0.130	0.145	0.059	0.155	0.165
1000	0.045	-	-	-	0.063	0.150	0.165	-	-	-	0.055	0.130	0.140	0.050	0.155	0.165

Note: r = conductor resistance at operating temperature
z = impedance, x = reactance

Current Rating and Voltage Drop

multi-core

Technical Table 4.1 & 4.2 – Multi-Core Cables having XLPE or LSZH Insulation, Unarmoured, (Copper Conductor) 300/500V or 600/1000V

Current-Carrying Capacity (Amp)

Technical Table 4.1

Size of Conductor	Reference Method 4 (enclosed in conduit and in insulated wall etc)		Reference Method 3 (enclosed in conduit on a wall or ceiling, or in trunking etc)		Reference Method 1 (clipped direct)		Reference Method 11 (on a perforated cable tray) or Reference Method 13 (free air)	
	2-core cables 1-phase ac or dc	3 or 4-core cables 3-phase ac	2-core cables 1-phase ac or dc	3 or 4-core cables 3-phase ac	2-core cables 1-phase ac or dc	3 or 4-core cables 3-phase ac	2-core cables 1-phase ac or dc	3 or 4-core cables 3-phase ac
1 mm ²	2 A	3 A	4 A	5 A	6 A	7 A	8 A	9 A
1.5	18.5	16.5	22	19.5	24	22	26	23
2.5	25	22	30	26	33	30	36	32
4	33	30	40	35	45	40	49	42
6	42	38	51	44	58	52	63	54
10	57	51	69	60	80	71	86	75
16	76	68	91	80	107	96	115	100
25	99	89	119	105	138	119	149	127
35	121	109	146	128	171	147	185	158
50	145	130	175	154	209	179	225	192
70	183	164	221	194	269	229	289	246
95	220	197	265	233	328	278	352	298
120	253	227	305	268	382	322	410	346
150	290	259	334	300	441	371	473	399
185	329	295	384	340	506	424	542	456
240	386	346	459	398	599	500	641	538
300	442	396	532	455	693	576	741	621
400			625	536	803	667	865	741

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

Voltage Drop (Per Amp Per Meter)

Technical Table 4.2

Size of Conductor 1 (mm ²)	2-core cable, dc			2-core cables 1-phase ac			3 or 4-core cables 3-phase, ac		
	2 (mV/A/m)			3 (mV/A/m)			4 (mV/A/m)		
			r	x	z	r	x	z	
1.5	31								
2.5	19								
4	12								
6	7.9								
10	4.7								
16	2.9								
25	1.85		1.85	0.16	1.9	1.6	0.14	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	0.19	0.115	0.120	0.165	

Note: r = conductor resistance at operating temperature
z = impedance, x = reactance

Technical Table 5.1 & 5.2 – 1-Core Cables having XLPE or LSZH Insulation, Armoured, (Copper Conductor) 600/ 1000V

Current-Carrying Capacity (Amp)

Technical Table 5.1

Size of Conductor	Reference Method 1 (clipped direct)		Reference Method 11 (on perforated cable tray)		Reference Method 12 (free air)	In single way ducts		Laid direct in ground	
	2 cables 1 phase ac or dc flat & touching	3 or 4 cables 3-phase ac flat & touching	2 cables 1 phase ac or dc flat & touching	3 or 4 cables 3-phase ac flat & touching	3 cables 3-phases ac trefoil touching	2 cables 1-phases ac or dc ducts touching	3 cables 3-phases ac, trefoil ducts touching	2 cables 1-phase ac or dc touching	3 cables 3-phase ac trefoil touching
1 mm ²	2 A	3 A	4 A	5 A	6 A	7 A	8 A	9 A	10 A
50	237	220	253	232	222	255	235	275	235
70	303	277	322	293	285	310	280	340	290
95	367	333	389	352	346	365	330	405	345
120	425	383	449	405	402	410	370	460	390
150	488	437	516	462	463	445	405	510	435
185	557	496	587	524	529	485	440	580	490
240	656	579	689	612	625	550	500	670	560
300	755	662	792	700	720	610	550	750	630
400	853	717	899	767	815	640	580	830	700
500	962	791	1016	851	918	690	620	910	770
630	1082	861	1146	935	1027	750	670	1000	840
800	1170	904	1246	987	1119	828	735	1117	931
1000	1261	961	1345	1055	1214	919	811	1254	1038

Ambient Temperature: 30°C
 Ground Temperature: 15°C
 Conductor Operating Temperature: 90°C

Voltage Drop (Per Amp Per Meter)

Technical Table 5.2

Size of Conductor	2 Cables dc	2 Cables, 1-phase ac			3 or 4 Cables, 3-phase ac						2 Cables, 1-phase ac		3 or 4 Cables, 3-phase ac, touching	
		Reference Methods 1 & 11 (touching)			Reference Methods 1,11 or 12 (in trefoil touching)			Reference Methods 1 & 11 (flat & touching)			In ducts	In ground	In ducts	In ground
		r	x	z	r	x	z	r	x	z	6 mV/A/m	7 mV/A/m	8 mV/A/m	9 mV/A/m
50	0.98	0.99	0.21	1	0.86	0.18	0.87	0.84	0.25	0.88	1.10	0.99	0.93	0.86
70	0.67	0.68	0.20	0.71	0.59	0.17	0.62	0.60	0.25	0.65	0.80	0.70	0.70	0.61
95	0.49	0.51	0.195	0.55	0.44	0.17	0.47	0.46	0.24	0.52	0.65	0.53	0.56	0.46
120	0.39	0.41	0.190	0.45	0.35	0.165	0.39	0.38	0.24	0.44	0.55	0.43	0.48	0.37
150	0.31	0.33	0.185	0.38	0.29	0.160	0.33	0.31	0.23	0.39	0.50	0.37	0.43	0.32
185	0.25	0.27	0.185	0.33	0.23	0.160	0.28	0.26	0.23	0.34	0.45	0.31	0.39	0.27
240	0.195	0.21	0.180	0.28	0.18	0.155	0.24	0.21	0.22	0.30	0.40	0.26	0.35	0.23
300	0.155	0.17	0.175	0.25	0.145	0.150	0.21	0.17	0.22	0.28	0.37	0.24	0.32	0.21
400	0.115	0.145	0.170	0.22	0.125	0.150	0.195	0.160	0.21	0.27	0.35	0.21	0.30	0.19
500	0.093	0.125	0.170	0.21	0.105	0.145	0.180	0.145	0.20	0.25	0.33	0.20	0.28	0.18
630	0.073	0.105	0.165	0.195	0.092	0.145	0.170	0.135	0.195	0.24	0.30	0.19	0.26	0.17
800	0.056	0.09	0.160	0.190	0.086	0.140	0.165	0.130	0.180	0.23	0.28	0.18	0.24	0.16
1000	0.045	0.092	0.155	0.180	0.080	0.135	0.155	0.125	0.170	0.21	0.26	0.17	0.22	0.15

Note: r = conductor resistance at operating temperature
 z = impedance, x = reactance

Current Rating and Voltage Drop

multi-core

Technical Table 6.1 & 6.2 – Multi-Core Cables having XLPE or LSZH Insulation, Armoured, (Copper Conductor) 600/ 1000V

Current-Carrying Capacity (Amp)

Technical Table 6.1

Size of Conductor	Reference Method 1 (clipped direct)		Reference Method 11 (on a perforated cable tray) or Method 13 (free air)		In single way ducts		Laid direct in ground	
	2-core cables 1-phase ac or dc	3 or 4-core cables 3-phase ac	2-core cables 1-phase ac or dc	3 or 4-core cables 3-phase ac	2-core cables 1-phase ac or dc	3 or 4-core cables 3-phase ac	2-core cables 1-phase ac or dc	3 or 4-core cables 3-phase ac
1 mm ²	2 A	3 A	4 A	5 A	6 A	7 A	8 A	9 A
1.5	27	23	29	25		23		28
2.5	36	31	39	33		30		36
4	49	42	52	44		40		48
6	62	53	66	56		50		60
10	85	73	90	78		65		80
16	110	94	115	99	115	94	140	115
25	146	124	152	131	145	125	180	150
35	180	154	188	162	175	150	215	180
50	219	187	228	197	210	175	255	215
70	279	238	291	251	260	215	315	265
95	338	289	354	304	310	260	380	315
120	392	335	410	353	355	300	430	360
150	451	386	472	406	400	335	480	405
185	515	441	539	463	455	380	540	460
240	607	520	636	546	520	440	630	530
300	698	599	732	628	590	495	700	590
400	787	673	847	728	660	560	790	670

Ambient Temperature: 30°C
Ground Temperature: 15°C
Conductor Operating Temperature: 90°C

Voltage Drop (Per Amp Per Meter)

Technical Table 6.2

Size of Conductor	2-Core Cables dc	2-Core Cables, 1-phase ac			3 or 4-Core Cables, 3-phase ac			2-Core Cables, 1-phase ac		3 or 4-Core Cables, 3-phase ac	
								In ducts	In ground	In ducts	In ground
1 mm ²	2 mV/A/m	3 mV/A/m			4 mV/A/m			5 mV/A/m	6 mV/A/m	7 mV/A/m	8 mV/A/m
1.5	31	31			27			31	31	25	25
2.5	19	19			16			19	19	15	15
4	12	12			10			12	12	9.7	9.7
6	7.9	7.9			6.8			7.9	7.9	6.5	6.5
10	4.7	4.7			4.0			4.7	4.7	3.9	3.9
16	2.9	2.9			2.5			2.9	2.9	2.6	2.6
		r	x	z	r	x	z				
25	1.85	1.85	0.16	1.9	1.6	0.14	1.65	1.9	1.9	1.6	1.6
35	1.35	1.35	0.155	1.35	1.15	0.135	1.15	1.35	1.35	1.2	1.2
50	0.98	0.99	0.155	1.00	0.86	0.135	0.87	1.00	1.00	0.87	0.87
70	0.67	0.67	0.150	0.69	0.59	0.130	0.60	0.69	0.69	0.61	0.61
95	0.49	0.50	0.150	0.52	0.43	0.130	0.45	0.52	0.52	0.45	0.45
120	0.39	0.40	0.145	0.42	0.34	0.130	0.37	0.42	0.42	0.36	0.36
150	0.31	0.32	0.145	0.35	0.28	0.125	0.30	0.35	0.35	0.30	0.30
185	0.25	0.26	0.145	0.29	0.22	0.125	0.26	0.29	0.29	0.25	0.25
240	0.195	0.20	0.140	0.24	0.175	0.125	0.21	0.24	0.24	0.21	0.21
300	0.155	0.16	0.140	0.21	0.140	0.120	0.185	0.21	0.21	0.19	0.19
400	0.120	0.13	0.140	0.19	0.115	0.120	0.165	0.19	0.19	0.18	0.18

Note: r = conductor resistance at operating temperature
z = impedance, x = reactance

Short Circuit Ratings

Short Circuit Ratings for Fire Resistant Cable

Technical Table 7.1

Cross-Sectional Area (mm ²)	Short Circuit Rating for 1 Second (kA)	Short Circuit Rating for 3 Second (kA)
1.5	0.2145	0.1238
2.5	0.3575	0.2064
4	0.5720	0.3302
6	0.8580	0.4954
10	1.4300	0.8256
16	2.2880	1.3210
25	3.5750	2.0640
35	5.0050	2.8896
50	7.1500	4.1281
70	10.0100	5.7793
95	13.5850	7.8433
120	17.1600	9.9073
150	21.4500	12.3842
185	26.4550	15.2738
240	34.3200	19.8147
300	42.9000	24.7683
400	57.2000	33.0244
500	71.5000	41.2805
630	90.0900	52.0135
800	114.4000	66.0489
1000	143.0000	82.5611

Another important factor for the determination of the 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 the formula:

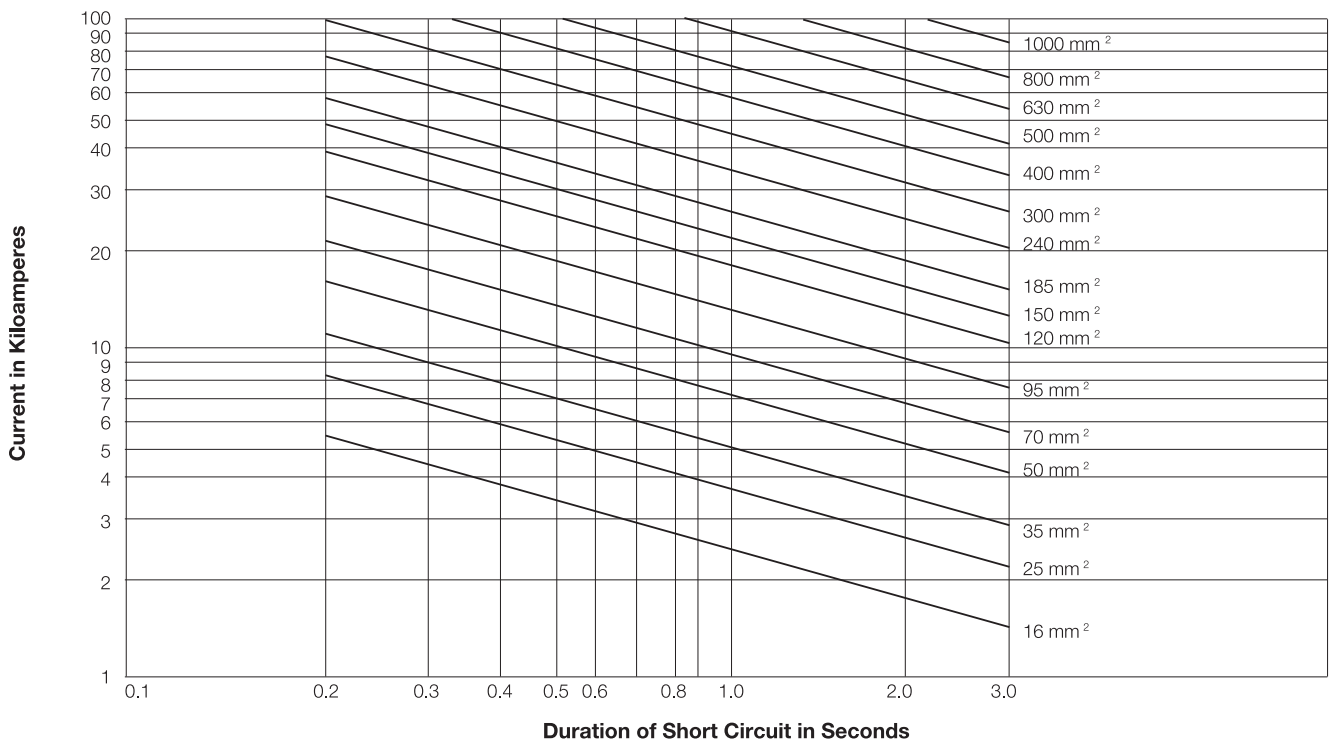
$$I = \frac{0.143S}{\sqrt{t}}$$

Where
I = Short Circuit Rating (kA)
S = Conductor Area (sq mm)
t = Duration of Short Circuit (sec)

The above rating is calculated based on 1 second and 3 seconds.

Copper Conductors

Technical Table 7.2



The values of fault current given in the graph are based on the cable being fully loaded at the start of the short circuit (conductor temperature 90°C) and a final conductor temperature of 250°C, and it should be ensured that the accessories associated with the cable are also capable of operation at these values of fault current.

Additional Technical Information

Technical Table 8.0 – For all Cables types of FR-XOL, FR-XOSL, FR-XIOL, FR-XIOSL & FRT-XOL, FRT-XOSL, FRT-XIOL, FRT-XIOSL

FR-XOL, FR-XOSL, FR-XIOL, FR-XIOSL & FRT-XOL, FRT-XOSL, FRT-XIOL, FRT-XIOSL

Technical Table 8.0

1. Test Voltage: 2000 Vr.m.s. for 15 minutes between each conductor in turn and all the other connected together.

2. Maximum DC Conductor Resistance at 20°C

Conductor Size	Multi-core	Multi-pair
0.5 mm ²	39.0	39.7
0.75 mm ²	26.0	26.5
1.0 mm ²	18.1	18.4
1.5 mm ²	12.1	12.30
2.5 mm ²	7.41	7.54

3. Minimum Insulation Resistance at 20°C

(a) Individual Conductor (between each conductor and remaining bunched conductors/screen and/or armour) 300 MΩ.km

(b) Individual Screens (between screens) 1 MΩ.km

4. Maximum Mutual Capacitance at 1 kHz (pF/m)

Cable Type	Conductor Size	0.5mm ²	0.75mm ²	1.0mm ²	1.5mm ²	2.5mm ²
Cables without individual pair screen		75	75	75	85	95
All cables with individual pair screen, 1 and 2 pair cables collective screen		115	115	115	120	130

5. Maximum Capacitance Unbalance at 1 kHz : 250 pF / 250 m

6. Maximum L/R Ratio (For Adjacent Cores)

Conductor Size	Multi-core
0.5 mm ²	25 μH/Ω
0.75 mm ²	25 μH/Ω
1.0 mm ²	25 μH/Ω
1.5 mm ²	40 μH/Ω
2.5 mm ²	60 μH/Ω

Maximum Conductor Resistance Technical Table 9.0

Cross-Sectional Area (mm ²)	Conductor for Fixed Wiring Class 1 (solid), Class 2 (stranded)
0.5	36.0
0.75	24.5
1.0	18.1
1.5	12.1
2.5	7.41
4	4.61
6	3.08
10	1.83
16	1.15
25	0.727
35	0.524
50	0.387
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

Electrical Characteristics Technical Table 10.0

Conductor Resistance Temperature Correction Factors	
Temp °C	Factor
10	1.042
11	1.037
12	1.033
13	1.029
14	1.025
15	1.020
16	1.016
17	1.012
18	1.008
19	1.004
20	1.000
21	0.996
22	0.992
23	0.988
24	0.984
25	0.980
30	0.962
35	0.943
40	0.926
45	0.909
50	0.893
55	0.877
60	0.862
65	0.847
70	0.833
75	0.820
80	0.806
85	0.794
90	0.781

Conversion Table of Conductor Size

(mm² - CM - AWG / MCM)

Technical Table 11.0

Cross-sectional Area		Conductor Size	Cross-sectional Area		Conductor Size
(mm ²)	(CM)	(AWG / MCM)	(mm ²)	(CM)	(AWG / MCM)
0.324	640	22	107.2	211600	4/0
0.519	1020	20	*120	236820	-
0.653	1290	19	127	250000	-250
0.823	1620	18	*150	296025	-
*1.0	1974	-	152	300000	300
1.04	2050	17	177	350000	350
1.31	2580	16	*185	365098	-
*1.5	2960	-	203	400000	400
1.65	3260	15	228	450000	450
2.08	4110	14	*240	473640	-
*2.5	4934	-	253	500000	500
2.63	5180	13	279	550000	550
3.31	6530	12	300	592050	-
*4.0	7894	-	304	600000	600
4.17	8230	11	329	650000	650
5.261	10380	10	355	700000	700
*6.0	11841	-	380	750000	750
6.631	13090	9	*400	789400	-
8.367	16510	8	405	800000	800
*10.0	19735	-	456	900000	900
10.55	20820	7	*500	986750	-
13.3	26240	6	507	1000000	1000
*16.6	31576	-	557	1100000	1100
16.77	33090	5	608	1200000	1200
21.15	41740	4	*630	1243305	-
*25.0	49338	-	633	1250000	1250
26.67	52620	3	659	1300000	1300
33.62	66360	2	709	1400000	1400
*35.0	69073	-	760	1500000	1500
42.41	83690	1	*800	1578800	-
*50.0	98675	-	811	1600000	1600
53.49	105600	1/0	861	1700000	1700
67.43	133100	2/0	887	1750000	1750
*70.0	138145	-	912	1800000	1800
85.01	167800	3/0	963	1900000	1900
*95.0	187483	-	*1000	1973500	-
			010	2000000	2000

Note : * British Standard
 * 127 mm² and larger is rounded off and not actual. CM area is actual.
 Conversion factors : mm² x 1973.5 = CM area, CM x 0.0005067 = mm².

AWG - America Wire Gauge. A standard measurement of the size of a conductor : 4/0 & smaller.

CM (Circular Mil) used to define cross-sectional areas of conductors. Area of circle 171000 inches in diameter. MCM - 1000 circular mils.

Terms & Conditions of Sale

1. APPLICATION OF TERMS & CONDITIONS

These conditions govern the sales and purchase of goods ordered by Buyer from Seller ("the goods") and shall override any terms and conditions whether previously or hereafter stipulated incorporated or referred to by Buyer whether orally in its purchase order or other documents.

2. DELIVERY

- a. Any time for delivery named by Seller is an estimate only and Seller is not liable to make good any damage or loss arising out of any such delay.
- b. Delivery shall be deemed to have been made if Seller delivers the goods to the location specified by the Buyer and Delivery Order is endorsed by any person present thereat. Seller not responsible to ensure the goods have been delivered to or is collected by Buyer or its authorized personnel and shall not be liable for any loss or damage to Buyer by reason of unauthorized collection of the goods.
- c. Should Buyer fail to take delivery of goods, Seller shall be entitled (without derogation of its rights under Law) to charge Buyer for storage and insurance for the goods calculated from the date fixed for delivery.
- d. The Seller reserves the right to deliver the goods by instalments and each instalment shall be deemed to have been sold under a separate contract. Failure to deliver any instalment shall not entitle the buyer to repudiate the contract.
- e. Off loading and/or handling will in all events be the responsibility of the Buyer.
- f. If the goods to be delivered are, at the Buyer's discretion, delivered to the destination other than the Buyer's premises, the Seller will arrange such delivery for the Buyer and all costs for carriage and insurance will be to the Buyer's account.
- g. Availability of the goods when offered ex-stock is subject to such goods being sold in another transaction between the date when the Seller advises the goods are available, and the date when it receives the Buyer's order. Any delivery time offered for products made to special customer order is indicative only, and the Seller shall not be liable for any loss or damage whatsoever arising as a consequence or result of any such failure to deliver.

3. PRICE

The quoted price for the goods are subjected to change in the event of any imposition or increase in taxes, levies or duties whatsoever on the goods, its components or raw materials.

4. PAYMENT

Payments for the goods shall be made within the time stipulated in the invoice. Interest at 1.5% per month will be charged on late payment.

5. TIME OF THE ESSENCE

Time within which the Buyer is to pay for the goods shall be of the essence of this Contract.

6. ACCEPTANCE

Buyer shall inspect the goods immediately upon delivery. Unless Seller receives notice that the goods are not in accordance with the Buyer's order and the goods returned to Seller within 24 hours from the date of delivery, the goods shall be deemed to have been accepted by the Buyer PROVIDED ALWAYS Seller will not accept return of used goods and Buyer shall not reject any goods which are in accordance with the Buyer's order.

7. DESCRIPTION

Notwithstanding any description of the goods given by the Seller or Buyer, no sale of goods shall constitute or be construed as a sale by description.

8. WARRANTIES

Save and except for written warranties (if any) given by Seller, the Seller does not give any warranties as to the quality, state, condition or fitness of the goods or their suitability for any purpose or for use under any specific conditions, notwithstanding that such purpose or condition may be known or made known to Seller.

9. DEFECTS

Save and except as notified pursuant to Clause 6 above, Seller shall be under no liability to Buyer either in contract or tort for loss, injury or damage sustained by Buyer or any third party by reason of defects in the goods whether latent or otherwise but Buyer will keep Seller indemnified against any such claim.

10. TITLE

Title to the goods remains vested in Seller until Seller receives the full purchase price. If such payment is overdue, the Seller may without prejudice to any other rights sue for the purchase price, recover or re-sell the goods and the Buyer grants the Seller, its servants/agents the right and/or license to enter the Buyer's premise and/or any other premise where the goods are stored. If any of the goods are sold by Buyer before title has passed to Buyer, Buyer shall hold the proceeds of sale and all rights against purchaser in trust for Seller.

11. RISK

Risk passes to Buyer upon delivery of goods to Buyer.

12. DEFAULT

If Buyer fail to pay Seller on due date, commits a breach of any of its obligation herein, becomes insolvent or commits an act of bankruptcy, Seller may without prejudice to its other rights and without giving any notice, suspend/cancel further deliveries, stop any delivery in transit under this Contract or any other contracts and/or limit/cancel the Buyer's credit as to time and/or amount for executed, executory or future orders, and/or request for securities or guarantees. Seller shall not be liable to Buyer for any damages which Buyer may suffer or incur by reason thereof.

13. CANCELLATION OF CREDIT

Notwithstanding anything herein contained, Seller reserves the right to limit/cancel the credit of the Buyer as to time and/or amount without giving any reasons thereof and to demand full settlement immediately of all sums that may be owing by Buyer notwithstanding that the credit period has not expired.

14. FORCE MAJEURE

Seller shall not be liable to Buyer for failure to deliver the goods by reason of any breakdown of plant, fire, explosion, Act of God, or outbreak of hostilities, national emergency, industrial disputes, shortage of labour, raw materials, energy or any causes beyond Seller's control and which seller is unable to prevent by the exercise of reasonable diligence, whether of the class of causes enumerated herein or not.

15. APPROPRIATION OF PAYMENTS

All payments received from the Buyer will be applied towards settlement of the Buyer's oldest debts comprising of the earliest invoices, debit notes (including debit notes for overdue interest) and other charges howsoever arising PROVIDED ALWAYS Seller may appropriate any payments towards account of interest before principal in respect of any debt as the Seller shall in its absolute discretion deem fit.

16. STATEMENT OF ACCOUNT

All amounts stated in the invoices and statement of accounts of Seller shall be conclusive of the amounts due and owing by Buyer to Seller and shall be binding against Buyer in any legal proceedings.

17. RIGHTS OF SET-OFF

Seller entitled to set-off against Buyer's debts all monies now or hereafter standing to the credit of Buyer's account with Seller and for this purpose Buyer shall give irrevocable authority to Seller to collect on behalf of Buyer and give valid receipt and discharge in respect of all such monies owing to the Buyer.

18. WAIVER

No failure or delay by the Seller in exercising any rights hereunder shall operate as a waiver hereof nor shall any single or partial exercise of right preclude any further exercise thereof or the exercise of any other right.

19. SALE OF GOODS ACT ("the Act")

The terms and conditions in favour of the Seller hereunder shall be in addition to and not in substitution for any term condition warranty expressed or implied in favour of the Seller under the Act or any statutory and re-enactment thereto for the time being enforced.

20. INFRINGEMENT OF PATENTS DESIGNS

Buyer shall indemnify Seller against all damages, claims, costs and expenses which Seller may become liable as a result of work done or goods sold in accordance with Buyer's specifications which involve infringement of any patents, registered designs or trademarks.

21. NOTICES

Any notices, communications or demands shall be deemed to have been sufficiently given if sent by prepaid post to the address of the addressee stated herein or to the addressee's last known place of business and shall be presumed to have reached the address in ordinary course of post.

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