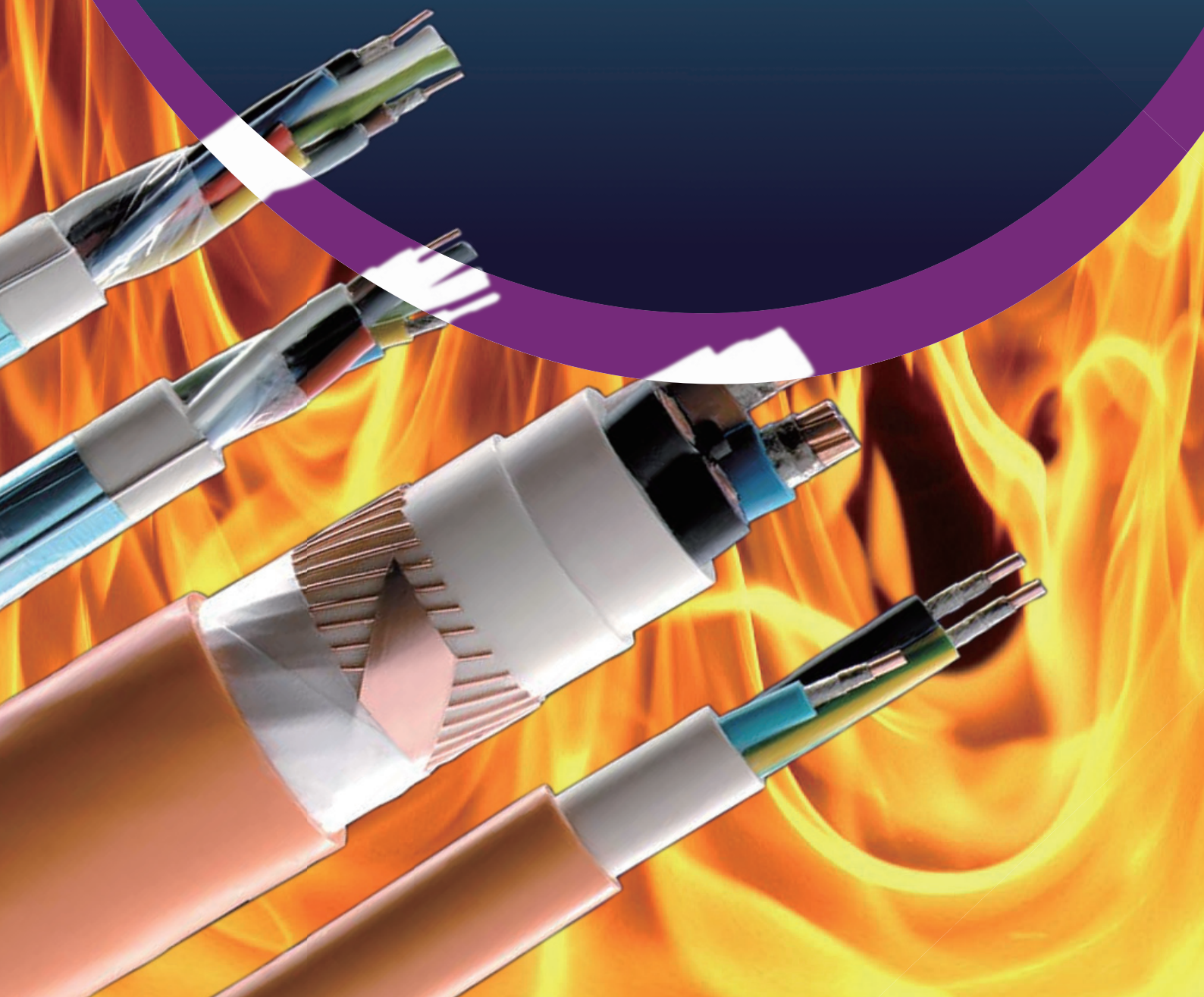
Caledonian

FIREFLIX
Fire Resistant Cables



Company Profile


QAS International

REGISTRATION CERTIFICATE

This document certifies that the administration systems of

Caledonian Cables Limited / Addison Technology Limited

Marchants Industrial Centre, Mill Lane, Laughton, Lewes, Sussex, BN8 6AJ, United Kingdom

have been assessed and approved by QAS International to the following management systems, standards and guidelines:

ISO 9001 : 2008

With the permitted exclusion of clauses 7.3 Design and Development

The approved administration systems apply to the following:

The manufacture and supply of electrical cables and ancillary power equipment to customers internationally.

Original Approval 6th September 1997
Current Certificate 7th February 2015
Certificate Expiry 7th February 2016
Certificate Number A6211

Signed: Certification Officer

On behalf of QAS International

This certificate remains valid while the holder maintains their quality administration systems in accordance with the standards and guidelines stated above, which will be audited annually by QAS International. The holder is entitled to display the above registration mark for the duration of this certificate, which should be returned to QAS International upon reasonable request. Issuing Office: QAS International, 20A Oxford Street, Malmesbury, Wiltshire SN16 9AX, UK

Caledonian & Addison, branded under Caledoniea & Addimax, established in 1978, offers one of the most complete lines of fiber and copper cabling solutions with over hundreds of different cabling system products. Our superior products provide leading edge within every cable series and for every application.

Among the national and international standards with which our cables could comply are: BS -British Standard; LPCB Fire Performance Standard. ISO Standard etc. Caledonian & Addison offers a comprehensive stock of cables and cabling products through its nationwide network of resellers and distributors. Caledonian & Addison has continually expanded its global presence in Europe and Asia.

Caledonian & Addison produces a wide range of cables for communication. power and electronics in its primary plants in UK. Turkey. Malaysia. Italy and Spain. To stay in front, we continually keep expanding our manufacturing capabilities in more low cost region such as China, Malaysia etc. This low-cost manufacturing facilities enable us provide a flexible scalable global system that delivers superior operational performance and optimal results for our customers.

Our extensive global network of manufacturing facilities gives us significant scale and the flexibility to fulfill our customer requirements. This global presence provides design and consultancy solutions that are combined with core cable manufacturing, logistic services and vertically integrated with our E commerce technologies, to optimize customer operations by lowering costs and reducing time to market.

Caledonian & Addison has been respected for its high standards of quality, excellent service level, competitive pricing and a unique and innovative spirit. With our latest technologies, we are both inspired and well-positioned to meet the changing needs of our customers. We have the resources to diversify and to enhance our product lines and services. We understand the need for change and with our accurate planning. we are ready for the future and the promise of new marketing opportunities. Our tradition of growth through excellence is assured.

Our Design Centers work closely with customers to constantly improve its standard range of products and technologies and to develop customized, country and industry-specific solutions. Caledonian & Addison has established an extensive network of design, manufacturing, and logistics facilities in the world’s major markets to serve the growing outsourcing needs of both multinational and regional customers.

Table of Contents

Fire Resistant Power & Control Cables

Fire Resistant Instrumentation Cables

Fire Resistant Fire Alarm Cables

Fire Resistant Signal & Data Cables

Fire Resistant Coaxial Cables

Fire Resistant Optic Fiber Cables

FIRE RESISTANT CABLES

In all fire disasters, fire smoke, heat and toxic fumes are the main obstacles to safe evacuation of a building or area. A major contribution towards overcoming these hazards is the use of fire resistant and non-halogenated cables.

Caledonian fire resistant cables, branded under Fireflix, provide the following features:

- Fire resistance
- Long-term circuit integrity in a fire
- Minimum smoke emission
- Flame retardance
- Reduced fire propagation
- Zero halogen

Fireflix cables are mainly used in the wiring of:

- Fire resistant safety circuits
- Public address and emergency voice communication systems in high-rise building
- Control and instrumentation services in industrial, commercial and residential complexes
- High-temperature installation conditions

CABLE CONSTRUCTION

Fireflix cables have been developed to maintain circuit integrity in a fire and to ensure maximum safe evacuation of personnel with no detrimental effects like toxic gases or smoke.

Fireflix cables are constructed in the following typical design:

- Solid/stranded annealed copper conductor
- Glass mica tape/silicone rubber as flame barrier
- XLPE/silicone rubber as insulation
- LSZH/flame retardant PVC as sheath

Fireflix cables are offered in either single core, multicore or multi-pair constructions. The insulation material can be elastomeric(EPR, SR), thermosetting (XLPE, LSZH) or thermoplastic (EVA, PVC) to meet different stringent environment requirement. The cables may be armoured or braided, with or without metallic screen, depending on different applications. Caledonian can provide PE, PU, PVC, SHF1, SHF2 or LSZH materials as outer sheath for different applications.

INTERNATIONAL STANDARD COMPLIANCE

The fire resistant cables manufactured by caledonian comply with either one or combination of the following standards.

What is Fire Resistance

In a fire, the electrical systems must be able to keep functioning for a suitable length of time. This is particularly important for safety equipments used in emergency ventilation, emergency lighting, and

alarm systems, together with the power supply to transport facilities and elevators.
Fire resistance means that the cable or the cable system where the cable is installed is capable to continue to operate even in case of fire for a specific period of time from 30 to 180 minutes.

Circuit integrity (Insulation integrity) refers to tests for the cables only. This is denoted by FE180 in some European countries such as Germany and Belgium. Functional integrity refers to tests on cables and systems (ladders, cable tray, clamps etc). It is denoted by E30, E60, E90 indicating the cable resistance for 30, 60 and 90 minutes according to a specific test and different installation systems.

The functional integrity and the circuit integrity are not related in any way as regards their content. The former is a system test and the circuit (insulation) integrity is an individual cable test. The integrated system test for functional integrity is regarded as a technical benchmark in the cable industry.

DESIGN STANDARD IN ACCORDANCE WITH DIFFERENT STANDARDS

BS 7629-1:2008 – Electric cables. Specification for 300/500V fire resistant screened cables having low emission of smoke and corrosive gases when affected by fire. Multicore and multipair cables.

This standard apply to cables with thermosetting insulation of rated voltage 300/500V which conform to the performance requirements for cables required to maintain limited circuit integrity under those fire conditions of BS 6387 specified as B, W and X. Those cables are intended for use in fire alarm and emergency lighting applications.

The cables are suitable for operation at a maximum sustained conductor temperature of 70°C although the insulation is suitable for operation at higher temperatures. Use at a temperature not exceeding 90°C is allowed for terminations within an enclosure providing the cable conductor temperature outside the enclosure does not exceed 70°C.

The standards apply to cables with a rated voltage of 300/500V, and
-two, three and four-core circular cables with uninsulated circuit protective conductor
-7,12 or 19 core with an uninsulated drain wire
-1,2,5,10,20 pairs having a collective metallic layer and drain wire.

They contain a metallic layer which provides electrostatic screening.

BS 7846:2009 – Electric cables. Thermosetting insulated, armoured, fire resistant cables of rated voltage 600/1000V, having low emission to smoke and corrosive gases when affected by fire.

Some circuits requiring an equivalent level of fire resistance need to be designed for larger cables than are found in BS 7629-1. Such circuits may be for the main emergency supply, fire fighting lifts, sprinkler system and water pumps, smoke extraction fans, fire shutters or smoke dampers. These larger cables are standardized in BS 7846 which covers the size range and LSZH performance under BS 6724. Through the use of mica tape to supplement the insulation, the cables can pass BS 6387 CWZ and additionally the ‘standard’ or ‘enhanced’ grade as specified in BS 5839-1.

The cables are intended for use in fixed installations in industrial areas, buildings and similar

applications, where maintenance of power supply during a fire is essential and where the evolution of smoke and corrosive gases must be kept to a minimum.

The circuit integrity performance under fire conditions is assessed on the basis of various tests where resistance to fire, resistance to fire with water, and resistance to fire with mechanical shock are assessed separately or in combination. The cables are designated by the following categories:

Category F1- resistance to fire alone
Category F2- resistance to fire, resistance to fire with water, resistance to fire with mechanical shock, assessed separately.
Category F3- resistance to fire with mechanical shock and water assessed in combination.
The cables are wire armoured and
-two, three, four and five-core stranded copper conductor
-multicore auxiliary stranded copper conductor.

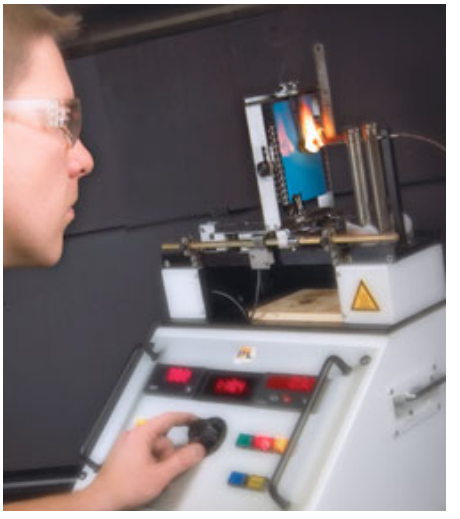
BS EN 60702 – Mineral insulated cables with a rated voltage not exceeding 750V.

BS EN 60702-1:2002 applies to mineral insulated general wiring cables with copper or copper alloy sheath and copper conductors and with rated voltage of 500V (light duty grade) and 750V(heavy duty grade). Provision is made for a corrosion resistant extruded outer covering over the copper sheath, when required. The standard sets out requirements for the optional outer covering, which includes requirements for halogen free covering and the thickness of the covering. The standard includes routine tests including a spark test on the outer covering. Sample tests includes such as flame retardance, emission of acidic and corrosive gases and smoke emission. Type tests such as fire resistance are included.

Mineral insulated cables are extremely resistant but rigid and a particular care has to be paid during installation to prevent moisture absorption by the mineral oxide.

500V grade cable includes the following conductor sizes:
- single and twin conductor cables up to 4mmsq csa
- three, four and seven conductor cables up to 2.5mmsq csa

750V grade cable provides for:
- single conductor cables up to 400mmsq csa
- two, three and four conductor cables up to 25mmsq csa
- seven conductor cables up to 4mmsq csa
- twelve conductor cables up to 2.5mmsq csa
- nineteen conductor cables up to 1.5mmsq csa



The fire related properties by the cable standards are summarised in the following table:

Cable Standard and type		Fire related properties	
BS 7629	Thermosetting insulated cables with limited circuit integrity when affected by fire	BS EN 50265-2-1	Tests on electric cables under fire conditions - single core cable.
		BS EN 50268-2	Measurement of smoke density of electric cables burning under defined conditions.
		BS 6387 Cat B, W & X	Fire burning under defined conditions. Performance requirements for cables required to maintain integrity under fire conditions.
		BS EN 50267-2-1	Gases evolved during combustion of electric cables.
BS 7846	600/1000 V armoured electric cables having low emissions of smoke and corrosive gases when affected by fire	BS EN 50265-2-1	Tests on electric cables under fire conditions - single core cable.
		BS EN 50266-2-4	Tests on electric cables under fire conditions - bunched cables.
		BS EN 50268-2	Measurement of smoke density of electric cables burning under defined conditions.
		BS EN 50267-2-1	Gases evolved during combustion of electric cables.
		BS 7846 Cat F1, F2 or F3	Performance requirements for cables required to maintain integrity under fire conditions.
BS EN 60702	Mineral insulated cables with a rated voltage not exceeding 750V	BS EN 50265-2-1	Tests on electric cables under fire conditions - single core cable.
		BS EN 50268-2 (for zero-halogen coverings)	Measurement of smoke density of electric cables burning under defined conditions.
		BS EN 50267-2-1(for zero-halogen coverings)	Gases evolved during combustion of electric cables.
		BS 6387 Cat C, W &Z	Performance requirements for cables required to maintain integrity under fire conditions.


CODE OF PRACTICE IN ACCORDANCE WITH DIFFERENT STANDARDS

BS 5839-1:2002+A2:2008 (Fire detection and fire alarm systems for buildings. Code of practice for system design, installation, commissioning and maintenance).

This standard provides recommendations for the planning, design, installation, commissioning and maintenance of fire detection and fire alarm systems in and around building, other than dwellings. It recommends the use of fire resisting cables for mains power supply circuit and all critical signal path in such systems. It does not recommend whether or not a fire alarm system should be installed in any given premises. Cables are described in clause 26. This standard introduces two different levels of resistance of cables during a fire(standard and enhanced grade).

BS 5839-6:2004 - Fire detection and fire alarm systems for buildings. Code of practice for the design, installation and maintenance of fire detection and fire alarm systems in dwellings.

This code of practice covers every type of fire detection ‘system’, from a simple self-contained battery smoke alarm right through to major hard wired 24V systems.

BS 5839-6 also covers almost every conceivable type of premises, including:
Bungalows
Multi-storey houses
Individual flats
Individual maisonettes
Mobile homes
Individual sheltered accommodation
Houses in multiple occupation (HMOs)
NHS housing in the community

BS 5839-6 is primarily concerned with saving lives and reducing injuries. BS 5839-6 grades fire detection systems from Grade F up to Grade A. Generally speaking, the greater the fire risk and the more demanding the application, the more comprehensive the system needs to be.

BS 5839-8:2008 - Fire detection and fire alarm systems for buildings. Code of practice for the design, installation, commissioning and maintenance of voice alarm systems.

Many people believe they can simply use their PA system to provide a voice message in the event of an emergency like a fire. Unfortunately PA systems, whilst very good for providing music and messages, are not guaranteed to work when there is an emergency. This is where the British Standard BS 5839 - 8:1998 on Voice

Alarm comes into use, as it clearly defines the requirements of a true VA system. A true VA system is a highly secure public address system which has the following features;

-All internal and external circuits are monitored for faults
-A minimum battery back up of 24 hours standby and 30 minutes alarm.
-A monitored secure link to a fire alarm panel
-A number of pre-recorded emergency messages
-Incorporates an emergency 'firemans' microphone

BS 5839-9:2011 - Fire detection and fire alarm systems for buildings. Code of practice for the design, installation, commissioning and maintenance of emergency voice communication systems.

An emergency voice communication systems(EVCS) is a fixed, secure, bi-directional, full duplex voice communication system to assist fire fighters in an emergency in high rise buildings or large sites where radio communication may not work, and covers the operation of both fire telephones and disabled refuge systems. Where both systems are fitted to a building, BS 5839-9 specifies these should be a single system.

BS 5266-1:2005 - Emergency lighting. Code of practice for the emergency lighting of premises.

The purpose of emergency lighting, anti-panic lighting and standby lighting is to ensure that the main fire exit routes from a building or open and high risk areas are sufficiently lit in the case of a mains failure, in order to allow persons to safely evacuate the areas or premises. Manual fire alarm points, first aid points, fire fighting and safety equipment should also be clearly lit, so that it can be clearly identified.

Cables installed for these systems have to withstand to fire for at least 60 minutes according to BS EN 50200.

BS 8519:2010- Selection and installation of fire resistant power and control cable systems for life safety and fire fighting applications. Code of practice.

BS 8519 was introduced specifically to apply only to large and complex buildings and has been widely welcomed within the industry. The new standard offers guidance for the selection of fire resistant power and control cables in life safety and firefighting systems such as smoke barriers, sprinkler systems, fire fighting and evacuation lift supplies. Consequently, BS 8519 should increase the protection of emergency and fire personnel, as well as evacuees who may be inside a large or complex building when fire breaks out.

CIRCUIT (INSULATION) INTEGRITY IN ACCORDANCE WITH DIFFERENT STANDARDS

Circuit (insulation) Integrity in accordance with IEC 60331

IEC 60331 specifies tests for electric cable for circuit integrity under fire conditions. It is divided in following parts that describe the test modes, the conditions, and the equipment to use. The test was originally carried out only in fire alone for a period of 180 minutes at a temperature of 750°C.

To better simulate the real fire conditions, with mechanical stresses due to the fall of materials and with the presence of water, the testing conditions have been modified by changing the duration, increasing the temperature of the flame and by adding mechanical stresses and water spray.

IEC 60331-1 ed 1.0 (2009-05)- Part 1: Test method for fire with shock at a temperature of at least 830°C for cables of rated voltage up to and including 0.6/1KV and with an overall diameter exceeding 20mm.

IEC 60331-2 ed 1.0 (2009-05)- Part 2: Test method for fire with shock at a temperature of at least 830°C for cables of rated voltage up to and including 0.6/1KV and with an overall diameter not exceeding 20mm.

IEC 60331-3 ed 1.0 (2009-05)- Part 3: Test method for fire with shock at a temperature of at least 830°C for cables of rated voltage up to and including 0.6/1KV tested in a metal enclosure.

IEC 60331-11 ed1.01 Consol. with am1 (2009-07) – Part 11: Apparatus – Fire alone at a flame temperature of at least 750°C.

IEC 60331-12 ed1.01 Consol. with am1 (2009-07) – Part 12: Apparatus – Fire with shock at a flame temperature of at least 830°C.

IEC 60331-21 ed1.0 (1999-04) – Part 21: Procedures and requirements – Cables of rated voltage up to and including 0.6/1KV.

IEC 60331-23 ed1.0 (1999-04) – Part 23: Procedures and requirements – Electric Data Cables.

IEC 60331-25 ed1.0 (1999-04) – Part 25: Procedures and requirements – Optic Fiber Cables.

IEC 60331-31 ed1.0 (1999-04) – Part 31: Tests for electric cables for fire conditions and shock-Circuit integrity. Procedures and requirements for fire with shock – Cables of rated voltage up to and including 0.6/1KV.

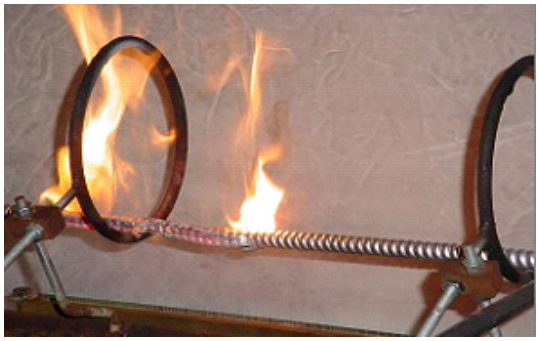
IEC 60331-21/60331-23 A sample of the cable length of 1200mm sustained by two metal rings is mounted horizontally in a special ventilated cabin. During the test, to the wire cores of cable a voltage of the nominal value is applied (for telecommunication cables equal to 110 V), thereby creating a closed electric circuit. The sample is subjected to an action of linear gas burner with a length of 500mm and the flame temperature equal to 750°C till 800°C. The time of the fire is 180 minutes. Result of the test is considered positive if at that time will not be considered a short circuit in the circuit being researched.

IEC 60331-25 details a method to assess the circuit integrity of optical fiber cables. The standard specifies a ribbon burner and the recommended flame temperature is 750°C. The optical power meter is zeroed and the changes in attenuation during the 180 minutes burner application period are monitored. The maximum change in attenuation (a change from zero) is recorded during the burner application period. In the 15 minutes period after the flame application, a maximum

attenuation is also recorded. Result of the test is considered positive if at that time will not be considered a short circuit in the circuit being tested.

IEC 60331-31 applies to the cables with a diameter greater than 20mm, and introduces the standards and procedures for testing of cables exposed to fire and mechanical shock (equipment according to 60331-12). The test sample provides cable fragment length at least 1500mm. Bent wire on the U-shaped with a radius equal to the smallest permissible by the manufacturer, is mounted on a metal assay ladder. During the study, through all the cable wires is passed current with rated voltage and these cables are subjected to fire during 120min, where fire source is a gas burner set in conformity with standards, as well the mechanical shock of the 5 minutes interval. Result of the test is considered positive if at that time will not be considered a short circuit in the circuit being tested.

Circuit (insulation) Integrity in accordance with BS 6387:1994



BS 6387:1994 specifies the requirements for cables required to maintain circuit integrity under fire conditions. This is the first standard to include also mechanical stress and water stress in the fire resistance test of electric cables. BS 6387 standard is still used in many countries. Being different from EN 50200, Its limits is to require three different tests on three different cable samples.

The fire resistant cables are categorized by a letter symbol (e.g. A) or series of symbols (e.g. CWZ) according to the requirements for fire resistance characteristics which they meet, the test temperature selected and the duration of the test for resistance to fire alone in according to BS 6387 as below:

The test provides the basis for the following categories:

Test	Category
(1) Resistance to fire alone 650°C for 3 hours 750°C for 3 hours 950°C for 3 hours 950°C for 20 minutes (short duration)	 A B C S
(2) Resistance to fire with water Exposed to fire @ 650°C for 15 mins then exposed to fire @ 650°C with water for another 15 mins.	W
(3) Resistance to fire with mechanical shock Exposed to fire @ 650°C for 15 mins then exposed to fire @ 650°C with mechanical shock for 15 mins. Exposed to fire @ 750°C for 15 mins then exposed to fire @ 750°C with mechanical shock for 15 mins. Exposed to fire @ 950°C for 15 mins then exposed to fire @ 950°C with mechanical shock for 15 mins	 X Y Z

The most common test comprises the three categories C, W and Z.
–Category C is a fire resistance test in which the cable is exposed to a fire at a temperature of 950°C with a duration of 3 hours. under realistic conditions.
– Category W is a fire and water resistance test in which the cable is exposed to a fire at a temperature of 650°C and then for another 15 minutes to fire with water that is poured over the area around the cable. This simulates effect of water from a sprinkler that is activated during the fire.
-Category Z is a fire and mechanical stroke test in which the cable is installed in a defined manner on a vertical wall with three cable clips and subject to heat from a gas burner; mechanical shock is simulated by striking the cable with a hammer. The cable is exposed to a fire at a temperature of 950°C and then for another 15 minutes to fire with mechanical shock at a frequency of 2 strikes per minute.

During testing in all three categories, the cable is connected to a 400V three-phase power supply protected with a 3 A fuse on each phase. The test is regarded as successful if none of the fuses blow during the test period.

Circuit (insulation) Integrity in accordance with EN 50200:2006

EN 50200:2006 defines method of test for resistance to fire of unprotected small cables (up to 20mm) for use in emergency circuits. In the adapted chamber is mounted a cable sample with a length of 1200mm, to which wire cores during the test a nominal value voltage is applied, creating thereby a closed circuit. During the test the cable is subjected to actions of the fire at conventional temperature 842°C and mechanical stroke for a specified period of time. The measured time of proper functioning of the cable corresponds to the so-called cable fire resistance class PH, which is also mentioned in the standard PN-B-02851-1 - Fire resistance tests of elements of buildings (Test method for thin wires with an outside diameter not greater than 20mm).

The test duration is expressed in minutes and is recorded in the following classification:

Test	Category
Flame exposure for 15 minutes	PH 15
Flame exposure for 30 minutes	PH 30
Flame exposure for 60 minutes	PH 60
Flame exposure for 90 minutes	PH 90
Flame exposure for 120 minutes	PH 120

EN 50200 annex E also foresees the water stress (fire, mechanical shock & water spray), as previously provided by BS 8434-1 standard. EN 50200 is similar to IEC 60331-2. Being different from BS 6387, EN 50200 test the same samples simultaneously stressed by the flame action, by the mechanical shock and by water spray.

Circuit (insulation) Integrity in accordance with EN 50362:2003

EN 50362:2003 / BS EN 50362:2003 / DIN EN 50362:2003 / CEI EN 50362:2003 (CEI 20-36/5-0) defines method of test for resistance to fire of larger unprotected power and control cables for use in emergency circuits. This standard provides the same tests foreseen by IEC 60331-31 standards. (Flame Temperature of 830°C).

Circuit (insulation) Integrity in accordance with BS 5839-1:2002

The new edition of BS 5839-1:2002 (Fire detection and fire alarm systems for buildings. Code of practice for system design, installation, commissioning and maintenance) describes two level of fire performance for fire rated cabling for fire alarm system: Standard Grade and Enhanced Grade. In order to confirm the compliance of the cable to both categories, BS 5839-1 refers to EN 50200 and BS 8434-2003 Part 1 & 2. (Method of tests for the assessment of fire integrity of electricity cables). These tests are carried out to verify the circuit integrity of small cables exposed to flame, mechanical shock and water in accordance with the new fire alarm code of practice.

Standard Grade clause 26.2d
Maintenance of circuit integrity:
BS 8434-1:2003 at 830°C for 30 minutes,
15 minutes with fire and mechanical shock plus
15 minutes with fire, mechanical shock and water.
BS EN 50200 PH30
30 minutes at 830°C with fire and mechanical shock

Enhanced Standard Grade clause 26.2e
Maintenance of circuit integrity:
BS 8434-2:2003 at 930°C for 60 minutes,
60 minutes with fire and mechanical shock plus
60 minutes with fire, mechanical shock and water.
BS EN 50200 PH120 (improved)
120 minutes at 930°C with fire and mechanical shock

Circuit (insulation) Integrity in accordance with BS 8434-1:2003 & BS 8434-2:2003 + A2:2009

BS 8434- Methods of test for assessment of the fire integrity of electric cables Part1: Test for unprotected small cables for use in emergency circuits - BS EN 50200 with the addition of water spray. Part 2: Test for unprotected small cables for use in emergency circuits- BS EN 50200 with a 930°C flame and with water spray.

BS 8434-1:2003 defines test which is equivalent to BS EN 50200 with a 830°C flame and water spray. The cable is stressed by the flame at 830°C with mechanical shocks for 15 minutes and further 15 minutes with the addition of water spray. BS 8434-2:2003 defines test which is equivalent to BS EN 50200 with a 930°C flame and water spray. The cable is stressed by the flame at 930°C with mechanical shocks for 60 minutes and further 60 minutes with the addition of water spray. The tests for BS 8434-2 have not been covered in the BS EN 50200 standard yet and are still in force.

Circuit (insulation) Integrity in accordance with BS 8491:2008

BS8491:2008 Method for assessment of fire integrity of large diameter power cables for use as components for smoke and heat control systems and certain other active fire safety systems. This standard is related to cables included in BS 7346-6 and certain other active fire safety systems. It is applicable to cables of rated voltage not exceeding 600/1000V and overall diameter greater than

20mm. The test method in BS 8491-2008 includes subjecting the cable under test to radiation via direct impingement corresponding to a constant temperature attack of 842°C, to direct mechanical impacts corresponding to a force of approximately 10N and to direct application of a water jet simulating a water fire fighting jet. The test method given in this standard includes three different test durations to allow testing of cables intended for different applications.

Circuit (insulation) Integrity in accordance with DIN VDE 0472-814

DIN VDE 0472-814:1991 - Testing of cables. wires and flexible cords; continuance of insulation effect under fire conditions.

A test fire is applied horizontally from a distance of 60cm to a single suspended cable during a specified time. The test is passed when there was continuous circuit integrity and no extremely increased attenuation values during and after the test respectively. For instance FE 90 cables can endure at least 90 minutes, “FE” stands for flame exposure. The fire test with circuit integrity shows how many minutes a mechanically unstressed connection at a flame exposure of minimum 750°C keeps minimum insulation efficiency (circuit integrity) in a dry environment.
Similar standard is IEC 60331 (FE) and BS 6387 Cat C. This is a fire test for insulation integrity without any mechanical and water stress.

Circuit (insulation) Integrity in accordance with NBN C30-004 (cat. F3)

NB N C30-004 – Fire Resistance of electric cables. Classification and test method.
The cable is stressed by the flame at 900°C with mechanical shocks every 30 seconds for a duration of 3 hours. The cable is deemed to pass the test if the current leakage does not exceed 1 amp per conductor. The test must be passed by 4 successive samples.

Circuit (insulation) Integrity in accordance with SS299-1

SS299-1 Fire resistant cables - Performance requirements for cables required to maintain circuit integrity under fire conditions.

Circuit (insulation) Integrity in accordance with CEI 20-36/2-1

CEI 20-36/2-1 Tests for electric cables under fire conditions-Circuit integrity - Part 21: Procedures and requirements- Cables of rated voltage up to and including 0.6/1KV.
This is equivalent to IEC 60331-21.

Circuit (insulation) Integrity in accordance with CEI 20-36/4-0

CEI 20-36/4-0 Method of test for fire resistance of small cables unprotected for use in emergency circuits. This is equivalent to CEI EN 50200.

Circuit (insulation) Integrity in accordance with NF C32-070-2.3(CR1)

The cable is installed in a stainless steel conduit and heated to 920°C ± 20°C according to a specified time curve. A voltage of 500 V AC or 1,000 V AC respectively is applied to the cable. To simulate mechanical shock, a small hammer strikes the pipe at a frequency of 2 strikes / min.

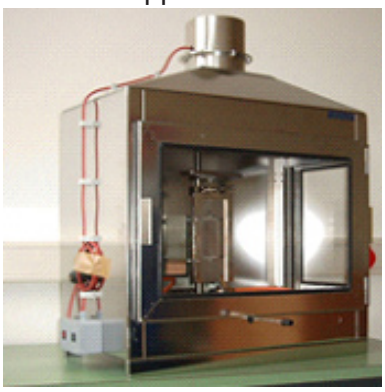
SYSTEM CIRCUIT (FUNCTIONAL) INTEGRITY IN ACCORDANCE WITH DIFFERENT STANDARDS

System Circuit (functional) Integrity in accordance with DIN 4102-12

Maintaining the function of electrical cable during the fire, defined as the concept of cable system is

characterized by the German DIN 4102, part 12. DIN 4101-12 is a testing for functional integrity of entire electrical cable systems together with fastener components and shall be considered as the most rigorous, but on the other hand, as most closely simulating the real fire conditions,
DIN 4102-12 defines the requirements and testing method for fire resistance of electric cable system required to maintain circuit integrity. The standard defines testing for the functionality of so-called cable set, which consists of a group set of power cables, telecommunications, data cables etc. to be fixed to the support structure consisting of channels, ladders, cable tray ,items to hang, handles, etc. Cables attached to this structure are powered by their work voltage. Functional integrity will be tested for short-circuit of insulation or discontinuity of any wire core.

DIN 4102-12 is a realistic fire-chamber testing with minimum dimensions 2 x 3 x 2.5 m. (width/length/height). A complete cable installation is tested under realistic conditions. The effects of thermal expansion and mechanical load during a fire are taken into account. The temperature must follow the standard fire curve (ETK): At E 90, the system is tested for 90 minutes, with a flame temperatures reaching up to 1000°C during the test. The cable is installed in a furnace and mounted with cable trays and cable clips with guides. A voltage of 400 V AC is applied to the cable (or 110 V AC for telecommunications cables)
There are three categories of function maintenance as follows:
E30 - cable system function maintenance in case of fire for 30 minutes
E60 - cable system function maintenance in case of fire for 60 minutes
E90 - cable system function maintenance in case of fire for 90 minutes
The numbers in each case designate the period of time for which the integrity of the power circuit must be maintained.



It is worth noting that duration of the cable operation under test is determined not only by design and selection of used cable materials, but also and often primarily, the construction and selection of supporting structure materials, which is subject to deformation in high temperatures, and these deformations in turn tighten the cables attached to the structure.

System Circuit (functional) Integrity in accordance with NBN 713 020

The test specifies fire performance of building materials and products. The cables are installed in 3 x 3 testing room They are installed on cable trays and undergo the flame action up to 1000°C. The cables are then classified according to the maximum time for resistance to fire (denoted by Rf1, Rf 1 1/2, Rf2 in which the number represents the time duration).

FLAME RETARDANCE IN ACCORDANCE WITH DIFFERENT STANDARDS

The following standards specify a method for flame propagation test for single core cables. The single cable sample undergoes the flame action of a bunsen burner. The test only lasts few minutes.

The IEC 60332-1 standards are taken over as EN standards and transferred to national standards Example: IEC 60332-1 becomes EN 60332-1 and introduced in Germany as DIN EN 60332-1.

Flame Retardance in accordance with EN 60332:2004

EN 60332:2004 Tests on electrical and optical cables under fire conditions. The standard applies

to single insulated wires (cables) and requires a vertical flame test with a maximum flame climb of 450mm. The test lasts between 1 and 8 minutes, depending on the cable diameter.

EN 60332-1-1:2004 / BS EN 60332-1-1:2004 / IEC 60332-1-1:2004 / DIN EN 60332-1-1:2004 / VDE 0482-1-1:2005-06 Test on electrical and optical cables under fire conditions. Test for a vertical flame propagation for a single insulated wire or cables.

EN 60332-1-2:2004 / BS EN 60332-1-2:2004 / IEC 60332-1-2:2004 / DIN EN 60332-1-2:2004 / VDE 0482-1-2:2005-06 / CEI 60332-1-2(CEI 20-35/1-2) Tests on electrical and optical fiber cables under fire conditions. Test for a vertical flame propagation for a single insulated wire or cable – Procedure for 1kW premixed flame.

This standard specifies a method of test for resistance to vertical flame propagation for a single insulated wire or cable. Part 1-1 specifies the test apparatus and Part 1-2 specifies the test procedure.

The cable sample is deemed to pass the test if the distance between the lower edge of the top support and the onset of charring is greater than 50mm. In addition, a failure shall be recorded if burning extends downward to a point greater than 540mm from the lower edge of the top support.

EN 60332-1-2:2004 specifies the use of 1kW premix flame and is for general use, except that the procedure may not be suitable for the testing of small insulated conductors or cables of less than 0.5mm sq cross section because the conductor melts before the test is completed, or for the testing of small optic fiber cables because the fiber will be broken before the test is completed. In this case, the procedure given by EN 60332-2-1/2 is recommended.

EN 60332-2-1:2004 / BS EN 60332-2-1:2004 / IEC 60332-2-1:2004 / DIN EN 60332-2-1:2004 / VDE 0482-2-1:2005-06 Tests on electrical and optical cables under fire conditions. Test for a vertical flame propagation for a single small insulated wire or cable.

EN 60332-2-2:2004 / BS EN 60332-2-2:2004 / IEC60332-2-2:2004 / DIN EN 60332-2-2:2004 / VDE 0482-2-2:2005-06 / CEI 60332-2-2 (CEI 20-35/2-2) Test on electric and optical fiber cables under fire conditions. Tests for vertical flame propagation for a single small insulated wire or cable. Procedure for diffusion flame.
This test applies to small dimensions cables.

This standard specifies a method of test for resistance to vertical flame propagation for a single insulated wire or cable. Part 2-1 specifies the test apparatus and Part 2-2 specifies the test procedure.

Flame Retardance in accordance with NF C32-070-2.1(C2)

NF C32-070:2001 Insulated conductors and cables for installation - Classification tests on conductors and cables with regard to fire behavior.
NF C32-070 2.1 Procedure for 1 kW pre-mixed flame.

The NF F 32070 2.1 (Category C2) and IEC 60332-1-2 are very similar. The sole difference is the time during which the flame is applied.

Flame Retardance in accordance with EN 50265-1:1999 (replaced by EN 60332)

EN 50265-1:1999 / BS EN 50265-1:1999 / DIN EN 50265-1:1999 / VDE 0482-265-1:1999-04– Common test methods for cables under fire conditions. Test for resistance to a vertical flame propagation for a single insulated conductor or cable. Apparatus (Replaced by EN 60332-1-1:2004 and EN 60332-2-1:2004).

EN 50265-2-1:1999 / BS EN 50265-2-1:1999 / DIN EN 50265-2-1:1999 / VDE 0482-265-2-1:1999-04 – Common test methods for cables under fire conditions. Test for resistance to a vertical flame propagation for a single insulated conductor or cable. Part 2-1: Procedure 1kW pre-mixed flame (Replaced by EN 60332-1-2:2004).

EN 50265-2-2:1999 / BS EN 50265-2-2:1999 / DIN EN 50265-2-2:1999 / VDE 0482-265-2-2:1999-04 – Common test methods for cables under fire conditions. Test for resistance to a vertical flame propagation for a single insulated conductor or cable. Part 2-2: Procedure Diffusion flame (Replaced by EN 60332-2-2:2004).

Flame Retardance in accordance with BS 4066 Part 1 & 2 (replaced by EN 60332)

BS 4066-2:1980 (superseded) – Tests on electric cables under fire conditions. Method of test on a single vertical insulated wire or cable.

This standard is no longer in force and is replaced by BS EN 50265-2-1 which was also superseded by BS EN 60332-1:2009.

Flame Retardance in accordance with NBN C 30-004 (cat. F1)

NBN C 32-004 specifies a method of test for measuring the vertical flame propagation characteristics of a single wire or cable. The cable specimen is deemed to have passed the test and categorized as F1 if after burning has ceased, the charred or affected portion does not reach within 50mm of the lower edge of the top clamp which is equivalent to 425mm above the point of flame application.

Flame Retardance in accordance with IEEE 383

In the IEEE 383 test, cables are supported by a one foot wide vertical rack eight feet high. The cables are positioned in the centre six inches of the rack, spaced one-half diameter apart. The rack is centered in an eight foot enclosure. A ten inch ribbon burner ignites the cable with a 21 kW (70000 BTU). The burner is positioned 2 feet above the floor and 9 to 12 inches of cables are exposed to direct flames for 20 minutes. Cables on which flame extends above the top of the 8 foot rack fail the test.

REDUCED FIRE PROPAGATION IN ACCORDANCE WITH DIFFERENT STANDARDS

These standards specify a method for fire propagation test for vertically mounted bunched cables. These tests simulate the chimney effect in vertical installation of bunch of cables. A certain number of cable sections with a length of 3.5 m is fastened to a vertical ladder in an adapted chamber. The amount of combustible materials for cables and duration of flame application depends on the category the cable has to meet.

Resistance of the wires bundle arranged vertically to the spread of the flame should be such that after a certain time and stopping the source of ignition, flame is extinguished by itself and the length of charred fragments will not exceed 2.5 m in height measured above the lower edge of the burner.

Reduced Fire Propagation in accordance with IEC 60332-3

This test is the most common one to verify the behaviour of a cables for the fire propagation. The cables are installed on a bunch of vertical ladder inside a metal cabinet and undergo the action of a ribbon flame at 750°C.The standard is subdivided in several parts that differ one from the other for the quantity of cable to be installed, the installation mode and the flame application time.

EN 60332-3-10:2009 / BS EN 60332-3-10:2009 / IEC 60332-3-10 ed1.1 / DIN EN 60332-3-10:2009 / VDE 0482-332-3-10:2010-08 – Common test methods for cables under fire conditions. Tests on electric and optical fiber cables under fire conditions - Part 3-10: Test for vertical flame spread of vertically mounted bunched wires or cables.

EN 60332-3-21:2009 / BS EN 60332-3-21:2009 / IEC 60332-3-21 ed1.1 / DIN EN 60332-3-21 / VDE 0482-332-3-21:2010-08 / CEI EN 60332-3-21:2009 (CEI 20-22/3-1)– Procedures. Tests on electric and optical fiber cables under fire conditions - Part 3-21: Test for vertical flame spread of vertically-mounted bunched wires or cables - Category A . F/R
-Installation In one layer (front).
-Installation In two layers (front and rear)
-The quantity of the Installed cable is equal to 7 litres/m of combustible materials for cables
-The time of application of the flame is 40 minutes

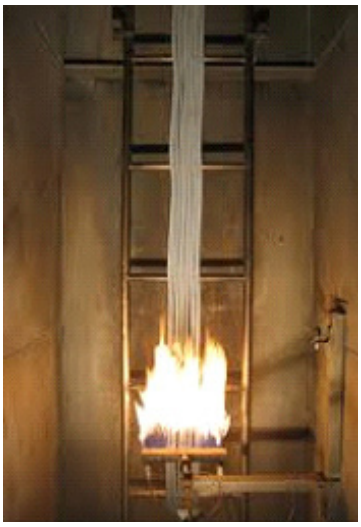
EN 60332-3-22:2009 / BS EN 60332-3-22:2009 / IEC 60332-3-22 ed1.1 / DIN EN 60332-3-22:2009 /VDE 0482-332-3-22:2010-08 / CEI EN 60332-3-22:2009 (CEI 20-22/3-2)– Procedures. Tests on electric and optical fiber cables under fire conditions - Part 3-22: Test for vertical flame spread of vertically-mounted bunched wires or cable - Category A

-Installation In one layer (front).
-The quantity of the installed cable is equal to 7 litres/m of combustible materials for cables
-The time of application of the flame is 40 minutes

EN 60332-3-23:2009 / BS EN 60332-3-23:2009 / IEC 60332-3-23 ed1.1 / DIN EN 60332-3-23:2009

/ VDE 0482-332-3-23:2010-08 / CEI EN 60332-3-23:2009 (CEI 20-22/3-3)– Procedures. Tests on electric and optical fiber cables under fire conditions - Part 3-23: Test for vertical flame spread of vertically-mounted bunched wires or cables - Category B

-Installation In one layer (front).
-The quantity of the installed cable is equal to 3.5 litres/m of combustible materials for cables
-The time of application of the flame is 40 minutes



EN 60332-3-24:2009 / BS EN 60332-3-24:2009 / IEC 60332-3-24 ed1.1 / DIN EN 60332-3-24:2009 / VDE 0482-332-3-24:2010-08 / CEI EN 60332-3-24:2009 (CEI 20-22/3-4) – Procedures. Tests on electric and optical fiber cables under fire conditions - Part 3-24: Test for vertical flame spread of vertically-mounted bunched wires or cables - Category C

-Installation In one layer (front).
-The quantity of the installed cable is equal to 1.5 litres/m of combustible materials for cables
-The time of application of the flame is 20 minutes

EN 60332-3-25:2009 / BS EN 60332-3-25:2009 / IEC 60332-3-25 ed1.1 / DIN EN 60332-3-25: 2009 / VDE 0482-332-3-25:2010-08 / CEI EN 60332-3-25:2009 (CEI 20-22/3-5)– Procedures. Tests on electric and optical fiber cables under fire conditions - Part 3-25: Test for vertical flame spread of vertically-mounted bunched wires or cables - Category D
-Installation In one layer (front).
-The quantity of the installed cable is equal to 0.5 litres/m of combustible materials for cables
-The time of application of the flame is 20 minutes.

Summary of test condition:

IEC	60332-3-21	60332-3-22			60332-3-23		60332-3-24		60332-3-25	
BS EN 50266	50266-2-1	50266-2-2			50266-2-3		50266-2-4		50266-2-5	
CEI	20-22/3-1	20-22/3-2			20-22/3-3		20-22/3-4		20-22/3-5	
Category	AF/R	A			B		C		D	
Conductor cross-sections(mm^2)	＞35	＞35	≤35		＞35	≤35	＞35	≤35	＞35	≤35
NMV(litres per metre of cable)	7	7			3.5		1.5		0.5	
Minimum length of test pieces(m)	3.5	3.5			3.5		3.5		3.5	
Standard ladder (500 mm wide): • Number of layers • Maximum width of test sample	1front+1rear 300mm	≥1front 300mm	1front 300mm	- -	≥1front 300mm	1front 300mm	≥1front 300mm	1front 300mm	≥1front 300mm	

Wide ladder (800 mm wide): • Number of layers • Maximum width of test sample	- -	- -	- -	1front 600 mm	- -		- -		- -			
Positioning of test pieces	Spaced 0.5×Diameter cable (Max.20mm)	Touching	Spaced 0.5×Diameter cable (Max.20mm)		Touching	Spaced 0.5×Diameter cable (Max.20mm)	Touching	Spaced 0.5×Diameter cable (Max.20 mm)			Touching	
Number of burners	1	1	1	2	1		1				1	
Ladder mounting	Front and rear	Front, Wider ladder for larger cables			Front		Front				Front	
Flame application time(min)	40	40	40		40		40				40	
Test conditions	Wind speed: <8 m/s; Temperature: 5°C - +40°C											
Extent of the charred portion	≤2.5m above the bottom edge of the burner, neither at the front nor at the rear of the ladder.											

Reduced fire propagation in accordance with NF C32-070-2.2(C1)

NF C32-070 :2001 Insulated conductors and cables for installation.
-Classification tests on conductors and cables with regard to fire behavior.

A 1600mm vertically installed bundled of cable is exposed to the effects of a radiating oven (approx 830°C) and forced ventilation. Pilot flames arranged above the oven burn off the emitted gases. The test duration is 30 minutes, with the ventilation stopped for every 10 minutes during the flame application period. The cable sample is classified under Category C1 according to NF F 32070-2.2 if the carbonised part of the cable sample does not extend more than 0.8m above the upper base of the oven.

Depending on the damaged length, they can be further classified into 4 classes A, B, C and D according to NF F 16-101 as follows:

Category	Test Result
A	No damaged length from top of the oven in upper position.
B	Damaged length from top of oven in upper position not extending more than 50mm.
C	Damaged length from top of oven in upper position not extending more than 300mm
D	Damaged length from top of oven in upper position not extending above the top of the chimney

Reduced Fire Propagation in accordance to EN 50266-1, EN 50266-2-2, EN 50266-2-3, EN 50266-2-4.

EN 50266-1:2001 / BS EN 50266-1:2001 / DIN EN 50266-1:2001 / VDE 0482-266-1:2001-09– Common test methods for cables under fire conditions. Test for vertical flame spread of vertically mounted bunched wires or cables - Part 1: Apparatus (Replaced by EN 60332-3-10:2009)

EN 50266-2-1:2001 / BS EN 50266-2-1:2001 / DIN EN 50266-2-1:2001 / VDE 0482-266-2-1: 2001-

09 / CEI EN 50266-2-1– Common test methods for cables under fire conditions. Test for vertical flame spread of vertically mounted bunched wires or cables - Part 2-1 : Procedures. Category A F/R (Replaced by EN 60332-3-21:2009)

EN 50266-2-2:2001 / BS EN 50266-2-2:2001 / DIN EN 50266-2-2: 2001 / VDE 0482-266-2-2:2001-09 / CEI EN 50266-2-2– Common test methods for cables under fire conditions. Test for vertical flame spread of vertically mounted bunched wires or cables - Part 2-2: Procedures. Category A (Replaced by EN 60332-3-22:2009)

EN 50266-2-3:2001 / BS EN 50266-2-3:2001 / DIN EN 50266-2-3: 2001 / VDE 0482-266-2-3:2001-09 / CEI EN 50266-2-1– Common test methods for cables under fire conditions. Test for vertical flame spread of vertically mounted bunched wires or cables - Part 2-3: Procedures. Category B (Replaced by EN 60332-3-23:2009)

EN 50266-2-4:2001 / BS EN 50266-2-4:2001 / DIN EN 50266-2-4:2001 / VDE 0482-266-2-4:2001 -09 / CEI EN 50266-2-4:2001 – Common test methods for cables under fire conditions. Test for vertical flame spread of vertically mounted bunched wires or cables - Part 2-4: Procedures. Category C (Replaced by EN 60332-3-24:2009).

Reduced Fire Propagation in accordance with BS 4066-3

BS 4066-3:1994 (superseded) – Tests on electric cables under fire conditions. Tests on bunched wires or cables.
This standard is no longer in force and is replaced by the BS EN 50266-1:2001

Reduced Fire Propagation in accordance with NBN C 32-004 (F2)

NBN C 32-004 specifies a method of test for measuring the vertical flame propagation characteristics of a bunch of cables. The cable specimen is deemed to have passed the test and categorized as F2 if after burning has ceased, the extent of charred or affected portion does not reach a height exceeding 2.5m above the bottom edge of the burner.

HALOGEN CONTENT TEST IN ACCORDANCE WITH DIFFERENT STANDARDS

In the event of a fire, many fumes are produced. This test is concerned with the possibilities of corrosive acid gases being released from halogen containing cables and the damage such cables can cause (to equipments). These standards specify a method for determination of the amount of halogen acid gas, evolved during combustion of compound.

Halogen Content Test in accordance with EN 50267-2-1

EN 50267-2-1:1998 / BS EN 50267-2-1:1999 / DIN EN 50267-2-1: 1999 / VDE 0482-267-2-1:1999-04 / CEI EN 50267-2-1:1999 (CEI 20-37/2-1) Common test methods for cables under fire conditions- Test on gases evolved during combustion of materials from cables- Part 2-1: Procedures. Determination of the amount of halogen acid gas. This part of the standard defines the method to measure the amount of halogen acid evolved and which should be expressed in hydrochloric acid. The amount of halogen acid contained in the test solution is determined by a

titration method.

If the cables are described as zero halogen or halogen free, it is recommended that the hydrochoric acid yield should be less than 0.5%.

Halogen Content Test in accordance with IEC 60754-1

IEC 60754-1 ed 2.0 Common test methods for cables under fire conditions. Test on gases evolved during combustion of materials from cables. Part 1: Procedures. Determination of the amount of halogen acid gas.
Basically, this is same as EN 50267-2-1.

Halogen Content Test in accordance with BS 6425-1

BS 6425-1:1990(superseded): Test on gases evolved during the combustion of materials from cables. Method for determination of amount of halogen acid gas evolved during combustion of polymeric materials taken from cables.
This standard is no longer in force and is replaced by the EN 50267-2-1.

ACID GAS EMISSION TEST IN ACCORDANCE WITH DIFFERENT STANDARDS

The following standards specify a method for determination of acidity of gas evolved during combustion of cables by measuring PH and conductivity. This test allows to determine the corrosivity of the acid gases generally halogens, that develop during the electric cable combustion.

Acid Gas Emission Test in accordance with EN 50267-2-2

EN 50267-2-2:1999 / BS EN 50267-2-2:1999 / DIN EN 50267-2-2:1999 / VDE 0482-267-2-2:1999-04/ CEI EN 50267-2-2:1999 (CEI 20-37/2-2). Common test methods for cables under fire conditions- Test on gases evolved during combustion of materials from cables- Part 2-2: Procedures. Determination of degree of acidity of gases for materials by measuring PH and conductivity.
The standard states that the pH and the conductivity of a test solution should be measured, using calibrated PH and conductivity meters.

If the cables are described as zero halogen or halogen free, it is recommended that at least both of the following requirements should be met for each of the individual materials of a cable:

-The PH value should not be less than 4.3 when related to 1 litre of water
-The conductivity should not be less than 10us/mm when related to 1 litre of water

EN 50267-2-3:1999 / BS EN 50267-2-3:1999 / DIN EN 50267-2-3:1999 / VDE 0482-267-2-3:1999-04 / CEI EN 50267-2-3:1999 (CEI 20-37/2-3). Common test methods for cables under fire conditions- Test on gases evolved during combustion of materials from cables- Part 2-3:Procedures. Determination of degree of acidity of gases for cables by determination of the weighted average of pH and conductivity.

The standard states that the pH and the conductivity of a test solution should be measured, using

calibrated pH and conductivity meters. The results from the different components of the cable are then weighted.

Acid Gas Emission Test in accordance with IEC 60754-2

IEC 60754-2 ed1.0 Test on gases evolved during combustion of electric cables - Part 2 : Determination of degree of acidity of gases evolved during combustion of materials taken from electric cables by measuring pH and conductivity.

Acid Gas Emission Test in accordance with NF C32-074

NF C32-074 Common test methods for cables under fire conditions - Test on gases evolved during combustion of materials from cables. This standard is equivalent to IEC 60754-2

Acid Gas Emission Test in accordance with BS 6425-2

BS 6425-2:1993 (superseded) Test on gases evolved during the combustion of materials from cables.
Determination of degree of acidity (corrosivity) of gases by measuring pH and conductivity.

This standard is no longer in force and is replaced by the EN 50267-2-2:1999.

Acid Gas Emission Test in accordance with DIN VDE 0472-813 / VDE 0472-813:1994

DIN VDE 0472-813 / VDE 0472-813:1994 Corrosivity of combustion gases.
The standards are no longer in force and are replaced by the EN 50267-2-2 & VDE 0482-267-2-2.

SMOKE DENSITY TEST IN ACCORDANCE WITH DIFFERENT STANDARDS

The smoke density measurement taken from a material under fire conditions gives an indication of the visibility through the smoke. This is important as reduced visibility in a real fire situation makes it more difficult to escape from the fire thus increasing the threat to human life from the toxic gas, fumes and heat.
The following standards specify the method for measuring the generation of smoke from cables during fire.

Smoke Density Test in accordance with IEC 61034-1 & IEC 61034-2

IEC 61034-1:2005 / EN 61034-1:2005 / BS EN 61034-1:2005 / DIN EN 61034-1:2006 / VDE 0482-1034-1:2006 Measurement of smoke density of cables burning under defined conditions. Part 1: Test apparatus

IEC 61034-2:2005 / EN 61034-2:2005 / BS EN 61034-2:2005 / DIN EN 61034-2:2006 / VDE 0482-1034-2:2006 / CEI EN 61034-2:2006 (CEI 20-37/3-1) Measurement of smoke density of cables burning under defined conditions.
Part 2: Test procedure and requirements.

The standard specifies a method of measurement of smoke density of cables. Part 1 specifies the test apparatus and Part 2 specifies the test procedure.

The test is usually performed inside a chamber of 3m x3m x3m and the test is sometimes described as 3 metres cube test. The test is performed by monitoring the transmittance reduction of a white light beam, running from one side of the chamber to the other, at a set height, thus monitoring the

build up of smoke inside the chamber. The minimum percentage of light transmittance is often used to determine if the cable has passed or failed the test , often a minimum light transmittance of 60% is applied in order to classify a cable as low smoke.

Smoke Density Test in accordance with NF C32- 073

NF C32 073 Common test methods for cables under fire conditions.
- Measurement of smoke density of cables burning under defined conditions.
This standard is equivalent to IEC 61034-2

Smoke Density Test in accordance with BS 7622-1 & BS 7622-2

BS 7622-1:1993 (superseded) – Measurement of smoke density of electric cables burning under defined conditions. Test apparatus.
BS 7622-2:1993 (superseded) – Measurement of smoke density of electric cables burning under defined conditions. Test procedure and requirements.

The standards are no longer in force and were replaced by the EN 50268-1:2000 and EN 50268-2:2000 even though they too were superseded by EN 61034-1:2005 and EN 61034-2:2005.

Smoke Density Test in accordance with EN 50268-1 & EN 50268-2

EN 50268-1:2000 / BS EN 50268-1:2000 / DIN EN 50268-1:2000 / VDE 0482-268-1:2000 (superseded) – Common test methods for cables under fire conditions. Measurement of smoke density of cable burning under defined conditions. Part 1: Apparatus
EN 50268-2:2000 / BS EN 50268-2:2000 / DIN EN 50268-2:2000 / VDE 0482-268-2:2000 (superseded) – Common test methods for cables under fire conditions. Measurement of smoke density of cable burning under defined conditions. Part 2: Procedure.
The standards are no longer in force and are replaced by the EN 61034-1:2005 and EN 61034-2:2005. Although these standards have been withdrawn, they are still called upon in some specification documents such as in the London Underground specification 1-085.

Smoke Density Test In Accordance with DIN VDE 0472-816 / VDE 0472-816:1994

DIN VDE 0472-816/VDE 0472-816:1994 Testing of cables, wires and flexible cords. Smoke Density.

The standards are no longer in force and are replaced by the EN 50268-1, VDE 0482-268-1, EN 50268-2 & VDE 0482-268-2 which are also replaced by the EN 61034-1:2005 and EN 61034-2:2005.

OXYGEN INDEX TEST IN ACCORDANCE WITH DIFFERENT STANDARDS

The oxygen index is defined as the minimum concentration of oxygen, expressed as volume percentage, in a mixture of oxygen and nitrogen that will just support combustion of a material initially at room temperature under specified test conditions.

Oxygen Index Test in accordance with ASTM D 2863

ASTM D 2863-10 Measuring the minimum oxygen concentration to support candle-like combustion of plastics (Oxygen Index).

The test is performed in accordance with the procedure specified in ASTM 2863-95 using test piece cut from the outer sheath of the cable. The apparatus holds a small specimen which is clamped vertically in a tube in an atmosphere where the relative concentration of oxygen and nitrogen can be changed. The aim is to test the flammability of the sample with a small pilot flame to find the minimum oxygen concentration required to just sustain combustion of the sample.

Oxygen Index Test in accordance with ISO 4589-2

ISO4589-2:1996 Determination of burning behaviour by oxygen index Part 2: Ambient temperature test.
Specimens measuring 100mm long by 6mm wide are used for testing. The test is performed in accordance with the procedure specified in the standard.

TEMPERATURE INDEX TEST IN ACCORDANCE WITH DIFFERENT STANDARDS

This is a test for assessing the performance of a material when it is tested in accordance with BS2782: Part 1: Method 143a and 143b. The oxygen index of a material will drop when the temperature rises. When the temperature rises and the oxygen index drops to 21%, the material will burn automatically. This temperature is defined as temperature index. For example, the oxygen index of the coal at room temperature is 50% and when the temperature climbs to 150°C, it's oxygen index drops to 21°C and the coal will burn by itself automatically. The temperature index of the coal is defined as 150°C. In general, the temperature index of fire retardant cable exceeds 250°C.

Temperature Index Test in accordance with BS 2782

BS 2782: Part 1:1989 Method 143a and 143b Temperature of materials. Determination of flammability.
Specimens measuring nominally 100mm long by 6.5mm wide by 3mm thick are used for testing. The specimens are then tested in accordance with the test procedure specified in the standard.

Temperature Index Test in accordance with ISO 4589-3

ISO4589-3:1996 Determination of burning behaviour by oxygen index Part 3: Elevated temperature test.
Specimens measuring 100mm long by 6mm wide are used for testing. The test is performed in accordance with the procedure specified in the standard.

TOXICITY TEST IN ACCORDANCE WITH DIFFERENT STANDARDS

Toxicity test in accordance with NES 02-713

Measuring a fume from a material exposed to a controlled fire conditions gives an indication of the fumes which may be produced in a real fire situation. A standard method of test for determining the toxicity of materials under fire condition is Defense Standard NES 02-713- Toxicity. This method gives the level of toxicity of the fumes produced from the material under test. During the test, the test specimen is heated via direct flame application at 1150°C.

The flame is applied via a bunsen burner with a flame height of between 100m and 125mm formed with a methane gas and an external supply of compressed air. The specimen toxicity is determined from accurate pre-analysis weight (4pp) colorimetric tubes and ion chromatography.

The test may determine the following species: Hydrogen Bromide, Hydrochloric Acid, Hydrogen Fluoride, Formaldehyde, Nitrous gases, Carbon Monoxide, Carbon Dioxide, Acrylonitrile, Phenol, Hydrogen Sulphide, Sulphur Dioxide, Hydrocyanic Acid, Ammonia. The concentration in ppm for each gas detected are provided. The toxicity index of the speciments summates the toxic gases, taking into account of their level of danger to humans. The smaller the toxicity index, the better the product. A limit of 5 is often applicable.

Toxicity test in accordance with NF C 20-454

NF C 20-454 base environmental testing procedures. Fire behaviour. Analysis and titration of gases evolved during pyrolysis or combustion of materials used in electrotechnics. Exposure to abnormal heat or fire. Tube furnace method.

The test defined by this standard serves to define the conventional toxicity index (cti) of the gases emitted by the insulating or sleeving materials during combustion at 800°C.

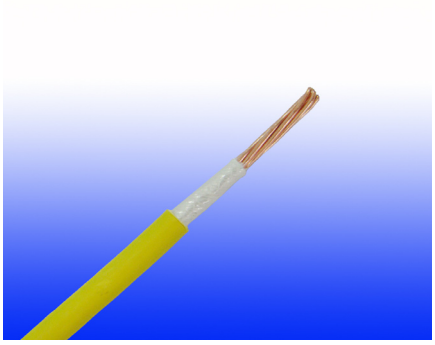
Toxicity test in accordance with NF X 70-100

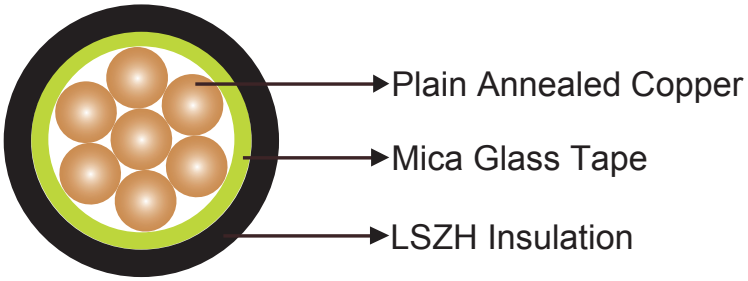
NF X 70-100 Fire Tests; Analysis of gaseous effluents.

The test is conducted within a tube furnace where the temperature is set at either 400°C, 600°C, 800°C (commonly 600°C is used for most of the materials or 800°C for some electrical products) for 40 minutes throughout the test by analysis of the toxicity index of the gases including CO, CO_2, HCL, HBr, HCN, HF and SO_2.

450/750V & 600/1000V Mica+LSZH Insulated Power Cables (Single Core)

FFX100 07mZ1-R (CU/MGT+LSZH 450/750V Class 2)
FFX100 1mZ1-R (CU/MGT+LSZH 600/1000V Class 2)





APPLICATION

This cable is used in fire extinguishing systems, sprinklers, control panels, and exit lights in high-rise buildings, hotels, hospitals, sub-ways, and public facilities.

STANDARDS

Basic design to BS 7211

FIRE PERFORMANCE

Circuit Integrity	IEC 60331-21; BS 6387 CWZ; DIN VDE 0472-814(FE180); CEI 20-36/2-1; SS299-1; NBN C 30-004 (cat. F3); NF C32-070-2.3(CR1)
System circuit integrity	DIN 4102-12, E30 depending on lay system
Flame Retardance (Single Vertical Wire Test)	EN 60332-1-2; IEC 60332-1-2; BS EN 60332-1-2; VDE 0482-332-1; NBN C 30-004 (cat. F1); NF C32-070-2.1(C2); CEI 20-35/1-2; EN 50265-2-1*; DIN VDE 0482-265-2-1*
Reduced Fire Propagation (Vertically-mounted bundled wires & cable test)	EN 60332-3-24 (cat. C); IEC 60332-3-24; BS EN 60332-3-24; VDE 0482-332-3; NBN C 30-004 (cat. F2); NF C32-070-2.2(C1); CEI 20-22/3-4; EN 50266-2-4*; DIN VDE 0482-266-2-4
Halogen Free	IEC 60754-1; EN 50267-2-1; DIN VDE 0482-267-2-1; CEI 20-37/2-1; BS 6425-1*
No Corrosive Gas Emission	IEC 60754-2; EN 50267-2-2; DIN VDE 0482-267-2-2; CEI 20-37/2-2; BS 6425-2*
Minimum Smoke Emission	IEC 61034-1&2; EN 61034 -1&2; DIN VDE 0482-1034-1&2; CEI 20-37/3-1&2; EN 50268-1&2*; BS 7622-1&2*
No Toxic gases	NES 02-713; NF C 20-454

*Note: Asterisk * denotes superseded standard.*

VOLTAGE RATING

450/750 V & 600/1000 V

CABLE CONSTRUCTION

Conductor: Plain annealed copper wire, stranded according to IEC 60228 class 2.
Fire Barrier: Mica glass tape.
Insulation: Thermoplastic LSZH compound type LTS3 as per BS 7655-6.1 (Thermosetting LSZH compound type SW2-SW4 as per BS 7655-2.6 can be offered.). UV resistance, hydrocarbon resistance, oil resistance, anti rodent and anti termite properties can be offered as option.

COLOUR CODE

Insulation Colour: Black (other colours upon request)

PHYSICAL AND THERMAL PROPERTIES

Temperature range during operation (fixed state): -30°C – +90°C
Temperature range during installation (mobile state): -20°C – +50°C
Minimum bending radius: 6 x Overall Diameter

ELECTRICAL PROPERTIES

Dielectric test:	600/1000V: 3500 V r.m.s. x 5' (core/core); 450/750V: 2500 V r.m.s. x 5' (core/core)
Insulation resistance	20 MΩ x km (at 20°C)
Short circuit temperature	250°C

CONSTRUCTION PARAMETERS

Conductor		FFX100 07mZ1-R			FFX100 1mZ1-R		
Nominal Cross Section Area	No./Nominal Diameter of Strands	Nominal Insulation Thickness	Nominal Overall Diameter	Approx. Weight	Nominal Insulation Thickness	Nominal Overall Diameter	Approx. Weight
mm^2	No./mm	mm	mm	kg/km	mm	mm	kg/km
1.5	7/0.53	0.7	3.5	25	0.8	3.8	30
2.5	7/0.67	0.8	4.1	35	0.8	4.2	40
4	7/0.85	0.8	4.6	52	1.0	5.3	70
6	7/1.04	0.8	5.2	72	1.0	6.0	96
10	7/1.35	1.0	6.5	120	1.0	6.6	130
16	7/1.70	1.0	7.6	180	1.0	7.7	200
25	7/2.14	1.2	9.0	275	1.2	9.1	290
35	7/2.52	1.2	10.2	370	1.2	10.3	390

Conductor		FFX100 07mZ1-R			FFX100 1mZ1-R		
Nominal Cross Section Area	No./Nominal Diameter of Strands	Nominal Insulation Thickness	Nominal Overall Diameter	Approx. Weight	Nominal Insulation Thickness	Nominal Overall Diameter	Approx. Weight
mm^2	No./mm	mm	mm	kg/km	mm	mm	kg/km
50	19/2.52	1.4	11.8	500	1.4	11.9	520
70	19/2.14	1.4	13.4	700	1.4	13.5	730
95	19.2.52	1.6	15.8	980	1.6	15.9	990
150	37/2.25	1.8	18.8	1500	1.8	18.9	1520
185	37.2.52	2.0	21.0	1900	2.0	21.2	1900
240	61/2.25	2.2	25.7	2500	2.2	25.8	2550
300	61/2.52	2.4	28.6	3140	2.4	28.8	3150
400	61/2.85	2.6	32.0	4000	2.6	32.2	4000
500	61/3.20	2.8	35.5	5000	2.8	35.7	5000
630	127/2.52	2.8	39.5	6300	2.8	39.7	6360

ELECTRICAL PROPERTIES

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

Current-Carrying Capacities (Amp)

Conductor cross-sectional area	Reference Method A (enclosed in conduit in thermally insulating wall etc)		Reference Method B (enclosed in conduit on a wall or in trunking etc)		Reference Method C (clipped direct)		Reference Method F (in free air or on a perforated cable tray, horizontal or vertical etc) Touching			Reference Method G (in free air) Spaced by one cable diameter	
	2 cables, single-phase a.c. or d.c.	3 or 4 cables, three-phase a.c.	2 cables, single-phase a.c. or d.c	3 or 4 cables, three-phase a.c.	2 cables, single-phase a.c. or d.c. flat and touching	3 or 4 cables, three-phase a.c. flat and touching or trefoil	2 cables, single-phase a.c. or d.c. flat	3 cables, three-phase a.c. flat	3 cables, three-phase a.c. trefoil	2 cables, single-phase a.c. or d.c. or 3 cables three-phase a.c. flat	
										Horizontal	Vertical
1	2	3	4	5	6	7	8	9	10	11	12
mm^2	A	A	A	A	A	A	A	A	A	A	A
1.5	19	17	23	20	25	23	-	-	-	-	-
2.5	26	23	31	28	34	31	-	-	-	-	-

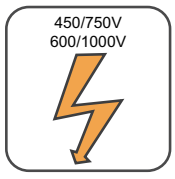
Conductor cross-sectional area	Reference Method A (enclosed in conduit in thermally insulating wall etc)		Reference Method B (enclosed in conduit on a wall or in trunking etc)		Reference Method C (clipped direct)		Reference Method F (in free air or on a perforated cable tray, horizontal or vertical etc) Touching			Reference Method G (in free air) Spaced by one cable diameter	
	2 cables, single-phase a.c. or d.c.	3 or 4 cables, three -phase a.c.	2 cables, single-phase a.c. or d.c	3 or 4 cables, three-phase a.c.	2 cables, single-phase a.c. or d.c. flat and touching	3 or 4 cables, three-phase a.c. flat and touching or trefoil	2 cables, single-phase a.c. or d.c. flat	3 cables, three-phase a.c. flat	3 cables, three-phase a.c. trefoil	2 cables, single-phase a.c. or d.c. or 3 cables three-phase a.c. flat	
										Horizontal	Vertical
1	2	3	4	5	6	7	8	9	10	11	12
mm^2	A	A	A	A	A	A	A	A	A	A	A
4	35	31	42	37	46	41	-	-	-	-	-
6	45	40	54	48	59	54	-	-	-	-	-
10	61	54	75	66	81	74	-	-	-	-	-
16	81	73	100	88	109	99	-	-	-	-	-
25	106	95	133	117	143	130	161	141	135	182	161
35	131	117	164	144	176	161	200	176	169	226	201
50	158	141	198	175	228	209	242	216	207	275	246
70	200	179	253	222	293	268	310	279	268	353	318
95	241	216	306	269	355	326	377	342	328	430	389
120	278	249	354	312	413	379	437	400	383	500	454
150	318	285	393	342	476	436	504	464	444	577	527
185	362	324	449	384	545	500	575	533	510	661	605
240	424	380	528	450	644	590	679	634	607	781	719
300	486	435	306	514	743	681	783	736	703	902	833
400	-	-	383	584	868	793	940	868	823	1085	1008
500	-	-	783	666	990	904	1083	998	946	1253	1169
630	-	-	900	764	113	1033	1254	1151	1088	1454	1362

Voltage Drop (Per Amp Per Meter)

Nominal Cross Section Area	2 cables d.c.	2 cables, single-phase a.c.			3 or 4 cables, three-phase a.c.			
		Ref. Methods A and B (enclosed in conduit or trunking)	Ref. Methods C, F&G(clipped direct, on trays or in free air)		Ref. Methods 3 and 4 (enclosed in conduit etc, in or on a wall)	Ref. Methods C, F&G (clipped direct, on trays or in free air)		
						Cables touching, Trefoil	Cables touching, Flat	Cables spaced*, Flat
1	2	3	touching 4	spaced*5	6	7	8	9
mm^2	mV/A/m	mV/A/m	mV/A/m	mV/A/m	mV/A/m	mV/A/m	mV/A/m	mV/A/m
1.5	31	31	31	31	27	27	27	27

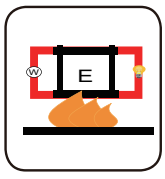
Nominal Cross Section Area	2 cables d.c.	2 cables, single-phase a.c.									3 or 4 cables, three-phase a.c.											
		Ref. Methods A and B (enclosed in conduit or trunking)			Ref. Methods C, F&G(clipped direct, on trays or in free air)						Ref. Methods 3 and 4 (enclosed in conduit etc, in or on a wall)			Ref. Methods C, F&G (clipped direct, on trays or in free air)								
														Cables touching, Trefoil			Cables touching, Flat			Cables spaced*, Flat		
1	2	3			touching 4			spaced*5			6			7			8			9		
mm^2	mV/A/m	mV/A/m			mV/A/m			mV/A/m			mV/A/m			mV/A/m			mV/A/m			mV/A/m		
2.5	19	19			19			19			16			16			16			16		
4	12	12			12			12			10			10			10			10		
6	7.9	7.9			7.9			7.9			6.8			6.8			6.8			6.8		
10	4.7	4.7			4.7			4.7			4.0			4.0			4.0			4.0		
16	2.9	2.9			2.9			2.9			2.5			2.5			2.5			2.5		
		r	x	z	r	x	z	r	x	z	r	x	z	r	x	z	r	x	z	r	x	z
25	1.85	1.85	0.31	1.90	1.85	0.190	1.85	1.85	0.28	1.85	1.60	0.27	1.65	1.60	0.165	1.60	1.60	0.190	1.60	1.60	0.27	1.65
35	1.35	1.35	0.29	1.35	1.35	0.180	1.35	1.35	0.27	1.35	1.15	0.25	1.15	1.15	0.155	1.15	1.15	0.180	1.15	1.15	0.26	1.20
50	0.99	1.00	0.29	1.05	0.99	0.180	1.00	0.99	0.27	1.00	0.87	0.25	0.90	0.86	0.155	0.87	0.86	0.180	0.87	0.86	0.26	0.89
70	0.68	0.70	0.28	0.75	0.68	0.175	0.71	0.68	0.26	0.73	0.60	0.24	0.65	0.59	0.150	0.61	0.59	0.175	0.62	0.59	0.25	0.65
95	0.49	0.51	0.27	0.58	0.49	0.170	0.52	0.49	0.26	0.56	0.44	0.23	0.50	0.43	0.145	0.50	0.43	0.170	0.45	0.43	0.25	0.49
120	0.39	0.41	0.26	0.48	0.39	0.165	0.43	0.39	0.25	0.47	0.35	0.23	0.42	0.34	0.140	0.37	0.34	0.165	0.38	0.34	0.24	0.42
150	032	0.33	0.26	0.43	0.32	0.165	0.36	0.32	0.25	0.41	0.29	0.23	0.37	0.28	0.140	0.31	0.28	0.165	0.32	0.28	0.24	0.37
185	0.25	0.27	0.26	0.37	0.26	0.165	0.30	0.25	0.25	0.36	0.23	0.23	0.32	0.22	0.140	0.26	0.22	0.165	0.28	0.22	0.24	0.33
240	0.190	0.21	0.26	0.33	0.20	0.160	0.25	0.195	0.25	0.31	0.185	0.22	0.29	0.170	0.140	0.22	0.170	0.165	0.24	0.170	0.24	0.29
300	0.155	0.175	0.25	0.31	0.160	0.160	0.22	0.155	0.25	0.29	0.150	0.22	0.27	0.140	0.140	0.195	0.135	0.160	0.21	0.135	0.24	0.27
400	0.120	0.140	0.25	0.29	0.130	0.155	0.20	0.125	0.24	0.27	0.125	0.22	0.25	0.110	0.135	0.175	0.110	0.160	0.195	0.110	0.24	0.26
500	0.093	0.120	0.25	0.28	0.105	0.155	0.185	0.098	0.24	0.26	0.100	0.22	0.24	0.090	0.135	0.160	0.088	0.160	0.180	0.085	0.24	0.25
630	0.072	0.100	0.25	0.27	0.086	0.155	0.175	0.078	0.24	0.25	0.088	0.21	0.23	0.074	0.135	0.150	0.071	0.160	0.170	0.068	0.23	0.24

Note: *Spacings larger than one cable diameter will result in a large voltage drop.
r = conductor resistance at operating temperature
x = reactance
z = impedance



Rated Voltage

Standard



IEC 60331/BS 6387
NF C32-070-2.3(CR1)
Circuit Integrity


NF C32-070-2.2(C1)
IEC60332-3-24/EN50266-2-4
Reduced Fire Propagation

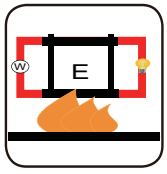

NF C32-070-2.1(C2)
IEC60332-1-2/EN50265-2-1
Flame Retardancy


NES 02-713/NF C 20-454
Low Toxicity


IEC60754-2
EN50267-2-2/3
NF C 32-074
Low Corrosivity


IEC 61034-1&2
EN 50268-1&2/NF C32-07
Low Smoke Emission

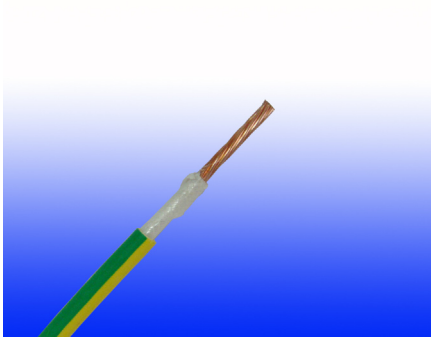
IEC60754-1
EN50267-2-1
Halogen Free



DIN 4102-12
Functional Integrity

300/500V Mica+XLPE Insulated, LSZH Sheathed Power Cables (Single Core)

FFX300 05mRZ1-R (CU/MGT+XLPE/LSZH 300/500V Class 2)



APPLICATION

The cables are designed for areas where the integrity of the electrical circuit is critical in maintaining power supply. Applications can be found in emergency lightings, control and power circuits, power stations, fire alarm systems, underground tunnels, lifts, escalators, and high-rise buildings.

STANDARDS

Basic design adapted to IEC 60502-1

FIRE PERFORMANCE

Circuit Integrity	IEC 60331-21; BS 6387 CWZ; DIN VDE 0472-814(FE180); CEI 20-36/2-1; SS299-1; NBN C 30-004 (cat. F3); NF C32-070-2.3(CR1)
System circuit integrity	DIN 4102-12, E30 depending on lay system
Flame Retardance (Single Vertical Wire Test)	EN 60332-1-2; IEC 60332-1-2; BS EN 60332-1-2; VDE 0482-332-1; NBN C 30-004 (cat. F1); NF C32-070-2.1(C2); CEI 20-35/1-2; EN 50265-2-1*; DIN VDE 0482-265-2-1*
Reduced Fire Propagation (Vertically-mounted bundled wires & cable test)	EN 60332-3-24 (cat. C); IEC 60332-3-24; BS EN 60332-3-24; VDE 0482-332-3; NBN C 30-004 (cat. F2); NF C32-070-2.2(C1); CEI 20-22/3-4; EN 50266-2-4*; DIN VDE 0482-266-2-4
Halogen Free	IEC 60754-1; EN 50267-2-1; DIN VDE 0482-267-2-1; CEI 20-37/2-1; BS 6425-1*
No Corrosive Gas Emission	IEC 60754-2; EN 50267-2-2; DIN VDE 0482-267-2-2; CEI 20-37/2-2; BS 6425-2*
Minimum Smoke Emission	IEC 61034-1&2; EN 61034 -1&2; DIN VDE 0482-1034-1&2; CEI 20-37/3-1&2; EN 50268-1&2*; BS 7622-1&2*
No Toxic gases	NES 02-713; NF C 20-454

*Note: Asterisk * denotes superseded standard.*

VOLTAGE RATING

300/500 V

CABLE CONSTRUCTION

Conductor: Plain annealed copper wire, stranded according to IEC 60228 class 2.
Insulation: Mica glass tape covered by extruded XLPE compound.
Sheath: Thermoplastic LSZH compound type LTS3 as per BS 7655-6.1 (Thermosetting LSZH compound type SW2-SW4 as per BS 7655-2.6 can be offered.). UV resistance, hydrocarbon resistance, oil resistance, anti rodent and anti termite properties can be offered as option.

COLOUR CODE

Insulation colour upon request.
Sheath Colour: Black (other colours upon request)

PHYSICAL AND THERMAL PROPERTIES

Temperature range during operation (fixed state): -30°C – +90°C
Temperature range during installation (mobile state): -20°C – +50°C
Minimum bending radius: 8 x Overall Diameter

ELECTRICAL PROPERTIES

Dielectric test:	2000 V r.m.s. x 5' (core/core)
Insulation resistance	1000 MΩ x km (at 20°C)
Short circuit temperature	250°C

CONSTRUCTION PARAMETERS

Conductor		FFX300 05mRZ1-R			
Nominal Cross Section Area	No./Nominal Diameter of Strands	Nominal Insulation Thickness	Nominal Sheath Thickness	Nominal Overall Diameter	Approx. Weight
mm^2	No./mm	mm	mm	mm	kg/km
1.5	7/0.53	0.5	0.5	4.4	29
2.5	7/0.67	0.5	0.5	4.9	40
4.0	7/0.85	0.5	0.5	5.5	55

ELECTRICAL PROPERTIES

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

Current-Carrying Capacities (Amp)

Conductor cross-sectional area	Reference Method A (enclosed in conduit in thermally insulating wall etc)		Reference Method B (enclosed in conduit on a wall or in trunking etc)		Reference Method C (clipped direct)		Reference Method F (in free air or on a perforated cable tray, horizontal or vertical etc) Touching			Reference Method G (in free air) Spaced by one cable diameter	
	2 cables, single-phase a.c. or d.c.	3 or 4 cables, three -phase a.c.	2 cables, single-phase a.c. or d.c	3 or 4 cables, three-phase a.c.	2 cables, single-phase a.c. or d.c. flat and touching	3 or 4 cables, three-phase a.c. flat and touching or trefoil	2 cables, single-phase a.c. or d.c. flat	3 cables, three-phase a.c. flat	3 cables, three-phase a.c. trefoil	2 cables, single-phase a.c. or d.c. or 3 cables three-phase a.c. flat	
										Horizontal	Vertical
1	2	3	4	5	6	7	8	9	10	11	12
mm^2	A	A	A	A	A	A	A	A	A	A	A
1.5	19	17	23	20	25	23	-	-	-	-	-
2.5	26	23	31	28	34	31	-	-	-	-	-
4	35	31	42	37	46	41	-	-	-	-	-

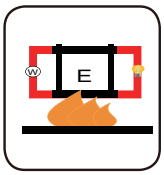
Voltage Drop (Per Amp Per Meter)

Nominal Cross Section Area	2 cables d.c.	2 cables, single-phase a.c.			3 or 4 cables, three-phase a.c.			
		Ref. Methods A and B (enclosed in conduit or trunking)	Ref. Methods C, F&G(clipped direct, on trays or in free air)		Ref. Methods 3 and 4 (enclosed in conduit etc, in or on a wall)	Ref. Methods C, F&G (clipped direct, on trays or in free air)		
						Cables touching, Trefoil	Cables touching, Flat	Cables spaced*, Flat
1	2	3	touching 4	spaced*5	6	7	8	9
mm^2	mV/A/m	mV/A/m	mV/A/m	mV/A/m	mV/A/m	mV/A/m	mV/A/m	mV/A/m
1.5	31	31	31	31	27	27	27	27
2.5	19	19	19	19	16	16	16	16
4	12	12	12	12	10	10	10	10

Note: *Spacings larger than one cable diameter will result in a large voltage drop.

Rated Voltage

Standard



IEC 60331/BS 6387
NF C32-070-2.3(CR1)
Circuit Integrity


NF C32-070-2.2(C1)
IEC60332-3-24/EN50266-2-4
Reduced Fire Propagation

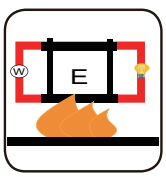

NF C32-070-2.1(C2)
IEC60332-1-2/EN50265-2-1
Flame Retardancy


NES 02-713/NF C 20-454
Low Toxicity


IEC60754-2
EN50267-2-2/3
NF C 32-074
Low Corrosivity


IEC 61034-1&2
EN 50268-1&2/NF C32-07
Low Smoke Emission

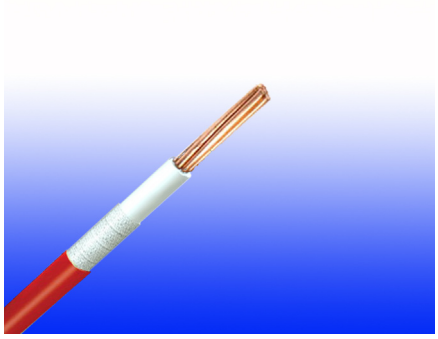
IEC60754-1
EN50267-2-1
Halogen Free

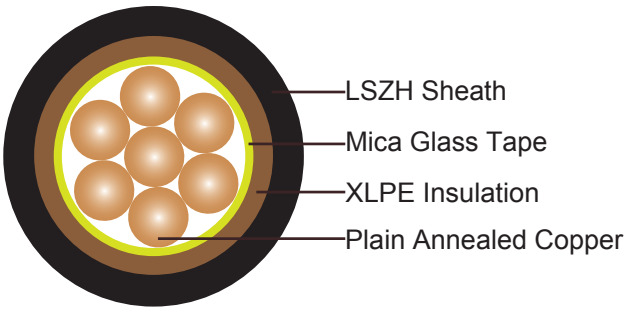


DIN 4102-12
Functional Integrity

600/1000V Mica+XLPE Insulated, LSZH Sheathed Power Cables (Single Core)

FFX300 1mRZ1-R (CU/MGT+XLPE/LSZH 600/1000V Class 2)





APPLICATION

This cable is designed for areas where the integrity of the electrical circuit is critical in maintaining power supply. Applications can be found in emergency lightings, control and power circuits, power stations, fire alarm systems, underground tunnels, communications systems, sewage treatment plants, lifts, escalators, and high-rise buildings.

STANDARDS

Basic design to IEC 60502-1

FIRE PERFORMANCE

Circuit Integrity	IEC 60331-21; BS 6387 CWZ; DIN VDE 0472-814(FE180); CEI 20-36/2-1; SS299-1; NBN C 30-004 (cat. F3); NF C32-070-2.3(CR1)
System circuit integrity	DIN 4102-12, E30 depending on lay system
Flame Retardance (Single Vertical Wire Test)	EN 60332-1-2; IEC 60332-1-2; BS EN 60332-1-2; VDE 0482-332-1; NBN C 30-004 (cat. F1); NF C32-070-2.1(C2); CEI 20-35/1-2; EN 50265-2-1*; DIN VDE 0482-265-2-1*
Reduced Fire Propagation (Vertically-mounted bundled wires & cable test)	EN 60332-3-24 (cat. C); IEC 60332-3-24; BS EN 60332-3-24; VDE 0482-332-3; NBN C 30-004 (cat. F2); NF C32-070-2.2(C1); CEI 20-22/3-4; EN 50266-2-4*; DIN VDE 0482-266-2-4
Halogen Free	IEC 60754-1; EN 50267-2-1; DIN VDE 0482-267-2-1; CEI 20-37/2-1; BS 6425-1*
No Corrosive Gas Emission	IEC 60754-2; EN 50267-2-2; DIN VDE 0482-267-2-2; CEI 20-37/2-2; BS 6425-2*
Minimum Smoke Emission	IEC 61034-1&2; EN 61034 -1&2; DIN VDE 0482-1034-1&2; CEI 20-37/3-1&2; EN 50268-1&2*; BS 7622-1&2*
No Toxic gases	NES 02-713; NF C 20-454

*Note: Asterisk * denotes superseded standard.*

VOLTAGE RATING

600/1000 V

CABLE CONSTRUCTION

Conductor: Plain annealed copper wire, stranded according to IEC 60228 class 2.
Insulation: Mica glass tape covered by extruded XLPE compound.
Sheath: Thermoplastic LSZH compound type LTS3 as per BS 7655-6.1 (Thermosetting LSZH compound type SW2-SW4 as per BS 7655-2.6 can be offered.). UV resistance, hydrocarbon resistance, oil resistance, anti rodent and anti termite properties can be offered as option.

COLOUR CODE

Insulation colour upon request.
Sheath Colour: Black (other colours upon request)

PHYSICAL AND THERMAL PROPERTIES

Temperature range during operation (fixed state): -30°C – +90°C
Temperature range during installation (mobile state): -20°C – +50°C
Minimum bending radius: 8 x Overall Diameter

ELECTRICAL PROPERTIES

Dielectric test:	3500 V r.m.s. x 5' (core/core)
Insulation resistance	1000 MΩ x km (at 20°C)
Short circuit temperature	250°C

CONSTRUCTION PARAMETERS

Conductor			FFX300 1mRZ1-R		
Nominal Cross Section Area	No./Nominal Diameter of Strands	Diameter of Conductor	Nominal Insulation Thickness	Approx. Overall Diameter	Approx. Weight
mm^2	No./mm	mm	mm	mm	kg/km
1.5	7/0.53	1.59	0.7	6.5	54
2.5	7/0.67	2.01	0.7	6.8	67
4	7/0.85	2.55	0.7	7.5	86
6	7/1.04	3.12	0.7	8.1	110
10	7/1.35	4.05	0.7	9.2	155
16	7/1.70	5.1	0.7	10.2	220
25	7/2.14	6.42	0.9	11.9	325
35	19/1.53	7.65	0.9	13.2	425
50	19/1.78	8.9	1.0	14.6	600
70	19/2.14	10.7	1.1	16.6	820
95	19/2.52	12.6	1.1	18.7	1100
120	37/2.03	14.21	1.2	20.5	1350
150	37/2.25	15.75	1.4	22.7	1640

Conductor			FFX300 1mRZ1-R		
Nominal Cross Section Area	No./Nominal Diameter of Strands	Diameter of Conductor	Nominal Insulation Thickness	Approx. Overall Diameter	Approx. Weight
mm^2	No./mm	mm	mm	mm	kg/km
185	37.2.52	17.64	1.6	25.5	2040
240	61/2.25	20.25	1.7	28.5	2650
300	61/2.52	22.68	1.8	31.5	3260
400	65/2.85	25.65	2.0	35.4	4130
500	61/3.20	28.8	2.2	39	5200
630	127/2.52	32.76	2.4	43.5	6600
800	127/2.85	37.05	2.6	48.5	8300
1000	127/3.20	41.6	2.8	53.5	10000

ELECTRICAL PROPERTIES

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

Current-Carrying Capacities (Amp)

Conductor cross-sectional area	Reference Method A (enclosed in conduit in thermally insulating wall etc)		Reference Method B (enclosed in conduit on a wall or in trunking etc)		Reference Method C (clipped direct)		Reference Method F (in free air or on a perforated cable tray, horizontal or vertical etc) Touching			Reference Method G (in free air) Spaced by one cable diameter	
	2 cables, single-phase a.c. or d.c.	3 or 4 cables, three -phase a.c.	2 cables, single-phase a.c. or d.c	3 or 4 cables, three-phase a.c.	2 cables, single-phase a.c. or d.c. flat and touching	3 or 4 cables, three-phase a.c. flat and touching or trefoil	2 cables, single-phase a.c. or d.c. flat	3 cables, three-phase a.c. flat	3 cables, three-phase a.c. trefoil	2 cables, single-phase a.c. or d.c. or 3 cables three-phase a.c. flat	
										Horizontal	Vertical
1	2	3	4	5	6	7	8	9	10	11	12
mm^2	A	A	A	A	A	A	A	A	A	A	A
1.5	19	17	23	20	25	23	-	-	-	-	-
2.5	26	23	31	28	34	31	-	-	-	-	-
4	35	31	42	37	46	41	-	-	-	-	-
6	45	40	54	48	59	54	-	-	-	-	-
10	61	54	75	66	81	74	-	-	-	-	-
16	81	73	100	88	109	99	-	-	-	-	-
25	106	95	133	117	143	130	161	141	135	182	161
35	131	117	164	144	176	161	200	176	169	226	201

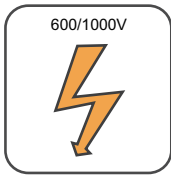
Conductor cross-sectional area	Reference Method A (enclosed in conduit in thermally insulating wall etc)		Reference Method B (enclosed in conduit on a wall or in trunking etc)		Reference Method C (clipped direct)		Reference Method F (in free air or on a perforated cable tray, horizontal or vertical etc) Touching			Reference Method G (in free air) Spaced by one cable diameter	
	2 cables, single-phase a.c. or d.c.	3 or 4 cables, three -phase a.c.	2 cables, single-phase a.c. or d.c	3 or 4 cables, three-phase a.c.	2 cables, single-phase a.c. or d.c. flat and touching	3 or 4 cables, three-phase a.c. flat and touching or trefoil	2 cables, single-phase a.c. or d.c. flat	3 cables, three-phase a.c. flat	3 cables, three-phase a.c. trefoil	2 cables, single-phase a.c. or d.c. or 3 cables three-phase a.c. flat	
										Horizontal	Vertical
1	2	3	4	5	6	7	8	9	10	11	12
mm^2	A	A	A	A	A	A	A	A	A	A	A
50	158	141	198	175	228	209	242	216	207	275	246
70	200	179	253	222	293	268	310	279	268	353	318
95	241	216	306	269	355	326	377	342	328	430	389
120	278	249	354	312	413	379	437	400	383	500	454
150	318	285	393	342	476	436	504	464	444	577	527
185	362	324	449	384	545	500	575	533	510	661	605
240	424	380	528	450	644	590	679	634	607	781	719
300	486	435	306	514	743	681	783	736	703	902	833
400	-	-	383	584	868	793	940	868	823	1085	1008
500	-	-	783	666	990	904	1083	998	946	1253	1169
630	-	-	900	764	1130	1033	1254	1151	1088	1454	1362
800	-	-	-	-	1288	1179	1358	1275	1214	1561	1485
1000	-	-	-	-	1443	1323	1520	1436	1349	1775	1671

Voltage Drop (Per Amp Per Meter)

Nominal Cross Section Area	2 cables d.c.	2 cables, single-phase a.c.			3 or 4 cables, three-phase a.c.			
		Ref. Methods A and B (enclosed in conduit or trunking)	Ref. Methods C, F&G(clipped direct, on trays or in free air)		Ref. Methods 3 and 4 (enclosed in conduit etc, in or on a wall)	Ref. Methods C, F&G (clipped direct, on trays or in free air)		
			Cables touching	Cables spaced*5		Cables touching, Trefoil	Cables touching, Flat	Cables spaced*, Flat
1	2	3	4		6	7	8	9
mm^2	mV/A/m	mV/A/m	mV/A/m	mV/A/m	mV/A/m	mV/A/m	mV/A/m	mV/A/m
1.5	31	31	31	31	27	27	27	27
2.5	19	19	19	19	16	16	16	16
4	12	12	12	12	10	10	10	10
6	7.9	7.9	7.9	7.9	6.8	6.8	6.8	6.8

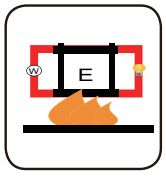
Nominal Cross Section Area	2 cables d.c.	2 cables, single-phase a.c.									3 or 4 cables, three-phase a.c.												
		Ref. Methods A and B (enclosed in conduit or trunking)			Ref. Methods C, F&G(clipped direct, on trays or in free air)						Ref. Methods 3 and 4 (enclosed in conduit etc, in or on a wall)			Ref. Methods C, F&G (clipped direct, on trays or in free air)								
														Cables touching, Trefoil			Cables touching, Flat			Cables spaced*, Flat		
1	2	3			Cables touching 4			Cables spaced*5			6			7			8			9		
mm^2	mV/A/m	mV/A/m			mV/A/m			mV/A/m			mV/A/m			mV/A/m			mV/A/m			mV/A/m		
10	4.7	4.7			4.7			4.7			4.0			4.0			4.0			4.0		
16	2.9	2.9			2.9			2.9			2.5			2.5			2.5			2.5		
		r	x	z	r	x	z	r	x	z	r	x	z	r	x	z	r	x	z	r	x	z
25	1.85	1.85	0.31	1.90	1.85	0.190	1.85	1.85	0.28	1.85	1.60	0.27	1.65	1.60	0.165	1.60	1.60	0.190	1.60	1.60	0.27	1.65
35	1.35	1.35	0.29	1.35	1.35	0.180	1.35	1.35	0.27	1.35	1.15	0.25	1.15	1.15	0.155	1.15	1.15	0.180	1.15	1.15	0.26	1.20
50	0.99	1.00	0.29	1.05	0.99	0.180	1.00	0.99	0.27	1.00	0.87	0.25	0.90	0.86	0.155	0.87	0.86	0.180	0.87	0.86	0.26	0.89
70	0.68	0.70	0.28	0.75	0.68	0.175	0.71	0.68	0.26	0.73	0.60	0.24	0.65	0.59	0.150	0.61	0.59	0.175	0.62	0.59	0.25	0.65
95	0.49	0.51	0.27	0.58	0.49	0.170	0.52	0.49	0.26	0.56	0.44	0.23	0.50	0.43	0.145	0.50	0.43	0.170	0.45	0.43	0.25	0.49
120	0.39	0.41	0.26	0.48	0.39	0.165	0.43	0.39	0.25	0.47	0.35	0.23	0.42	0.34	0.140	0.37	0.34	0.165	0.38	0.34	0.24	0.42
150	032	0.33	0.26	0.43	0.32	0.165	0.36	0.32	0.25	0.41	0.29	0.23	0.37	0.28	0.140	0.31	0.28	0.165	0.32	0.28	0.24	0.37
185	0.25	0.27	0.26	0.37	0.26	0.165	0.30	0.25	0.25	0.36	0.23	0.23	0.32	0.22	0.140	0.26	0.22	0.165	0.28	0.22	0.24	0.33
240	0.190	0.21	0.26	0.33	0.20	0.160	0.25	0.195	0.25	0.31	0.185	0.22	0.29	0.170	0.140	0.22	0.170	0.165	0.24	0.170	0.24	0.29
300	0.155	0.175	0.25	0.31	0.160	0.160	0.22	0.155	0.25	0.29	0.150	0.22	0.27	0.140	0.140	0.195	0.135	0.160	0.21	0.135	0.24	0.27
400	0.120	0.140	0.25	0.29	0.130	0.155	0.20	0.125	0.24	0.27	0.125	0.22	0.25	0.110	0.135	0.175	0.110	0.160	0.195	0.110	0.24	0.26
500	0.093	0.120	0.25	0.28	0.105	0.155	0.185	0.098	0.24	0.26	0.100	0.22	0.24	0.090	0.135	0.160	0.088	0.160	0.180	0.085	0.24	0.25
630	0.072	0.100	0.25	0.27	0.086	0.155	0.175	0.078	0.24	0.25	0.088	0.21	0.23	0.074	0.135	0.150	0.071	0.160	0.170	0.068	0.23	0.24
800	0.056	-	-	-	0.072	0.150	0.170	0.064	0.24	0.25	-	-	-	0.062	0.130	0.145	0.059	0.155	0.165	0.055	0.23	0.24
1000	0.045	-	-	-	0.063	0.150	0.165	0.054	0.24	0.24	-	-	-	0.055	0.130	0.140	0.050	0.155	0.165	0.047	0.23	0.24

Note: *Spacings larger than one cable diameter will result in a large voltage drop.
r = conductor resistance at operating temperature
x = reactance
z = impedance



Rated Voltage

Standard



IEC 60331/BS 6387
NF C32-070-2.3(CR1)
Circuit Integrity


NF C32-070-2.2(C1)
IEC60332-3-24/EN50266-2-4
Reduced Fire Propagation

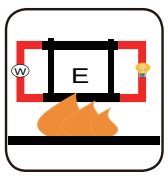

NF C32-070-2.1(C2)
IEC60332-1-2/EN50265-2-1
Flame Retardancy


NES 02-713/NF C 20-454
Low Toxicity


IEC60754-2
EN50267-2-2/3
NF C 32-074
Low Corrosivity


IEC 61034-1&2
EN 50268-1&2/NF C32-07
Low Smoke Emission

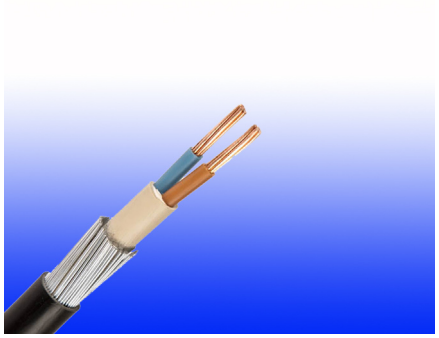
IEC60754-1
EN50267-2-1
Halogen Free

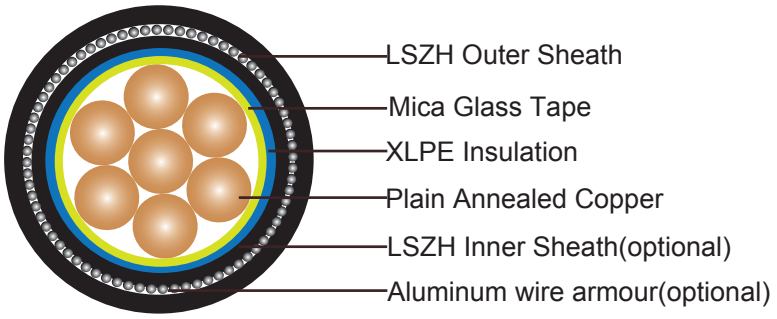


DIN 4102-12
Functional Integrity

600/1000V Mica+XLPE Insulated, Armoured LSZH Sheathed Power Cables (Single Core)

FFX300 1mRMAZ1-R (CU/MGT+XLPE/LSZH/AWA/LSZH 600/1000V Class 2)





APPLICATION

This cable is designed for areas where the integrity of the electrical circuit is critical in maintaining power supply. Applications can be found in emergency lightings, control and power circuits, power stations, fire alarm systems, underground tunnels, communications systems, sewage treatment plants, lifts, escalators, and high-rise buildings.

STANDARDS

Basic design to IEC 60502-1

FIRE PERFORMANCE

Circuit Integrity	IEC 60331-21; BS 6387 CWZ; DIN VDE 0472-814(FE180); CEI 20-36/2-1; SS299-1; NBN C 30-004 (cat. F3); NF C32-070-2.3(CR1)
System circuit integrity	DIN 4102-12, E30 depending on lay system
Flame Retardance (Single Vertical Wire Test)	EN 60332-1-2; IEC 60332-1-2; BS EN 60332-1-2; VDE 0482-332-1; NBN C 30-004 (cat. F1); NF C32-070-2.1(C2); CEI 20-35/1-2; EN 50265-2-1*; DIN VDE 0482-265-2-1*
Reduced Fire Propagation (Vertically-mounted bundled wires & cable test)	EN 60332-3-24 (cat. C); IEC 60332-3-24; BS EN 60332-3-24; VDE 0482-332-3; NBN C 30-004 (cat. F2); NF C32-070-2.2(C1); CEI 20-22/3-4; EN 50266-2-4*; DIN VDE 0482-266-2-4
Halogen Free	IEC 60754-1; EN 50267-2-1; DIN VDE 0482-267-2-1; CEI 20-37/2-1; BS 6425-1*
No Corrosive Gas Emission	IEC 60754-2; EN 50267-2-2; DIN VDE 0482-267-2-2; CEI 20-37/2-2; BS 6425-2*
Minimum Smoke Emission	IEC 61034-1&2; EN 61034 -1&2; DIN VDE 0482-1034-1&2; CEI 20-37/3-1&2; EN 50268-1&2*; BS 7622-1&2*
No Toxic gases	NES 02-713; NF C 20-454

*Note: Asterisk * denotes superseded standard.*

VOLTAGE RATING

600/1000 V

CABLE CONSTRUCTION

Conductor: Plain annealed copper wire, stranded according to IEC 60228 class 2.
Insulation: Mica glass tape covered by extruded XLPE compound.
Inner Sheath: Thermoplastic LSZH compound type LTS3 as per BS 7655-6.1
Armouring: Aluminum wire armour.
Outer Sheath: Thermoplastic LSZH compound type LTS3 as per BS 7655-6.1 (Thermosetting LSZH compound type SW2-SW4 as per BS 7655-2.6 can be offered.). UV resistance, hydrocarbon resistance, oil resistance, anti rodent and anti termite properties can be offered as option.

COLOUR CODE

Insulation colour upon request.
Sheath Colour: Black (other colours upon request)

PHYSICAL AND THERMAL PROPERTIES

Temperature range during operation (fixed state): -30°C – +90°C
Temperature range during installation (mobile state): -20°C – +50°C
Minimum bending radius: 10 x Overall Diameter

ELECTRICAL PROPERTIES

Dielectric test:	3500 V r.m.s. x 5' (core/core)
Insulation resistance	1000 MΩ x km (at 20°C)
Short circuit temperature	250°C

CONSTRUCTION PARAMETERS

Conductor			FFX300 1mRMAZ1-R		
Nominal Cross Section Area	No./Nominal Diameter of Strands	Diameter of Conductor	Nominal Insulation Thickness	Approx. Overall Diameter	Approx. Weight
mm^2	No./mm	mm	mm	mm	kg/km
50	19/1.78	8.9	1.0	18.5	780
70	19/2.14	10.7	1.1	20.5	1010
95	19/2.52	12.6	1.1	23	1320
120	37/2.03	14.21	1.2	24.5	1610
150	37/2.25	15.75	1.4	27	2010
185	37.2.52	17.64	1.6	29.5	2440
240	61/2.25	20.25	1.7	34.5	3060
300	61/2.52	22.68	1.8	36.9	3690
400	65/2.85	25.65	2.0	41.5	4780

Conductor			FFX300 1mRMAZ1-R		
Nominal Cross Section Area	No./Nominal Diameter of Strands	Diameter of Conductor	Nominal Insulation Thickness	Approx. Overall Diameter	Approx. Weight
mm^2	No./mm	mm	mm	mm	kg/km
500	61/3.20	28.8	2.2	45.5	5970
630	127/2.52	32.76	2.4	50.5	7530
800	127/2.85	37.05	2.6	56.8	9680
1000	127/3.20	41.6	2.8	61.5	11980

ELECTRICAL PROPERTIES

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

Current-Carrying Capacities (Amp)

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

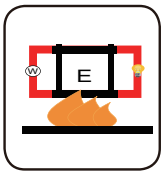
Voltage Drop (Per Amp Per Meter)

Nominal Cross Section Area 1	2 cables d.c. 2	Ref. Methods C&F(clipped direct, on trays or in free air)														
		2 cables, single-phase a.c.						3 or 4 cables, three-phase a.c.								
		Touching 3			Spaced* 4			Trefoil and touching 5			Flat and touching 6			Flat and spaced* 7		
mm^2	mV/A/m	mV/A/m			mV/A/m			mV/A/m			mV/A/m			mV/A/m		
		r	x	z	r	x	z	r	x	z	r	x	z	r	x	z
50	0.98	0.99	0.21	1.00	0.98	0.29	1.00	0.86	0.180	0.87	0.84	0.25	0.88	0.84	0.33	0.90
70	0.67	0.68	0.20	0.71	0.69	0.29	0.75	0.59	0.170	0.62	0.60	0.25	0.65	0.62	0.32	0.70
95	0.49	0.51	0.195	0.55	0.53	0.28	0.60	0.44	0.170	0.47	0.46	0.24	0.52	0.49	0.31	0.58
120	0.39	0.41	0.190	0.45	0.43	0.27	0.51	0.35	0.165	0.39	0.38	0.34	0.44	0.41	0.30	0.51
150	0.31	0.33	0.185	0.38	0.36	0.27	0.45	0.29	0.160	0.33	0.31	0.23	0.39	0.34	0.39	0.45
185	0.25	0.27	0.185	0.33	0.30	0.26	0.40	0.23	0.160	0.28	0.26	0.23	0.34	0.29	0.29	0.41
240	0.195	0.21	0.180	0.28	0.24	0.26	0.35	0.180	0.155	0.24	0.21	0.22	0.30	0.24	0.28	0.37
300	0.155	0.17	0.175	0.25	0.195	0.25	0.32	0.145	0.150	0.21	0.170	0.22	0.28	0.20	0.27	0.34
400	0.115	0.145	0.170	0.22	0.180	0.24	0.30	0.125	0.150	0.195	0.160	0.21	0.27	0.20	0.27	0.33
500	0.093	0.125	0.170	0.21	0.165	0.24	0.29	0.105	0.145	0.180	0.145	0.20	0.25	0.190	0.24	0.31
630	0.073	0.105	0.165	0.195	0.150	0.23	0.27	0.092	0.145	0.170	0.135	0.195	0.24	0.175	0.23	0.29
800	0.056	0.090	0.160	0.190	0.145	0.23	0.27	0.086	0.140	0.165	0.130	0.180	0.23	0.175	0.195	0.26
1000	0.045	0.092	0.155	0.180	0.140	0.21	0.25	0.080	0.135	0.155	0.125	0.170	0.21	0.165	0.180	0.24

Note: *Spacings larger than one cable diameter will result in a large voltage drop.
r = conductor resistance at operating temperature
x = reactance
z = impedance

Rated Voltage

Standard

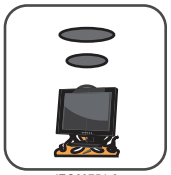


IEC 60331/BS 6387
NF C32-070-2.3(CR1)
Circuit Integrity

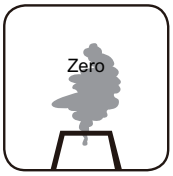

NF C32-070-2.2(C1)
IEC60332-3-24/EN50266-2-4
Reduced Fire Propagation


NF C32-070-2.1(C2)
IEC60332-1-2/EN50265-2-1
Flame Retardancy

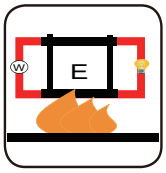

NES 02-713/NF C 20-454
Low Toxicity


IEC60754-2
EN50267-2-2/3
NF C 32-074
Low Corrosivity


IEC 61034-1&2
EN 50268-1&2/NF C32-07
Low Smoke Emission



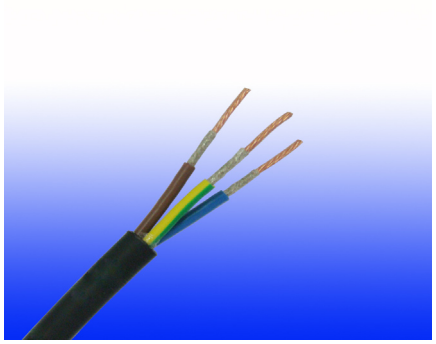
IEC60754-1
EN50267-2-1
Halogen Free

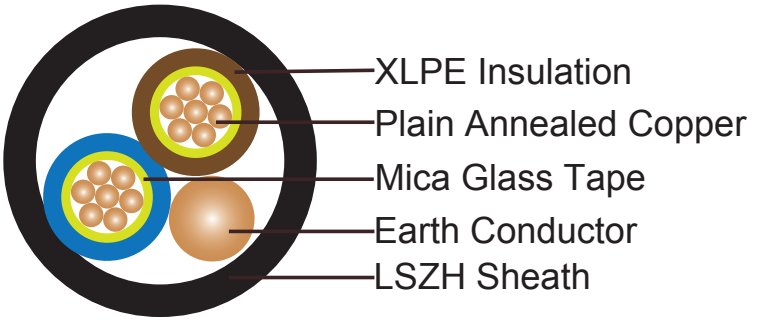


DIN 4102-12
Functional Integrity

300/500V Mica+XLPE Insulated, LSZH Sheathed Power Cables (2-4 Cores)

FFX200 05mRZ1-R (CU/MGT+XLPE/LSZH 300/500V Class 2)





APPLICATION

The cables are designed for areas where the integrity of the electrical circuit is critical in maintaining power supply. Applications can be found in emergency lightings, control and power circuits, power stations, fire alarm systems, underground tunnels, lifts, escalators, and high-rise buildings.

STANDARDS

Basic design adapted to IEC 60502-1

FIRE PERFORMANCE

Circuit Integrity	IEC 60331-21; BS 6387 CWZ; DIN VDE 0472-814(FE180); CEI 20-36/2-1; SS299-1; NBN C 30-004 (cat. F3); NF C32-070-2.3(CR1)
System circuit integrity	DIN 4102-12, E30 depending on lay system
Flame Retardance (Single Vertical Wire Test)	EN 60332-1-2; IEC 60332-1-2; BS EN 60332-1-2; VDE 0482-332-1; NBN C 30-004 (cat. F1); NF C32-070-2.1(C2); CEI 20-35/1-2; EN 50265-2-1*; DIN VDE 0482-265-2-1*
Reduced Fire Propagation (Vertically-mounted bundled wires & cable test)	EN 60332-3-24 (cat. C); IEC 60332-3-24; BS EN 60332-3-24; VDE 0482-332-3; NBN C 30-004 (cat. F2); NF C32-070-2.2(C1); CEI 20-22/3-4; EN 50266-2-4*; DIN VDE 0482-266-2-4
Halogen Free	IEC 60754-1; EN 50267-2-1; DIN VDE 0482-267-2-1; CEI 20-37/2-1; BS 6425-1*
No Corrosive Gas Emission	IEC 60754-2; EN 50267-2-2; DIN VDE 0482-267-2-2; CEI 20-37/2-2; BS 6425-2*
Minimum Smoke Emission	IEC 61034-1&2; EN 61034 -1&2; DIN VDE 0482-1034-1&2; CEI 20-37/3-1&2; EN 50268-1&2*; BS 7622-1&2*
No Toxic gases	NES 02-713; NF C 20-454

*Note: Asterisk * denotes superseded standard.*

VOLTAGE RATING

300/500 V

CABLE CONSTRUCTION

Conductor: Plain annealed copper wire, stranded according to IEC 60228 class 2.
Insulation: Mica glass tape covered by extruded XLPE compound.
Earth Conductor: Uninsulated solid or stranded tinned copper conductor.
Cabling: The cores are cabled together in concentric layers with suitable non-hygroscopic fillers.
Sheath: Thermoplastic LSZH compound type LTS3 as per BS 7655-6.1 (Thermosetting LSZH compound type SW2-SW4 as per BS 7655-2.6 can be offered.). UV resistance, hydrocarbon resistance, oil resistance, anti rodent and anti termite properties can be offered as option.

COLOUR CODE

Insulation Colour as per BS7671

	With Earth Conductor	Without Earth Conductor
2 Cores	-	Brown, Blue
3 Cores	Yellow/Green, Brown, Blue	Brown, Grey, Black
4 Cores	Yellow/Green, Brown, Grey, Black	Brown, Grey, Black, Blue

Sheath Colour: Black (other colours upon request)

PHYSICAL AND THERMAL PROPERTIES

Temperature range during operation (fixed state): -30°C – +90°C
Temperature range during installation (mobile state): -20°C – +50°C
Minimum bending radius: 8 x Overall Diameter

ELECTRICAL PROPERTIES

Dielectric test:	2000 V r.m.s. x 5' (core/core)
Insulation resistance	1000 MΩ x km (at 20°C)
Short circuit temperature	250°C

CONSTRUCTION PARAMETERS

Conductor		FFX200 05mRZ1-R					
				Without Earth Conductor		With Earth Conductor	
No. of Core X Cross Section	No./Nominal Diameter of Strands	Nominal Insulation Thickness	Nominal Sheath Thickness	Nominal Overall Diameter	Approx. Weight	Nominal Overall Diameter	Approx. Weight
No*mm^2	No./mm	mm	mm	mm	kg/km	mm	kg/km
2 Cores							
2x1.5	7/0.53	0.5	0.5	7.7	70	8.2	80
2x2.5	7/0.67	0.5	0.5	8.8	100	9.6	120
2x4.0	7/0.85	0.5	0.5	9.8	140	10.5	170
3 Cores							
3x1.5	7/0.53	0.5	0.5	8.7	90	10.5	100

Conductor		FFX200 05mRZ1-R					
				Without Earth Conductor		With Earth Conductor	
No. of Core X Cross Section	No./Nominal Diameter of Strands	Nominal Insulation Thickness	Nominal Sheath Thickness	Nominal Overall Diameter	Approx. Weight	Nominal Overall Diameter	Approx. Weight
No*mm^2	No./mm	mm	mm	mm	kg/km	mm	kg/km
3x2.5	7/0.67	0.5	0.5	9.5	125	10.7	150
3x4.0	7/0.85	0.5	0.5	11.5	180	12.5	220
4 Cores							
4x1.5	7/0.53	0.5	0.5	10.3	105	12.2	120
4x2.5	7/0.67	0.5	0.5	11	155	13	190
4x4.0	7/0.85	0.5	0.5	12.5	255	13.5	270

ELECTRICAL PROPERTIES

Conductor Operating Temperature : 90°C
Ambient Temperature : 30°C
Current-Carrying Capacities (Amp)

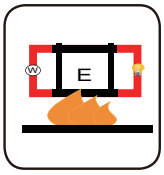
Conductor cross-sectional area	Reference Method A (enclosed in conduit in thermally insulating wall etc)		Reference Method B (enclosed in conduit on a wall or in trunking etc)		Reference Method C (clipped direct)		Reference Method E (in free air or on a perforated cable tray, horizontal or vertical etc) Touching	
	1 two-core cable*, single-phase a.c. or d.c.	1 three-or four core cable*, three-phase a.c.	1 two-core cable*, single-phase a.c. or d.c.	1 three-or four core cable*, three-phase a.c.	1 two-core cable*, single-phase a.c. or d.c.	1 three-or four core cable*, three-phase a.c.	1 two-core cable*, single-phase a.c. or d.c.	1 three-or four core cable*, three-phase a.c.
1	2	3	4	5	6	7	8	9
mm^2	A	A	A	A	A	A	A	A
1.5	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

Voltage Drop (Per Amp Per Meter)

Conductor cross-sectional area	Two-core cables, d.c.	Two-core cable, single-phase a.c.	Three-or four core cable, three-phase a.c.
1	2	3	4
mm^2	mV/A/m	mV/A/m	mV/A/m
1.5	31	31	27
2.5	19	19	16
4	12	12	10

Rated Voltage

Standard



IEC 60331/BS 6387
NF C32-070-2.3(CR1)
Circuit Integrity

NF C32-070-2.2(C1)
IEC60332-3-24/EN50266-2-4
Reduced Fire Propagation

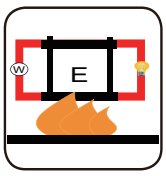
NF C32-070-2.1(C2)
IEC60332-1-2/EN50265-2-1
Flame Retardancy

NES 02-713/NF C 20-454
Low Toxicity

IEC60754-2
EN50267-2-2/3
NF C 32-074
Low Corrosivity

IEC 61034-1&2
EN 50268-1&2/NF C32-07
Low Smoke Emission

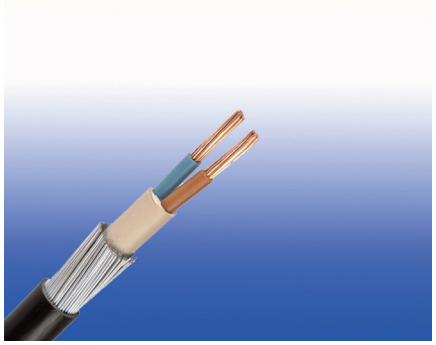
IEC60754-1
EN50267-2-1
Halogen Free

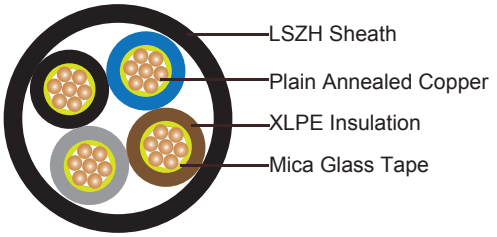


DIN 4102-12
Functional Integrity

600/1000V Mica+XLPE Insulated, LSZH Sheathed Power Cables (2-4 cores & Multicore)

FFX400 1mRZ1-R (CU/MGT+XLPE/LSZH 600/1000V Class 2)





APPLICATION

This cable is designed for areas where the integrity of the electrical properties circuit is critical in maintaining power supply. Applications can be found in emergency lightings, control and power circuits, power stations, fire alarm systems, underground tunnels, communications systems, sewage treatment plants, lifts, escalators, and high-rise buildings.

STANDARDS

Basic design to IEC 60502-1

FIRE PERFORMANCE

Circuit Integrity	IEC 60331-21; BS 6387 CWZ; DIN VDE 0472-814(FE180); CEI 20-36/2-1; SS299-1; NBN C 30-004 (cat. F3); NF C32-070-2.3(CR1); BS 7846-(F2)
System circuit integrity	DIN 4102-12, E30 depending on lay system
Flame Retardance (Single Vertical Wire Test)	EN 60332-1-2; IEC 60332-1-2; BS EN 60332-1-2; VDE 0482-332-1; NBN C 30-004 (cat. F1); NF C32-070-2.1(C2); CEI 20-35/1-2; EN 50265-2-1*; DIN VDE 0482-265-2-1*
Reduced Fire Propagation (Vertically-mounted bundled wires & cable test)	EN 60332-3-24 (cat. C); IEC 60332-3-24; BS EN 60332-3-24; VDE 0482-332-3; NBN C 30-004 (cat. F2); NF C32-070-2.2(C1); CEI 20-22/3-4; EN 50266-2-4*; DIN VDE 0482-266-2-4
Halogen Free	IEC 60754-1; EN 50267-2-1; DIN VDE 0482-267-2-1; CEI 20-37/2-1; BS 6425-1*
No Corrosive Gas Emission	IEC 60754-2; EN 50267-2-2; DIN VDE 0482-267-2-2; CEI 20-37/2-2; BS 6425-2*
Minimum Smoke Emission	IEC 61034-1&2; EN 61034 -1&2; DIN VDE 0482-1034-1&2; CEI 20-37/3-1&2; EN 50268-1&2*; BS 7622-1&2*
No Toxic gases	NES 02-713; NF C 20-454

*Note: Asterisk * denotes superseded standard.*

VOLTAGE RATING

600/1000 V

CABLE CONSTRUCTION

Conductor: Plain annealed copper wire, stranded according to IEC 60228 class 2.
Insulation: Mica glass tape covered by extruded XLPE compound.
Cabling: The cores are cabled together in concentric layers with suitable non-hygroscopic fillers.
Sheath: Thermoplastic LSZH compound type LTS3 as per BS 7655-6.1 (Thermosetting LSZH compound type SW2-SW4 as per BS 7655-2.6 can be offered.). UV resistance, hydrocarbon resistance, oil resistance, anti rodent and anti termite properties can be offered as option.

COLOUR CODE

Insulation Colour as per BS7671

	With Earth Conductor	Without Earth Conductor
2 Cores	-	Brown, Blue
3 Cores	Yellow/Green, Brown, Blue	Brown, Grey, Black
4 Cores	Yellow/Green, Brown, Grey, Black	Brown, Grey, Black, Blue
5 Cores	Yellow/Green, Brown, Grey, Black, Blue	Brown, Grey, Black, Blue, Black
above 5 Cores	Yellow/Green, Black Numbered	Black Numbered

Sheath Colour: Black (other colours upon request)

PHYSICAL AND THERMAL PROPERTIES

Temperature range during operation (fixed state): -30°C – +90°C
Temperature range during installation (mobile state): -20°C – +50°C
Minimum bending radius: 8 x Overall Diameter

ELECTRICAL PROPERTIES

Dielectric test:	3500 V r.m.s. x 5' (core/core)
Insulation resistance	1000 MΩ x km (at 20°C)
Short circuit temperature	250°C

CONSTRUCTION PARAMETERS

Conductor		FFX400 1mRZ1-R		
No. of Core X Cross Section	No./Nominal Diameter of Strands	Nominal Insulation Thickness	Nominal Overall Diameter	Approx. Weight
No.×mm^2	No./mm	mm	mm	kg/km
2 Cores				
2G1.5	7/0.53	0.7	12.2	150
2G2.5	7/0.67	0.7	12.6	180

Conductor		FFX400 1mRZ1-R		
No. of Core X Cross Section	No./Nominal Diameter of Strands	Nominal Insulation Thickness	Nominal Overall Diameter	Approx. Weight
No.×mm^2	No./mm	mm	mm	kg/km
2G4	7/0.85	0.7	14.7	250
2G6	7/1.04	0.7	16.2	290
2G10	7/1.35	0.7	17.1	450
2G16	7/1.70	0.7	19.2	550
2G25	7/2.14	0.9	20	680
2G35	19/1.53	0.9	22	940
2G50	19/1.78	1.0	24	1250
2G70	19/2.14	1.1	27	1700
2G95	19/2.52	1.1	31	2300
2G120	37/2.03	1.2	36	3150
3 Cores				
3G1.5	7/0.53	0.7	12.3	170
3G2.5	7/0.67	0.7	13.8	200
3G4	7/0.85	0.7	15.2	300
3G6	7/1.04	0.7	16.8	380
3G10	7/1.35	0.7	18	550
3G16	7/1.70	0.7	21	760
3G25	7/2.14	0.9	22	960
3G35	19/1.53	0.9	24	1300
3G50	19/1.78	1.0	28	1700
3G70	19/2.14	1.1	31	2400
3G95	19/2.52	1.1	36	3250
3G120	37/2.03	1.2	38	4000
3G150	37/2.25	1.4	42	5000
3G185	37/2.52	1.6	47	6100
3G240	61/2.25	1.7	52	8000
3G300	61/2.52	1.8	59	9850
3G400	61/2.85	2.0	63	13000
3 Cores+1 Core Earth Conductor				
3G10/6	7/1.35	0.7	18.6	580
3G16/10	7/1.70	0.7	19.7	810
3G25/10	7/2.14	0.9	22	1090
3G25/16	7/2.14	0.9	23	1150

Conductor		FFX400 1mRZ1-R		
No. of Core X Cross Section	No./Nominal Diameter of Strands	Nominal Insulation Thickness	Nominal Overall Diameter	Approx. Weight
No.×mm^2	No./mm	mm	mm	kg/km
3G35/16	19/1.53	0.9	26	1420
3G35/25	19/1.53	0.9	27	1490
3G50/16	19/1.78	1.0	29	1800
3G50/25	19/1.78	1.0	30	1890
3G50/35	19/1.78	1.0	31	1920
3G70/16	19/2.14	1.1	32	2200
3G70/25	19/2.14	1.1	33	2400
3G70/35	19/2.14	1.1	35	2900
3G70/50	19/2.14	1.1	36	3300
3G95/16	19/2.52	1.1	37	3560
3G95/25	19/2.52	1.1	38	3700
3G95/35	19/2.52	1.1	39	3910
3G95/50	19/2.52	1.1	40	4200
3G120/35	37/2.03	1.2	40	4250
3G120/50	37/2.03	1.2	41	4300
3G120/70	37/2.03	1.2	42	4400
3G120/95	37/2.03	1.2	43	4600
3G150/50	37/2.25	1.4	44	5700
3G150/70	37/2.25	1.4	45	6700
3G150/95	37/2.25	1.4	46	6800
3G150/120	37/2.25	1.4	47	6900
3G185/70	37/2.52	1.6	49	7980
3G185/95	37/2.52	1.6	50	8050
3G185/120	37/2.52	1.6	51	8200
3G185/150	37/2.52	1.6	51	8400
3G240/70	61/2.25	1.7	52	8800
3G240/95	61/2.25	1.7	57	9000
3G240/120	61/2.25	1.7	58	9500
3G240/150	61/2.25	1.7	59	9700
3G300/95	61/2.52	1.8	60	10300
3G300/120	61/2.52	1.8	61	11050
3G300/150	61/2.52	1.8	62	12000
3G300/185	61/2.52	1.8	64	12800

Conductor		FFX400 1mRZ1-R		
No. of Core X Cross Section	No./Nominal Diameter of Strands	Nominal Insulation Thickness	Nominal Overall Diameter	Approx. Weight
No.×mm^2	No./mm	mm	mm	kg/km
3G300/240	61/2.52	1.8	67	13800
4 Cores				
4G1.5	7/0.53	0.7	14.3	210
4G2.5	7/0.67	0.7	15.2	270
4G4	7/0.85	0.7	17.2	380
4G6	7/1.04	0.7	19	440
4G10	7/1.35	0.7	20.6	670
4G16	1/1.70	0.7	23.6	820
4G25	7/2.14	0.9	26	1320
4G35	19/1.53	0.9	29	1730
4G50	19/1.78	1.0	32	2300
4G70	19/2.14	1.1	38	3180
4G95	19/2.52	1.1	41.9	4370
4G120	37/2.03	1.2	44	5400
4G150	37/2.25	1.4	50.8	6500
4G185	37/2.52	1.6	55	8200
4G240	61/2.25	1.7	60.5	10600
4G300	61/2.52	1.8	68.5	13200
4G400	61/2.85	2.0	76	17000
4 Cores+1 Core Earth Conductor				
4G10/6	7/1.35	0.7	21	740
4G16/10	7/1.70	0.7	22	900
4G25/10	7/2.14	0.7	24	1200
4G25/16	7/2.14	0.7	25	1450
4G35/16	19/1.53	0.9	29.4	1800
4G35/25	19/1.53	0.9	29.6	1890
4G50/16	19/1.78	1.0	33	2400
4G50/25	19/1.78	1.0	35.8	2560
4G50/35	19/1.78	1.0	36.8	2730
4G70/16	19/2.14	1.1	40	3350
4G70/25	19/2.14	1.1	41	3500
4G70/35	19/2.14	1.1	41.5	3800
4G70/50	19/2.14	1.1	41.7	4600

Conductor		FFX400 1mRZ1-R		
No. of Core X Cross Section	No./Nominal Diameter of Strands	Nominal Insulation Thickness	Nominal Overall Diameter	Approx. Weight
No.×mm^2	No./mm	mm	mm	kg/km
4G95/16	19/2.52	1.1	41.8	5300
4G95/25	19/2.52	1.1	42.6	5700
4G95/35	19/2.52	1.1	43.4	6390
4G95/50	19/2.52	1.1	43.9	6600
4G120/35	37/2.03	1.2	44	6400
4G120/50	37/2.03	1.2	45	6500
4G120/70	37/2.03	1.2	46	6600
4G120/95	37/2.03	1.2	47	6700
4G150/50	37/2.25	1.4	52	7600
4G150/70	37/2.25	1.4	53	7800
4G150/95	37/2.25	1.4	54	7900
4G150/120	37/2.25	1.4	55	8100
4G185/70	37/2.52	1.6	56	8400
4G185/95	37/2.52	1.6	57	8800
4G185/120	37/2.52	1.6	58	9200
4G185/150	37/2.52	1.6	60	9700
4G240/70	61/2.25	1.7	62	10800
4G240/95	61/2.25	1.7	65	11400
4G240/120	61/2.25	1.7	66	11900
4G240/150	61/2.25	1.7	68	12400
4G300/95	61/2.52	1.8	69	12800
4G300/120	61/2.52	1.8	70	13400
4G300/150	61/2.52	1.8	71	13900
4G300/185	61/2.52	1.8	74	14800
4G300/240	61/2.52	1.8	76	16200
5 Cores				
5G1.5	7/0.53	0.7	16.8	247
5G2.5	7/0.67	0.7	17.9	317
5G4	7/0.85	0.7	20.2	447
5G6	7/1.04	0.7	22.3	517
5G10	7/1.35	0.7	24.2	787
5G16	1/1.70	0.7	27.7	964
5G25	7/2.14	0.9	30.6	1551

Conductor		FFX400 1mRZ1-R		
No. of Core X Cross Section	No./Nominal Diameter of Strands	Nominal Insulation Thickness	Nominal Overall Diameter	Approx. Weight
No.×mm^2	No./mm	mm	mm	kg/km
5G35	19/1.53	0.9	34.1	2033
5G50	19/1.78	1.0	37.6	2703
5G70	19/2.14	1.1	44.7	3737
5G95	19/2.52	1.1	49.2	5135
5G120	37/2.03	1.2	51.7	6345
5G150	37/2.25	1.4	59.7	7638
5G185	37/2.52	1.6	64.6	9635
5G240	61/2.25	1.7	71.1	12455
5G300	61/2.52	1.8	80.5	15510
5G400	61/2.85	2.0	89.3	19975

ELECTRICAL PROPERTIES

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

Current-Carrying Capacities (Amp)

Conductor cross-sectional area	Reference Method A (enclosed in conduit in thermally insulating wall etc)		Reference Method B (enclosed in conduit on a wall or in trunking etc)		Reference Method C (clipped direct)		Reference Method E (in free air or on a perforated cable tray, horizontal or vertical etc) Touching	
	1 two-core cable*, single-phase a.c. or d.c.	1 three-or four core cable*, three-phase a.c.	1 two-core cable*, single-phase a.c. or d.c.	1 three-or four core cable*, three-phase a.c.	1 two-core cable*, single-phase a.c. or d.c.	1 three-or four core cable*, three-phase a.c.	1 two-core cable*, single-phase a.c. or d.c.	1 three-or four core cable*, three-phase a.c.
1	2	3	4	5	6	7	8	9
mm^2	A	A	A	A	A	A	A	A
1.0	14.5	13	17	15	19	17	21	18
1.5	18.5	16.5	22	19.5	24	22	26	23
2.5	25	22	30	26	33	30	36	32
4	33	30	40	35	45	40	49	42
6	42	38	51	44	58	52	63	54
10	57	51	69	60	80	71	86	75

Conductor cross-sectional area	Reference Method A (enclosed in conduit in thermally insulating wall etc)		Reference Method B (enclosed in conduit on a wall or in trunking etc)		Reference Method C (clipped direct)		Reference Method E (in free air or on a perforated cable tray, horizontal or vertical etc) Touching	
	1 two-core cable*, single-phase a.c. or d.c.	1 three-or four core cable*, three-phase a.c.	1 two-core cable*, single-phase a.c. or d.c.	1 three-or four core cable*, three-phase a.c.	1 two-core cable*, single-phase a.c. or d.c.	1 three-or four core cable*, three-phase a.c.	1 two-core cable*, single-phase a.c. or d.c.	1 three-or four core cable*, three-phase a.c.
1	2	3	4	5	6	7	8	9
mm^2	A	A	A	A	A	A	A	A
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	1654	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

Voltage Drop (Per Amp Per Meter)

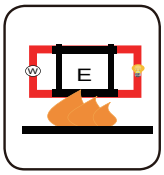
Conductor cross-sectional area	Two-core cables, d.c.	Two-core cable, single-phase a.c.	Three-or four core cable, three-phase a.c.
1	2	3	4
mm^2	mV/A/m	mV/A/m	mV/A/m
1.0	46	46	40
1.5	31	31	27
2.5	19	19	16
4	12	12	10
6	7.9	7.9	6.8
10	4.7	4.7	4.0
16	2.9	2.9	2.5

Conductor cross-sectional area	Two-core cables, d.c.	Two-core cable, single-phase a.c.			Three-or four core cable, three-phase a.c.		
1	2	3			4		
mm^2	mV/A/m	mV/A/m			mV/A/m		
		r	x	z	r	x	z
25	1.85	1.85	0.160	1.90	1.60	0.140	1.65
35	1.35	1.35	0.155	1.35	1.15	0.135	1.15
50	0.98	0.99	0.155	1.00	0.86	0.135	0.87
70	0.67	0.67	0.150	0.69	0.59	0.130	0.60
95	0.49	0.50	0.150	0.52	0.43	0.130	0.45
120	0.39	0.40	0.145	0.42	0.34	0.130	0.37
150	0.31	0.32	0.145	0.35	0.38	0.125	0.30
185	0.25	0.26	0.145	0.29	0.22	0.125	0.26
240	0.195	0.200	0.140	0.24	0.175	0.125	0.21
300	0.155	0.160	0.140	0.21	0.140	0.120	0.185
400	0.120	0.130	0.140	0.190	0.115	0.120	0.165

Note: *Spacings larger than one cable diameter will result in a large voltage drop.
r = conductor resistance at operating temperature
x = reactance
z = impedance

Rated Voltage

Standard

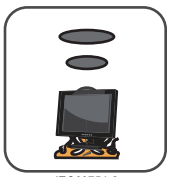


IEC 60331/BS 6387
NF C32-070-2.3(CR1)
Circuit Integrity


NF C32-070-2.2(C1)
IEC60332-3-24/EN50266-2-4
Reduced Fire Propagation

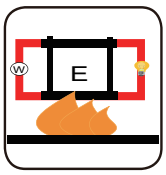

NF C32-070-2.1(C2)
IEC60332-1-2/EN50265-2-1
Flame Retardancy


NES 02-713/NF C 20-454
Low Toxicity


IEC60754-2
EN50267-2-2/3
NF C 32-074
Low Corrosivity


IEC 61034-1&2
EN 50268-1&2/NF C32-07
Low Smoke Emission

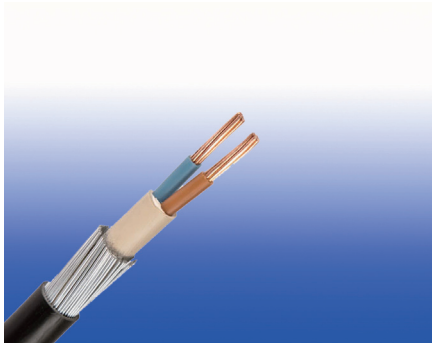
IEC60754-1
EN50267-2-1
Halogen Free

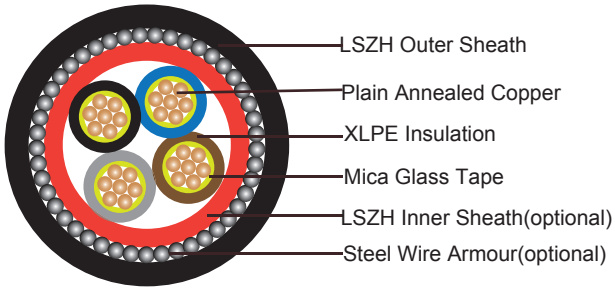


DIN 4102-12
Functional Integrity

600/1000V Mica+XLPE Insulated, LSZH Sheathed Power Cables (2-4 cores & Multicore)

FFX400 1mRZ1MZ1-R (CU/MGT+XLPE/LSZH/SWA/LSZH 600/1000V Class 2)





APPLICATION

This cable is designed for areas where the integrity of the electrical properties circuit is critical in maintaining power supply. Applications can be found in emergency lightings, control and power circuits, power stations, fire alarm systems, underground tunnels, communications systems, sewage treatment plants, lifts, escalators, and high-rise buildings.

STANDARDS

Basic design to IEC 60502-1

FIRE PERFORMANCE

Circuit Integrity	IEC 60331-21; BS 6387 CWZ; DIN VDE 0472-814(FE180); CEI 20-36/2-1; SS299-1; NBN C 30-004 (cat. F3); NF C32-070-2.3(CR1); BS 7846-(F2)
System circuit integrity	DIN 4102-12, E30 depending on lay system
Flame Retardance (Single Vertical Wire Test)	EN 60332-1-2; IEC 60332-1-2; BS EN 60332-1-2; VDE 0482-332-1; NBN C 30-004 (cat. F1); NF C32-070-2.1(C2); CEI 20-35/1-2; EN 50265-2-1*; DIN VDE 0482-265-2-1*
Reduced Fire Propagation (Vertically-mounted bundled wires & cable test)	EN 60332-3-24 (cat. C); IEC 60332-3-24; BS EN 60332-3-24; VDE 0482-332-3; NBN C 30-004 (cat. F2); NF C32-070-2.2(C1); CEI 20-22/3-4; EN 50266-2-4*; DIN VDE 0482-266-2-4
Halogen Free	IEC 60754-1; EN 50267-2-1; DIN VDE 0482-267-2-1; CEI 20-37/2-1; BS 6425-1*
No Corrosive Gas Emission	IEC 60754-2; EN 50267-2-2; DIN VDE 0482-267-2-2; CEI 20-37/2-2; BS 6425-2*
Minimum Smoke Emission	IEC 61034-1&2; EN 61034 -1&2; DIN VDE 0482-1034-1&2; CEI 20-37/3-1&2; EN 50268-1&2*; BS 7622-1&2*
No Toxic gases	NES 02-713; NF C 20-454

*Note: Asterisk * denotes superseded standard.*

VOLTAGE RATING

600/1000 V

CABLE CONSTRUCTION

Conductor: Plain annealed copper wire, stranded according to IEC 60228 class 2.
Insulation: Mica glass tape covered by extruded XLPE compound.
Cabling: The cores are cabled together in concentric layers with suitable non-hygroscopic fillers.
Inner Sheath: Thermoplastic LSZH compound type LTS3 as per BS 7655-6.1.
Armouring: Galvanized steel wire armour.
Outer Sheath: Thermoplastic LSZH compound type LTS3 as per BS 7655-6.1 (Thermosetting LSZH compound type SW2-SW4 as per BS 7655-2.6 can be offered.). UV resistance, hydrocarbon resistance, oil resistance, anti rodent and anti termite properties can be offered as option.

COLOUR CODE

Insulation Colour as per BS7671

	With Earth Conductor	Without Earth Conductor
2 Cores	-	Brown, Blue
3 Cores	Yellow/Green, Brown, Blue	Brown, Grey, Black
4 Cores	Yellow/Green, Brown, Grey, Black	Brown, Grey, Black, Blue
5 Cores	Yellow/Green, Brown, Grey, Black, Blue	Brown, Grey, Black, Blue, Black
above 5 Cores	Yellow/Green, Black Numbered	Black Numbered

Sheath Colour: Black (other colours upon request)

PHYSICAL AND THERMAL PROPERTIES

Temperature range during operation (fixed state): -30°C – +90°C
Temperature range during installation (mobile state): -20°C – +50°C
Minimum bending radius: 10 x Overall Diameter

ELECTRICAL PROPERTIES

Dielectric test:	3500 V r.m.s. x 5' (core/core)
Insulation resistance	1000 MΩ x km (at 20°C)
Short circuit temperature	250°C

CONSTRUCTION PARAMETERS

Conductor		FFX400 1mRZ1MZ1-R			
No. of Core X Cross Section	No./Nominal Diameter of Strands	Nominal Insulation Thickness	Nominal Steel Armour Wire Diameter	Nominal Overall Diameter	Approx. Weight
No.×mm^2	No./mm	mm	mm	mm	kg/km
2 Cores					
2G1.5	7/0.53	0.7	0.8	15.3	390
2G2.5	7/0.67	0.7	0.8	16.5	450

Conductor		FFX400 1mRZ1MZ1-R			
No. of Core X Cross Section	No./Nominal Diameter of Strands	Nominal Insulation Thickness	Nominal Steel Armour Wire Diameter	Nominal Overall Diameter	Approx. Weight
No.×mm^2	No./mm	mm	mm	mm	kg/km
2G4	7/0.85	0.7	0.8	17.6	525
2G6	7/1.04	0.7	0.8	18.8	620
2G10	7/1.35	0.7	0.8	21	800
2G16	7/1.70	0.7	1.25	23	1100
2G25	7/2.14	0.9	1.6	27	1480
2G35	19/1.53	0.9	2.0	30	2000
2G50	19/1.78	1.0	2.5	33	2450
2G70	19/2.14	1.1	3.15	37	3200
2G95	19/2.52	1.1	3.15	42	4350
2G120	37/2.03	1.2	3.15	48	6500
3 Cores					
3G1.5	7/0.53	0.7	0.8	16.5	420
3G2.5	7/0.67	0.7	0.8	17	500
3G4	7/0.85	0.7	0.8	18.5	600
3G6	7/1.04	0.7	0.8	19.8	785
3G10	7/1.35	0.7	0.8	22.6	1030
3G16	7/1.70	0.7	1.25	25	1370
3G25	7/2.14	0.9	1.6	29	1900
3G35	19/1.53	0.9	2.0	32	2300
3G50	19/1.78	1.0	2.5	35	2900
3G70	19/2.14	1.1	3.15	40	4000
3G95	19/2.52	1.1	3.15	45	5400
3G120	37/2.03	1.2	3.15	49	6450
3G150	37/2.25	1.4	3.15	55	8200
3G185	37/2.52	1.6	3.15	60	9800
3G240	61/2.25	1.7	3.15	68	12300
3G300	61/2.52	1.8	3.15	74	14800
3G400	61/2.85	2.0	3.15	83	17600
3 Cores+1 Core Earth Conductor					
3G10/6	7/1.35	0.7	0.8	22.9	1100
3G16/10	7/1.70	0.7	1.6	25.7	1385
3G25/10	7/2.14	0.9	1.6	27.3	1980

Conductor		FFX400 1mRZ1MZ1-R			
No. of Core X Cross Section	No./Nominal Diameter of Strands	Nominal Insulation Thickness	Nominal Steel Armour Wire Diameter	Nominal Overall Diameter	Approx. Weight
No.×mm^2	No./mm	mm	mm	mm	kg/km
3G25/16	7/2.14	0.9	1.6	29.8	2070
3G35/16	19/1.53	0.9	2.0	30.5	2190
3G35/25	19/1.53	0.9	2.0	32.8	2400
3G50/16	19/1.78	1.0	2.5	36	3100
3G50/25	19/1.78	1.0	2.5	36.6	3250
3G50/35	19/1.78	1.0	2.5	37.3	3360
3G70/16	19/2.14	1.1	3.15	38	3600
3G70/25	19/2.14	1.1	3.15	41	3990
3G70/35	19/2.14	1.1	3.15	42	4760
3G70/50	19/2.14	1.1	3.15	44	5120
3G95/16	19/2.52	1.1	3.15	45.8	5600
3G95/25	19/2.52	1.1	3.15	46.7	6150
3G95/35	19/2.52	1.1	3.15	47.2	6340
3G95/50	19/2.52	1.1	3.15	47.8	6500
3G120/35	37/2.03	1.2	3.15	49	6600
3G120/50	37/2.03	1.2	3.15	50.5	6990
3G120/70	37/2.03	1.2	3.15	51	7200
3G120/95	37/2.03	1.2	3.15	52.3	7600
3G150/50	37/2.25	1.4	3.15	57	9000
3G150/70	37/2.25	1.4	3.15	59	10600
3G150/95	37/2.25	1.4	3.15	60	10900
3G150/120	37/2.25	1.4	3.15	61	11100
3G185/70	37/2.52	1.6	3.15	63	11650
3G185/95	37/2.52	1.6	3.15	64	12000
3G185/120	37/2.52	1.6	3.15	65	12300
3G185/150	37/2.52	1.6	3.15	67	12700
3G240/70	61/2.25	1.7	3.15	70	12900
3G240/95	61/2.25	1.7	3.15	71	13500
3G240/120	61/2.25	1.7	3.15	73	14000
3G240/150	61/2.25	1.7	3.15	74	14700
3G300/95	61/2.52	1.8	3.15	75	15600
3G300/120	61/2.52	1.8	3.15	76	15720

Conductor		FFX400 1mRZ1MZ1-R			
No. of Core X Cross Section	No./Nominal Diameter of Strands	Nominal Insulation Thickness	Nominal Steel Armour Wire Diameter	Nominal Overall Diameter	Approx. Weight
No.×mm^2	No./mm	mm	mm	mm	kg/km
3G300/150	61/2.52	1.8	3.15	77	16000
3G300/185	61/2.52	1.8	3.15	79	17560
3G300/240	61/2.52	1.8	3.15	86	18900
4 Cores					
4G1.5	7/0.53	0.7	0.8	16	475
4G2.5	7/0.67	0.7	0.8	17.8	570
4G4	7/0.85	0.7	0.8	19.8	690
4G6	7/1.04	0.7	0.8	21	940
4G10	7/1.35	0.7	0.8	23.3	1200
4G16	1/1.70	0.7	1.25	26.5	1400
4G25	7/2.14	0.9	1.6	30.5	2400
4G35	19/1.53	0.9	2.0	34	2800
4G50	19/1.78	1.0	2.5	38	3500
4G70	19/2.14	1.1	3.15	44	5300
4G95	19/2.52	1.1	3.15	48.5	6700
4G120	37/2.03	1.2	3.15	54	8500
4G150	37/2.25	1.4	3.15	59	10000
4G185	37/2.52	1.6	3.15	64.5	12200
4G240	61/2.25	1.7	3.15	74	15400
4G300	61/2.52	1.8	3.15	82	19500
4G400	61/2.85	2.0	3.15	92	25500
4 Cores+1 Core Earth Conductor					
4G10/6	7/1.35	0.7	0.8	24	1300
4G16/10	7/1.70	0.7	1.25	26	1600
4G25/10	7/2.14	0.7	1.6	29	2015
4G25/16	7/2.14	0.7	1.6	32	2540
4G35/16	19/1.53	0.9	2.0	35	3000
4G35/25	19/1.53	0.9	2.0	35.6	3170
4G50/16	19/1.78	1.0	2.5	40	3800
4G50/25	19/1.78	1.0	2.5	41.4	4100
4G50/35	19/1.78	1.0	2.5	42.9	4350
4G70/16	19/2.14	1.1	3.15	45	6270

Conductor		FFX400 1mRZ1MZ1-R			
No. of Core X Cross Section	No./Nominal Diameter of Strands	Nominal Insulation Thickness	Nominal Steel Armour Wire Diameter	Nominal Overall Diameter	Approx. Weight
No.×mm^2	No./mm	mm	mm	mm	kg/km
4G70/25	19/2.14	1.1	3.15	47	6900
4G70/35	19/2.14	1.1	3.15	48	7200
4G70/50	19/2.14	1.1	3.15	50	7600
4G95/16	19/2.52	1.1	3.15	51	8000
4G95/25	19/2.52	1.1	3.15	52	8100
4G95/35	19/2.52	1.1	3.15	53	8250
4G95/50	19/2.52	1.1	3.15	54	8390
4G120/35	37/2.03	1.2	3.15	54	8600
4G120/50	37/2.03	1.2	3.15	55	8800
4G120/70	37/2.03	1.2	3.15	56	9100
4G120/95	37/2.03	1.2	3.15	57	9400
4G150/50	37/2.25	1.4	3.15	61	10800
4G150/70	37/2.25	1.4	3.15	62	11100
4G150/95	37/2.25	1.4	3.15	64	11500
4G150/120	37/2.25	1.4	3.15	65	11900
4G185/70	37/2.52	1.6	3.15	66	12900
4G185/95	37/2.52	1.6	3.15	68	13600
4G185/120	37/2.52	1.6	3.15	70	14700
4G185/150	37/2.52	1.6	3.15	73	15500
4G240/70	61/2.25	1.7	3.15	76	16000
4G240/95	61/2.25	1.7	3.15	77	16900
4G240/120	61/2.25	1.7	3.15	78	17600
4G240/150	61/2.25	1.7	3.15	79	18200
4G300/95	61/2.52	1.8	3.15	81	19700
4G300/120	61/2.52	1.8	3.15	82	20700
4G300/150	61/2.52	1.8	3.15	83	21060
4G300/185	61/2.52	1.8	3.15	85	22170
4G300/240	61/2.52	1.8	3.15	87	24500
5 Cores					
5G1.5	7/0.53	0.7	0.8	18.8	558
5G2.5	7/0.67	0.7	0.8	20.9	670
5G4	7/0.85	0.7	0.8	23.3	811

Conductor		FFX400 1mRZ1MZ1-R			
No. of Core X Cross Section	No./Nominal Diameter of Strands	Nominal Insulation Thickness	Nominal Steel Armour Wire Diameter	Nominal Overall Diameter	Approx. Weight
No.×mm^2	No./mm	mm	mm	mm	kg/km
5G6	7/1.04	0.7	0.8	24.7	1105
5G10	7/1.35	0.7	0.8	27.4	1410
5G16	1/1.70	0.7	1.25	31.1	1645
5G25	7/2.14	0.9	1.6	35.8	2820
5G35	19/1.53	0.9	2.0	40.0	3290
5G50	19/1.78	1.0	2.5	44.7	4113
5G70	19/2.14	1.1	3.15	51.7	6228
5G95	19/2.52	1.1	3.15	57.0	7873
5G120	37/2.03	1.2	3.15	63.5	9988
5G150	37/2.25	1.4	3.15	69.3	11750
5G185	37/2.52	1.6	3.15	75.8	14335
5G240	61/2.25	1.7	3.15	87.0	18095
5G300	61/2.52	1.8	3.15	96.4	22913
5G400	61/2.85	2.0	3.15	108.1	29963

ELECTRICAL PROPERTIES

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

Current-Carrying Capacities (Amp)

Conductor cross-sectional area	Reference Method C (clipped direct)		Reference Method E (in free air or on a perforated cable tray, horizontal or vertical)		Reference Method D (direct in in ground or in ducting in ground. in or around buildings)	
	1 two-core cable*, single-phase a.c. or d.c.	1 three-or four core cable*, three-phase a.c.	1 two-core cable*, single-phase a.c. or d.c.	1 three-or four core cable*, three-phase a.c.	1 two-core cable*, single-phase a.c. or d.c.	1 three-or four core cable*, three-phase a.c.
1	2	3	4	5	6	7
mm^2	A	A	A	A	A	A
1.5	27	23	29	25	25	21
2.5	36	31	39	33	33	28
4	49	42	52	44	43	36
6	62	53	66	56	53	44
10	85	73	90	78	71	58
16	110	94	115	99	91	75

Conductor cross-sectional area	Reference Method C (clipped direct)		Reference Method E (in free air or on a perforated cable tray, horizontal or vertical)		Reference Method D (direct in in ground or in ducting in ground. in or around buildings)	
	1 two-core cable*, single-phase a.c. or d.c.	1 three-or four core cable*, three-phase a.c.	1 two-core cable*, single-phase a.c. or d.c.	1 three-or four core cable*, three-phase a.c.	1 two-core cable*, single-phase a.c. or d.c.	1 three-or four core cable*, three-phase a.c.
1	2	3	4	5	6	7
mm^2	A	A	A	A	A	A
25	146	124	152	131	116	96
35	180	154	188	162	139	115
50	219	187	228	197	164	135
70	279	238	291	251	203	167
95	338	289	354	304	239	197
120	392	335	410	353	271	223
150	451	386	472	406	306	251
185	515	441	539	463	343	281
240	607	520	636	546	395	324
300	698	599	732	628	446	365
400	787	673	847	728	-	-

Voltage Drop (Per Amp Per Meter)

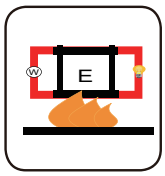
Conductor cross-sectional area	Two-core cables, d.c.	Two-core cable, single-phase a.c.			Three-or four core cable, three-phase a.c.		
1	2	3			4		
mm^2	mV/A/m	mV/A/m			mV/A/m		
1.5	31	31			27		
2.5	19	19			16		
4	12	12			10		
6	7.9	7.9			6.8		
10	4.7	4.7			4.0		
16	2.9	2.9			2.5		
		r	x	z	r	x	z
25	1.85	1.85	0.160	1.90	1.60	0.140	1.65
35	1.35	1.35	0.155	1.35	1.15	0.135	1.15
50	0.98	0.99	0.155	1.00	0.86	0.135	0.87
70	0.67	0.67	0.150	0.69	0.59	0.130	0.60
95	0.49	0.50	0.150	0.52	0.43	0.130	0.45
120	0.39	0.40	0.145	0.42	0.34	0.130	0.37

Conductor cross-sectional area	Two-core cables, d.c.	Two-core cable, single-phase a.c.			Three-or four core cable, three-phase a.c.		
1	2	3			4		
mm^2	mV/A/m	mV/A/m			mV/A/m		
150	0.31	0.32	0.145	0.35	0.38	0.125	0.30
185	0.25	0.26	0.145	0.29	0.22	0.125	0.26
240	0.195	0.200	0.140	0.24	0.175	0.125	0.21
300	0.155	0.160	0.140	0.21	0.140	0.120	0.185
400	0.120	0.130	0.140	0.190	0.115	0.120	0.165

Note: *Spacings larger than one cable diameter will result in a large voltage drop.
r = conductor resistance at operating temperature
x = reactance
z = impedance

Rated Voltage

Standard



IEC 60331/BS 6387
NF C32-070-2.3(CR1)
Circuit Integrity


NF C32-070-2.2(C1)
IEC60332-3-24/EN50266-2-4
Reduced Fire Propagation

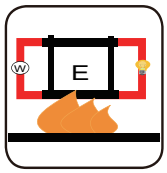

NF C32-070-2.1(C2)
IEC60332-1-2/EN50265-2-1
Flame Retardancy


NES 02-713/NF C 20-454
Low Toxicity


IEC60754-2
EN50267-2-2/3
NF C 32-074
Low Corrosivity


IEC 61034-1&2
EN 50268-1&2/NF C32-07
Low Smoke Emission

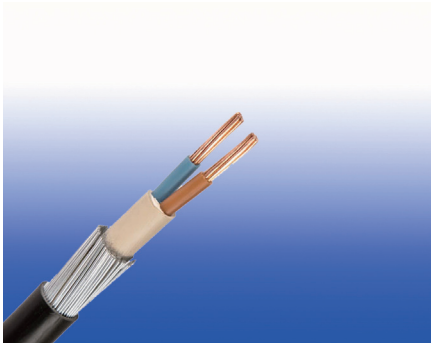
IEC60754-1
EN50267-2-1
Halogen Free

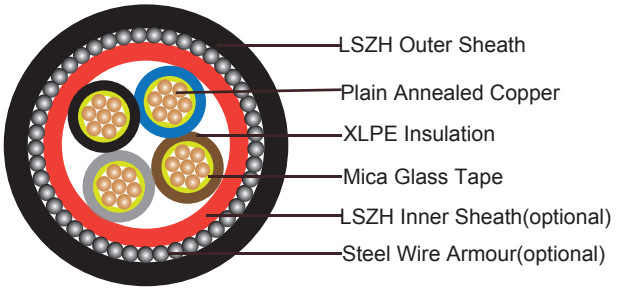


DIN 4102-12
Functional Integrity

600/1000V Mica+XLPE Insulated, LSZH Sheathed Power Cables (2-4 cores & Multicore)

FFX400 1mRZ1MZ1-R (CU/MGT+XLPE/LSZH/SWA/LSZH 600/1000V Class 2)





APPLICATION

This cable is designed for areas where the integrity of the electrical properties circuit is critical in maintaining power supply. Applications can be found in emergency lightings, control and power circuits, power stations, fire alarm systems, underground tunnels, communications systems, sewage treatment plants, lifts, escalators, and high-rise buildings.

STANDARDS

Basic design to BS 7846

FIRE PERFORMANCE

Circuit Integrity	IEC 60331-21; BS 6387 CWZ; DIN VDE 0472-814(FE180); CEI 20-36/2-1; SS299-1; NBN C 30-004 (cat. F3); NF C32-070-2.3(CR1); BS 7846-(F2)
System circuit integrity	DIN 4102-12, E30 depending on lay system
Flame Retardance (Single Vertical Wire Test)	EN 60332-1-2; IEC 60332-1-2; BS EN 60332-1-2; VDE 0482-332-1; NBN C 30-004 (cat. F1); NF C32-070-2.1(C2); CEI 20-35/1-2; EN 50265-2-1*; DIN VDE 0482-265-2-1*
Reduced Fire Propagation (Vertically-mounted bundled wires & cable test)	EN 60332-3-24 (cat. C); IEC 60332-3-24; BS EN 60332-3-24; VDE 0482-332-3; NBN C 30-004 (cat. F2); NF C32-070-2.2(C1); CEI 20-22/3-4; EN 50266-2-4*; DIN VDE 0482-266-2-4
Halogen Free	IEC 60754-1; EN 50267-2-1; DIN VDE 0482-267-2-1; CEI 20-37/2-1; BS 6425-1*
No Corrosive Gas Emission	IEC 60754-2; EN 50267-2-2; DIN VDE 0482-267-2-2; CEI 20-37/2-2; BS 6425-2*
Minimum Smoke Emission	IEC 61034-1&2; EN 61034 -1&2; DIN VDE 0482-1034-1&2; CEI 20-37/3-1&2; EN 50268-1&2*; BS 7622-1&2*
No Toxic gases	NES 02-713; NF C 20-454

*Note: Asterisk * denotes superseded standard.*

VOLTAGE RATING

600/1000 V

CABLE CONSTRUCTION

Conductor: Plain annealed copper wire, stranded according to IEC 60228 class 2.
Insulation: Mica glass tape covered by extruded XLPE compound.
Cabling: The cores are cabled together in concentric layers with suitable non-hygroscopic fillers.
Inner Sheath: Thermoplastic LSZH compound type LTS3 as per BS 7655-6.1.
Armouring: Galvanized steel wire armour.
Outer Sheath: Thermoplastic LSZH compound type LTS3 as per BS 7655-6.1 (Thermosetting LSZH compound type SW2-SW4 as per BS 7655-2.6 can be offered.). UV resistance, hydrocarbon resistance, oil resistance, anti rodent and anti termite properties can be offered as option.

COLOUR CODE

Insulation Colour as per BS7671

	With Earth Conductor	Without Earth Conductor
2 Cores	-	Brown, Blue
3 Cores	Yellow/Green, Brown, Blue	Brown, Grey, Black
4 Cores	Yellow/Green, Brown, Grey, Black	Brown, Grey, Black, Blue
5 Cores	Yellow/Green, Brown, Grey, Black, Blue	Brown, Grey, Black, Blue, Black
above 5 Cores	Yellow/Green, Black Numbered	Black Numbered

Sheath Colour: Black (other colours upon request)

PHYSICAL AND THERMAL PROPERTIES

Temperature range during operation (fixed state): -30°C – +90°C
Temperature range during installation (mobile state): -20°C – +50°C
Minimum bending radius: 10 x Overall Diameter

ELECTRICAL PROPERTIES

Dielectric test:	3500 V r.m.s. x 5' (core/core)
Insulation resistance	1000 MΩ x km (at 20°C)
Short circuit temperature	250°C

CONSTRUCTION PARAMETERS

Conductor		FFX400 1mRZ1MZ1-R					
No. of Core X Cross Section	No./Nominal Diameter of Strands	Nominal Insulation Thickness	Nominal Extruded Bedding Thickness	Nominal Steel Armour Wire Diameter	Nominal Sheath Thickness	Nominal Overall Diameter	Approx. Weight
No.×mm^2	No./mm	mm	mm	mm	mm	mm	kg/km
2 Cores							
2G1.5[a]	7/0.53	0.6	0.8	0.9	1.3	13.1	310

Conductor		FFX400 1mRZ1MZ1-R					
No. of Core X Cross Section	No./Nominal Diameter of Strands	Nominal Insulation Thickness	Nominal Extruded Bedding Thickness	Nominal Steel Armour Wire Diameter	Nominal Sheath Thickness	Nominal Overall Diameter	Approx. Weight
No.×mm^2	No./mm	mm	mm	mm	mm	mm	kg/km
2G2.5[a]	7/0.67	0.7	0.8	0.9	1.4	14.6	380
2G4[a]	7/0.85	0.7	0.8	0.9	1.4	15.7	450
2G6[a]	7/1.04	0.7	0.8	0.9	1.4	16.9	530
2G10[a]	7/1.35	0.7	0.8	0.9	1.5	19.0	630
2G16[a]	7/1.70	0.7	0.8	1.25	1.5	21.4	920
2G25[b]	7/2.14	0.9	0.8	1.25	1.6	21.4	1260
2G25[a]	7/2.14	0.9	0.8	1.25	1.6	25.1	1200
2G35[b]	19/1.53	0.9	1.0	1.6	1.7	24.3	1680
2G35[a]	19/1.53	0.9	1.0	1.6	1.7	28.7	1600
2G50[c]	19/1.78	1.0	1.0	1.6	1.8	26.8	2000
2G70	19/2.14	1.1	1.0	1.6	1.9	30.0	2400
2G95	19/2.52	1.1	1.2	2.0	2.0	34.1	3300
2G120	37/2.03	1.2	1.2	2.0	2.1	37.1	3800
2G150	37/2.25	1.4	1.2	2.0	2.2	40.3	4400
2G185	37/2.52	1.6	1.4	2.5	2.4	45.7	5700
2G240	61/2.25	1.7	1.4	2.5	2.5	50.0	7200
2G300	61/2.52	1.8	1.6	2.5	2.6	54.5	8300
2G400	61/2.85	2.0	1.6	2.5	2.8	60.0	10500
3 Cores							
3G1.5[a]	7/0.53	0.6	0.8	0.9	1.3	13.7	340
3G2.5[a]	7/0.67	0.7	0.8	0.9	1.4	15.2	430
3G4[a]	7/0.85	0.7	0.8	0.9	1.4	16.4	510
3G6[a]	7/1.04	0.7	0.8	0.9	1.4	17.7	620
3G10[a]	7/1.35	0.7	0.8	1.25	1.5	20.6	930
3G16[a]	7/1.70	0.7	0.8	1.25	1.6	22.7	1210
3G25[b]	7/2.14	0.9	1.0	1.6	1.7	24.7	1890
3G25[a]	7/2.14	0.9	1.0	1.6	1.7	27.8	1800
3G35[b]	19/1.53	0.9	1.0	1.6	1.8	26.8	2200
3G35[a]	19/1.53	0.9	1.0	1.6	1.8	30.5	2100
3G50[c]	19/1.78	1.0	1.0	1.6	1.8	29.6	2600
3G70	19/2.14	1.1	1.0	1.6	1.9	33.3	3400
3G95	19/2.52	1.1	1.2	2.0	2.1	38.1	4500

Conductor		FFX400 1mRZ1MZ1-R					
No. of Core X Cross Section	No./Nominal Diameter of Strands	Nominal Insulation Thickness	Nominal Extruded Bedding Thickness	Nominal Steel Armour Wire Diameter	Nominal Sheath Thickness	Nominal Overall Diameter	Approx. Weight
No.×mm^2	No./mm	mm	mm	mm	mm	mm	kg/km
3G120	37/2.03	1.2	1.2	2.0	2.2	41.5	5500
3G150	37/2.25	1.4	1.4	2.5	2.3	46.6	6900
3G185	37/2.52	1.6	1.4	2.5	2.4	50.9	8200
3G240	61/2.25	1.7	1.4	2.5	2.6	56.2	10200
3G300	61/2.52	1.8	1.6	2.5	2.7	61.3	12200
3G400	61/2.85	2.0	1.6	2.5	2.9	67.7	15000
3 Cores+1 Core Earth Conductor							
3G10/6	7/1.35	0.7	0.8	1.25	1.5	22.9	950
3G16/10	7/1.70	0.7	0.8	1.25	1.6	25.7	1320
3G25/10	7/2.14	0.9	1.0	1.6	1.7	27.3	1950
3G25/16	7/2.14	0.9	1.0	1.6	1.7	29.8	2000
3G35/16	19/1.53	0.9	1.0	1.6	1.8	30.5	2350
3G35/25	19/1.53	0.9	1.0	1.6	1.8	32.8	2400
3G50/16	19/1.78	1.0	1.0	1.6	1.8	36	2950
3G50/25	19/1.78	1.0	1.0	1.6	1.8	36.6	3000
3G50/35	19/1.78	1.0	1.0	1.6	1.8	37.3	3050
3G70/16	19/2.14	1.1	1.0	1.6	1.9	38	3750
3G70/25	19/2.14	1.1	1.0	1.6	1.9	41	3850
3G70/35	19/2.14	1.1	1.0	1.6	1.9	42	4000
3G70/50	19/2.14	1.1	1.0	1.6	1.9	44	4300
3G95/16	19/2.52	1.1	1.2	2.0	2.1	45.8	4800
3G95/25	19/2.52	1.1	1.2	2.0	2.1	46.7	5000
3G95/35	19/2.52	1.1	1.2	2.0	2.1	47.2	5150
3G95/50	19/2.52	1.1	1.2	2.0	2.1	47.8	5400
3G120/35	37/2.03	1.2	1.2	2.0	2.2	49	6100
3G120/50	37/2.03	1.2	1.2	2.0	2.2	50.5	6300
3G120/70	37/2.03	1.2	1.2	2.0	2.2	51	6550
3G120/95	37/2.03	1.2	1.2	2.0	2.2	52.3	6850
3G150/50	37/2.25	1.4	1.4	2.5	2.3	57	7300
3G150/70	37/2.25	1.4	1.4	2.5	2.3	59	7500
3G150/95	37/2.25	1.4	1.4	2.5	2.3	60	7800
3G150/120	37/2.25	1.4	1.4	2.5	2.3	61	8150

Conductor		FFX400 1mRZ1MZ1-R					
No. of Core X Cross Section	No./Nominal Diameter of Strands	Nominal Insulation Thickness	Nominal Extruded Bedding Thickness	Nominal Steel Armour Wire Diameter	Nominal Sheath Thickness	Nominal Overall Diameter	Approx. Weight
No.×mm^2	No./mm	mm	mm	mm	mm	mm	kg/km
3G185/70	37/2.52	1.6	1.4	2.5	2.4	63	8900
3G185/95	37/2.52	1.6	1.4	2.5	2.4	64	9150
3G185/120	37/2.52	1.6	1.4	2.5	2.4	65	9450
3G185/150	37/2.52	1.6	1.4	2.5	2.4	67	9900
3G240/70	61/2.25	1.7	1.4	2.5	2.6	70	11000
3G240/95	61/2.25	1.7	1.4	2.5	2.6	71	11350
3G240/120	61/2.25	1.7	1.4	2.5	2.6	73	11800
3G240/150	61/2.25	1.7	1.4	2.5	2.6	74	12300
3G300/95	61/2.52	1.8	1.6	2.5	2.7	75	12900
3G300/120	61/2.52	1.8	1.6	2.5	2.7	76	13200
3G300/150	61/2.52	1.8	1.6	2.5	2.7	77	13600
3G300/185	61/2.52	1.8	1.6	2.5	2.7	79	14200
3G300/240	61/2.52	1.8	1.6	2.5	2.7	86	15000
4 Cores							
4G1.5[a]	7/0.53	0.6	0.8	0.9	1.3	14.5	390
4G2.5[a]	7/0.67	0.7	0.8	0.9	1.4	16.2	490
4G4[a]	7/0.85	0.7	0.8	0.9	1.4	17.6	590
4G6[a]	7/1.04	0.7	0.8	1.25	1.5	19.9	830
4G10[a]	7/1.35	0.7	0.8	1.25	1.5	22.3	1040
4G16[a]	1/1.70	0.7	0.8	1.25	1.6	24.6	1370
4G25[b]	7/2.14	0.9	1.0	1.6	1.7	27.3	2190
4G25[a]	7/2.14	0.9	1.0	1.6	1.7	30.1	2100
4G35[b]	19/1.53	0.9	1.0	1.6	1.8	29.8	2600
4G35[a]	19/1.53	0.9	1.0	1.6	1.8	33.1	2500
4G50[c]	19/1.78	1.0	1.0	1.6	1.9	33.2	3200
4G70	19/2.14	1.1	1.2	2.0	2.1	38.9	4500
4G95	19/2.52	1.1	1.2	2.0	2.2	42.9	5600
4G120	37/2.03	1.2	1.4	2.5	2.3	48.3	7200
4G150	37/2.25	1.4	1.4	2.5	2.4	52.6	8500
4G185	37/2.52	1.6	1.4	2.5	2.6	57.8	10300
4G240	61/2.25	1.7	1.6	2.5	2.7	64.2	12800
4G300	61/2.52	1.8	1.6	2.5	2.9	70.0	15600

Conductor		FFX400 1mRZ1MZ1-R					
No. of Core X Cross Section	No./Nominal Diameter of Strands	Nominal Insulation Thickness	Nominal Extruded Bedding Thickness	Nominal Steel Armour Wire Diameter	Nominal Sheath Thickness	Nominal Overall Diameter	Approx. Weight
No.×mm^2	No./mm	mm	mm	mm	mm	mm	kg/km
4G400	61/2.85	2.0	1.8	3.15	3.2	79.3	20400
4 Cores+1 Core Earth Conductor							
4G10/6	7/1.35	0.7	0.7	0.8	1.25	24	1120
4G16/10	7/1.70	0.7	0.7	0.8	1.25	26	1490
4G25/10	7/2.14	0.7	0.9	1.0	1.6	29	2200
4G25/16	7/2.14	0.7	0.9	1.0	1.6	32	2250
4G35/16	19/1.53	0.9	1.0	1.6	1.8	35	2680
4G35/25	19/1.53	0.9	1.0	1.6	1.8	35.6	2760
4G50/16	19/1.78	1.0	1.0	1.6	1.9	40	3340
4G50/25	19/1.78	1.0	1.0	1.6	1.9	41.4	3550
4G50/35	19/1.78	1.0	1.0	1.6	1.9	42.9	3660
4G70/16	19/2.14	1.1	1.2	2.0	2.1	45	4900
4G70/25	19/2.14	1.1	1.2	2.0	2.1	47	5120
4G70/35	19/2.14	1.1	1.2	2.0	2.1	48	5300
4G70/50	19/2.14	1.1	1.2	2.0	2.1	50	5500
4G95/16	19/2.52	1.1	1.2	2.0	2.2	51	6050
4G95/25	19/2.52	1.1	1.2	2.0	2.2	52	6200
4G95/35	19/2.52	1.1	1.2	2.0	2.2	53	6450
4G95/50	19/2.52	1.1	1.2	2.0	2.2	54	6780
4G120/35	37/2.03	1.2	1.4	2.5	2.3	54	7500
4G120/50	37/2.03	1.2	1.4	2.5	2.3	55	7700
4G120/70	37/2.03	1.2	1.4	2.5	2.3	56	7950
4G120/95	37/2.03	1.2	1.4	2.5	2.3	57	8290
4G150/50	37/2.25	1.4	1.4	2.5	2.4	61	8890
4G150/70	37/2.25	1.4	1.4	2.5	2.4	62	9050
4G150/95	37/2.25	1.4	1.4	2.5	2.4	64	9300
4G150/120	37/2.25	1.4	1.4	2.5	2.4	65	9600
4G185/70	37/2.52	1.6	1.4	2.5	2.6	66	10600
4G185/95	37/2.52	1.6	1.4	2.5	2.6	68	10950
4G185/120	37/2.52	1.6	1.4	2.5	2.6	70	11350
4G185/150	37/2.52	1.6	1.4	2.5	2.6	73	11850
4G240/70	61/2.25	1.7	1.6	2.5	2.7	76	13200

Conductor		FFX400 1mRZ1MZ1-R					
No. of Core X Cross Section	No./Nominal Diameter of Strands	Nominal Insulation Thickness	Nominal Extruded Bedding Thickness	Nominal Steel Armour Wire Diameter	Nominal Sheath Thickness	Nominal Overall Diameter	Approx. Weight
No.×mm^2	No./mm	mm	mm	mm	mm	mm	kg/km
4G240/95	61/2.25	1.7	1.6	2.5	2.7	77	13550
4G240/120	61/2.25	1.7	1.6	2.5	2.7	78	14000
4G240/150	61/2.25	1.7	1.6	2.5	2.7	79	14600
4G300/95	61/2.52	1.8	1.6	2.5	2.9	81	16000
4G300/120	61/2.52	1.8	1.6	2.5	2.9	82	16500
4G300/150	61/2.52	1.8	1.6	2.5	2.9	83	17100
4G300/185	61/2.52	1.8	1.6	2.5	2.9	85	18000
4G300/240	61/2.52	1.8	1.6	2.5	2.9	87	19000
5 Cores							
5G1.5	7/0.53	0.6	0.8	0.9	1.4	15.6	480
5G2.5	7/0.67	0.7	0.8	0.9	1.4	17.4	620
5G4.0	7/0.85	0.7	0.8	0.9	1.5	19.1	760
5G6.0	7/1.04	0.7	0.8	1.25	1.5	21.3	1010
5G10	7/1.35	0.7	0.8	1.25	1.6	24.2	1230
5G16	1/1.70	0.7	0.8	1.6	1.7	27.9	1620
5G25	7/2.14	0.9	1.0	1.6	1.8	32.8	2450
5G35	19/1.53	0.9	1.0	1.6	1.9	36.1	2800
5G50	19/1.78	1.0	1.0	2.0	2.0	41.7	3680
5G70	19/2.14	1.1	1.2	2.0	2.2	47.6	5100
7 Cores							
7G1.5	7/0.53	0.6	0.8	0.9	1.4	16.7	500
7G2.5	7/0.67	0.7	0.8	0.9	1.4	18.6	640
7G4	7/0.85	0.7	0.8	1.25	1.5	21.2	910
12 Cores							
12G1.5	7/0.53	0.6	0.8	1.25	1.5	21.5	850
12G2.5	7/0.67	0.7	0.8	1.25	1.6	24.5	1090
12G4.0	7/0.85	0.7	1.0	1.6	1.6	27.8	1550
19 Cores							
19G1.5	7/0.53	0.6	0.8	1.25	1.6	24.7	1120
19G2.5	7/0.67	0.7	1.0	1.6	1.6	29.1	1650
19G4.0	7/0.85	0.7	1.0	1.6	1.7	31.8	2400
27 Cores							

Conductor		FFX400 1mRZ1MZ1-R					
No. of Core X Cross Section	No./Nominal Diameter of Strands	Nominal Insulation Thickness	Nominal Extruded Bedding Thickness	Nominal Steel Armour Wire Diameter	Nominal Sheath Thickness	Nominal Overall Diameter	Approx. Weight
No.×mm^2	No./mm	mm	mm	mm	mm	mm	kg/km
27G1.5	7/0.53	0.6	1.0	1.6	1.3	29.8	1650
27G2.5	7/0.67	0.7	1.0	1.6	1.4	33.8	2150
27G4.0	7/0.85	0.7	1.0	1.6	1.4	37.5	2700
37 Cores							
37G1.5	7/0.53	0.6	1.0	1.6	1.3	32.5	2000
37G2.5	7/0.67	0.7	1.0	1.6	1.4	36.3	2650
37G4.0	7/0.85	0.7	1.2	1.6	1.4	42.7	4100
48 Cores							
48G1.5	7/0.53	0.6	1.0	1.6	1.3	36.8	2240
48G2.5	7/0.67	0.7	1.2	2.0	1.4	43.4	3260
48G4.0	7/0.85	0.7	1.2	2.0	1.4	48.2	4240

a: Circular or compacted circular stranded conductors (class 2).
b: Shaped stranded conductor (class 2).
c: Cables having conductors of nominal cross-sectional area 50 mm^2 and above have shaped stranded conductors (class 2).

ELECTRICAL PROPERTIES

Conductor Operating Temperature : 90°C
Ambient Temperature : 30°C
Current-Carrying Capacities (Amp)

Conductor cross-sectional area	Reference Method C (clipped direct)		Reference Method E (in free air or on a perforated cable tray, horizontal or vertical)		Reference Method D (direct in in ground or in ducting in ground. in or around buildings)	
	1 two-core cable*, single-phase a.c. or d.c.	1 three-or four core cable*, three-phase a.c.	1 two-core cable*, single-phase a.c. or d.c.	1 three-or four core cable*, three-phase a.c.	1 two-core cable*, single-phase a.c. or d.c.	1 three-or four core cable*, three-phase a.c.
1	2	3	4	5	6	7
mm^2	A	A	A	A	A	A
1.5	27	23	29	25	25	21
2.5	36	31	39	33	33	28
4	49	42	52	44	43	36
6	62	53	66	56	53	44
10	85	73	90	78	71	58
16	110	94	115	99	91	75
25	146	124	152	131	116	96
35	180	154	188	162	139	115

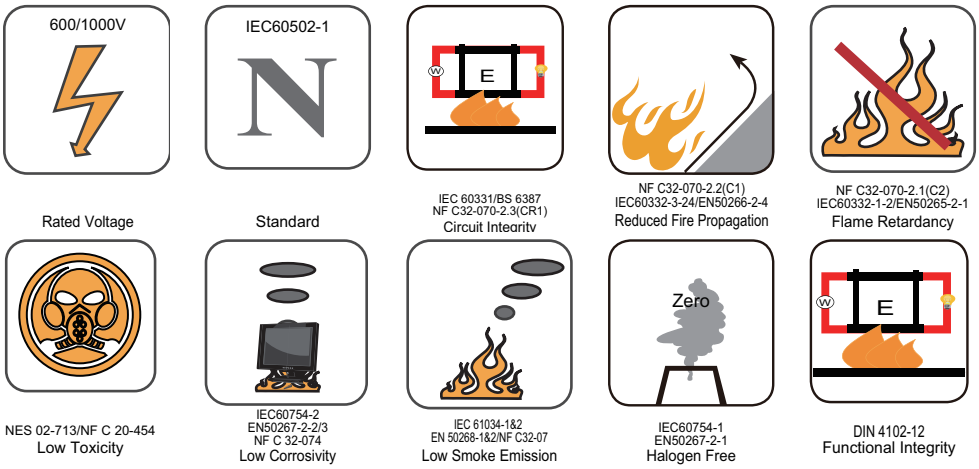
Conductor cross-sectional area	Reference Method C (clipped direct)		Reference Method E (in free air or on a perforated cable tray, horizontal or vertical)		Reference Method D (direct in in ground or in ducting in ground. in or around buildings)	
	1 two-core cable*, single-phase a.c. or d.c.	1 three-or four core cable*, three-phase a.c.	1 two-core cable*, single-phase a.c. or d.c.	1 three-or four core cable*, three-phase a.c.	1 two-core cable*, single-phase a.c. or d.c.	1 three-or four core cable*, three-phase a.c.
1	2	3	4	5	6	7
mm^2	A	A	A	A	A	A
50	219	187	228	197	164	135
70	279	238	291	251	203	167
95	338	289	354	304	239	197
120	392	335	410	353	271	223
150	451	386	472	406	306	251
185	515	441	539	463	343	281
240	607	520	636	546	395	324
300	698	599	732	628	446	365
400	787	673	847	728	-	-

Voltage Drop (Per Amp Per Meter)

Conductor cross-sectional area	Two-core cables, d.c.	Two-core cable, single-phase a.c.			Three-or four core cable, three-phase a.c.		
1	2	3			4		
mm^2	mV/A/m	mV/A/m			mV/A/m		
1.5	31	31			27		
2.5	19	19			16		
4	12	12			10		
6	7.9	7.9			6.8		
10	4.7	4.7			4.0		
16	2.9	2.9			2.5		
		r	x	z	r	x	z
25	1.85	1.85	0.160	1.90	1.60	0.140	1.65
35	1.35	1.35	0.155	1.35	1.15	0.135	1.15
50	0.98	0.99	0.155	1.00	0.86	0.135	0.87
70	0.67	0.67	0.150	0.69	0.59	0.130	0.60
95	0.49	0.50	0.150	0.52	0.43	0.130	0.45
120	0.39	0.40	0.145	0.42	0.34	0.130	0.37
150	0.31	0.32	0.145	0.35	0.38	0.125	0.30
185	0.25	0.26	0.145	0.29	0.22	0.125	0.26

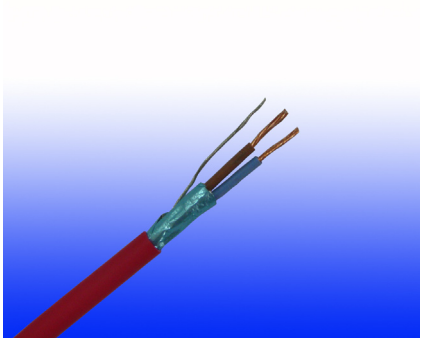
Conductor cross-sectional area	Two-core cables, d.c.	Two-core cable, single-phase a.c.			Three-or four core cable, three-phase a.c.		
1	2	3			4		
mm^2	mV/A/m	mV/A/m			mV/A/m		
240	0.195	0.200	0.140	0.24	0.175	0.125	0.21
300	0.155	0.160	0.140	0.21	0.140	0.120	0.185
400	0.120	0.130	0.140	0.190	0.115	0.120	0.165

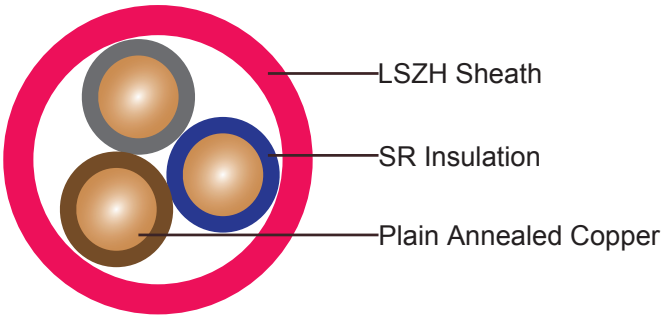
Note: *Spacings larger than one cable diameter will result in a large voltage drop.
r = conductor resistance at operating temperature
x = reactance
z = impedance



300/500V SR Insulated Control Cables (2-4 Cores)

FFX200 05SZ1-U (PH60) (CU/SR/LSZH 300/500V Class 1)





APPLICATION

The cables are designed, for use as control cable for emergency services and fire circuit control.

STANDARDS

Basic design adapted to BS 7629-1

FIRE PERFORMANCE

Circuit Integrity	IEC 60331-21; BS 6387 CWZ; DIN VDE 0472-814(FE180); BS 8434-1 (30mins); BS 5839-1 Clause 26 2d; CEI 20-36/2-1; SS299-1; NBN C 30-004 (cat. F3); NF C32-070-2.3(CR1)
Circuit Integrity with mechanical shock	EN 50200(PH60); CEI 20-36/4-0
Circuit Integrity with mechanical shock & water spray	EN 50200 annex E
System circuit integrity	DIN 4102-12, E30 depending on lay system
Flame Retardance (Single Vertical Wire Test)	EN 60332-1-2; IEC 60332-1-2; BS EN 60332-1-2; VDE 0482-332-1; NBN C 30-004 (cat. F1); NF C32-070-2.1(C2); CEI 20-35/1-2; EN 50265-2-1*; DIN VDE 0482-265-2-1*
Reduced Fire Propagation (Vertically-mounted bundled wires & cable test)	EN 60332-3-24 (cat. C); IEC 60332-3-24; BS EN 60332-3-24; VDE 0482-332-3; NBN C 30-004 (cat. F2); NF C32-070-2.2(C1); CEI 20-22/3-4; EN 50266-2-4*; DIN VDE 0482-266-2-4
Halogen Free	IEC 60754-1; EN 50267-2-1; DIN VDE 0482-267-2-1; CEI 20-37/2-1; BS 6425-1*
No Corrosive Gas Emission	IEC 60754-2; EN 50267-2-2; DIN VDE 0482-267-2-2; CEI 20-37/2-2; BS 6425-2*
Minimum Smoke Emission	IEC 61034-1&2; EN 61034 -1&2; DIN VDE 0482-1034-1&2; CEI 20-37/3-1&2; EN 50268-1&2*; BS 7622-1&2*
No Toxic gases	NES 02-713; NF C 20-454

*Note: Asterisk * denotes superseded standard.*

VOLTAGE RATING

300/500 V

CABLE CONSTRUCTION

Conductors: Plain annealed copper wire, solid according to IEC 60228 class 1.
Insulation: Fire resistant special ceramized silicone rubber compound type EI2 as per BS 7655-1.1.
Cabling: The cores are cabled together in concentric layers with suitable non-hygroscopic fillers.
Sheath: Thermoplastic LSZH compound type LTS3 as per BS 7655-6.1 (Thermosetting LSZH compound type SW2-SW4 as per BS 7655-2.6 can be offered.). UV resistance, hydrocarbon resistance, oil resistance, anti rodent and anti termite properties can be offered as option.

COLOUR CODE

Insulation Colour as per BS7629

Number of cores	Core colours or numbering
2 cores+uninsulated circuit protective conductor	Brown, Blue or Brown, Brown
3 cores+uninsulated circuit protective conductor	Brown, Black, Grey
4 cores+uninsulated circuit protective conductor	Brown, Blue, Black, Grey

Sheath Colour: Orange (other colours upon request)

PHYSICAL AND THERMAL PROPERTIES

Temperature range during operation (fixed state): -30°C – +90°C
Temperature range during installation (mobile state): -20°C – +50°C
Minimum bending radius: 6 x Overall Diameter

ELECTRICAL PROPERTIES

Dielectric test:	2000 V r.m.s. x 5' (core/core)
Insulation resistance	≥300 MΩ x km (at 20°C)
Short circuit temperature	350°C

CONSTRUCTION PARAMETERS

Cable Code	No. of Core X Cross Section	Nominal Insulation Thickness	Nominal Sheath Thickness	Nominal Overall Diameter	Approx. Weight
	mm^2	mm	mm	mm	kg/km
2 Cores					
FFX200 05SZ1-U (PH60) 2G1.5	2x1.5	0.7	0.9	7.4	70
FFX200 05SZ1-U (PH60) 2G2.5	2x2.5	0.8	1.0	8.8	105

Cable Code	No. of Core X Cross Section	Nominal Insulation Thickness	Nominal Sheath Thickness	Nominal Overall Diameter	Approx. Weight
	mm^2	mm	mm	mm	kg/km
3 Cores					
FFX200 05SZ1-U (PH60) 3G1.5	3x1.5	0.7	0.9	7.9	93
FFX200 05SZ1-U (PH60) 3G2.5	3x2.5	0.8	1.0	9.4	141
4 Cores					
FFX200 05SZ1-U (PH60) 4G1.5	4x1.5	0.7	1.0	8.8	122
FFX200 05SZ1-U (PH60) 4G2.5	4x2.5	0.8	1.1	10.4	183

ELECTRICAL PROPERTIES

Conductor Operating Temperature : 90°C
Ambient Temperature : 30°C
Current-Carrying Capacities (Amp)

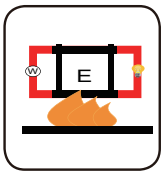
Conductor cross-sectional area	Reference Method A (enclosed in conduit in thermally insulating wall etc)		Reference Method B (enclosed in conduit on a wall or in trunking etc)		Reference Method C (clipped direct)		Reference Method E (in free air or on a perforated cable tray, horizontal or vertical etc) Touching	
	1 two-core cable*, single-phase a.c. or d.c.	1 three-or four core cable*, three-phase a.c.	1 two-core cable*, single-phase a.c. or d.c.	1 three-or four core cable*, three-phase a.c.	1 two-core cable*, single-phase a.c. or d.c.	1 three-or four core cable*, three-phase a.c.	1 two-core cable*, single-phase a.c. or d.c.	1 three-or four core cable*, three-phase a.c.
1	2	3	4	5	6	7	8	9
mm^2	A	A	A	A	A	A	A	A
1.5	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

Voltage Drop (Per Amp Per Meter)

Conductor cross-sectional area	Two-core cables, d.c.	Two-core cable, single-phase a.c.	Three-or four core cable, three-phase a.c.
1	2	3	4
mm^2	mV/A/m	mV/A/m	mV/A/m
1.5	31	31	27
2.5	19	19	16
4	12	12	10

Rated Voltage

Standard

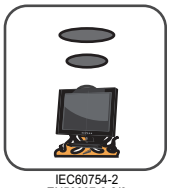


IEC 60331/BS 6387
NF C32-070-2.3(CR1)
Circuit Integrity

NF C32-070-2.2(C1)
IEC60332-3-24/EN50266-2-4
Reduced Fire Propagation

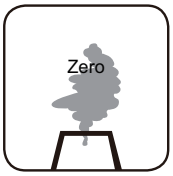
NF C32-070-2.1(C2)
IEC60332-1-2/EN50265-2-1
Flame Retardancy

NES 02-713/NF C 20-454
Low Toxicity

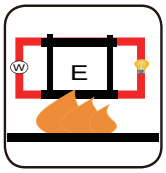


IEC60754-2
EN50267-2-2/3
NF C 32-074
Low Corrosivity

IEC 61034-1&2
EN 50268-1&2/NF C32-07
Low Smoke Emission



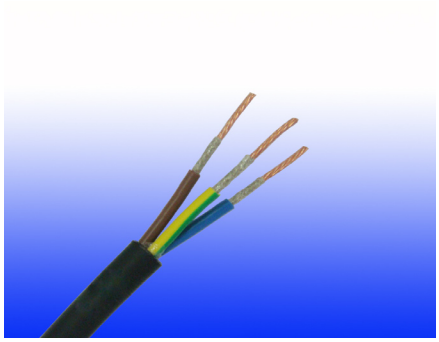
IEC60754-1
EN50267-2-1
Halogen Free

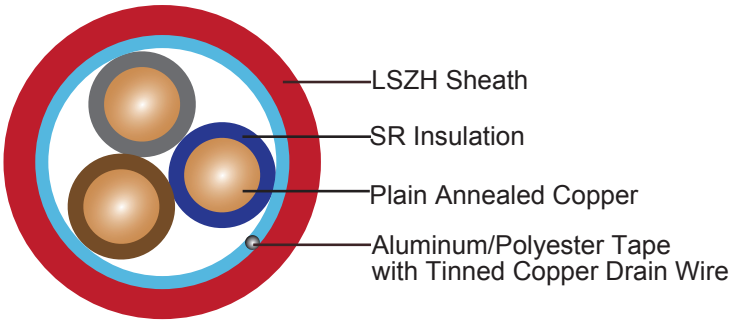


DIN 4102-12
Functional Integrity

300/500V SR Insulated & Overall Screened Control Cables (2-4 Cores & Multicore)

FFX200 05SOZ1-U (PH30/60) (CU/SR/OSCR/LSZH 300/500V Class 1)
FFX200 05SOZ1-R (PH30/60) (CU/SR/OSCR/LSZH 300/500V Class 2)





APPLICATION

The cables are primarily intended for use in the following applications:

BS 5266-1 for emergency lighting of premises
BS 5839-1 for fire detection and fire alarm systems in and around building
BS 5839-8 for voice alarm systems
BS 5839-9 for emergency voice communication systems.

STANDARDS

Basic design to BS7629-1

FIRE PERFORMANCE

Circuit Integrity	IEC 60331-21; BS 6387 CWZ; DIN VDE 0472-814(FE180); BS 8434-1 (30mins); BS 5839-1 Clause 26 2d; CEI 20-36/2-1; SS299-1; NBN C 30-004 (cat. F3); NF C32-070-2.3(CR1)
Circuit Integrity with mechanical shock	EN 50200(PH30/60); CEI 20-36/4-0
Circuit Integrity with mechanical shock & water spray	EN 50200 annex E
System circuit integrity	DIN 4102-12, E30 depending on lay system
Flame Retardance (Single Vertical Wire Test)	EN 60332-1-2; IEC 60332-1-2; BS EN 60332-1-2; VDE 0482-332-1; NBN C 30-004 (cat. F1); NF C32-070-2.1(C2); CEI 20-35/1-2; EN 50265-2-1*; DIN VDE 0482-265-2-1*
Reduced Fire Propagation (Vertically-mounted bundled wires & cable test)	EN 60332-3-24 (cat. C); IEC 60332-3-24; BS EN 60332-3-24; VDE 0482-332-3; NBN C 30-004 (cat. F2); NF C32-070-2.2(C1); CEI 20-22/3-4; EN 50266-2-4*; DIN VDE 0482-266-2-4
Halogen Free	IEC 60754-1; EN 50267-2-1; DIN VDE 0482-267-2-1; CEI 20-37/2-1; BS 6425-1*
No Corrosive Gas Emission	IEC 60754-2; EN 50267-2-2; DIN VDE 0482-267-2-2; CEI 20-37/2-2; BS 6425-2*

Minimum Smoke Emission	IEC 61034-1&2; EN 61034 -1&2; DIN VDE 0482-1034-1&2; CEI 20-37/3-1&2; EN 50268-1&2*; BS 7622-1&2*
No Toxic gases	NES 02-713; NF C 20-454

*Note: Asterisk * denotes superseded standard.*

VOLTAGE RATING

300/500 V

CABLE CONSTRUCTION

Conductors: Plain annealed copper wire, solid according to IEC 60228 class 1, stranded according to IEC 60228 class 2.
Insulation: Fire resistant special ceramized silicone rubber compound type EI2 as per BS 7655-1.1.
Cabling: The cores are cabled together in concentric layers with suitable non-hygroscopic fillers.
Overall Screen: Aluminum/polyester tape with tinned copper drain wire.
Circuit Protective Conductor or Drain Wire: Uninsulated tinned copper conductor of the same section and class as the insulated conductors in the 2-, 3-and 4-core cables. Drain wire of 0.5mm^2 tinned copper conductor is provided in cables of more than 4 conductors.
Sheath: Thermoplastic LSZH compound type LTS3 as per BS 7655-6.1 (Thermosetting LSZH compound type SW2-SW4 as per BS 7655-2.6 can be offered.). UV resistance, hydrocarbon resistance, oil resistance, anti rodent and anti termite properties can be offered as option.

COLOUR CODE

Insulation Colour as per BS7629

Number of cores	Core colours or numbering
2 cores+uninsulated circuit protective conductor	Brown, Blue or Brown, Brown
3 cores+uninsulated circuit protective conductor	Brown, Black, Grey
4 cores+uninsulated circuit protective conductor	Brown, Blue, Black, Grey
7, 12 and19 cores+uninsulated drain wire	Numbers 1, 2, 3, 4, 5, 6, 7 and upwards or, for identification by colour, an identical colour(excluding brown and black),except for two adjacent cores in each layer distinctively coloured brown and black.

Sheath Colour: Orange (other colours upon request)

PHYSICAL AND THERMAL PROPERTIES

Temperature range during operation (fixed state): -30°C – +90°C
Temperature range during installation (mobile state): -20°C – +50°C
Minimum bending radius: 6 x Overall Diameter

ELECTRICAL PROPERTIES

Dielectric test:	2000 V r.m.s. x 5’ (core/core)

Insulation resistance	≥300 MΩ x km (at 20°C)
Short circuit temperature	350°C

CONSTRUCTION PARAMETERS

Cable Code	No. of Core X Cross Section	Nominal Insulation Thickness	Nominal Sheath Thickness	Nominal Overall Diameter	Approx. Weight
	mm^2	mm	mm	mm	kg/km
2 Cores					
FFX200 05SOZ1-U (PH30/60) 2G1.0	2x1.0	0.6	0.9	7.1	80
FFX200 05SOZ1-U (PH30/60) 2G1.5	2x1.5	0.7	0.9	8.0	95
FFX200 05SOZ1-U (PH30/60) 2G2.5	2x2.5	0.8	1.0	9.4	135
FFX200 05SOZ1-R (PH30/60) 2G1.5	2x1.5	0.7	0.9	8.4	106
FFX200 05SOZ1-R (PH30/60) 2G2.5	2x2.5	0.8	1.0	9.9	145
FFX200 05SOZ1-R (PH30/60) 2G4.0	2x4.0	0.8	1.1	11.5	210
3 Cores					
FFX200 05SOZ1-U (PH30/60) 3G1.0	3x1.0	0.6	0.9	8.0	95
FFX200 05SOZ1-U (PH30/60) 3G1.5	3x1.5	0.7	0.9	8.5	115
FFX200 05SOZ1-U (PH30/60) 3G2.5	3x2.5	0.8	1.0	10.0	170
FFX200 05SOZ1-R (PH30/60) 3G1.5	3x1.5	0.7	0.9	8.9	134
FFX200 05SOZ1-R (PH30/60) 3G2.5	3x2.5	0.8	1.0	10.3	180
FFX200 05SOZ1-R (PH30/60) 3G4.0	3x4.0	0.8	1.1	12.2	260
4 Cores					
FFX200 05SOZ1-U (PH30/60) 4G1.0	4x1.0	0.6	1.0	8.3	115
FFX200 05SOZ1-U (PH30/60) 4G1.5	4x1.5	0.7	1.0	9.4	150
FFX200 05SOZ1-U (PH30/60) 4G2.5	4x2.5	0.8	1.1	11.0	210
FFX200 05SOZ1-R (PH30/60) 4G1.5	4x1.5	0.7	1.0	9.8	166
FFX200 05SOZ1-R (PH30/60) 4G2.5	4x2.5	0.8	1.1	11.8	250
FFX200 05SOZ1-R (PH30/60) 4G4.0	4x4.0	0.8	1.2	13.5	330
7 Cores					
FFX200 05SOZ1-U (PH30/60) 7G1.0	7x1.0	0.6	1.0	10.0	165
FFX200 05SOZ1-U (PH30/60) 7G1.5	7x1.5	0.7	1.1	11.3	225

Cable Code	No. of Core X Cross Section	Nominal Insulation Thickness	Nominal Sheath Thickness	Nominal Overall Diameter	Approx. Weight
	mm^2	mm	mm	mm	kg/km
FFX200 05SOZ1-R (PH30/60) 7G2.5	7x2.5	0.8	1.2	14.2	375
12 Cores					
FFX200 05SOZ1-U (PH30/60) 12G1.5	12x1.5	0.7	1.2	14.5	350
FFX200 05SOZ1-R (PH30/60) 12G2.5	12x2.5	0.8	1.4	18.3	480
19 Cores					
FFX200 05SOZ1-U (PH30/60) 19G1.5	19x1.5	0.7	1.3	17.0	520

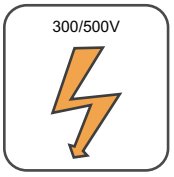
ELECTRICAL PROPERTIES

CONDUCTOR OPERATING TEMPERATURE : 90°C
AMBIENT TEMPERATURE : 30°C
Current-Carrying Capacities (Amp)

Conductor cross-sectional area	Reference Method A (enclosed in conduit in thermally insulating wall etc)		Reference Method B (enclosed in conduit on a wall or in trunking etc)		Reference Method C (clipped direct)		Reference Method E (in free air or on a perforated cable tray, horizontal or vertical etc) Touching	
	1 two-core cable*, single-phase a.c. or d.c.	1 three-or four core cable*, three-phase a.c.	1 two-core cable*, single-phase a.c. or d.c.	1 three-or four core cable*, three-phase a.c.	1 two-core cable*, single-phase a.c. or d.c.	1 three-or four core cable*, three-phase a.c.	1 two-core cable*, single-phase a.c. or d.c.	1 three-or four core cable*, three-phase a.c.
1	2	3	4	5	6	7	8	9
mm^2	A	A	A	A	A	A	A	A
1.0	14.5	13	17	15	19	17	21	18
1.5	18.5	16.5	22	19.5	24	22	26	23
2.5	25	22	30	26	33	30	36	32
4	33	30	40	35	45	40	49	42

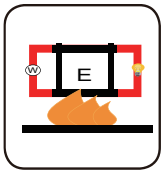
Voltage Drop (Per Amp Per Meter)

Conductor cross-sectional area	Two-core cables, d.c.	Two-core cable, single-phase a.c.	Three-or four core cable, three-phase a.c.
1	2	3	4
mm^2	mV/A/m	mV/A/m	mV/A/m
1.0	46	46	40
1.5	31	31	27
2.5	19	19	16
4	12	12	10



Rated Voltage

Standard



IEC 60331/BS 6387
NF C32-070-2.3(CR1)
Circuit Integrity


NF C32-070-2.2(C1)
IEC60332-3-24/EN50266-2-4
Reduced Fire Propagation

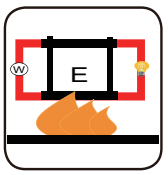

NF C32-070-2.1(C2)
IEC60332-1-2/EN50265-2-1
Flame Retardancy


NES 02-713/NF C 20-454
Low Toxicity


IEC60754-2
EN50267-2-2/3
NF C 32-074
Low Corrosivity


IEC 61034-1&2
EN 50268-1&2/NF C32-07
Low Smoke Emission

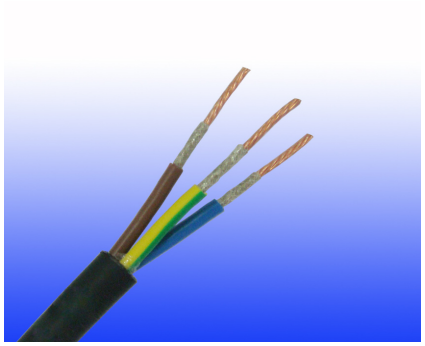
IEC60754-1
EN50267-2-1
Halogen Free

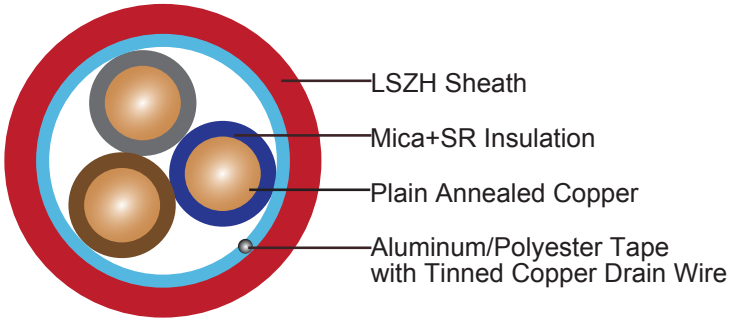


DIN 4102-12
Functional Integrity

300/500V Mica+SR Insulated & Overall Screened Control Cables (2-4 Cores & Multicore)

FFX200E 05mSOZ1-U (PH120) (CU/MGT+SR/OSCR/LSZH 300/500V Class 1)
FFX200E 05mSOZ1-R (PH120) (CU/MGT+SR/OSCR/LSZH 300/500V Class 2)





APPLICATION

The cables are primarly intended for use in the following applications:

BS 5266-1 for emergency lighting of premises
BS 5839-1 for fire detection and fire alarm systems in and around building
BS 5839-8 for voice alarm systems
BS 5839-9 for emergency voice communication systems.

STANDARDS

Basic design to BS 7629-1

FIRE PERFORMANCE

Circuit Integrity	IEC 60331-21; BS 6387 CWZ; DIN VDE 0472-814(FE180); BS 8434-2 (120mins); BS 5839-1 Clause 26 2e; CEI 20-36/2-1; SS299-1; NBN C 30-004 (cat. F3); NF C32-070-2.3(CR1)
Circuit Integrity with mechanical shock	EN 50200(PH120); CEI 20-36/4-0
Circuit Integrity with mechanical shock & water spray	EN 50200 annex E
System circuit integrity	DIN 4102-12, E30 depending on lay system
Flame Retardance (Single Vertical Wire Test)	EN 60332-1-2; IEC 60332-1-2; BS EN 60332-1-2; VDE 0482-332-1; NBN C 30-004 (cat. F1); NF C32-070-2.1(C2); CEI 20-35/1-2; EN 50265-2-1*; DIN VDE 0482-265-2-1*
Reduced Fire Propagation (Vertically-mounted bundled wires & cable test)	EN 60332-3-24 (cat. C); IEC 60332-3-24; BS EN 60332-3-24; VDE 0482-332-3; NBN C 30-004 (cat. F2); NF C32-070-2.2(C1); CEI 20-22/3-4; EN 50266-2-4*; DIN VDE 0482-266-2-4
Halogen Free	IEC 60754-1; EN 50267-2-1; DIN VDE 0482-267-2-1; CEI 20-37/2-1; BS 6425-1*
No Corrosive Gas Emission	IEC 60754-2; EN 50267-2-2; DIN VDE 0482-267-2-2; CEI 20-37/2-2; BS 6425-2*

Minimum Smoke Emission	IEC 61034-1&2; EN 61034 -1&2; DIN VDE 0482-1034-1&2; CEI 20-37/3-1&2; EN 50268-1&2*; BS 7622-1&2*
No Toxic gases	NES 02-713; NF C 20-454

*Note: Asterisk * denotes superseded standard.*

VOLTAGE RATING

300/500 V

CABLE CONSTRUCTION

Conductors: Plain annealed copper wire, solid according to IEC 60228 class 1, stranded according to IEC 60228 class 2.
Insulation: Mica glass fire resistant tape covered by fire resistant special ceramized silicone rubber compound type EI2 as per BS 7655-1.1.
Cabling: The cores are cabled together in concentric layers with suitable non-hygroscopic fillers.
Overall Screen: Aluminum/polyester tape with tinned copper drain wire.
Circuit Protective Conductor: Uninsulated tinned copper conductor of the same section and class as the insulated conductors in the 2-, 3- and 4-core cables. Drain wire of 0.5mm^2 tinned copper conductor is provided in cables of more than 4 conductors.
Sheath: Thermoplastic LSZH compound type LTS3 as per BS 7655-6.1 (Thermosetting LSZH compound type SW2-SW4 as per BS 7655-2.6 can be offered.). UV resistance, hydrocarbon resistance, oil resistance, anti rodent and anti termite properties can be offered as option.

COLOUR CODE

Insulation Colour as per BS7629

Number of cores	Core colours or numbering
2 cores+uninsulated circuit protective conductor	Brown, Blue or Brown, Brown
3 cores+uninsulated circuit protective conductor	Brown, Black, Grey
4 cores+uninsulated circuit protective conductor	Brown, Blue, Black, Grey
7, 12 and19 cores+uninsulated drain wire	Numbers 1, 2, 3, 4, 5, 6, 7 and upwards or, for identification by colour, an identical colour(excluding brown and black),except for two adjacent cores in each layer distinctively coloured brown and black.

Sheath Colour: Orange (other colours upon request)

PHYSICAL AND THERMAL PROPERTIES

Temperature range during operation (fixed state): -30°C – +90°C
Temperature range during installation (mobile state): -20°C – +50°C
Minimum bending radius: 7.5 x Overall Diameter

ELECTRICAL PROPERTIES

Dielectric test:	2000 V r.m.s. x 5’ (core/core)

Insulation resistance	≥300 MΩ x km (at 20°C)
Short circuit temperature	350°C

CONSTRUCTION PARAMETERS

Cable Code	No. of Core X Cross Section	Nominal Insulation Thickness	Nominal Sheath Thickness	Nominal Overall Diameter	Approx. Weight
	mm^2	mm	mm	mm	kg/km
2 Cores					
FFX200E 05mSOZ1-U(PH120) 2G1.0	2x1.0	0.6	0.9	7.9	85
FFX200E 05mSOZ1-U(PH120) 2G1.5	2x1.5	0.7	0.9	8.8	105
FFX200E 05mSOZ1-U(PH120) 2G2.5	2x2.5	0.8	1.0	10.2	150
FFX200E 05mSOZ1-R(PH120) 2G1.5	2x1.5	0.7	0.9	9.2	110
FFX200E 05mSOZ1-R(PH120) 2G2.5	2x2.5	0.8	1.0	10.3	155
FFX200E 05mSOZ1-R(PH120) 2G4.0	2x4.0	0.8	1.1	12.2	220
3 Cores					
FFX200E 05mSOZ1-U(PH120) 3G1.0	3x1.0	0.6	0.9	8.4	105
FFX200E 05mSOZ1-U(PH120) 3G1.5	3x1.5	0.7	0.9	9.3	130
FFX200E 05mSOZ1-U(PH120) 3G2.5	3x2.5	0.8	1.0	10.8	190
FFX200E 05mSOZ1-R(PH120) 3G1.5	3x1.5	0.7	0.9	9.4	135
FFX200E 05mSOZ1-R(PH120) 3G2.5	3x2.5	0.8	1.0	10.9	190
FFX200E 05mSOZ1-R(PH120) 3G4.0	3x4.0	0.8	1.1	13.0	280
4 Cores					
FFX200E 05mSOZ1-U(PH120) 4G1.0	4x1.0	0.6	1.0	9.3	125
FFX200E 05mSOZ1-U(PH120) 4G1.5	4x1.5	0.7	1.0	10.3	165
FFX200E 05mSOZ1-U(PH120) 4G2.5	4x2.5	0.8	1.1	12.0	240
FFX200E 05mSOZ1-R(PH120) 4G1.5	4x1.5	0.7	1.0	10.5	170
FFX200E 05mSOZ1-R(PH120) 4G2.5	4x2.5	0.8	1.1	12.1	250
FFX200E 05mSOZ1-R(PH120) 4G4.0	4x4.0	0.8	1.2	14.4	350

Cable Code	No. of Core X Cross Section	Nominal Insulation Thickness	Nominal Sheath Thickness	Nominal Overall Diameter	Approx. Weight
	mm^2	mm	mm	mm	kg/km
7 Cores					
FFX200E 05mSOZ1-U(PH120) 7G1.0	7x1.0	0.6	1.0	10.5	175
FFX200E 05mSOZ1-U(PH120) 7G1.5	7x1.5	0.7	1.1	12.1	230
FFX200E 05mSOZ1-R(PH120) 7G2.5	7x2.5	0.8	1.2	15.0	340
12 Cores					
FFX200E 05mSOZ1-U(PH120) 12G1.5	12x1.5	0.7	1.2	16.0	380
FFX200E 05mSOZ1-R(PH120) 12G2.5	12x2.5	0.8	1.4	20.0	560
19 Cores					
FFX200E 05mSOZ1-U(PH120) 19G1.5	19x1.5	0.7	1.3	17.5	470

ELECTRICAL PROPERTIES

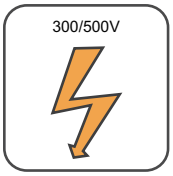
Conductor Operating Temperature : 90°C
Ambient Temperature : 30°C

Current-Carrying Capacities (Amp)

Conductor cross-sectional area	Reference Method A (enclosed in conduit in thermally insulating wall etc)		Reference Method B (enclosed in conduit on a wall or in trunking etc)		Reference Method C (clipped direct)		Reference Method E (in free air or on a perforated cable tray, horizontal or vertical etc) Touching	
	1 two-core cable*, single-phase a.c. or d.c.	1 three-or four core cable*, three-phase a.c.	1 two-core cable*, single-phase a.c. or d.c.	1 three-or four core cable*, three-phase a.c.	1 two-core cable*, single-phase a.c. or d.c.	1 three-or four core cable*, three-phase a.c.	1 two-core cable*, single-phase a.c. or d.c.	1 three-or four core cable*, three-phase a.c.
1	2	3	4	5	6	7	8	9
mm^2	A	A	A	A	A	A	A	A
1.0	14.5	13	17	15	19	17	21	18
1.5	18.5	16.5	22	19.5	24	22	26	23
2.5	25	22	30	26	33	30	36	32
4	33	30	40	35	45	40	49	42

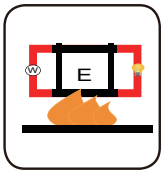
Voltage Drop (Per Amp Per Meter)

Conductor cross-sectional area	Two-core cables, d.c.	Two-core cable, single-phase a.c.	Three-or four core cable, three-phase a.c.
1	2	3	4
mm^2	mV/A/m	mV/A/m	mV/A/m
1.0	46	46	40
1.5	31	31	27
2.5	19	19	16
4	12	12	10



Rated Voltage

Standard

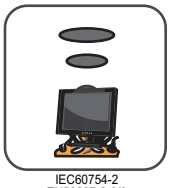


IEC 60331/BS 6387
NF C32-070-2.3(CR1)
Circuit Integrity

NF C32-070-2.2(C1)
IEC60332-3-24/EN50266-2-4
Reduced Fire Propagation

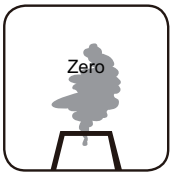
NF C32-070-2.1(C2)
IEC60332-1-2/EN50265-2-1
Flame Retardancy

NES 02-713/NF C 20-454
Low Toxicity

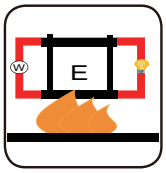


IEC60754-2
EN50267-2-2/3
NF C 32-074
Low Corrosivity

IEC 61034-1&2
EN 50268-1&2/NF C32-07
Low Smoke Emission



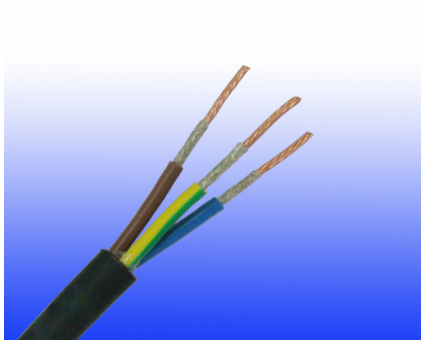
IEC60754-1
EN50267-2-1
Halogen Free

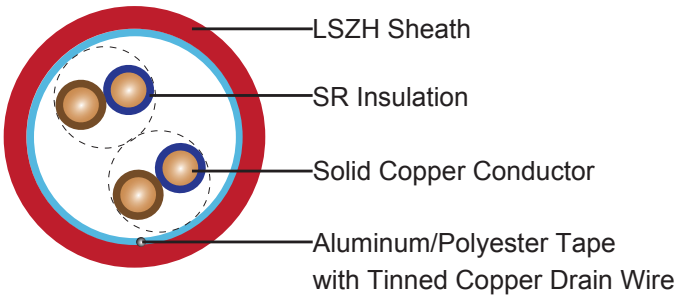


DIN 4102-12
Functional Integrity

300/500V SR Insulated & Overall Screened Control Cables (Multipair)

FFX200 05SOZ1-U (PH30/60) (CU/SR/OSCR/LSZH 300/500V Class 1)
FFX200 05SOZ1-R (PH30/60) (CU/SR/OSCR/LSZH 300/500V Class 2)





APPLICATION

The cables are primarily intended for use in the following applications:

BS 5266-1 for emergency lighting of premises
BS 5839-1 for fire detection and fire alarm systems in and around building
BS 5839-8 for voice alarm systems
BS 5839-9 for emergency voice communication systems.

STANDARDS

Basic design to BS7629-1

FIRE PERFORMANCE

Circuit Integrity	IEC 60331-21; BS 6387 CWZ; DIN VDE 0472-814(FE180); BS 8434-1 (30mins); BS 5839-1 Clause 26 2d; CEI 20-36/2-1; SS299-1; NBN C 30-004 (cat. F3); NF C32-070-2.3(CR1)
Circuit Integrity with mechanical shock	EN 50200(PH30/60); CEI 20-36/4-0
Circuit Integrity with mechanical shock & water spray	EN 50200 annex E
System circuit integrity	DIN 4102-12, E30 depending on lay system
Flame Retardance (Single Vertical Wire Test)	EN 60332-1-2; IEC 60332-1-2; BS EN 60332-1-2; VDE 0482-332-1; NBN C 30-004 (cat. F1); NF C32-070-2.1(C2); CEI 20-35/1-2; EN 50265-2-1*; DIN VDE 0482-265-2-1*
Reduced Fire Propagation (Vertically-mounted bundled wires & cable test)	EN 60332-3-24 (cat. C); IEC 60332-3-24; BS EN 60332-3-24; VDE 0482-332-3; NBN C 30-004 (cat. F2); NF C32-070-2.2(C1); CEI 20-22/3-4; EN 50266-2-4*; DIN VDE 0482-266-2-4
Halogen Free	IEC 60754-1; EN 50267-2-1; DIN VDE 0482-267-2-1; CEI 20-37/2-1; BS 6425-1*
No Corrosive Gas Emission	IEC 60754-2; EN 50267-2-2; DIN VDE 0482-267-2-2; CEI 20-37/2-2; BS 6425-2*

Minimum Smoke Emission	IEC 61034-1&2; EN 61034 -1&2; DIN VDE 0482-1034-1&2; CEI 20-37/3-1&2; EN 50268-1&2*; BS 7622-1&2*
No Toxic gases	NES 02-713; NF C 20-454

*Note: Asterisk * denotes superseded standard.*

VOLTAGE RATING

300/500 V

CABLE CONSTRUCTION

Conductors: Plain annealed copper wire, solid according to IEC 60228 class 1, stranded according to IEC 60228 class 2.
Insulation: Fire resistant special ceramized silicone rubber compound type EI2 as per BS 7655-1.1.
Cabling: The cores are cabled together in concentric layers with suitable non-hygroscopic fillers.
Overall Screen: Aluminum/polyester tape with tinned copper drain wire.
Circuit Protective Conductor or Drain Wire: Uninsulated tinned copper conductor of the same section and class as the insulated conductors in the 2-, 3-and 4-core cables. Drain wire of 0.5mm^2 tinned copper conductor is provided in cables of more than 4 conductors.
Sheath: Thermoplastic LSZH compound type LTS3 as per BS 7655-6.1 (Thermosetting LSZH compound type SW2-SW4 as per BS 7655-2.6 can be offered.). UV resistance, hydrocarbon resistance, oil resistance, anti rodent and anti termite properties can be offered as option.

COLOUR CODE

Insulation colour as per BS7629.
Sheath Colour: Orange (other colours upon request)

PHYSICAL AND THERMAL PROPERTIES

Temperature range during operation (fixed state): -30°C – +90°C
Temperature range during installation (mobile state): -20°C – +50°C
Minimum bending radius: 6 x Overall Diameter

ELECTRICAL PROPERTIES

Dielectric test:	2000 V r.m.s. x 5' (core/core)
Insulation resistance	≥300 MΩ x km (at 20°C)
Short circuit temperature	350°C

CONSTRUCTION PARAMETERS

Cable Code	No. of Pairs X Cross Section	Nominal Insulation Thickness	Nominal Sheath Thickness	Nominal Overall Diameter	Approx. Weight
	mm^2	mm	mm	mm	kg/km
2 Pairs					

Cable Code	No. of Pairs X Cross Section	Nominal Insulation Thickness	Nominal Sheath Thickness	Nominal Overall Diameter	Approx. Weight
	mm^2	mm	mm	mm	kg/km
FFX200 05SOZ1-U (PH30/60) 2P1.0	2x2x1.0	0.6	1.1	13.5	480
FFX200 05SOZ1-U (PH30/60) 2P1.5	2x2x1.5	0.7	1.2	15.5	590
FFX200 05SOZ1-R (PH30/60) 2P1.5	2x2x1.5	0.7	1.2	16.2	579
FFX200 05SOZ1-R (PH30/60) 2P2.5	2x2x2.5	0.8	1.3	18.0	750
3 Pairs					
FFX200 05SOZ1-U (PH30/60) 3P1.0	3x2x1.0	0.6	1.2	14.5	675
FFX200 05SOZ1-U (PH30/60) 3P1.5	3x2x1.5	0.7	1.2	16.5	810
FFX200 05SOZ1-R (PH30/60) 3P1.5	3x2x1.5	0.7	1.2	17.5	730
FFX200 05SOZ1-R (PH30/60) 3P2.5	3x2x2.5	0.8	1.3	19.5	1045

ELECTRICAL PROPERTIES

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

Current-Carrying Capacities (Amp)

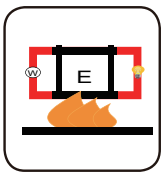
Conductor cross-sectional area	Reference Method A (enclosed in conduit in thermally insulating wall etc)		Reference Method B (enclosed in conduit on a wall or in trunking etc)		Reference Method C (clipped direct)		Reference Method E (in free air or on a perforated cable tray, horizontal or vertical etc) Touching	
	1 two-core cable*, single-phase a.c. or d.c.	1 three-or four core cable*, three-phase a.c.	1 two-core cable*, single-phase a.c. or d.c.	1 three-or four core cable*, three-phase a.c.	1 two-core cable*, single-phase a.c. or d.c.	1 three-or four core cable*, three-phase a.c.	1 two-core cable*, single-phase a.c. or d.c.	1 three-or four core cable*, three-phase a.c.
1	2	3	4	5	6	7	8	9
mm^2	A	A	A	A	A	A	A	A
1.0	14.5	13	17	15	19	17	21	18
1.5	18.5	16.5	22	19.5	24	22	26	23
2.5	25	22	30	26	33	30	36	32
4	33	30	40	35	45	40	49	42

Voltage Drop (Per Amp Per Meter)

Conductor cross-sectional area	Two-core cables, d.c.	Two-core cable, single-phase a.c.	Three-or four core cable, three-phase a.c.
1	2	3	4
mm^2	mV/A/m	mV/A/m	mV/A/m
1.0	46	46	40
1.5	31	31	27
2.5	19	19	16
4	12	12	10

Rated Voltage

Standard

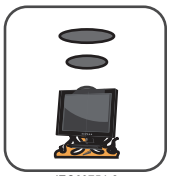


IEC 60331/BS 6387
NF C32-070-2.3(CR1)
Circuit Integrity

NF C32-070-2.2(C1)
IEC60332-3-24/EN50266-2-4
Reduced Fire Propagation

NF C32-070-2.1(C2)
IEC60332-1-2/EN50265-2-1
Flame Retardancy

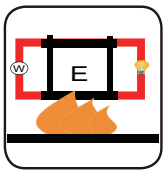
NES 02-713/NF C 20-454
Low Toxicity



IEC60754-2
EN50267-2-2/3
NF C 32-074
Low Corrosivity

IEC 61034-1&2
EN 50268-1&2/NF C32-07
Low Smoke Emission

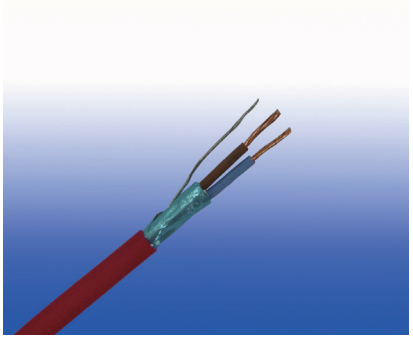
IEC60754-1
EN50267-2-1
Halogen Free

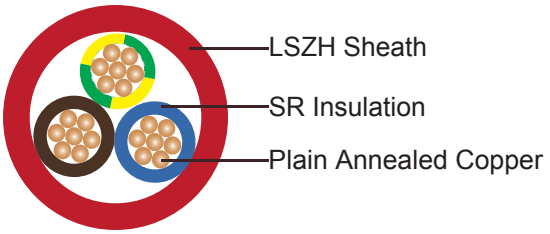


DIN 4102-12
Functional Integrity

450/750V SR Insulated Control Cables (2-5 Cores)

FFX200 07SZ1-R (PH60) (CU/SR/LSZH 450/750V Class 2)





APPLICATION

The cables are designed, manufactured and tested for general application in power supply and signal wiring, for emergency circuit and fire circuit control.

STANDARDS

Basic design adapted to BS 7629-1

FIRE PERFORMANCE

Circuit Integrity	IEC 60331-21; BS 6387 CWZ; DIN VDE 0472-814(FE180); BS 8434-1 (30mins); BS 5839-1 Clause 26 2d; CEI 20-36/2-1; SS299-1; NBN C 30-004 (cat. F3); NF C32-070-2.3(CR1)
Circuit Integrity with mechanical shock	EN 50200(PH60); CEI 20-36/4-0
Circuit Integrity with mechanical shock & water spray	EN 50200 annex E
System circuit integrity	DIN 4102-12, E30 depending on lay system
Flame Retardance (Single Vertical Wire Test)	EN 60332-1-2; IEC 60332-1-2; BS EN 60332-1-2; VDE 0482-332-1; NBN C 30-004 (cat. F1); NF C32-070-2.1(C2); CEI 20-35/1-2; EN 50265-2-1*; DIN VDE 0482-265-2-1*
Reduced Fire Propagation (Vertically-mounted bundled wires & cable test)	EN 60332-3-24 (cat. C); IEC 60332-3-24; BS EN 60332-3-24; VDE 0482-332-3; NBN C 30-004 (cat. F2); NF C32-070-2.2(C1); CEI 20-22/3-4; EN 50266-2-4*; DIN VDE 0482-266-2-4
Halogen Free	IEC 60754-1; EN 50267-2-1; DIN VDE 0482-267-2-1; CEI 20-37/2-1; BS 6425-1*
No Corrosive Gas Emission	IEC 60754-2; EN 50267-2-2; DIN VDE 0482-267-2-2; CEI 20-37/2-2; BS 6425-2*
Minimum Smoke Emission	IEC 61034-1&2; EN 61034 -1&2; DIN VDE 0482-1034-1&2; CEI 20-37/3-1&2; EN 50268-1&2*; BS 7622-1&2*
No Toxic gases	NES 02-713; NF C 20-454

*Note: Asterisk * denotes superseded standard.*

VOLTAGE RATING

450/750 V

CABLE CONSTRUCTION

Conductors: Plain annealed copper wire, stranded according to IEC 60228 class 2.
Insulation: Fire resistant special ceramized silicone rubber compound type EI2 as per BS 7655-1.1.
Cabling: The cores are cabled together in concentric layers with suitable non-hygroscopic fillers.
Sheath: Thermoplastic LSZH compound type LTS3 as per BS 7655-6.1 (Thermosetting LSZH compound type SW2-SW4 as per BS 7655-2.6 can be offered.). UV resistance, hydrocarbon resistance, oil resistance, anti rodent and anti termite properties can be offered as option.

COLOUR CODE

Insulation Colour as per BS7629

Number of cores	Core colours or numbering
2 cores+uninsulated circuit protective conductor	Brown, Blue or Brown, Brown
3 cores+uninsulated circuit protective conductor	Brown, Black, Grey
4 cores+uninsulated circuit protective conductor	Brown, Blue, Black, Grey
7, 12 and19 cores+uninsulated drain wire	Numbers 1, 2, 3, 4, 5, 6, 7 and upwards or, for identification by colour, an identical colour(excluding brown and black),except for two adjacent cores in each layer distinctively coloured brown and black.

Sheath Colour: Orange (other colours upon request)

PHYSICAL AND THERMAL PROPERTIES

Temperature range during operation (fixed state): -30°C – +90°C
Temperature range during installation (mobile state): -20°C – +50°C
Minimum bending radius: 7.5 x Overall Diameter

ELECTRICAL PROPERTIES

Dielectric test:	2500 V r.m.s. x 5’ (core/core)
Insulation resistance	≥300 MΩ x km (at 20°C)
Short circuit temperature	350°C

CONSTRUCTION PARAMETERS

Cable Code	No. of Core X Cross Section	Nominal Insulation Thickness	Nominal Sheath Thickness	Nominal Overall Diameter	Approx. Weight
	mm^2	mm	mm	mm	kg/km
2 Cores					
FFX200 07SZ1-R (PH60) 2G1.5	2x1.5	0.8	1.0	7,8	96
FFX200 07SZ1-R (PH60) 2G2.5	2x2.5	0.9	1.1	9,2	138
FFX200 07SZ1-R (PH60) 2G4.0	2x4.0	0.9	1.2	10,5	189
3 Cores					
FFX200 07SZ1-R (PH60) 3G1.5	3x1.5	0.8	1.0	8,3	116
FFX200 07SZ1-R (PH60) 3G2.5	3x2.5	0.9	1.1	9,8	169
FFX200 07SZ1-R (PH60) 3G4.0	3x4.0	0.9	1.2	11,6	246
4 Cores					
FFX200 07SZ1-R (PH60) 4G1.5	4x1.5	0.8	1.1	9,3	147
FFX200 07SZ1-R (PH60) 4G2.5	4x2.5	0.9	1.2	11,3	222
FFX200 07SZ1-R (PH60) 4G4.0	4x4.0	0.9	1.3	12,5	299
5 Cores					
FFX200 07SZ1-R (PH60) 5G1.5	5x1.5	0.8	1.1	10,5	180
FFX200 07SZ1-R (PH60) 5G2.5	5x2.5	0.9	1.2	12,3	259
FFX200 07SZ1-R (PH60) 5G4.0	5x4.0	0.9	1.3	14,0	359

ELECTRICAL PROPERTIES

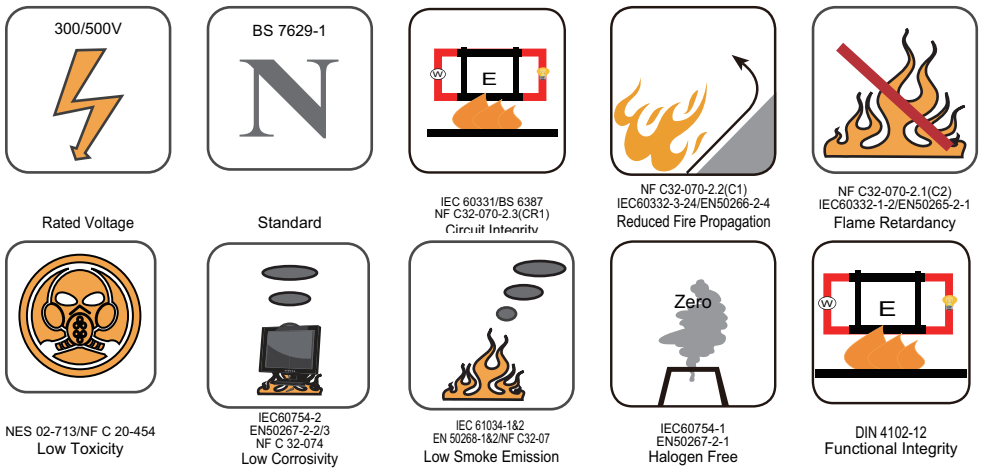
Conductor Operating Temperature : 90°C
Ambient Temperature : 30°C

Current-Carrying Capacities (Amp)

Conductor cross-sectional area	Reference Method A (enclosed in conduit in thermally insulating wall etc)		Reference Method B (enclosed in conduit on a wall or in trunking etc)		Reference Method C (clipped direct)		Reference Method E (in free air or on a perforated cable tray, horizontal or vertical etc) Touching	
	1 two-core cable*, single-phase a.c. or d.c.	1 three-or four core cable*, three-phase a.c.	1 two-core cable*, single-phase a.c. or d.c.	1 three-or four core cable*, three-phase a.c.	1 two-core cable*, single-phase a.c. or d.c.	1 three-or four core cable*, three-phase a.c.	1 two-core cable*, single-phase a.c. or d.c.	1 three-or four core cable*, three-phase a.c.
1	2	3	4	5	6	7	8	9
mm^2	A	A	A	A	A	A	A	A
1.5	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

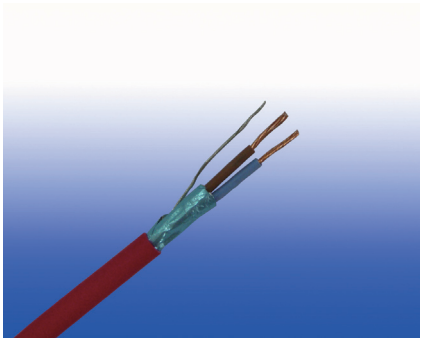
Voltage Drop (Per Amp Per Meter)

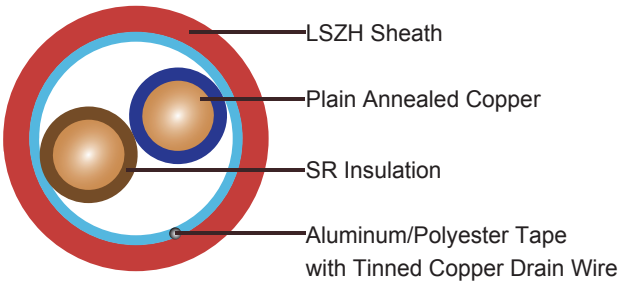
Conductor cross-sectional area	Two-core cables, d.c.	Two-core cable, single-phase a.c.	Three-or four core cable, three-phase a.c.
1	2	3	4
mm^2	mV/A/m	mV/A/m	mV/A/m
1.5	31	31	27
2.5	19	19	16
4	12	12	10



450/750V SR Insulated & Overall Screened Control Cables (2-4 Cores & Multicore)

FFX200 07SOZ1-K (PH30/60)(CU/SR/OSCR/LSZH 450/750V Class 5)





APPLICATION

The cables are designed, manufactured and tested for general application in power and signal wiring, for emergency circuit and fire circuit control where high rejection to electrostatic noise is needed.

STANDARDS

Basic design adapted to BS 7629-1

FIRE PERFORMANCE

Circuit Integrity	IEC 60331-21; BS 6387 CWZ; DIN VDE 0472-814(FE180); BS 8434-1 (30mins); BS 5839-1 Clause 26 2d; CEI 20-36/2-1; SS299-1; NBN C 30-004 (cat. F3); NF C32-070-2.3(CR1)
Circuit Integrity with mechanical shock	EN 50200(PH30/60); CEI 20-36/4-0
Circuit Integrity with mechanical shock & water spray	EN 50200 annex E
System circuit integrity	DIN 4102-12, E30 depending on lay system
Flame Retardance (Single Vertical Wire Test)	EN 60332-1-2; IEC 60332-1-2; BS EN 60332-1-2; VDE 0482-332-1; NBN C 30-004 (cat. F1); NF C32-070-2.1(C2); CEI 20-35/1-2; EN 50265-2-1*; DIN VDE 0482-265-2-1*
Reduced Fire Propagation (Vertically-mounted bundled wires & cable test)	EN 60332-3-24 (cat. C); IEC 60332-3-24; BS EN 60332-3-24; VDE 0482-332-3; NBN C 30-004 (cat. F2); NF C32-070-2.2(C1); CEI 20-22/3-4; EN 50266-2-4*; DIN VDE 0482-266-2-4
Halogen Free	IEC 60754-1; EN 50267-2-1; DIN VDE 0482-267-2-1; CEI 20-37/2-1; BS 6425-1*
No Corrosive Gas Emission	IEC 60754-2; EN 50267-2-2; DIN VDE 0482-267-2-2; CEI 20-37/2-2; BS 6425-2*
Minimum Smoke Emission	IEC 61034-1&2; EN 61034 -1&2; DIN VDE 0482-1034-1&2; CEI 20-37/3-1&2; EN 50268-1&2*; BS 7622-1&2*
No Toxic gases	NES 02-713; NF C 20-454

*Note: Asterisk * denotes superseded standard.*

VOLTAGE RATING

450/750 V

CABLE CONSTRUCTION

Conductors: Plain annealed copper wire, flexible according to IEC 60228 class 5.
Insulation: Fire resistant special ceramized silicone rubber compound type EI2 as per BS 7655-1.1.
Cabling: The cores are cabled together in concentric layers with suitable non-hygroscopic fillers.
Overall Screen: Aluminum/polyester tape with tinned copper drain wire.
Sheath: Thermoplastic LSZH compound type LTS3 as per BS 7655-6.1 Thermosetting LSZH compound type SW2-SW4 as per BS 7655-2.6 can be offered.). UV resistance, hydrocarbon resistance, oil resistance, anti rodent and anti termite properties can be offered as option.

COLOUR CODE

Insulation Colour as per BS7629

Number of cores	Core colours or numbering
2 cores+uninsulated circuit protective conductor	Brown, Blue or Brown, Brown
3 cores+uninsulated circuit protective conductor	Brown, Black, Grey
4 cores+uninsulated circuit protective conductor	Brown, Blue, Black, Grey
7, 12 and19 cores+uninsulated drain wire	Numbers 1, 2, 3, 4, 5, 6, 7 and upwards or, for identification by colour, an identical colour(excluding brown and black),except for two adjacent cores in each layer distinctively coloured brown and black.

Sheath Colour: Orange (other colours upon request)

PHYSICAL AND THERMAL PROPERTIES

Temperature range during operation (fixed state): -30°C – +90°C
Temperature range during installation (mobile state): -20°C – +50°C
Minimum bending radius: 7.5 x Overall Diameter

ELECTRICAL PROPERTIES

Dielectric test:	2500 V r.m.s. x 5’ (core/core)
Insulation Resistance	≥300 MΩ x km (at 20°C)
Short circuit Temperature	350°C

CONSTRUCTION PARAMETERS

Cable Code	No. of Core X Cross Section	Nominal Insulation Thickness	Nominal Sheath Thickness	Nominal Overall Diameter	Approx. Weight
	mm^2	mm	mm	mm	kg/km
2 Cores					
FFX200 07SOZ1-K(PH30/60) 2G0.75	2x0.75	0.7	0.9	7,6	69
FFX200 07SOZ1-K(PH30/60) 2G1.0	2x1.0	0.7	1.0	8,0	78
FFX200 07SOZ1-K(PH30/60) 2G1.5	2x1.5	0.8	1.0	8,3	88
FFX200 07SOZ1-K(PH30/60) 2G2.5	2x2.5	0.9	1.1	9,8	123
3 Cores					
FFX200 07SOZ1-K(PH30/60) 3G0.75	3x0.75	0.7	0.9	8,0	84
FFX200 07SOZ1-K(PH30/60) 3G1.0	3x1.0	0.7	1.0	8,2	86
FFX200 07SOZ1-K(PH30/60) 3G1.5	3x1.5	0.8	1.0	8,8	112
FFX200 07SOZ1-K(PH30/60) 3G2.5	3x2.5	0.9	1.1	10,4	159
4 Cores					
FFX200 07SOZ1-K(PH30/60) 4G0.75	4x0.75	0.7	1.0	8,7	103
FFX200 07SOZ1-K(PH30/60) 4G1.0	4x1.0	0.7	1.1	8,9	110
FFX200 07SOZ1-K(PH30/60) 4G1.5	4x1.5	0.8	1.1	9,8	141
FFX200 07SOZ1-K(PH30/60) 4G2.5	4x2.5	0.9	1.2	11,4	196
7 Cores					
FFX200 07SOZ1-K(PH30/60) 7G1.0	7x1.0	0.7	1.1	10,8	176
FFX200 07SOZ1-K(PH30/60) 7G1.5	7x1.5	0.8	1.2	11,7	218
FFX200 07SOZ1-K(PH30/60) 7G2.5	7x2.5	0.9	1.3	13,4	305
12 Cores					
FFX200 07SOZ1-K(PH30/60) 12G1.0	12x1.0	0.7	1.2	13,9	275
FFX200 07SOZ1-K(PH30/60) 12G1.5	12x1.5	0.8	1.3	15,3	352
FFX200 07SOZ1-K(PH30/60) 12G2.5	12x2.5	0.9	1.5	17,9	505
19 Cores					
FFX200 07SOZ1-K(PH30/60) 19G1.0	19x1.0	0.7	1.4	16,4	408
FFX200 07SOZ1-K(PH30/60) 19G1.5	19x1.5	0.8	1.5	18,2	535
FFX200 07SOZ1-K(PH30/60) 19G2.5	19x2.5	0.9	1.6	21,1	760

ELECTRICAL PROPERTIES

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

Current-Carrying Capacities (Amp)

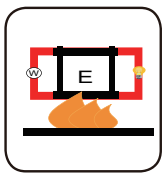
Conductor cross-sectional area	Reference Method A (enclosed in conduit in thermally insulating wall etc)		Reference Method B (enclosed in conduit on a wall or in trunking etc)		Reference Method C (clipped direct)		Reference Method E (in free air or on a perforated cable tray, horizontal or vertical etc) Touching	
	1 two-core cable*, single-phase a.c. or d.c.	1 three-or four core cable*, three-phase a.c.	1 two-core cable*, single-phase a.c. or d.c.	1 three-or four core cable*, three-phase a.c.	1 two-core cable*, single-phase a.c. or d.c.	1 three-or four core cable*, three-phase a.c.	1 two-core cable*, single-phase a.c. or d.c.	1 three-or four core cable*, three-phase a.c.
1	2	3	4	5	6	7	8	9
mm^2	A	A	A	A	A	A	A	A
0.75								
1.0	14.5	13	17	15	19	17	21	18
1.5	18.5	16.5	22	19.5	24	22	26	23
2.5	25	22	30	26	33	30	36	32
4	33	30	40	35	45	40	49	42

Voltage Drop (Per Amp Per Meter)

Conductor cross-sectional area	Two-core cables, d.c.	Two-core cable, single-phase a.c.	Three-or four core cable, three-phase a.c.
1	2	3	4
mm^2	mV/A/m	mV/A/m	mV/A/m
0.75			
1.0	46	46	40
1.5	31	31	27
2.5	19	19	16
4	12	12	10

Rated Voltage

Standard



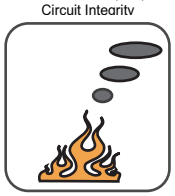
IEC 60331/BS 6387
NF C32-070-2.3(CR1)
Circuit Integrity


NF C32-070-2.2(C1)
IEC60332-3-24/EN50266-2-4
Reduced Fire Propagation

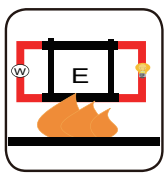

NF C32-070-2.1(C2)
IEC60332-1-2/EN50265-2-1
Flame Retardancy


NES 02-713/NF C 20-454
Low Toxicity


IEC60754-2
EN50267-2-2/3
NF C 32-074
Low Corrosivity


IEC 61034-1&2
EN 50268-1&2/NF C32-07
Low Smoke Emission

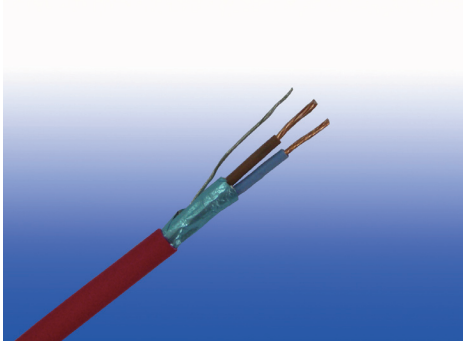
IEC60754-1
EN50267-2-1
Halogen Free

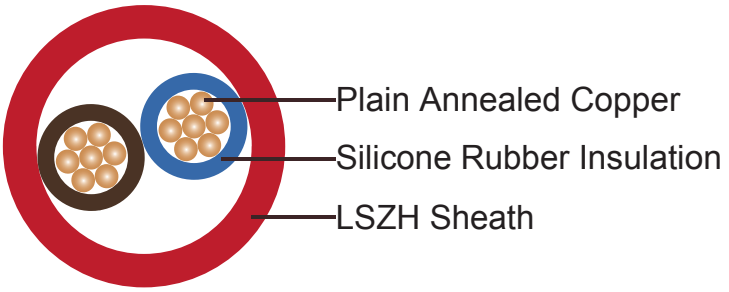


DIN 4102-12
Functional Integrity

600/1000V SR Insulated Flexibles Control Cables (2-4 Cores & Multicore)

FFX400 1SZ1-R(PH60)(CU/SR/LSZH 600/1000V Class 2)
FFX400 1SZ1-K(PH60)(CU/SR/LSZH 600/1000V Class 5)





APPLICATION

The cables are designed for power supply and signals trasmission, indoor or outdoor even wet environment. They are designed for fixed laying in free air, in pipe or conduit, on masonry and metal structures or suspended in places where in case of fire people are exposed to serious risks for emission of smoke, toxic and corrosive gases and where you want to avoid damage to facilities, equipment, goods. They are primarily intended for feeding of: emergency exits, alarm signals, warning of smoke or gas, escalators.

STANDARDS

Basic design adapted to BS 7629-1

FIRE PERFORMANCE

Circuit Integrity	IEC 60331-21; BS 6387 CWZ; DIN VDE 0472-814(FE180); BS 8434-1 (30mins); BS 5839-1 Clause 26 2d; CEI 20-36/2-1; SS299-1; NBN C 30-004 (cat. F3); NF C32-070-2.3(CR1)
Circuit Integrity with mechanical shock	EN 50200(PH60); CEI 20-36/4-0
Circuit Integrity with mechanical shock & water spray	EN 50200 annex E
System circuit integrity	DIN 4102-12, E30 depending on lay system
Flame Retardance (Single Vertical Wire Test)	EN 60332-1-2; IEC 60332-1-2; BS EN 60332-1-2; VDE 0482-332-1; NBN C 30-004 (cat. F1); NF C32-070-2.1(C2); CEI 20-35/1-2; EN 50265-2-1*; DIN VDE 0482-265-2-1*
Reduced Fire Propagation (Vertically-mounted bundled wires & cable test)	EN 60332-3-24 (cat. C); IEC 60332-3-24; BS EN 60332-3-24; VDE 0482-332-3; NBN C 30-004 (cat. F2); NF C32-070-2.2(C1); CEI 20-22/3-4; EN 50266-2-4*; DIN VDE 0482-266-2-4
Halogen Free	IEC 60754-1; EN 50267-2-1; DIN VDE 0482-267-2-1; CEI 20-37/2-1; BS 6425-1*

No Corrosive Gas Emission	IEC 60754-2; EN 50267-2-2; DIN VDE 0482-267-2-2; CEI 20-37/2-2; BS 6425-2*
Minimum Smoke Emission	IEC 61034-1&2; EN 61034 -1&2; DIN VDE 0482-1034-1&2; CEI 20-37/3-1&2; EN 50268-1&2*; BS 7622-1&2*
No Toxic gases	NES 02-713; NF C 20-454

*Note: Asterisk * denotes superseded standard.*

VOLTAGE RATING

600/1000 V

CABLE CONSTRUCTION

Conductors: Plain annealed copper wire, stranded for section up to 10mm^2 according to IEC 60228 class 2 or flexible for section above 10mm^2 according to IEC 60228 class 5.
Insulation: Fire resistant silicone rubber compound type EI2 as per BS 7655-1.1.
Cabling: The cores are cabled together in concentric layers with suitable non-hygroscopic fillers.
Sheath: Thermoplastic LSZH compound type LTS3 as per BS 7655-6.1 (Thermosetting LSZH compound type SW2-SW4 as per BS 7655-2.6 can be offered.). UV resistance, hydrocarbon resistance, oil resistance, anti rodent and anti termite properties can be offered as option.

COLOUR CODE

Insulation Colour as per BS7629

Number of cores	Core colours or numbering
2 cores+uninsulated circuit protective conductor	Brown, Blue or Brown, Brown
3 cores+uninsulated circuit protective conductor	Brown, Black, Grey
4 cores+uninsulated circuit protective conductor	Brown, Blue, Black, Grey
7, 12 and19 cores+uninsulated drain wire	Numbers 1, 2, 3, 4, 5, 6, 7 and upwards or, for identification by colour, an identical colour(excluding brown and black),except for two adjacent cores in each layer distinctively coloured brown and black.

Sheath Colour: Orange (other colours upon request)

PHYSICAL AND THERMAL PROPERTIES

Temperature range during operation (fixed state): -30°C – +90°C
Temperature range during installation (mobile state): -20°C – +50°C
Minimum bending radius: 6 x Overall Diameter

ELECTRICAL PROPERTIES

Dielectric test:	3500 V r.m.s. x 5' (core/core)
Insulation Resistance	≥300 MΩ x km (at 20°C)
Short circuit Temperature	350°C

CONSTRUCTION PARAMETERS

Cable Code	No. of Core X Cross Section	Nominal Insulation Thickness	Nominal Sheath Thickness	Nominal Overall Diameter	Approx. Weight
	mm^2	mm	mm	mm	kg/km
2 Cores					
FFX400 1SZ1-R(PH60)	2x1.5	1.0	1.2	9,2	124
FFX400 1SZ1-R(PH60)	2x2.5	1.1	1.3	10,0	155
FFX400 1SZ1-R(PH60)	2x4.0	1.1	1.4	11,2	207
FFX400 1SZ1-R(PH60)	2x6.0	1.1	1.5	13,1	298
FFX400 1SZ1-K(PH60)	2x10	1.1	1.6	15,9	441
FFX400 1SZ1-K(PH60)	2x16	1.1	1.7	17,4	602
3 Cores					
FFX400 1SZ1-K(PH60)	3x1.5	1.0	1.2	9,8	148
FFX400 1SZ1-K(PH60)	3x2.5	1.1	1.3	10,6	188
FFX400 1SZ1-K(PH60)	3x4.0	1.1	1.4	12,1	263
FFX400 1SZ1-K(PH60)	3x6.0	1.1	1.5	14,4	372
FFX400 1SZ1-K(PH60)	3x10	1.1	1.6	16,8	541
FFX400 1SZ1-K(PH60)	3x16	1.1	1.7	19,4	777
4 Cores					
FFX400 1SZ1-K(PH60)	4x1.5	1.0	1.3	10,6	176
FFX400 1SZ1-K(PH60)	4x2.5	1.1	1.4	11,5	228
FFX400 1SZ1-K(PH60)	4x4.0	1.1	1.5	13,6	332
FFX400 1SZ1-K(PH60)	4x6.0	1.1	1.6	11,5	214
FFX400 1SZ1-K(PH60)	4x10	1.1	1.7	18,5	680
FFX400 1SZ1-K(PH60)	4x16	1.1	1.8	21,2	973
5 Cores					
FFX400 1SZ1-K(PH60)	5x2.5	1.1	1.4	12,6	266
FFX400 1SZ1-K(PH60)	5x4.0	1.1	1.5	14,5	399
FFX400 1SZ1-K(PH60)	5x6.0	1.1	1.6	17,6	576
FFX400 1SZ1-K(PH60)	5x10	1.1	1.7	20,5	850
FFX400 1SZ1-K(PH60)	5x16	1.1	1.8	23,3	1202

ELECTRICAL PROPERTIES

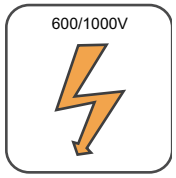
Conductor Operating Temperature : 90°C
Ambient Temperature : 30°C

Current-Carrying Capacities (Amp)

Conductor cross-sectional area	Reference Method A (enclosed in conduit in thermally insulating wall etc)		Reference Method B (enclosed in conduit on a wall or in trunking etc)		Reference Method C (clipped direct)		Reference Method E (in free air or on a perforated cable tray, horizontal or vertical etc) Touching	
	1 two-core cable*, single-phase a.c. or d.c.	1 three-or four core cable*, three-phase a.c.	1 two-core cable*, single-phase a.c. or d.c.	1 three-or four core cable*, three-phase a.c.	1 two-core cable*, single-phase a.c. or d.c.	1 three-or four core cable*, three-phase a.c.	1 two-core cable*, single-phase a.c. or d.c.	1 three-or four core cable*, three-phase a.c.
1	2	3	4	5	6	7	8	9
mm^2	A	A	A	A	A	A	A	A
1.5	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

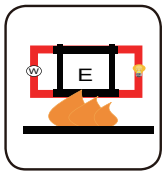
Voltage Drop (Per Amp Per Meter)

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



Rated Voltage

Standard



IEC 60331/BS 6387
NF C32-070-2.3(CR1)
Circuit Integrity

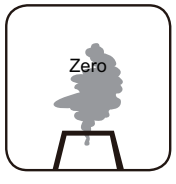

NF C32-070-2.2(C1)
IEC60332-3-24/EN50266-2-4
Reduced Fire Propagation


NF C32-070-2.1(C2)
IEC60332-1-2/EN50265-2-1
Flame Retardancy

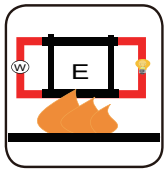

NES 02-713/NF C 20-454
Low Toxicity


IEC60754-2
EN50267-2-2/3
NF C 32-074
Low Corrosivity


IEC 61034-1&2
EN 50268-1&2/NF C32-07
Low Smoke Emission



IEC60754-1
EN50267-2-1
Halogen Free



DIN 4102-12
Functional Integrity

TYPE CODES FOR FIRE RESISTANT POWER & CONTROL CABLES

FFXA-B-C-D-E-F-G-H

H Conductor
U: Solid to IEC 60228 class 1
R: Stranded to IEC 60228 class 2
K: Stranded to IEC 60228 class 5

G Outer Sheath
Z1: Thermoplastic LSZH
Z: Polyolefin-based cross-linked thermosetting LSZH

F Armour
M: Steel wire armour
MA: Aluminium wire armour
F: Steel tape armour
FA: Aluminium tape armour
F2: Double steel tape armour
F3: Flat steel wire armour

E Inner Sheath
Z1: Thermoplastic LSZH
Z: Polyolefin-based cross-linked thermosetting LSZH

D Screen
O: Overall aluminium screen
C: Overall copper braiding

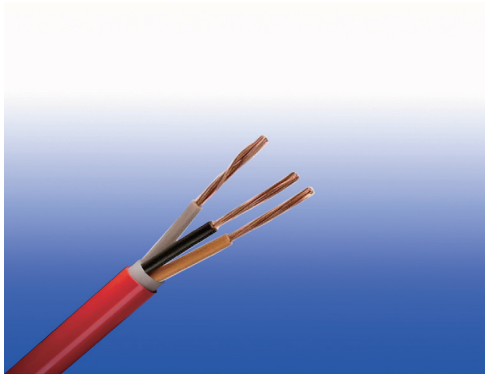
C Insulation
mR: Mica tape+XLPE
mZ1: Mica tape+thermoplastic LSZH
mS: Mica tape+ silicone rubber
S: Silicone rubber

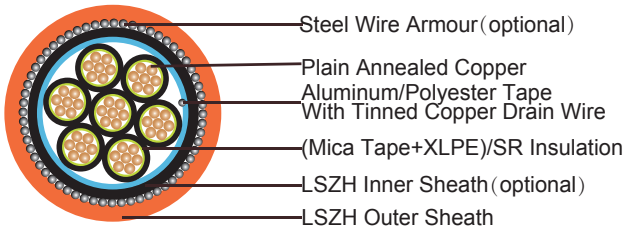
B Voltage
05: 300/500V
07: 450/750V
1: 600/1000V

A Type
100: Single core unsheathed
200: 300/500V & 450/750V multicore/multipair
300: Single core sheathed
400: 600/1000V multicore

300/500V Mica+XLPE or SR Insulated & Overall Screened Multicore Instrumentation Cables

RE-2X(St)H...CI. FE 180 PH30 (CU/MGT+XLPE/OSCR/LSZH 300/500V Class 2)
RE-2G(St)H...CI. FE 180 PH30 (CU/SR/OSCR/LSZH 300/500V Class 2)
RE-2X(St)HSWAH...CI. FE 180 PH30 (CU/MGT+XLPE/OSCR/LSZH/SWA/LSZH 300/500V Class 2)
RE-2G(St)HSWAH...CI. FE 180 PH30 (CU/SR/OSCR/LSZH/SWA/LSZH 300/500V Class 2)





APPLICATION

The cables are designed, manufactured and tested as data transmission cables for emergency services. These are used for data and voice transmission when high frequency signal has to be assured also in the event of a fire.

STANDARDS

Basic design to BS 5308/BS 7629-1

FIRE PERFORMANCE

Circuit Integrity	IEC 60331-21; BS 6387 CWZ; DIN VDE 0472-814(FE180); BS 8434-1 (30mins); BS 5839-1 Clause 26 2d; CEI 20-36/2-1; SS299-1; NBN C 30-004 (cat. F3); NF C32-070-2.3(CR1)
Circuit Integrity with mechanical shock	EN 50200(PH30); CEI 20-36/4-0
Circuit Integrity with mechanical shock & water spray	EN 50200 annex E
System circuit integrity	DIN 4102-12, E30 depending on lay system
Flame Retardance (Single Vertical Wire Test)	EN 60332-1-2; IEC 60332-1-2; BS EN 60332-1-2; VDE 0482-332-1; NBN C 30-004 (cat. F1); NF C32-070-2.1(C2); CEI 20-35/1-2; EN 50265-2-1*; DIN VDE 0482-265-2-1*

Reduced Fire Propagation (Vertically-mounted bundled wires & cable test)	EN 60332-3-24 (cat. C); IEC 60332-3-24; BS EN 60332-3-24; VDE 0482-332-3; NBN C 30-004 (cat. F2); NF C32-070-2.2(C1); CEI 20-22/3-4; EN 50266-2-4*; DIN VDE 0482-266-2-4
Halogen Free	IEC 60754-1; EN 50267-2-1; DIN VDE 0482-267-2-1; CEI 20-37/2-1; BS 6425-1*
No Corrosive Gas Emission	IEC 60754-2; EN 50267-2-2; DIN VDE 0482-267-2-2; CEI 20-37/2-2; BS 6425-2*
Minimum Smoke Emission	IEC 61034-1&2; EN 61034 -1&2; DIN VDE 0482-1034-1&2; CEI 20-37/3-1&2; EN 50268-1&2*; BS 7622-1&2*
No Toxic gases	NES 02-713; NF C 20-454

*Note: Asterisk * denotes superseded standard.*

CABLE CONSTRUCTION

Conductor: Plain annealed copper wire, stranded according to IEC 60228 class 2.
Insulation: Mica glass tape covered by extruded XLPE compound or fire resistant special ceramized silicone rubber compound type EI2 as per BS 7655-1.1.
Cabling: The cores are cabled together in concentric layers with suitable non-hygroscopic fillers.
Overall Screen: Aluminum/polyester tape with 0.5mm^2(7/0.3mm) tinned copper drain wire.
Inner Sheath(optional): Thermoplastic LSZH compound type LTS3 as per BS 7655-6.1
Armouring(optional): Galvanized steel wire armour
Outer Sheath: Thermoplastic LSZH compound type LTS3 as per BS 7655-6.1(Thermosetting LSZH compound type SW2-SW4 as per BS 7655-2.6 can be offered.). UV resistance, hydrocarbon resistance, oil resistance, anti rodent and anti termite properties can be offered as option.

VOLTAGE RATING

300/500 V

COLOUR CODE

Insulation Colour: White with black numberings.
Sheath Colour: Orange (other colours on request).

PHYSICAL AND THERMAL PROPERTIES

Temperature range during operation (fixed state): -30°C – +90°C
Temperature range during installation (mobile state): -20°C – +50°C
Minimum bending radius: 6 x Overall Diameter (unarmoured cables with SR insulation)
8 x Overall Diameter (unarmoured cables with XLPE insulation)
10 x Overall Diameter (armoured cables)

ELECTRICAL PROPERTIES

Dielectric test:	2000 V r.m.s. x 5' (core/core)
Insulation Resistance@20°C	XLPE: ≥1000 MΩ x km SR: ≥300 MΩ x km
Short circuit Temperature	XLPE: 250°C SR: 350°C

CONSTRUCTION PARAMETERS

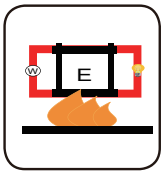
Conductor			RE-2X(St)H.CI. FE 180 PH30 RE-2G(St)H.CI. FE 180 PH30		RE-2X(St)HSWAH...CI. FE 180 PH30 RE-2G(St)HSWAH...CI. FE 180 PH30			
			Unarmoured		Armoured			
No. of Core X Cross Section	No./ Nominal Diameter of Strands	Nominal Insulation Thickness	Nominal Overall Diameter	Approx. Weight	Diameter Under Armour	Armour Wire Diameter	Nominal Overall Diameter	Approx. Weight
mm^2	no./mm	mm	mm	kg/km	mm	mm	mm	kg/km
2 Cores								
2x1.0	1/1.13	0.6	8.0	82	8.0	0.90	12.4	288
2x1.5	7/0.53	0.6	8.5	101	8.5	0.90	13.1	342
2x2.5	7/0.67	0.7	10.5	137	10.5	0.90	15.1	419
2x4.0	7/0.85	0.8	12.5	180	12.5	0.90	17.1	484
3 Cores								
3x1.0	1/1.13	0.6	8.0	100	8.0	0.90	12.4	324
3x1.5	7/0.53	0.6	9.5	127	9.5	0.90	14.1	383
3x2.5	7/0.67	0.7	12.0	176	12.0	0.90	16.6	466
3x4.0	7/0.85	0.8	13.5	236	13.5	0.90	18.1	560
4 Cores								
4x1.0	1/1.13	0.6	9.0	127	9.0	0.90	13.6	383
4x1.5	7/0.53	0.6	10.5	161	10.5	0.90	15.1	445
4x2.5	7/0.67	0.7	13.0	224	13.0	0.90	17.6	548
4x4.0	7/0.85	0.8	15.0	302	15.0	1.25	20.5	772
7 Cores								
7x1.0	1/1.13	0.6	11.0	187	11.0	0.90	15.6	485

Conductor			RE-2X(St)H.Cl. FE 180 PH30 RE-2G(St)H.Cl. FE 180 PH30		RE-2X(St)HSWAH...Cl. FE 180 PH30 RE-2G(St)HSWAH...Cl. FE 180 PH30			
			Unarmoured		Armoured			
No. of Core X Cross Section	No./ Nominal Diameter of Strands	Nominal Insulation Thickness	Nominal Overall Diameter	Approx. Weight	Diameter Under Armour	Armour Wire Diameter	Nominal Overall Diameter	Approx. Weight
mm^2	no./mm	mm	mm	kg/km	mm	mm	mm	kg/km
7x1.5	7/0.53	0.6	12.5	250	12.5	0.90	17.3	597
7x2.5	7/0.67	0.7	15.0	354	15.0	1.25	20.5	862
12 Cores								
12x1.5	7/0.53	0.6	16.0	402	16.0	1.25	21.7	997
12x2.5	7/0.67	0.7	20.0	585	20.0	1.60	26.4	1421
19 Cores								
19x1.5	7/0.53	0.6	19.0	597	19.0	1.60	25.6	1465
19x2.5	7/0.67	0.7	24.0	873	24.0	1.60	30.6	1837

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

Rated Voltage

Standard

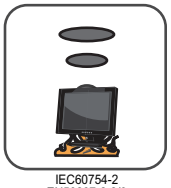


IEC 60331/BS 6387
NF C32-070-2.3(CR1)
Circuit Integrity


NF C32-070-2.2(C1)
IEC60332-3-24/EN50266-2-4
Reduced Fire Propagation

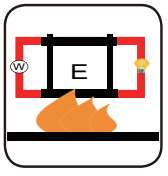

NF C32-070-2.1(C2)
IEC60332-1-2/EN50265-2-1
Flame Retardancy


NES 02-713/NF C 20-454
Low Toxicity


IEC60754-2
EN50267-2-2/3
NF C 32-074
Low Corrosivity


IEC 61034-1&2
EN 50268-1&2/NF C32-07
Low Smoke Emission

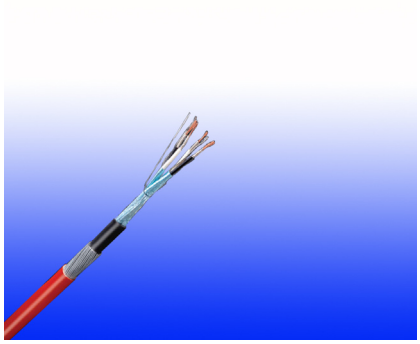
IEC60754-1
EN50267-2-1
Halogen Free

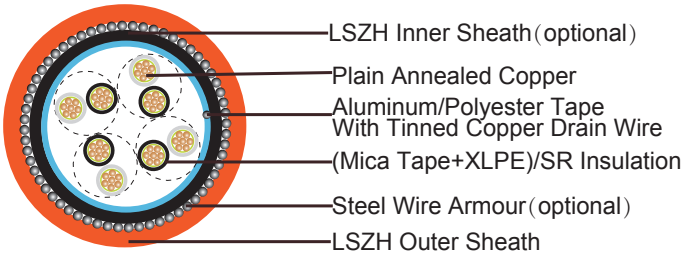


DIN 4102-12
Functional Integrity

300/500V Mica+XLPE/SR Insulated & Overall Screened Multipair Instrumentation Cables

RE-2X(St)H...CI. FE 180 PH30 (CU/MGT+XLPE/OSCR/LSZH 300/500V Class 2)
RE-2G(St)H...CI. FE 180 PH30 (CU/SR/OSCR/LSZH 300/500V Class 2)
RE-2X(St)HSWAH...CI. FE 180 PH30 (CU/MGT+XLPE/OSCR/LSZH/SWA/LSZH 300/500V Class 2)
RE-2G(St)HSWAH...CI. FE 180 PH30 (CU/SR/OSCR/LSZH/SWA/LSZH 300/500V Class 2)





APPLICATION

The cables are designed, manufactured and tested as data transmission cables for emergency services. These are used for data and voice transmission when high frequency signal has to be assured also in the event of a fire.

STANDARDS

Basic design to BS 5308/BS 7629-1

FIRE PERFORMANCE

Circuit Integrity	IEC 60331-21; BS 6387 CWZ; DIN VDE 0472-814(FE180); BS 8434-1 (30mins); BS 5839-1 Clause 26 2d; CEI 20-36/2-1; SS299-1; NBN C 30-004 (cat. F3); NF C32-070-2.3(CR1)
Circuit Integrity with mechanical shock	EN 50200(PH30); CEI 20-36/4-0
Circuit Integrity with mechanical shock & water spray	EN 50200 annex E
System circuit integrity	DIN 4102-12, E30 depending on lay system
Flame Retardance (Single Vertical Wire Test)	EN 60332-1-2; IEC 60332-1-2; BS EN 60332-1-2; VDE 0482-332-1; NBN C 30-004 (cat. F1); NF C32-070-2.1(C2); CEI 20-35/1-2; EN 50265-2-1*; DIN VDE 0482-265-2-1*
Reduced Fire Propagation (Vertically-mounted bundled wires & cable test)	EN 60332-3-24 (cat. C); IEC 60332-3-24; BS EN 60332-3-24; VDE 0482-332-3; NBN C 30-004 (cat. F2); NF C32-070-2.2(C1); CEI 20-22/3-4; EN 50266-2-4*; DIN VDE 0482-266-2-4

Halogen Free	IEC 60754-1; EN 50267-2-1; DIN VDE 0482-267-2-1; CEI 20-37/2-1; BS 6425-1*
No Corrosive Gas Emission	IEC 60754-2; EN 50267-2-2; DIN VDE 0482-267-2-2; CEI 20-37/2-2; BS 6425-2*
Minimum Smoke Emission	IEC 61034-1&2; EN 61034 -1&2; DIN VDE 0482-1034-1&2; CEI 20-37/3-1&2; EN 50268-1&2*; BS 7622-1&2*
No Toxic gases	NES 02-713; NF C 20-454

*Note: Asterisk * denotes superseded standard.*

CABLE CONSTRUCTION

Conductor: Plain annealed copper wire, stranded according to IEC 60228 class 1 or class 2.
Insulation: Mica glass tape covered by extruded XLPE compound or fire resistant special ceramized silicone rubber compound type EI2 as per BS 7655-1.1.
Cabling Elements: Insulated cores are twisted to form pairs with varying lay length to minimize crosstalk. Two-pair cable had four cores laid in quad formation.
Cabling: Pairs are cabled together. In cables with 8 pairs or more, 4 pairs are assembled to form a bunch, the bunches are then cabled together.
Overall Screen: Aluminum/polyester tape with 0.5mm^2 screen (7/0.3mm) tinned copper drain wire.
Inner Sheath(optional): Thermoplastic LSZH compound type LTS3 as per BS 7655-6.1
Armouring(optional): Galvanized steel wire armour
Outer Sheath: Thermoplastic LSZH compound type LTS3 as per BS 7655-6.1(Thermosetting LSZH compound type SW2-SW4 as per BS 7655-2.6 can be offered.). UV resistance, hydrocarbon resistance, oil resistance, anti rodent and anti termite properties can be offered as option.

VOLTAGE RATING

300/500 V

COLOUR CODE

Insulation Colour: White with black numberings.
Sheath Colour: Orange (other colours on request).

PHYSICAL AND THERMAL PROPERTIES

Temperature range during operation (fixed state): -30°C – +70°C
Temperature range during installation (mobile state): -20°C – +50°C
Minimum bending radius: 6 x Overall Diameter (unarmoured cables with SR insulation)
8 x Overall Diameter (unarmoured cables with XLPE insulation)
10 x Overall Diameter (armoured cables)

ELECTRICAL PROPERTIES

Dielectric test:	2000 V r.m.s. x 5' (core/core)
Insulation Resistance@20°C	XLPE: ≥1000 MΩ x km SR: ≥300 MΩ x km
Short circuit Temperature	XLPE: 250°C SR: 350°C

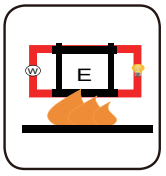
CONSTRUCTION PARAMETERS

Conductor			RE-2X(St)H...CI. FE 180 PH30 RE-2G(St)H...CI. FE 180 PH30		RE-2X(St)HSWAH...CI. FE 180 PH30 RE-2G(St)HSWAH...CI. FE 180 PH30			
			Unarmoured		Armoured			
No. of Pairs X Cross Section	No./ Nominal Diameter of Strands	Nominal Insulation Thickness	Nominal Overall Diameter	Approx. Weight	Armour Wire Diameter	Diameter Over Armour	Nominal Overall Diameter	Approx. Weight
mm^2	no./mm	mm	mm	kg/km	mm	mm	mm	kg/km
1 Pair								
1X2x0.5	1/0.8	0.5	5.3	50	0.90	7.1	9.7	200
1X2x1.0	1/1.13	0.6	6.4	76	0.90	8.2	10.8	281
1X2x1.5	7/0.53	0.6	7.3	94	0.90	9.1	11.9	332
1X2x2.5	7/0.67	0.7	10.5	130	0.90	13.2	15.1	401
2 Pairs								
2X2x0.5	1/0.8	0.5	6.1	75	0.90	7.9	10.5	260
2X2x1.0	1/1.13	0.6	7.4	120	0.90	9.2	12.0	370
2X2x1.5	7/0.53	0.6	8.7	160	0.90	10.5	13.3	450
2X2x2.5	7/0.67	0.7	16.0	230	0.90	16.0	20.5	550
5 Pairs								
5X2x0.5	1/0.8	0.5	10.6	200	0.90	12.4	15.2	460
5X2x1.0	1/1.13	0.6	13.2	276	1.25	15.7	18.7	854
5X2x1.5	7/0.53	0.6	15.4	368	1.25	17.9	21.1	1023
5X2x2.5	7/0.67	0.7	23.0	518	1.25	23.8	28.9	1276
10 Pairs								
10X2x0.5	1/0.8	0.5	14.0	270	1.25	16.5	19.7	790
10X2x1.0	1/1.13	0.6	17.4	501	1.25	19.9	23.3	1271
10X2x1.5	7/0.53	0.6	20.6	673	1.60	23.8	27.4	1742
10X2x2.5	7/0.67	0.7	29.5	971	1.60	30.2	36.5	2205
15 Pairs								
15X2x0.5	1/0.8	0.5	16.1	370	1.25	18.6	21.8	1100
15X2x1.0	1/1.13	0.6	20.3	670	1.60	23.5	27.1	1740
15X2x1.5	7/0.53	0.6	24.2	880	1.60	27.4	31.2	1970
15X2x2.5	7/0.67	0.7	32.4	1020	2.0	33.5	39.5	2370

Conductor			RE-2X(St)H...Cl. FE 180 PH30 RE-2G(St)H...Cl. FE 180 PH30		RE-2X(St)HSWAH...Cl. FE 180 PH30 RE-2G(St)HSWAH...Cl. FE 180 PH30			
			Unarmoured		Armoured			
No. of Pairs X Cross Section	No./ Nominal Diameter of Strands	Nominal Insulation Thickness	Nominal Overall Diameter	Approx. Weight	Armour Wire Diameter	Diameter Over Armour	Nominal Overall Diameter	Approx. Weight
mm^2	no./mm	mm	mm	kg/km	mm	mm	mm	kg/km
20 Pairs								
20X2x0.5	1/0.8	0.5	18.4	440	1.25	21.6	25.0	1280
20X2x1.0	1/1.13	0.6	23.4	917	1.60	26.6	30.2	2040
20X2x1.5	7/0.53	0.6	27.5	1258	2.0	31.5	35.5	2705
20X2x2.5	7/0.67	0.7	38.5	1830	2.0	36.8	46.7	3836
30 Pairs								
30X2x0.5	1/0.8	0.5	22.0	630	1.60	25.2	28.8	1520
30X2x1.0	1/1.13	0.6	28.0	1030	1.6	31.2	35.2	2680
30X2x1.5	7/0.53	0.6	33.3	1560	2.0	37.3	41.5	3170
30X2x2.5	7/0.67	0.7	49.7	1980	2.5	46.3	49.7	4250
50 Pairs								
50X2x0.5	1/0.8	0.5	27.9	980	1.60	31.1	35.9	2100
50X2x1.0	1/1.13	0.6	36.3	1750	2.0	40.3	44.7	3500
50X2x1.5	7/0.53	0.6	42.6	2400	2.5	47.6	52.4	5020
50X2x2.5	7/0.67	0.7	60.4	3240	2.5	57.2	68.6	5870

Rated Voltage

Standard



IEC 60331/BS 6387
NF C32-070-2.3(CR1)
Circuit Integrity


NF C32-070-2.2(C1)
IEC60332-3-24/EN50266-2-4
Reduced Fire Propagation

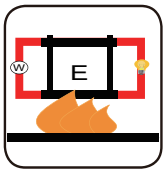

NF C32-070-2.1(C2)
IEC60332-1-2/EN50265-2-1
Flame Retardancy


NES 02-713/NF C 20-454
Low Toxicity


IEC60754-2
EN50267-2-2/3
NF C 32-074
Low Corrosivity


IEC 61034-1&2
EN 50268-1&2/NF C32-07
Low Smoke Emission

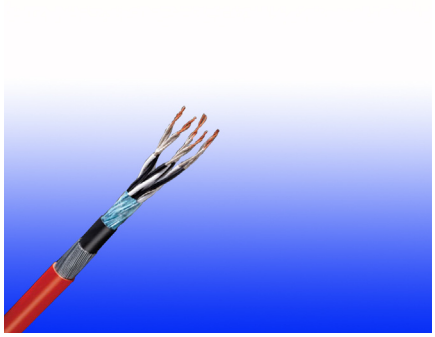
IEC60754-1
EN50267-2-1
Halogen Free

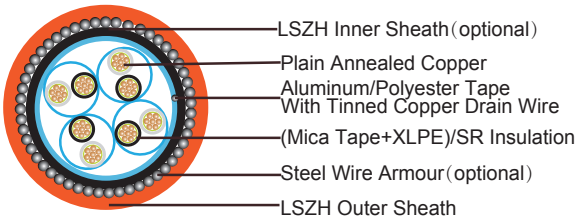


DIN 4102-12
Functional Integrity

300/500V Mica+XLPE/SR Insulated Individual and Overall Screened Instrumentation Cables

RE-2X(St)H PiMF...CI. FE 180 PH30 (CU/MGT+XLPE/PSCR/OSCR/LSZH 300/500V Class 2)
RE-2G(St)H PiMF...CI. FE 180 PH 30 (CU/SR/PSCR/OSCR/LSZH 300/500V Class 2)
RE-2X(St)HSWAH PiMF..CI. FE 180 PH 30 (CU/MGT+XLPE/PSCR/OSCR/LSZH/SWA/LSZH 300/500V Class 2)
RE-2G(St)HSWAH PiMF...CI. FE 180 PH 30 (CU/SR/PSCR/OSCR/LSZH/SWA/LSZH 300/500V Class 2)





APPLICATION

The cables are designed, manufactured and tested as data transmission cables for emergency services. These are used for data and voice transmission when high frequency signal has to be assured also in the event of a fire.

STANDARDS

Basic design to BS 5308/BS 7629-1

FIRE PERFORMANCE

Circuit Integrity	IEC 60331-21; BS 6387 CWZ; DIN VDE 0472-814(FE180); BS 8434-1 (30mins); BS 5839-1 Clause 26 2d; CEI 20-36/2-1; SS299-1; NBN C 30-004 (cat. F3); NF C32-070-2.3(CR1)
Circuit Integrity with mechanical shock	EN 50200(PH30); CEI 20-36/4-0
Circuit Integrity with mechanical shock & water spray	EN 50200 annex E
System circuit integrity	DIN 4102-12, E30 depending on lay system
Flame Retardance (Single Vertical Wire Test)	EN 60332-1-2; IEC 60332-1-2; BS EN 60332-1-2; VDE 0482-332-1; NBN C 30-004 (cat. F1); NF C32-070-2.1(C2); CEI 20-35/1-2; EN 50265-2-1*; DIN VDE 0482-265-2-1*

Reduced Fire Propagation (Vertically-mounted bundled wires & cable test)	EN 60332-3-24 (cat. C); IEC 60332-3-24; BS EN 60332-3-24; VDE 0482-332-3; NBN C 30-004 (cat. F2); NF C32-070-2.2(C1); CEI 20-22/3-4; EN 50266-2-4*; DIN VDE 0482-266-2-4
Halogen Free	IEC 60754-1; EN 50267-2-1; DIN VDE 0482-267-2-1; CEI 20-37/2-1; BS 6425-1*
No Corrosive Gas Emission	IEC 60754-2; EN 50267-2-2; DIN VDE 0482-267-2-2; CEI 20-37/2-2; BS 6425-2*
Minimum Smoke Emission	IEC 61034-1&2; EN 61034 -1&2; DIN VDE 0482-1034-1&2; CEI 20-37/3-1&2; EN 50268-1&2*; BS 7622-1&2*
No Toxic gases	NES 02-713; NF C 20-454

*Note: Asterisk * denotes superseded standard.*

CABLE CONSTRUCTION

Conductor: Plain annealed copper wire, stranded according to IEC 60228 class 2.
Insulation: Mica glass tape covered by extruded XLPE compound or fire resistant special ceramized silicone rubber compound type EI2 as per BS 7655-1.1.
Cabling Elements: Insulated cores are twisted to form pairs with varying lay length to minimize crosstalk. Two-pair cable had four cores laid in quad formation.
Cabling: Pairs are cabled together. In cables with 8 pairs or more, 4 pairs are assembled to form a bunch, the bunches are then cabled together.
Individual Screen: Aluminum/polyester tape with 0.5mm^2 screen (7/0.3mm) tinned copper drain wire.
Overall Screen: Aluminum/polyester tape with 0.5mm^2 screen (7/0.3mm) tinned copper drain wire.
Inner Sheath(optional): Thermoplastic LSZH compound type LTS3 as per BS 7655-6.1
Armouring(optional): Galvanized steel wire armour
Outer Sheath: Thermoplastic LSZH compound type LTS3 as per BS 7655-6.1(Thermosetting LSZH compound type SW2-SW4 as per BS 7655-2.6 can be offered.). UV resistance, hydrocarbon resistance, oil resistance, anti rodent and anti termite properties can be offered as option.

VOLTAGE RATING

300/500 V

COLOUR CODE

Insulation Colour: White with black numberings.
Sheath Colour: Orange (other colours on request).

PHYSICAL AND THERMAL PROPERTIES

Temperature range during operation (fixed state): -30°C – +70°C
Temperature range during installation (mobile state): -20°C – +50°C
Minimum bending radius: 6 x Overall Diameter (unarmoured cables with SR insulation)
8 x Overall Diameter (unarmoured cables with XLPE insulation)
10 x Overall Diameter (armoured cables)

ELECTRICAL PROPERTIES

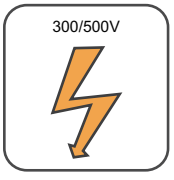
Dielectric test:	2000 V r.m.s. x 5' (core/core)
Insulation Resistance@20°C	≥1000 MΩ x km
Short circuit Temperature	XLPE: 250°C SR: 350°C

CONSTRUCTION PARAMETERS

Conductor			RE-2X(St)H PiMF...CI. FE 180 PH30 RE-2G(St)H PiMF...CI. FE 180 PH30		RE-2X(St)HSWAH PiMF..CI. FE 180 PH30 RE-2G(St)HSWAH PiMF..CI. FE 180 PH30			
			Unarmoured		Armoured			
No. of Pairs X Cross Section	No./ Nominal Diameter of Strands	Nominal Insulation Thickness	Nominal Overall Diameter	Approx. Weight	Armour Wire Diameter	Diameter Over Armour	Nominal Overall Diameter	Approx. Weight
mm^2	no./mm	mm	mm	kg/km	mm	mm	mm	kg/km
2 Pairs								
2X2x0.5	1/0.8	0.5	9.3	150	0.90	11.1	13.9	380
2X2x1.0	1/1.13	0.6	11.8	166	0.90	13.6	16.6	555
2X2x1.5	7/0.53	0.6	13.7	205	1.25	16.2	19.4	769
2X2x2.5	7/0.67	0.7	19.2	350	1.25	19.2	24.9	938
5 Pairs								
5X2x0.5	1/0.8	0.5	12.5	250	1.25	15.0	18.0	640
5X2x1.0	1/1.13	0.6	15.2	335	1.25	17.7	20.9	1000
5X2x1.5	7/0.53	0.6	17.8	433	1.60	21.0	24.4	1352
5X2x2.5	7/0.67	0.7	24.0	592	1.60	24.0	30.8	1665
10 Pairs								
10X2x0.5	1/0.8	0.5	17.3	380	1.25	19.8	23.2	890
10X2x1.0	1/1.13	0.6	21.6	626	1.60	24.8	28.4	1800
10X2x1.5	7/0.53	0.6	25.5	811	1.60	28.7	32.5	2165
10X2x2.5	7/0.67	0.7	31.5	1132	2.00	31.5	39.5	3007
15 Pairs								
15X2x0.5	1/0.8	0.5	20.1	490	1.60	23.3	26.7	1350
15X2x1.0	1/1.13	0.6	25.2	780	1.60	28.4	32.2	1680
15X2x1.5	7/0.53	0.6	29.8	1020	2.0	33.0	37.8	2350
15X2x2.5	7/0.67	0.7	36.7	1490	2.5	38.5	45.9	3380

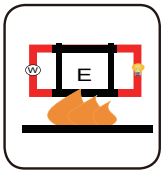
Conductor			RE-2X(St)H PiMF...CI. FE 180 PH30 RE-2G(St)H PiMF...CI. FE 180 PH30		RE-2X(St)HSWAH PiMF..CI. FE 180 PH30 RE-2G(St)HSWAH PiMF..CI. FE 180 PH30			
			Unarmoured		Armoured			
No. of Pairs X Cross Section	No./ Nominal Diameter of Strands	Nominal Insulation Thickness	Nominal Overall Diameter	Approx. Weight	Armour Wire Diameter	Diameter Over Armour	Nominal Overall Diameter	Approx. Weight
mm^2	no./mm	mm	mm	kg/km	mm	mm	mm	kg/km
20 Pairs								
20X2x0.5	1/0.8	0.5	22.5	640	1.60	25.7	29.3	1470
20X2x1.0	1/1.13	0.6	28.8	1143	2.0	32.8	36.8	2540
20X2x1.5	7/0.53	0.6	33.4	1509	2.0	37.4	41.6	3030
20X2x2.5	7/0.67	0.7	42.5	2112	2.5	42.5	51.9	5107
30 Pairs								
30X2x0.5	1/0.8	0.5	26.9	970	2.0	38.4	42.8	1870
30X2x1.0	1/1.13	0.6	34.4	1430	2.0	31.2	35.2	2900
30X2x1.5	7/0.53	0.6	40.0	1900	2.5	45.0	49.8	4050
30X2x2.5	7/0.67	0.7	50.6	2600	2.5	51.8	60.5	6400
50 Pairs								
50X2x0.5	1/0.8	0.5	35.1	1470	2.0	39.1	43.5	3000
50X2x1.0	1/1.13	0.6	43.9	2360	2.5	48.9	53.9	4800
50X2x1.5	7/0.53	0.6	51.2	3060	2.5	56.2	61.6	5960
50X2x2.5	7/0.67	0.7	63.5	3950	2.5	68.0	74.5	8390

Note : Other conductor sizes & pair confi gurations are available upon request.



Rated Voltage

Standard

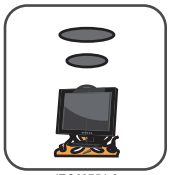


IEC 60331/BS 6387
NF C32-070-2.3(CR1)
Circuit Integrity


NF C32-070-2.2(C1)
IEC60332-3-24/EN50266-2-4
Reduced Fire Propagation

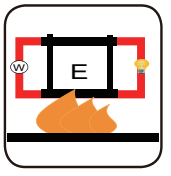

NF C32-070-2.1(C2)
IEC60332-1-2/EN50265-2-1
Flame Retardancy


NES 02-713/NF C 20-454
Low Toxicity


IEC60754-2
EN50267-2-2/3
NF C 32-074
Low Corrosivity


IEC 61034-1&2
EN 50268-1&2/NF C32-07
Low Smoke Emission

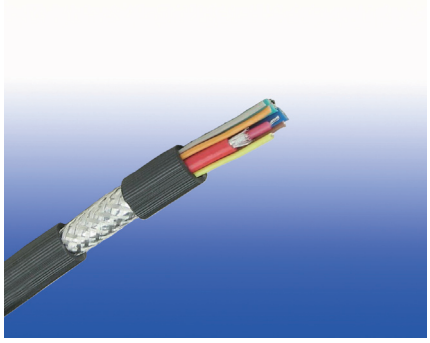
IEC60754-1
EN50267-2-1
Halogen Free

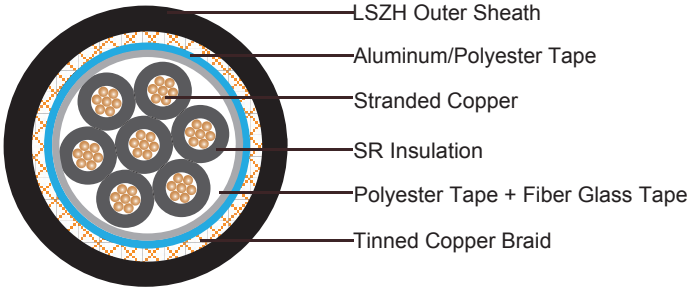


DIN 4102-12
Functional Integrity

300/500V Braid-Screened Flexible Equipment Cables (Multipair)

LI-05SCH FE180 (PH30) (CU/SR/CWB/LSZH 300/500V Class 5)





APPLICATION

The cables are designed for indoor instrumentation and control cabling, electrically noisy environments and fire alarm systems in office buildings.

STANDARDS

Basic design to VDE 0812

FIRE PERFORMANCE

Circuit Integrity	IEC 60331-21; BS 6387 CWZ; DIN VDE 0472-814(FE180); BS 8434-1 (30mins); BS 5839-1 Clause 26 2d; CEI 20-36/2-1; SS299-1; NBN C 30-004 (cat. F3); NF C32-070-2.3(CR1)
Circuit Integrity with mechanical shock	EN 50200(PH30); CEI 20-36/4-0
Circuit Integrity with mechanical shock & water spray	EN 50200 annex E
System circuit integrity	DIN 4102-12, E30 depending on lay system
Flame Retardance (Single Vertical Wire Test)	EN 60332-1-2; IEC 60332-1-2; BS EN 60332-1-2; VDE 0482-332-1; NBN C 30-004 (cat. F1); NF C32-070-2.1(C2); CEI 20-35/1-2; EN 50265-2-1*; DIN VDE 0482-265-2-1*
Reduced Fire Propagation (Vertically-mounted bundled wires & cable test)	EN 60332-3-24 (cat. C); IEC 60332-3-24; BS EN 60332-3-24; VDE 0482-332-3; NBN C 30-004 (cat. F2); NF C32-070-2.2(C1); CEI 20-22/3-4; EN 50266-2-4*; DIN VDE 0482-266-2-4
Halogen Free	IEC 60754-1; EN 50267-2-1; DIN VDE 0482-267-2-1; CEI 20-37/2-1; BS 6425-1*
No Corrosive Gas Emission	IEC 60754-2; EN 50267-2-2; DIN VDE 0482-267-2-2; CEI 20-37/2-2; BS 6425-2*
Minimum Smoke Emission	IEC 61034-1&2; EN 61034 -1&2; DIN VDE 0482-1034-1&2; CEI 20-37/3-1&2; EN 50268-1&2*; BS 7622-1&2*
No Toxic gases	NES 02-713; NF C 20-454

*Note: Asterisk * denotes superseded standard.*

CABLE CONSTRUCTION

Conductor: Plain annealed copper wire, stranded according to IEC 60228 class 5.
Insulation: Fire resistant special ceramized silicone rubber compound type EI2 as per BS 7655-1.1.
Cabling: The insulated cores are cabled in concentric layers with suitable non-hygroscopic fillers.
Fire Barrier: Polyester tape + fiber glass tape
Overall Screen: Aluminum/polyester tape with tinned copper braid (min. 85% Coverage)
Sheath: Thermoplastic LSZH compound type LTS3 as per BS 7655-6.1 (Thermosetting LSZH compound type SW2-SW4 as per BS 7655-2.6 can be offered.). UV resistance, hydrocarbon resistance, oil resistance, anti rodent and anti termite properties can be offered as option.

VOLTAGE RATING

300/500 V

COLOUR CODE

Insulation Colour as per VDE 0812
Sheath Colour: Orange (other colours on request)

PHYSICAL AND THERMAL PROPERTIES

Temperature range during operation (fixed state): -30°C – +90°C
Temperature range during installation (mobile state): -20°C – +50°C
Minimum bending radius: 7.5 x Overall Diameter

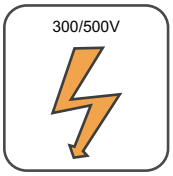
ELECTRICAL PROPERTIES

Dielectric test:	2000 V r.m.s. x 5' (core/core)
Insulation Resistance@20°C	≥300 MΩ x km
Short circuit Temperature	350°C

CONSTRUCTION PARAMETERS

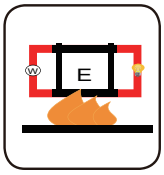
Cable Code	No. of Core X Cross Section	Nominal Insulation Thickness	Nominal Sheath Thickness	Nominal Overall Diameter	Approx. Weight
	mm^2	mm	mm	mm	kg/km
2 Cores					
LI-05SCH FE180 (PH30) 2G0.75	2x0.75	0.6	0.8	6.3	55
LI-05SCH FE180 (PH30) 2G1.0	2x1.0	0.6	0.9	6.9	62
LI-05SCH FE180 (PH30) 2G1.5	2x1.5	0.7	0.9	7.3	79
3 Cores					
LI-05SCH FE180 (PH30) 3G0.75	3x0.75	0.6	0.8	6.6	67

Cable Code	No. of Core X Cross Section	Nominal Insulation Thickness	Nominal Sheath Thickness	Nominal Overall Diameter	Approx. Weight
	mm^2	mm	mm	mm	kg/km
LI-05SCH FE180 (PH30) 3G1.0	3x1.0	0.6	0.9	7.2	77
LI-05SCH FE180 (PH30) 3G1.5	3x1.5	0.7	0.9	7.6	101
4 Cores					
LI-05SCH FE180 (PH30) 4G0.75	4x0.75	0.6	0.9	7.2	85
LI-05SCH FE180 (PH30) 4G1.0	4x1.0	0.6	1.0	7.7	98
LI-05SCH FE180 (PH30) 4G1.5	4x1.5	0.7	1.0	8.2	112
5 Cores					
LI-05SCH FE180 (PH30) 5G0.75	5x0.75	0.6	0.9	7.9	105
LI-05SCH FE180 (PH30) 5G1.0	5x1.0	0.6	1.0	7.9	117
LI-05SCH FE180 (PH30) 5G1.5	5x1.5	0.7	1.0	9.0	127
6 Cores					
LI-05SCH FE180 (PH30) 6G0.75	6x0.75	0.6	0.9	8.6	121
LI-05SCH FE180 (PH30) 6G1.0	6x1.0	0.6	1.0	9.1	138
LI-05SCH FE180 (PH30) 6G1.5	6x1.5	0.7	1.0	10.0	161
7 Cores					
LI-05SCH FE180 (PH30) 7G0.75	7x0.75	0.6	0.9	8.6	131
LI-05SCH FE180 (PH30) 7G1.0	7x1.0	0.6	1.0	9.1	152
LI-05SCH FE180 (PH30) 7G1.5	7x1.5	0.7	1.1	10.0	193



Rated Voltage

Standard



IEC 60331/BS 6387
NF C32-070-2.3(CR1)
Circuit Integrity


NF C32-070-2.2(C1)
IEC60332-3-24/EN50266-2-4
Reduced Fire Propagation

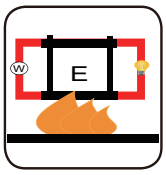

NF C32-070-2.1(C2)
IEC60332-1-2/EN50265-2-1
Flame Retardancy


NES 02-713/NF C 20-454
Low Toxicity


IEC60754-2
EN50267-2-2/3
NF C 32-074
Low Corrosivity


IEC 61034-1&2
EN 50268-1&2/NF C32-07
Low Smoke Emission

IEC60754-1
EN50267-2-1
Halogen Free



DIN 4102-12
Functional Integrity

TYPE CODES FOR FIRE RESISTANT INSTRUMENTATION CABLES

A-B-C-D-E-F-G-H-I

I
PH30: Fire test for 30 mins at 830°C

H
FE180: Insulation integrity (950°C 180 minutes)

G
PiMF: Individual aluminium screen

F
CI: Circuit integrity

E Sheath
Z1: Thermoplastic LSZH
Z: Thermosetting LSZH

D Armour
SWA: Steel wire armour

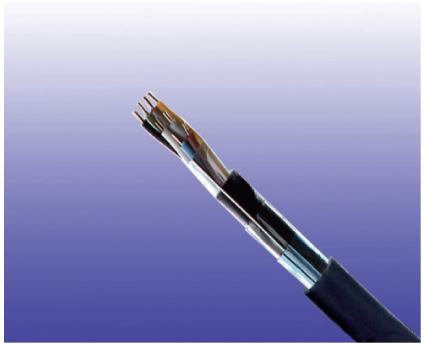
C Screen
St: Overall aluminium screen
C: Copper wire braid

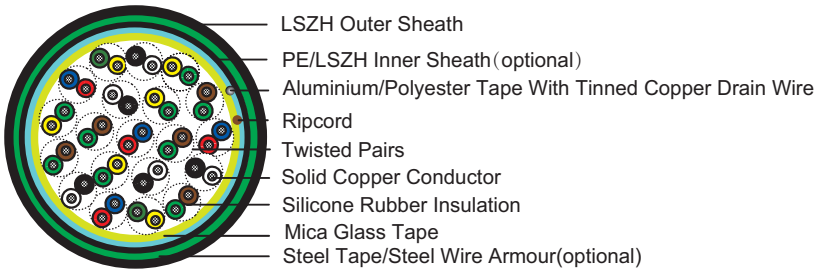
B Insulation
2X: XLPE
2G: Silicone rubber(for instrumentation cables)
S: Silicone rubber(for fire alarm cables)

A Cable Type
RE: Instrumentation and instrumentation control cables
LI: Equipment cables

225V SR Insulated & LSZH Sheathed Fire Alarm Cables

JE-2G(St)H…Bd FE180 E30 (CU/SR/OSCR/LSZH 225V Class 1)
JE-2G(St)HSWAH…Bd FE180 E30 (CU/SR/OSCR/LSZH/SWA/LSZH 225V Class 1)





APPLICATION

The cables are used for the internal wiring of building when the circuit integrity during fire is paramount. The cables are intended for use in fire fighting plants with special ceramized silicone insulation, with and without aluminum foil and LSZH outer sheath. The fire alarm cables with 30 to 90 minutes circuit integrity should be used for control voltages and data transfer in alarm and fire alarm systems, where a system circuit integrity E30/E60/E90 depending on lay system in accordance with DIN 4102-12 is required. The circuit integrity is guaranteed with a test voltage of 110V.

STANDARDS

BASIC DESIGN TO VDE 0815

FIRE PERFORMANCE

Circuit Integrity	IEC 60331-23; BS 6387 CWZ; DIN VDE 0472-814(FE180); CEI 20-36/2-1; SS299-1; NBN C 30-004 (cat. F3); NF C32-070-2.3(CR1)
System circuit integrity	DIN 4102-12, E30 depending on lay system
Flame Retardance (Single Vertical Wire Test)	EN 60332-1-2; IEC 60332-1-2; BS EN 60332-1-2; VDE 0482-332-1; NBN C 30-004 (cat. F1); NF C32-070-2.1(C2); CEI 20-35/1-2; EN 50265-2-1*; DIN VDE 0482-265-2-1*
Reduced Fire Propagation (Vertically-mounted bundled wires & cable test)	EN 60332-3-24 (cat. C); IEC 60332-3-24; BS EN 60332-3-24; VDE 0482-332-3; NBN C 30-004 (cat. F2); NF C32-070-2.2(C1); CEI 20-22/3-4; EN 50266-2-4*; DIN VDE 0482-266-2-4
Halogen Free	IEC 60754-1; EN 50267-2-1; DIN VDE 0482-267-2-1; CEI 20-37/2-1; BS 6425-1*
No Corrosive Gas Emission	IEC 60754-2; EN 50267-2-2; DIN VDE 0482-267-2-2; CEI 20-37/2-2; BS 6425-2*
Minimum Smoke Emission	IEC 61034-1&2; EN 61034 -1&2; DIN VDE 0482-1034-1&2; CEI 20-37/3-1&2; EN 50268-1&2*; BS 7622-1&2*
No Toxic gases	NES 02-713; NF C 20-454

*Note: Asterisk * denotes superseded standard.*

CABLE CONSTRUCTION

Conductors: Solid annealed bare or tinned copper sized 0.6/0.8/0.9mm as per class 1 of VDE 0295/IEC 60228.
Insulation: Silicone Rubber compound as per DIN VDE 0266.
Cabling Elements: Insulated cores are twisted to form pairs with varying lay length to minimize crosstalk. Two-pair cable had four cores laid in quad formation.
Cabling: Pairs are cabled together.In cables with 8 pairs or more, 4 pairs are assembled to form a bunch, and the bunches are then cabled together.
Cable Core Assembly: The twisted pairs are stranded to the core in layers.
Core Wrapping: One or more non hygroscopic polyester tapes are helically or longitudinally laid with an overlap prior to sheathing.
Screen: A laminated Aluminum/Polyester tape is placed in contact with solid copper 0.6mm or 0.8mm drain wire.
Inner Sheath(optional): PE or thermoplastic LSZH compound type.
Armour (optional): Either corrugated steel tape armour or galvanized steel wire is applied over an inner polyethylene sheath. For steel tape armour, the 0.15mm thick steel tape is coated with a copolymer and applied with an overlap. For steel wire armour, single layer of galvanized steel wire armour is applied.
Ripcord: Nylon ripcord may be placed parallel to the cores to facilitate sheath removal.
Drain Wire: A solid tinned earth/continuity wire shall be laid longitudinally for screened cables.
Outer Sheath: Thermoplastic LSZH compound HM2 as per DIN VDE 0207-24. UV resistance, hydrocarbon resistance, oil resistance, anti rodent and anti termite properties can be offered as option.

VOLTAGE RATING

225 V

COLOUR CODE

Insulation Colour: Quad colour in each bundle
Pair 1: Blue-Red
Pair 2: Grey-Yellow
Pair 3: Green-Brown
Pair 4: White-Black
The individual bundles are identified by a numbered helix.
Sheath Colour: Black (other colours on request).

PHYSICAL AND THERMAL PROPERTIES

Temperature range during operation (fixed state): -30°C – +90°C
Temperature range during installation (mobile state): -20°C – +50°C
Minimum bending radius: 8 x Overall Diameter (unarmoured cable)
10 x Overall Diameter (armoured cables)

ELECTRICAL PROPERTIES

Conductor Diameter	mm	0.6	0.8	0.9

Conductor Size	mm^2	0.283	0.5	0.636
Maximum Conductor Resistance @20°C	Ω/km	63	34.6	28.0
Maximum Loop Resistance @20°C	Ω/km	130	73.2	60
Minimum Insulation Resistance @500V DC @20°C	MΩ.km	100	100	100
Maximum Average Attenuation @0.8KHz	dB/km	1.7	1.2	0.74
Nominal Mutual Capacitance @0.8KHz	nF/km	120	120	120
Maximum Capacitance Unbalance K1 @0.8KHz pair-to-pair	pF/100m	200	200	200
Working Voltage	V	225	225	225
Nominal Insulation Thickness	mm	0.3	0.4	0.45
Nominal Insulated Conductor Diameter	mm	1.2	1.6	1.8

CONSTRUCTION PARAMETERS

VDE CODE: JE-2G(St)H…x2x0.8 Bd FE180/E30

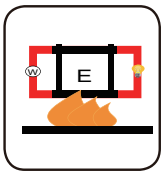
Cable Code	No.of Pairs	Nominal Insulation Thickness	Nominal Sheath Thickness	Nominal Overall Diameter	Approx. Weight
	No.	mm	mm	mm	kg/km
0.8mm Conductor, 1.6mm Insulated Wire					
JE-2G(St)H...1x2x0.8 Bd FE180/E30 1P0.8	1	0.4	1.0	6.0	46
JE-2G(St)H...2x2x0.8 Bd FE180/E30 2P0.8	2	0.4	1.0	6.6	61
JE-2G(St)H...4x2x0.8 Bd FE180/E30 4P0.8	4	0.4	1.0	8.8	104
JE-2G(St)H...6x2x0.8 Bd FE180/E30 6P0.8	6	0.4	1.0	10.8	160
JE-2G(St)H...8x2x0.8 Bd FE180/E30 8P0.8	8	0.4	1.0	12.8	218
JE-2G(St)H...10x2x0.8 Bd FE180/E30 10P0.8	10	0.4	1.2	13.1	220
JE-2G(St)H...12x2x0.8 Bd FE180/E30 12P0.8	12	0.4	1.2	13.5	235
JE-2G(St)H...16x2x0.8 Bd FE180/E30 16P0.8	16	0.4	1.2	14.7	297
JE-2G(St)H...20x2x0.8 Bd FE180/E30 20P0.8	20	0.4	1.2	16.1	367
JE-2G(St)H...24x2x0.8 Bd FE180/E30 24P0.8	24	0.4	1.4	18.1	440
JE-2G(St)H...30x2x0.8 Bd FE180/E30 30P0.8	30	0.4	1.4	20.1	645
JE-2G(St)H...32x2x0.8 Bd FE180/E30 32P0.8	32	0.4	1.4	20.6	645
JE-2G(St)H...40x2x0.8 Bd FE180/E30 40P0.8	40	0.4	1.4	22.5	656
JE-2G(St)H...50x2x0.8 Bd FE180/E30 50P0.8	50	0.4	1.6	24.3	840

VDE CODE: JE-2G(St)HSWAH…x2x0.6/0.8/0.9 Bd FE180/E30

Cable Code	No. of Pairs	Nominal Insulation Thickness	Nominal Bedding/ Sheath Thickness	Nominal Overall Diameter	Approx. Weight
		mm	mm	mm	kg/km
0.6mm Conductor,1.2mm Insulated Wire					
JE-2G(St)HSWAH...2x2x0.6 Bd FE180/E30 2P0.6	2	0.3	1.0/1.8	12.1	305
JE-2G(St)HSWAH...3x2x0.6 Bd FE180/E30 3P0.6	3	0.3	1.0/1.8	12.6	325
JE-2G(St)HSWAH...6x2x0.6 Bd FE180/E30 6P0.6	6	0.3	1.0/1.8	12.6	380
JE-2G(St)HSWAH...8x2x0.6 Bd FE180/E30 8P0.6	8	0.3	1.0/1.8	14.6	415
JE-2G(St)HSWAH...10x2x0.6 Bd FE180/E30 10P0.6	10	0.3	1.0/1.8	16.5	450
JE-2G(St)HSWAH...12x2x0.6 Bd FE180/E30 12P0.6	12	0.3	1.0/1.8	17.0	500
JE-2G(St)HSWAH...20x2x0.6 Bd FE180/E30 20P0.6	20	0.3	1.0/1.8	20.5	580
JE-2G(St)HSWAH...25x2x0.6 Bd FE180/E30 25P0.6	25	0.3	1.0/1.8	21.5	940
JE-2G(St)HSWAH...30x2x0.6 Bd FE180/E30 30P0.6	30	0.3	1.0/1.8	22.5	1300
0.8mm Conductor, 1.6mm Insulated Wire					
JE-2G(St)HSWAH...2x2x0.8 Bd FE180/E30 2P0.8	2	0.4	1.0/1.8	14.0	415
JE-2G(St)HSWAH...3x2x0.8 Bd FE180/E30 3P0.8	3	0.4	1.0/1.8	14.0	425
JE-2G(St)HSWAH...6x2x0.8 Bd FE180/E30 6P0.8	6	0.4	1.0/1.8	15.0	485
JE-2G(St)HSWAH...8x2x0.8 Bd FE180/E30 8P0.8	8	0.4	1.0/1.8	17.5	520
JE-2G(St)HSWAH...10x2x0.8 Bd FE180/E30 10P0.8	10	0.4	1.2/1.8	19.0	540
JE-2G(St)HSWAH...12x2x0.8 Bd FE180/E30 12P0.8	12	0.4	1.2/1.8	20.5	600
JE-2G(St)HSWAH...20x2x0.8 Bd FE180/E30 20P0.8	20	0.4	1.4/1.8	24.5	1050
JE-2G(St)HSWAH...25x2x0.8 Bd FE180/E30 25P0.8	25	0.4	1.4/1.8	27.0	1250
JE-2G(St)HSWAH...30x2x0.8 Bd FE180/E30 30P0.8	30	0.4	1.4/1.8	28.5	1450
0.9mm Conductor, 1.8mm Insulated Wire					
JE-2G(St)HSWAH...10x2x0.9 Bd FE180/E30 10P0.8	10	0.45	1.2/1.8	19.7	600
JE-2G(St)HSWAH...15x2x0.9 Bd FE180/E30 15P0.8	15	0.45	1.2/1.8	23.0	1020
JE-2G(St)HSWAH...20x2x0.9 Bd FE180/E30 20P0.8	20	0.45	1.4/1.8	25.3	1160
JE-2G(St)HSWAH...25x2x0.9 Bd FE180/E30 25P0.8	25	0.45	1.4/1.8	27.3	1330
JE-2G(St)HSWAH...30x2x0.9 Bd FE180/E30 30P0.8	30	0.45	1.4/1.8	29.3	1520

Rated Voltage

Standard

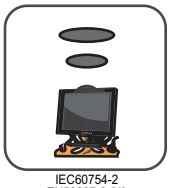


IEC 60331/BS 6387
NF C32-070-2.3(CR1)
Circuit Integrity


NF C32-070-2.2(C1)
IEC60332-3-24/EN50266-2-4
Reduced Fire Propagation

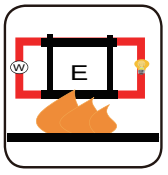

NF C32-070-2.1(C2)
IEC60332-1-2/EN50265-2-1
Flame Retardancy


NES 02-713/NF C 20-454
Low Toxicity


IEC60754-2
EN50267-2-2/3
NF C 32-074
Low Corrosivity


IEC 61034-1&2
EN 50268-1&2/NF C32-07
Low Smoke Emission

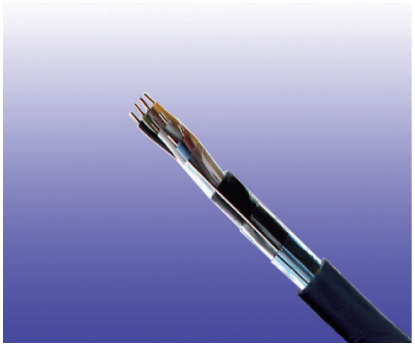
IEC60754-1
EN50267-2-1
Halogen Free



DIN 4102-12
Functional Integrity

300V Mica+LSZH Insulated & LSZH Sheathed Fire Alarm Cables

JE-H(St)H…Bd FE180 E90 (CU/MICA+LSZH/OSCR/LSZH 300V Class 1)
JE-H(St)H…Bd FE180 E90 BMK* (CU/MICA+LSZH/OSCR/LSZH 300V Class 1)



APPLICATION

The cables are used for the internal wiring of building when the circuit integrity during fire is paramount. The cables are intended for use in fire fighting plants with mica tapes, with and without Aluminum foil and LSZH outer sheath.The fire alarm cables with 30 to 90 minutes circuit integrity should be used for control voltages and data transfer in alarm and fire alarm systems, where a system circuit integrity E30/E60/E90 depending on lay system in accordance with DIN 4102-12 is required. The circuit integrity is guaranteed with a test voltage of 110V.

STANDARDS

Basic design to VDE 0815

FIRE PERFORMANCE

Circuit Integrity	IEC 60331-23; BS 6387 CWZ; DIN VDE 0472-814(FE180); CEI 20-36/2-1; SS299-1; NBN C 30-004 (cat. F3); NF C32-070-2.3(CR1)
System circuit integrity	DIN 4102-12, E90 depending on lay system
Flame Retardance (Single Vertical Wire Test)	EN 60332-1-2; IEC 60332-1-2; BS EN 60332-1-2; VDE 0482-332-1; NBN C 30-004 (cat. F1); NF C32-070-2.1(C2); CEI 20-35/1-2; EN 50265-2-1*; DIN VDE 0482-265-2-1*
Reduced Fire Propagation (Vertically-mounted bundled wires & cable test)	EN 60332-3-24 (cat. C); IEC 60332-3-24; BS EN 60332-3-24; VDE 0482-332-3; NBN C 30-004 (cat. F2); NF C32-070-2.2(C1); CEI 20-22/3-4; EN 50266-2-4*; DIN VDE 0482-266-2-4
Halogen Free	IEC 60754-1; EN 50267-2-1; DIN VDE 0482-267-2-1; CEI 20-37/2-1; BS 6425-1*
No Corrosive Gas Emission	IEC 60754-2; EN 50267-2-2; DIN VDE 0482-267-2-2; CEI 20-37/2-2; BS 6425-2*
Minimum Smoke Emission	IEC 61034-1&2; EN 61034 -1&2; DIN VDE 0482-1034-1&2; CEI 20-37/3-1&2; EN 50268-1&2*; BS 7622-1&2*
No Toxic gases	NES 02-713; NF C 20-454

*Note: Asterisk * denotes superseded standard.*

CABLE CONSTRUCTION

Conductors: Solid annealed bare or tinned copper sized 0.8mm as per class 1 of VDE 0295/IEC 60228.
Fire Barrier: Mica glass tape.
Insulation: Thermoplastic LSZH compound HI1 as per DIN VDE 0207-23.
Cabling Elements: Insulated cores are twisted to form pairs with varying lay length to minimize crosstalk. Two-pair cable had four cores laid in quad formation.
Cabling: Pairs are cabled together. In cables with 8 pairs or more, 4 pairs are assembled to form a bunch, the bunches are then cabled together.
Cable Core Assembly: The twisted pairs are stranded to the core in layers.
Core Wrapping: One or more non hygroscopic polyester tapes are helically or longitudinally laid with an overlap prior to sheathing.
Screen: Laminated Aluminum/Polyester tape in contact with solid copper 0.6mm or 0.8mm drain wire.
Ripcord: Nylon ripcord may be placed parallel to the cores to facilitate sheath removal.
Drain Wire: A solid tinned earth/continuity wire shall be laid longitudinally for screened cables.
Outer Sheath: Thermoplastic LSZH compound HM2 as per DIN VDE 0207-24. UV resistance, hydrocarbon resistance, oil resistance, anti rodent and anti termite properties can be offered as option.

VOLTAGE RATING

300 V

COLOUR CODE

Insulation Colour: Quad colour in each bundle
Pair 1: Blue-Red
Pair 2: Grey-Yellow
Pair 3: Green-Brown
Pair 4: White-Black
The individual bundles are identified by a numbered helix.
Sheath Colour: Black (other colours on request).

PHYSICAL AND THERMAL PROPERTIES

Temperature range during operation (fixed state): -30°C – +90°C
Temperature range during installation (mobile state): -20°C – +50°C
Minimum bending radius: 8 x Overall Diameter

ELECTRICAL PROPERTIES

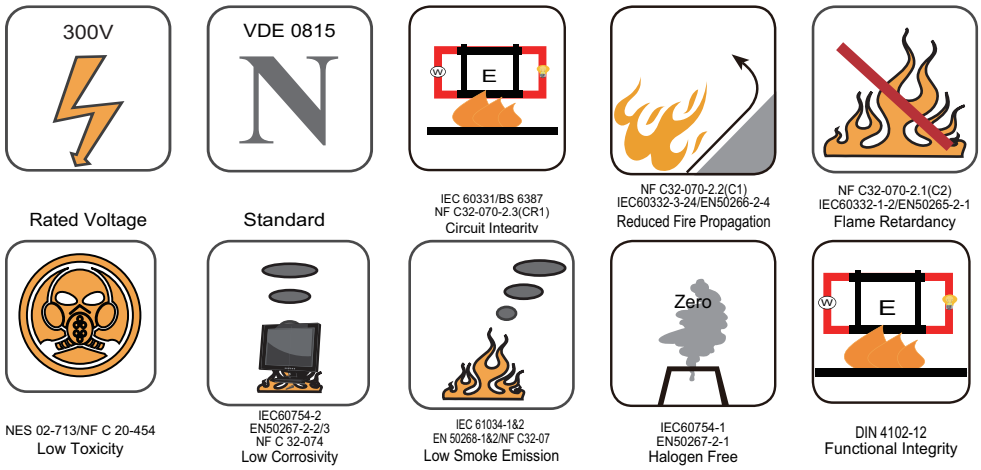
Nominal Conductor Diameter	mm	0.8
Conductor Size	mm^2	0.5
Maximum Conductor Resistance @20°C	Ω/km	34.6
Maximum Loop Resistance @20°C	Ω/km	69.2
Minimum Insulation Resistance @500V DC @20°C	MΩ.km	100
Maximum Average Attenuation @0.8KHz	dB/km	1.1

Average Mutual Capacitance	nF/km	120
Capacitance Unbalance K1 @0.8KHz pair-to-pair	pF/100m	200
Working Voltage	V	300
Nominal Insulation Thickness	mm	0.4
Nominal Insulated Conductor Diameter	mm	1.6

CONSTRUCTION PARAMETERS

VDE CODE: JE-H(ST)H…X2X0.8 BD FE180 E90 /JE-H(ST)H…X2X0.8 BD FE180/E90 BMK*

Cable Code	No. of Pairs	Nominal Insulation Thickness	Nominal Sheath Thickness	Nominal Overall Diameter	Approx. Weight
		mm	mm	mm	kg/km
0.8mm Conductor, 1.6mm Insulated Wire					
JE-H(St)H...2x2x0.8 Bd FE180/E90 BMK*	2	0.4	1.0	12.8	177
JE-H(St)H...4x2x0.8 Bd FE180/E90 BMK*	4	0.4	1.0	16.3	284
JE-H(St)H...8x2x0.8 Bd FE180/E90 BMK*	8	0.4	1.0	20.3	447
JE-H(St)H...12x2x0.8 Bd FE180/E90 BMK*	12	0.4	1.2	23.9	615
JE-H(St)H...16x2x0.8 Bd FE180/E90 BMK*	16	0.4	1.2	26.6	756
JE-H(St)H...20x2x0.8 Bd FE180/E90 BMK*	20	0.4	1.2	29.4	921
JE-H(St)H...32x2x0.8 Bd FE180/E90 BMK*	32	0.4	1.4	30.7	1074
JE-H(St)H...40x2x0.8 Bd FE180/E90 BMK*	40	0.4	1.4	33.6	1278
JE-H(St)H...52x2x0.8 Bd FE180/E90 BMK*	52	0.4	1.6	43.7	2011



Rated Voltage

Standard

IEC 60331/BS 6387
NF C32-070-2.3(CR1)
Circuit Integrity

NF C32-070-2.2(C1)
IEC60332-3-24/EN50266-2-4
Reduced Fire Propagation

NF C32-070-2.1(C2)
IEC60332-1-2/EN50265-2-1
Flame Retardancy

NES 02-713/NF C 20-454
Low Toxicity

IEC60754-2
EN50267-2-2/3
NF C 32-074
Low Corrosivity

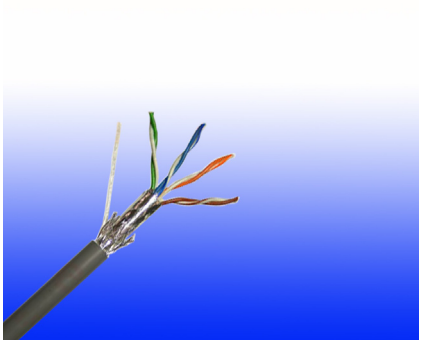
IEC 61034-1&2
EN 50268-1&2/NF C32-07
Low Smoke Emission

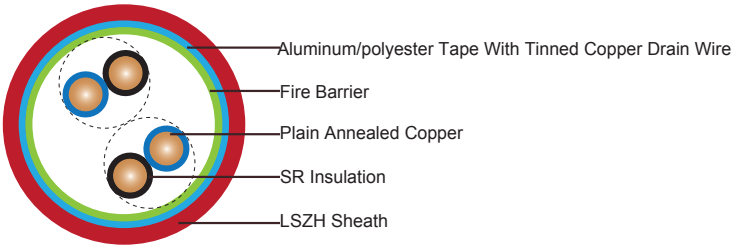
IEC60754-1
EN50267-2-1
Halogen Free

DIN 4102-12
Functional Integrity

225V SR Insulated & LSZH Sheathed Fire Alarm Cables BMK

JE-2G(St)H…Bd FE180 E30 BMK (CU/SR/OSCR/LSZH 225V Class 1)





APPLICATION

The cables are used for the internal wiring of building when the circuit integrity during fire is paramount. The cables are intended for use in fire fighting plants with mica tapes, with and without Aluminum foil and LSZH outer sheath.The fire alarm cables with 30 to 90 minutes circuit integrity should be used for control voltages and data transfer in alarm and fire alarm systems, where a system circuit integrity E30/E60/E90 depending on lay system in accordance with DIN 4102-12 is required. The circuit integrity is guaranteed with a test voltage of 110V.

STANDARDS

Basic design to VDE 0815

FIRE PERFORMANCE

Circuit Integrity	IEC 60331-23; BS 6387 CWZ; DIN VDE 0472-814(FE180); CEI 20-36/2-1; SS299-1; NBN C 30-004 (cat. F3); NF C32-070-2.3(CR1)
System circuit integrity	DIN 4102-12, E30 depending on lay system
Flame Retardance (Single Vertical Wire Test)	EN 60332-1-2; IEC 60332-1-2; BS EN 60332-1-2; VDE 0482-332-1; NBN C 30-004 (cat. F1); NF C32-070-2.1(C2); CEI 20-35/1-2; EN 50265-2-1*; DIN VDE 0482-265-2-1*
Reduced Fire Propagation (Vertically-mounted bundled wires & cable test)	EN 60332-3-24 (cat. C); IEC 60332-3-24; BS EN 60332-3-24; VDE 0482-332-3; NBN C 30-004 (cat. F2); NF C32-070-2.2(C1); CEI 20-22/3-4; EN 50266-2-4*; DIN VDE 0482-266-2-4
Halogen Free	IEC 60754-1; EN 50267-2-1; DIN VDE 0482-267-2-1; CEI 20-37/2-1; BS 6425-1*
No Corrosive Gas Emission	IEC 60754-2; EN 50267-2-2; DIN VDE 0482-267-2-2; CEI 20-37/2-2; BS 6425-2*
Minimum Smoke Emission	IEC 61034-1&2; EN 61034 -1&2; DIN VDE 0482-1034-1&2; CEI 20-37/3-1&2; EN 50268-1&2*; BS 7622-1&2*
No Toxic gases	NES 02-713; NF C 20-454

*Note: Asterisk * denotes superseded standard.*

CABLE CONSTRUCTION

Conductors: Plain annealed copper wire, sized 0.8mm solid according to IEC 60228 class 1.
Insulation: Fire resistant silicone rubber type HJ1 as per DIN VDE 0207-23.
Cabling Elements: Insulated cores are twisted to form pairs with varying lay length to minimize crosstalk. Two-pair cable had four cores laid in quad formation.
Cabling: Pairs are cabled together. In cables with 8 pairs or more, 4 pairs are assembled to form a bunch, the bunches are then cabled together in concentric layers with suitable non-hygroscopic fillers.
Fire barrier: Special fireproof tape.
Overall Screen: Aluminum/polyester tape with tinned copper drain wire.
Outer Sheath: Thermoplastic LSZH compound HM2 as per DIN VDE 0207-24. UV resistance, hydrocarbon resistance, oil resistance, anti rodent and anti termite properties can be offered as option.

VOLTAGE RATING

225 V

COLOUR CODE

Insulation Colour: Quad colour in each bundle
Pair 1: Blue-Red
Pair 2: Grey-Yellow
Pair 3: Green-Brown
Pair 4: White-Black
The individual bundles are identified by a numbered helix.
Sheath Colour: Black (other colours on request).

PHYSICAL AND THERMAL PROPERTIES

Temperature range during operation (fixed state): -30°C – +90°C
Temperature range during installation (mobile state): -20°C – +50°C
Minimum bending radius: 7.5 x Overall Diameter

ELECTRICAL PROPERTIES

Conductor Diameter	mm	0.8
Conductor Size	mm^2	0.5
Maximum Conductor Resistance @20°C	Ω/km	34.6
Maximum Loop Resistance @20°C	Ω/km	73.2
Minimum Insulation Resistance @500V DC @20°C	MΩ.km	100
Maximum Average Attenuation @0.8KHz	dB/km	1.2
Nominal Mutual Capacitance @0.8KHz	nF/km	120
Maximum Capacitance Unbalance K1 @0.8KHz pair-to-pair	pF/100m	200
Working Voltage	V	225

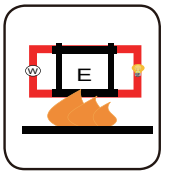
Nominal Insulation Thickness	mm	0.4
Nominal Insulated Conductor Diameter	mm	1.6

CONSTRUCTION PARAMETERS

Cable Code	Nominal Insulation Thickness	Nominal Sheath Thickness	Nominal Overall Diameter	Approx. Weight
	mm	mm	mm	kg/km
0.8mm Conductor, Solid 0,5 mm^2 Section				
JE-2G(St)H...1X2x0.8 FE180/E30 BMK	0.4	1.0	6.1	52
JE-2G(St)H...2X2x0. 8(quad) FE180/E30 BMK	0.4	1.0	7.5	77
JE-2G(St)H...4X2x0. 8 FE180/E30 BMK			10.5	133
0.8mm Conductor, Solid 0,5 mm^2 Section				
JE-2G(St)H...8X2x0.8 Bd FE180/E30 BMK	0.4	1.0	17.4	296
JE-2G(St)H...12X2x0.8 Bd FE180/E30 BMK	0.4	1.2	18.9	368
JE-2G(St)H...16X2x0.8 Bd FE180/E30 BMK	0.4	1.2	20.7	442
JE-2G(St)H...20X2x0.8 Bd FE180/E30 BMK	0.4	1.2	22.7	508
JE-2G(St)H...32X2x0.8 Bd FE180/E30 BMK	0.4	1.4	24.5	772
JE-2G(St)H...40X2x0.8 Bd FE180/E30 BMK	0.4	1.4	26.5	946
JE-2G(St)H...52X2x0.8 Bd FE180/E30 BMK	0.4	1.6	28.0	1016

Rated Voltage

Standard

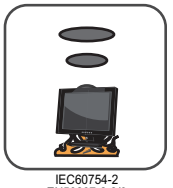


IEC 60331/BS 6387
NF C32-070-2.3(CR1)
Circuit Integrity

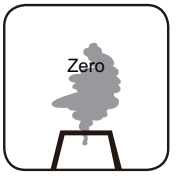

NF C32-070-2.2(C1)
IEC60332-3-24/EN50266-2-4
Reduced Fire Propagation


NF C32-070-2.1(C2)
IEC60332-1-2/EN50265-2-1
Flame Retardancy

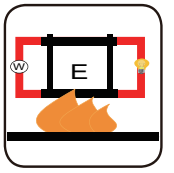

NES 02-713/NF C 20-454
Low Toxicity


IEC60754-2
EN50267-2-2/3
NF C 32-074
Low Corrosivity


IEC 61034-1&2
EN 50268-1&2/NF C32-07
Low Smoke Emission



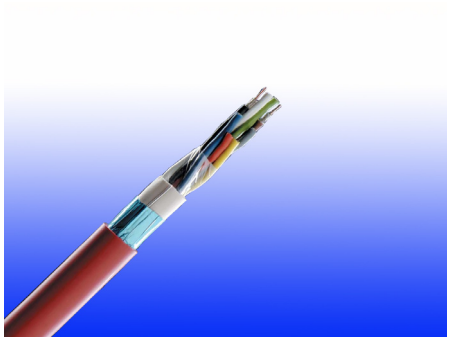
IEC60754-1
EN50267-2-1
Halogen Free

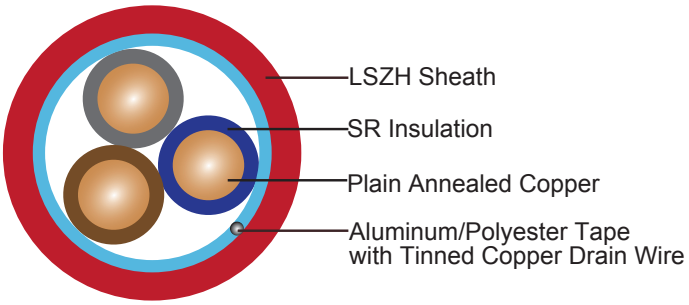


DIN 4102-12
Functional Integrity

300/500V SR Insulated & LSZH Sheathed Fire Alarm Cables

FFX200P 05SOZ1-U (PH30) (CU/SR/OSCR/LSZH 300/500V Class 1)
FFX200P 05SOZ1-R (PH30) (CU/SR/OSCR/LSZH 300/500V Class 2)





APPLICATION

The cables are designed, manufactured and tested as data transmission cables for emergency services. These are primarily intended for for indoor instrumentation and control cabling, electrically noisy environments and fire alarm systems in office buildings when high frequency signal transmission has to be assured in the event of a fire.

STANDARDS

Basic design to BS 7629-1

FIRE PERFORMANCE

Circuit Integrity	IEC 60331-21; BS 6387 CWZ; DIN VDE 0472-814(FE180); BS 8434-1 (30mins); BS 5839-1 Clause 26 2d; CEI 20-36/2-1; SS299-1; NBN C 30-004 (cat. F3); NF C32-070-2.3(CR1)
Circuit Integrity with mechanical shock	EN 50200(PH30); CEI 20-36/4-0
Circuit Integrity with mechanical shock & water spray	EN 50200 annex E
System circuit integrity	DIN 4102-12, E30 depending on lay system
Flame Retardance (Single Vertical Wire Test)	EN 60332-1-2; IEC 60332-1-2; BS EN 60332-1-2; VDE 0482-332-1; NBN C 30-004 (cat. F1); NF C32-070-2.1(C2); CEI 20-35/1-2; EN 50265-2-1*; DIN VDE 0482-265-2-1*
Reduced Fire Propagation (Vertically-mounted bundled wires & cable test)	EN 60332-3-24 (cat. C); IEC 60332-3-24; BS EN 60332-3-24; VDE 0482-332-3; NBN C 30-004 (cat. F2); NF C32-070-2.2(C1); CEI 20-22/3-4; EN 50266-2-4*; DIN VDE 0482-266-2-4
Halogen Free	IEC 60754-1; EN 50267-2-1; DIN VDE 0482-267-2-1; CEI 20-37/2-1; BS 6425-1*
No Corrosive Gas Emission	IEC 60754-2; EN 50267-2-2; DIN VDE 0482-267-2-2; CEI 20-37/2-2; BS 6425-2*

Minimum Smoke Emission	IEC 61034-1&2; EN 61034 -1&2; DIN VDE 0482-1034-1&2; CEI 20-37/3-1&2; EN 50268-1&2*; BS 7622-1&2*
No Toxic gases	NES 02-713; NF C 20-454

*Note: Asterisk * denotes superseded standard.*

CABLE CONSTRUCTION

Conductors: Plain annealed copper wire, solid according to IEC 60228 class 1, stranded according to IEC 60228 class 2.
Insulation: Fire resistant silicone rubber compound type EI2 as per BS 7655-1.1.
Cabling Elements: Insulated cores are twisted to form pairs with varying lay length to minimize crosstalk. Two-pair cable had four cores laid in quad formation.
Cabling: Pairs are cabled together in concentric layers with suitable non-hygroscopic fillers.
Overall Screen: Aluminum/polyester tape with tinned copper drain wire.
Sheath: Thermoplastic LSZH compound type LTS3 as per BS 7655-6.1 (Thermosetting LSZH compound type SW2-SW4 as per BS 7655-2.6 can be offered.). UV resistance, hydrocarbon resistance, oil resistance, anti rodent and anti termite properties can be offered as option.

VOLTAGE RATING

300/500 V

COLOUR CODE

Insulation Colour:
Cables up to 6 pairs black-red / black-blue / red-blue / yellow-black /yellow-red / yellow-blue
Cables above 6 pairs all pairs black-red numbered on the wrapping tape.
Sheath Colour: Red (other colours on request).

PHYSICAL AND THERMAL PROPERTIES

Temperature range during operation (fixed state): -30°C – +90°C
Temperature range during installation (mobile state): -20°C – +50°C
Minimum bending radius: 7.5 x Overall Diameter

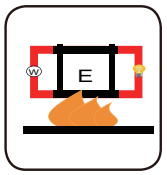
CONSTRUCTION PARAMETERS

Cable Code	Nominal Insulation Thickness	Nominal Sheath Thickness	Nominal Overall Diameter	Approx. Weight
	mm	mm	mm	kg/km
1 Pairs				
FFX200P 05SOZ1-R 1x2x1.0 (PH30)	0.6	0.9	7.4	77
FFX200P 05SOZ1-R 1x2x1.5 (PH30)	0.7	0.9	8,7	100
2 Pairs				
FFX200P 05SOZ1-R 2x2x1.0 (PH30)	0.6	1.0	10.6	130
FFX200P 05SOZ1-R 2x2x1.5 (PH30)	0.7	1.0	10.2	188

Cable Code	Nominal Insulation Thickness	Nominal Sheath Thickness	Nominal Overall Diameter	Approx. Weight
	mm	mm	mm	kg/km
3 Pairs				
FFX200P 05SOZ1-R 3x2x1.0 (PH30)	0.6	1.1	11.2	196
FFX200P 05SOZ1-R 3x2x1.5 (PH30)	0.7	1.1	12.9	223
5 Pairs				
FFX200P 05SOZ1-R 5x2x1.0 (PH30)	0.6	1.2	13.7	245
FFX200P 05SOZ1-R 5x2x1.5 (PH30)	0.7	1.3	16.7	346
6 Pairs				
FFX200P 05SOZ1-R 6x2x1.0 (PH30)	0.6	1.2	14.8	300
FFX200P 05SOZ1-R 6x2x1.5 (PH30)	0.7	1.3	17.5	426
10 Pairs				
FFX200P 05SOZ1-R 10x2x1.0 (PH30)	0.6	1.4	18.9	378
FFX200P 05SOZ1-R 10x2x1.5 (PH30)	0.7	1.5	23.4	541
15 Pairs				
FFX200P 05SOZ1-R 15x2x1.0 (PH30)	0.6	1.5	23.2	567
FFX200P 05SOZ1-R 15x2x1.5 (PH30)	0.7	1.6	28.9	892
20 Pairs				
FFX200P 05SOZ1-R 20x2x1.0 (PH30)	0.6	1.6	26.2	831
FFX200P 05SOZ1-R 20x2x1.5 (PH30)	0.7	1.8	32.5	1182

Rated Voltage

Standard



IEC 60331/BS 6387
NF C32-070-2.3(CR1)
Circuit Integrity


NF C32-070-2.2(C1)
IEC60332-3-24/EN50266-2-4
Reduced Fire Propagation

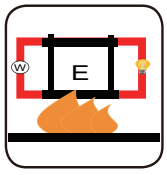

NF C32-070-2.1(C2)
IEC60332-1-2/EN50265-2-1
Flame Retardancy


NES 02-713/NF C 20-454
Low Toxicity


IEC60754-2
EN50267-2-2/3
NF C 32-074
Low Corrosivity


IEC 61034-1&2
EN 50268-1&2/NF C32-07
Low Smoke Emission

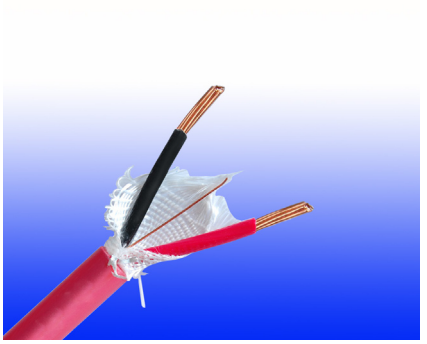
IEC60754-1
EN50267-2-1
Halogen Free

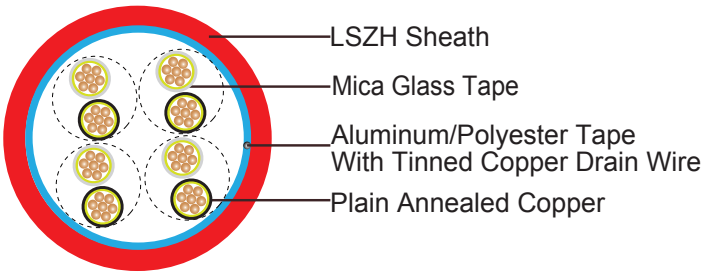


DIN 4102-12
Functional Integrity

300/500V Mica+XLPE Insulated & LSZH Sheathed Fire Alarm Cables

FFX200P 05mROZ1-R (CU/MICA+XLPE/OSCR/LSZH 300/500V Class 2)





APPLICATION

The cables are designed, manufactured and tested as data transmission cables for emergency services. These are primarily intended for for indoor instrumentation and control cabling, electrically noisy environments and fire alarm systems in office buildings when high frequency signal transmission has to be assured in the event of a fire.

STANDARDS

Basic design to BS 7629-1

FIRE PERFORMANCE

Circuit Integrity	IEC 60331-21; BS 6387 CWZ; DIN VDE 0472-814(FE180); CEI 20-36/2-1; SS299-1; NBN C 30-004 (cat. F3); NF C32-070-2.3(CR1)
System circuit integrity	DIN 4102-12, E30 depending on lay system
Flame Retardance (Single Vertical Wire Test)	EN 60332-1-2; IEC 60332-1-2; BS EN 60332-1-2; VDE 0482-332-1; NBN C 30-004 (cat. F1); NF C32-070-2.1(C2); CEI 20-35/1-2; EN 50265-2-1*; DIN VDE 0482-265-2-1*
Reduced Fire Propagation (Vertically-mounted bundled wires & cable test)	EN 60332-3-24 (cat. C); IEC 60332-3-24; BS EN 60332-3-24; VDE 0482-332-3; NBN C 30-004 (cat. F2); NF C32-070-2.2(C1); CEI 20-22/3-4; EN 50266-2-4*; DIN VDE 0482-266-2-4
Halogen Free	IEC 60754-1; EN 50267-2-1; DIN VDE 0482-267-2-1; CEI 20-37/2-1; BS 6425-1*
No Corrosive Gas Emission	IEC 60754-2; EN 50267-2-2; DIN VDE 0482-267-2-2; CEI 20-37/2-2; BS 6425-2*
Minimum Smoke Emission	IEC 61034-1&2; EN 61034 -1&2; DIN VDE 0482-1034-1&2; CEI 20-37/3-1&2; EN 50268-1&2*; BS 7622-1&2*
No Toxic gases	NES 02-713; NF C 20-454

*Note: Asterisk * denotes superseded standard.*

CABLE CONSTRUCTION

Conductors: Plain annealed copper wire, stranded according to IEC 60228 class 2.
Insulation: Mica glass tape covered by extruded XLPE compound or cross-linked compound type EI5 as per BS 7655: section 5.1.
Cabling Elements: Insulated cores are twisted to form pairs with varying lay length to minimize crosstalk. Two-pair cable had four cores laid in quad formation.
Cabling: Pairs are cabled together. In cables with 8 pairs or more, 4 pairs are assembled to form a bunch, the bunches are then cabled together.
Overall Screen: Aluminum/polyester tape with tinned copper drain wire.
Sheath: Thermoplastic LSZH compound type LTS3 as per BS 7655-6.1 (Thermosetting LSZH compound type SW2-SW4 as per BS 7655-2.6 can be offered.). UV resistance, hydrocarbon resistance, oil resistance, anti rodent and anti termite properties can be offered as option.

VOLTAGE RATING

300/500 V

COLOUR CODE

Insulation Colour: According to IEC 60189-2 (other colour code on request).
Sheath Colour: Red (other colours on request).

PHYSICAL AND THERMAL PROPERTIES

Temperature range during operation (fixed state): -30°C - +90°C
Temperature range during installation (mobile state): -20°C - +50°C
Minimum bending radius: 8 x Overall Diameter

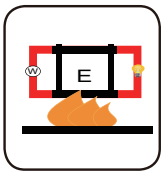
CONSTRUCTION PARAMETERS

Cable Code	Nominal Insulation Thickness	Nominal Sheath Thickness	Nominal Overall Diameter	Approx. Weight
	mm	mm	mm	kg/km
1 Pairs				
FFX200P 05mROZ1-R 1x2x0.75 (PH30)	0.6	0.8	7.8	64
FFX200P 05mROZ1-R 1x2x1.0 (PH30)	0.6	0.9	8.4	73
FFX200P 05mROZ1-R 1x2x1.5 (PH30)	0.7	0.9	9.3	87
2 Pairs				
FFX200P 05mROZ1-R 2x2x0.75 (PH30)	0.6	0.9	10.7	118
FFX200P 05mROZ1-R 2x2x1.0 (PH30)	0.6	1.0	11.5	136
FFX200P 05mROZ1-R 2x2x1.5 (PH30)	0.7	1.0	13.0	165
5 Pairs				
FFX200P 05mROZ1-R 5x2x0.75 (PH30)	0.6	1.1	14.8	218
FFX200P 05mROZ1-R 5x2x1.0 (PH30)	0.6	1.2	15.7	266

Cable Code	Nominal Insulation Thickness	Nominal Sheath Thickness	Nominal Overall Diameter	Approx. Weight
	mm	mm	mm	kg/km
FFX200P 05mROZ1-R 5x2x1.5 (PH30)	0.7	1.3	18.1	342
10 Pairs				
FFX200P 05mROZ1-R 10x2x0.75 (PH30)	0.6	1.3	20.1	380
FFX200P 05mROZ1-R 10x2x1.0 (PH30)	0.6	1.4	21.3	455
FFX200P 05mROZ1-R 10x2x1.5 (PH30)	0.7	1.5	24.8	606
15 Pairs				
FFX200P 05mROZ1-R 15x2x0.75 (PH30)	0.6	1.4	24.9	535
FFX200P 05mROZ1-R 15x2x1.0 (PH30)	0.6	1.5	26.5	646
FFX200P 05mROZ1-R 15x2x1.5 (PH30)	0.7	1.6	30.8	862
20 Pairs				
FFX200P 05mROZ1-R 20x2x0.75 (PH30)	0.6	1.5	28.2	680
FFX200P 05mROZ1-R 20x2x1.0 (PH30)	0.6	1.6	30.2	839
FFX200P 05mROZ1-R 20x2x1.5 (PH30)	0.7	1.8	34.9	1121

Rated Voltage

Standard

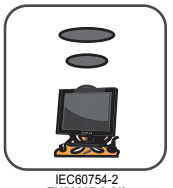


IEC 60331/BS 6387
NF C32-070-2.3(CR1)
Circuit Integrity

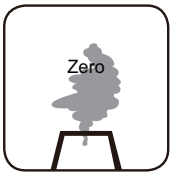

NF C32-070-2.2(C1)
IEC60332-3-24/EN50266-2-4
Reduced Fire Propagation


NF C32-070-2.1(C2)
IEC60332-1-2/EN50265-2-1
Flame Retardancy

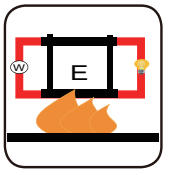

NES 02-713/NF C 20-454
Low Toxicity


IEC60754-2
EN50267-2-2/3
NF C 32-074
Low Corrosivity


IEC 61034-1&2
EN 50268-1&2/NF C32-07
Low Smoke Emission



IEC60754-1
EN50267-2-1
Halogen Free



DIN 4102-12
Functional Integrity

TYPE CODES FOR FIRE RESISTANT FIRE ALARM CABLES

A-B-C-D-E-F-G-H

H
PH30: Fire test for 30 mins at 830°C
E30: 30 mins system circuit integrity
E90: 90 mins system circuit integrity

G
FE180: Insulation integrity (950°C 180 minutes)

F
Bd: Unit type stranding

E Sheath
H: LSZH (Harmonized standard)
Z: Thermosetting LSZH
Z1: Thermoplastic LSZH

D Armour
SWA: Steel wire armour

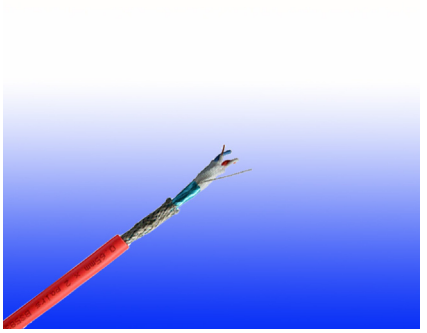
C Screen
O: Overall aluminium screen

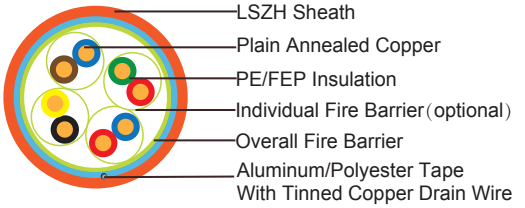
B Insulation
mR: Mica tape+XLPE
S: Silicone rubber
H: LSZH

A Cable Type
JE: Fire alarm cables
FFX200P: Multipairs Fire alarm cables

Fire Resistant Cat3 Data Cables

CAT3UTPXP24FR
CAT3FTPXP24FR
CAT3F/UTPXP24FR





APPLICATION

The cables are desgined for structure wiring, compatible with all known connection systems according to EN 50173. Based on the design for structured wiring (found in IEC 61156 and BS EN 50288), this cable brings together high frequency data transmission and circuit integrity in a one pair, two pair and four pair cable that will continue to transmit data even when being directly attacked by fire.

STANDARDS

Basic design to EN 50173

FIRE PERFORMANCE

Circuit Integrity	IEC 60331-23
Flame Retardance (Single Vertical Wire Test)	EN 60332-1-2; IEC 60332-1-2; BS EN 60332-1-2; VDE 0482-332-1; NBN C 30-004 (cat. F1); NF C32-070-2.1(C2); CEI 20-35/1-2; EN 50265-2-1*; DIN VDE 0482-265-2-1*
Reduced Fire Propagation (Vertically-mounted bundled wires & cable test)	EN 60332-3-24 (cat. C); IEC 60332-3-24; BS EN 60332-3-24; VDE 0482-332-3; NBN C 30-004 (cat. F2); NF C32-070-2.2(C1); CEI 20-22/3-4; EN 50266-2-4*; DIN VDE 0482-266-2-4
Halogen Free	IEC 60754-1; EN 50267-2-1; DIN VDE 0482-267-2-1; CEI 20-37/2-1; BS 6425-1*
No Corrosive Gas Emission	IEC 60754-2; EN 50267-2-2; DIN VDE 0482-267-2-2; CEI 20-37/2-2; BS 6425-2*
Minimum Smoke Emission	IEC 61034-1&2; EN 61034 -1&2; DIN VDE 0482-1034-1&2; CEI 20-37/3-1&2; EN 50268-1&2*; BS 7622-1&2*
No Toxic gases	NES 02-713; NF C 20-454

*Note: Asterisk * denotes superseded standard.*

VOLTAGE RATING

110V

CABLE CONSTRUCTION

Conductors: Plain annealed copper wire, sized 0.64mm and solid according to IEC 60228 class 1.
Insulation: PE or fluoropolymer(FEP) compound.
Fire Barrier: Fire resistance tape wrapped around the individual pairs or core assembly.
Cabling Elements: Insulated cores are twisted to form pairs with varying lay length to minimize crosstalk. Two-pair cable had four cores laid in quad formation.
Cabling: Pairs are cabled together in concentric layer.
Overall Screen: Aluminum/polyester tape with tinned copper drain wire
Sheath: Thermoplastic LSZH compound type LTS3 as per BS 7655-6.1 (Thermosetting LSZH compound type SW2-SW4 as per BS 7655-2.6 can be offered.) . UV resistance, hydrocarbon resistance, oil resistance, anti rodent and anti termite properties can be offered as option.

COLOUR CODE:

Sheath Colour: Red, white or black(other colours on request).

PHYSICAL AND THERMAL PROPERTIES

Temperature range during operation (fixed state): -20°C - +90°C
Temperature range during installation (mobile state): -5°C - +50°C
Minimum bending radius: 8 x Overall Diameter

ELECTRICAL PROPERTIES

Characteristic Impedance	100±15Ω
Nominal Velocity Of Propagation (NVP)	69%
Max. DC Resistance	9.38 Ω/100m
Max. Resistance Unbalance	5%
Max. Propagation Delay Skew	30 ns/100m
Max. Propagation Delay	536 ns/100m@100mhz
Max. Pulling Load	80 N

TRANSMISSION PROPERTIES

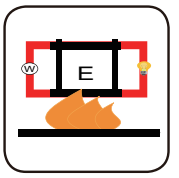
FREQ	NEXT Minmum Value/Typical Value/Standard Value	IL	SRL Minmum Value/ Typical Value/ Standard Value
MHz	dB/100m	dB/100m	dB/100m
1	43.0/48.0/41.0	2.6	13.0/16.0/12.0
4	34.0/38.0/32.0	5.6	13.0/16.0/12.0
8	29.0/33.0/26.0	8.5	13.0/16.0/12.0
10	28.0/33.0/26.0	9.8	13.0/16.0/12.0
16	25.0/30.0/23.0	13.1	11.0/14.0/10.0

CONSTRUCTION PARAMETERS

Cable Code	Nominal Insulation Thickness	Nominal Overall Diameter	Approx. Weight
	mm	mm	kg/km
CAT3FTP1P24FR	0.4	7.2±1.0	48
CAT3FTP2P24FR	0.4	9.5±1.0	97
CAT3FTP4P24FR	0.4	11±1.0	122

Rated Voltage

Standard



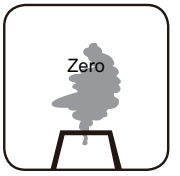
IEC 60331-23
Circuit Integrity


NF C32-070-2.2(C1)
IEC60332-3-24/EN50266-2-4
Reduced Fire Propagation


NES 02-713/NF C 20-454
Low Toxicity


IEC60754-2
EN50267-2-2/3
NF C 32-074
Low Corrosivity


IEC 61034-1&2
EN 50268-1&2/NF C32-07
Low Smoke Emission

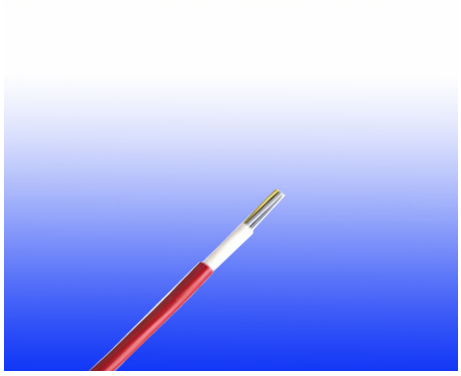


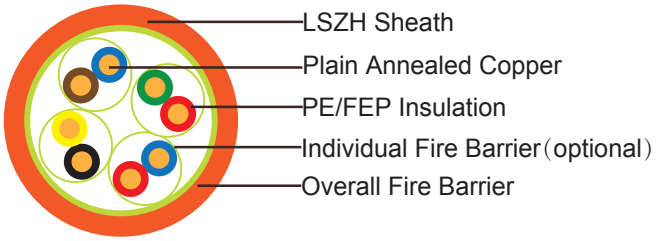
IEC60754-1
EN50267-2-1
Halogen Free


NF C32-070-2.1(C2)
IEC60332-1-2/EN50265-2-1
Flame Retardancy

Fire Resistant UTP CAT5 Data Cables

CAT5UTP4P23FR





APPLICATION

The cables are desgined for structure wiring, compatible with all known connection systems according to EN 50173. Based on the design for structured wiring (found in IEC 61156 and BS EN 50288), this cable brings together high frequency data transmission and circuit integrity in four pair cable that will continue to transmit data even when being directly attacked by fire.

STANDARDS

Basic design to EN50173

FIRE PERFORMANCE

Circuit Integrity	IEC 60331-23
Flame Retardance (Single Vertical Wire Test)	EN 60332-1-2; IEC 60332-1-2; BS EN 60332-1-2; VDE 0482-332-1; NBN C 30-004 (cat. F1); NF C32-070-2.1(C2); CEI 20-35/1-2; EN 50265-2-1*; DIN VDE 0482-265-2-1*
Reduced Fire Propagation (Vertically-mounted bundled wires & cable test)	EN 60332-3-24 (cat. C); IEC 60332-3-24; BS EN 60332-3-24; VDE 0482-332-3; NBN C 30-004 (cat. F2); NF C32-070-2.2(C1); CEI 20-22/3-4; EN 50266-2-4*; DIN VDE 0482-266-2-4
Halogen Free	IEC 60754-1; EN 50267-2-1; DIN VDE 0482-267-2-1; CEI 20-37/2-1; BS 6425-1*
No Corrosive Gas Emission	IEC 60754-2; EN 50267-2-2; DIN VDE 0482-267-2-2; CEI 20-37/2-2; BS 6425-2*
Minimum Smoke Emission	IEC 61034-1&2; EN 61034 -1&2; DIN VDE 0482-1034-1&2; CEI 20-37/3-1&2; EN 50268-1&2*; BS 7622-1&2*
No Toxic gases	NES 02-713; NF C 20-454

*Note: Asterisk * denotes superseded standard.*

VOLTAGE RATING

110V

CABLE CONSTRUCTION

Conductors: Plain annealed copper wire, solid according to IEC 60228 class 1.
Insulation: PE or fluoropolymer(FEP) compound.
Fire Barrier: Fire resistance tape wrapped around the individual pairs or core assembly.
Twisted Pairs: Insulated conductors are twisted into pairs with varying lay length to minimize crosstalk.
Cabling Elements: Insulated cores are twisted to form pairs with varying lay length to minimize crosstalk. Two-pair cable had four cores laid in quad formation.
Cabling: Pairs are cabled together in concentric layers.
Sheath: Thermoplastic LSZH compound type LTS3 as per BS 7655-6.1 (Thermosetting LSZH compound type SW2-SW4 as per BS 7655-2.6 can be offered.). UV resistance, hydrocarbon resistance, oil resistance, anti rodent and anti termite properties can be offered as option.

PHYSICAL AND THERMAL PROPERTIES

Temperature range during operation (fixed state): -5°C - +50°C
Temperature range during installation (mobile state): -20°C - +90°C
Minimum bending radius: 8 x Overall Diameter

ELECTRICAL PROPERTIES

Characteristic Impedance	100±15Ω
Nominal Velocity of Propagation (NVP)	69%
Max. DC Resistance	7.5 Ω/100m
Max. Resistance Unbalance	5%
Max. Mutual Capacitance:	5.6 nF/100m
Maximum Capacitance Unbalance	330 pF/100m
Max. Propagation Delay Skew	30 ns/100m
Max. Propagation Delay	536 ns/100m@100mhz
Max. Pulling Load	80 N

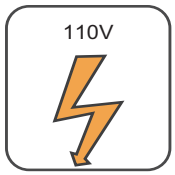
TRANSMISSION PROPERTIES

FREQ	NEXT Minimum Value/Typical Value/ Standard Value	IL	SRL Minimum Value/Typical Value/ Standard Value
MHz	dB/100m	dB/100m	dB/100m
1	64.0/71.0/62.0	2.0	24.5/26.0/23.0
4	55.0/62.0/53.0	4.0	24.5/26.0/23.0
8	49.5/57.0/48.0	5.7	24.5/26.0/23.0
10	49.0/56.0/47.0	6.4	24.5/26.0/23.0

FREQ	NEXT Minimum Value/Typical Value/ Standard Value	IL	SRL Minimum Value/Typical Value/ Standard Value
MHz	dB/100m	dB/100m	dB/100m
16	44.9/52.0/44.0	8.2	24.5/26.0/23.0
20	42.5/48.0/42.0	9.2	24.5/26.0/23.0
25	42.0/48.0/41.0	10.3	24.5/26.0/23.0
31.25	40.6/48.0/39.0	11.6	22.5/24.0/21.0
62.5	36.1/43.0/35.0	16.9	19.5/22.0/18.0
100	34.0/40.0/32.0	21.8	17.5/20.0/16.0

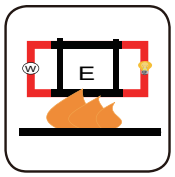
CONSTRUCTION PARAMETERS

Cable Code	Conductor Diameter	Nominal Insulation Thickness	Nominal Overall Diameter	Approx. Weight
	mm	mm	mm	kg/km
CAT5UTP4P23FR	0.58	0.4	6.5±1.0	68



Rated Voltage

Standard



IEC 60331-23
Circuit Integrity


NF C32-070-2.2(C1)
IEC60332-3-24/EN50266-2-4
Reduced Fire Propagation


NES 02-713/NF C 20-454
Low Toxicity


IEC60754-2
EN50267-2-2/3
NF C 32-074
Low Corrosivity

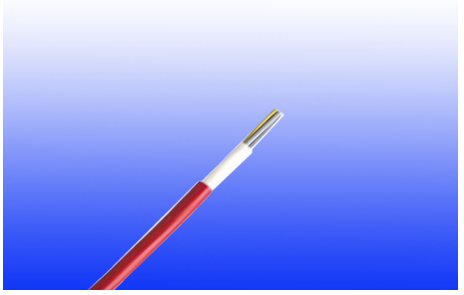

IEC 61034-1&2
EN 50268-1&2/NF C32-07
Low Smoke Emission

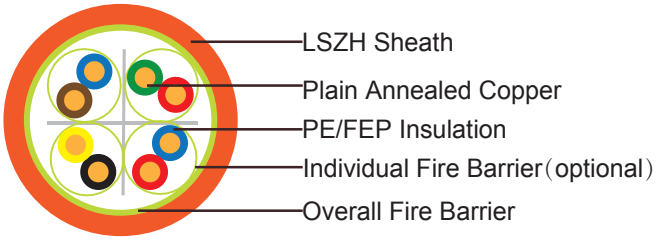
IEC60754-1
EN50267-2-1
Halogen Free


NF C32-070-2.1(C2)
IEC60332-1-2/EN50265-2-1
Flame Retardancy

Fire Resistant UTP CAT6 Data Cables

CAT6UTP4P23FR





APPLICATION

Category 6 Cable is a cable standard for Gigabit Ethernet and other network protocol that is backward compatible with the Category 5/5E and Category3 Cable Standard. Cat. 6 feature more stringent specification for crosstalk and system noise. The cable standard is suitable for 10BaseT, 100BaseTx & 1000BaseT (Gigabit Ethernet) application.

With fire barrier tape, it will continue to transmit data even when being directly attacked by fire.

STANDARDS

Basic design to EN50173

FIRE PERFORMANCE

Circuit Integrity	IEC 60331-23
Flame Retardance (Single Vertical Wire Test)	EN 60332-1-2; IEC 60332-1-2; BS EN 60332-1-2; VDE 0482-332-1; NBN C 30-004 (cat. F1); NF C32-070-2.1(C2); CEI 20-35/1-2; EN 50265-2-1*; DIN VDE 0482-265-2-1*
Reduced Fire Propagation (Vertically-mounted bundled wires & cable test)	EN 60332-3-24 (cat. C); IEC 60332-3-24; BS EN 60332-3-24; VDE 0482-332-3; NBN C 30-004 (cat. F2); NF C32-070-2.2(C1); CEI 20-22/3-4; EN 50266-2-4*; DIN VDE 0482-266-2-4
Halogen Free	IEC 60754-1; EN 50267-2-1; DIN VDE 0482-267-2-1; CEI 20-37/2-1; BS 6425-1*
No Corrosive Gas Emission	IEC 60754-2; EN 50267-2-2; DIN VDE 0482-267-2-2; CEI 20-37/2-2; BS 6425-2*
Minimum Smoke Emission	IEC 61034-1&2; EN 61034 -1&2; DIN VDE 0482-1034-1&2; CEI 20-37/3-1&2; EN 50268-1&2*; BS 7622-1&2*
No Toxic gases	NES 02-713; NF C 20-454

*Note: Asterisk * denotes superseded standard.*

VOLTAGE RATING

110V

CABLE CONSTRUCTION

Conductors: Plain annealed copper wire, solid according to IEC 60228 class 1.
Insulation: PE or fluoropolymer(FEP) compound.
Fire Barrier: Fire resistance tape wrapped around the individual pairs or core assembly.
Cabling Elements: Insulated cores are twisted to form pairs with varying lay length to minimize crosstalk. Two-pair cable had four cores laid in quad formation.
Separator: Plastic separator
Sheath: Thermoplastic LSZH compound type LTS3 as per BS 7655-6.1 (Thermosetting LSZH compound type SW2-SW4 as per BS 7655-2.6 can be offered.). UV resistance, hydrocarbon resistance, oil resistance, anti rodent and anti termite properties can be offered as option.

PHYSICAL AND THERMAL PROPERTIES

Temperature range during operation (fixed state): -20°C - +60°C
Temperature range during installation (mobile state): -5°C - +50°C
Minimum bending radius: 10 x Overall Diameter

ELECTRICAL PERFORMANCE

Characteristic Impedance	100±15Ω
Nominal Velocity of Propagation (NVP)	69%
Max. DC Resistance	7.5 Ω/100m
Max. Resistance Unbalance	3%
Max. Mutual Capacitance:	5.6 nF/100m
Max. Capacitance Unbalance	330 pF/100m
Max. Propagation Delay Skew	30 ns/100m
Max. Propagation Delay	536 ns/100m@100mhz
Max. Pulling Load	80 N

TRANSMISSION PROPERTIES

Frequency	Min.RL	Max.Attenuation	NEXT	PSNEXT
MHz	dB	dB/100m	dB	dB
1	18	1.0	74.3	72.3
4	21	2.8	65.3	63.3
8	22.5	4.3	60.8	58.8
10	23	5.0	59.3	57.3
16	23	6.6	56.2	54.2
20	23	7.5	54.8	52.8
25	22.3	8.5	53.3	51.3
31.25	21.6	9.7	51.9	49.9
62.5	19.5	14.4	47.4	45.4
100	18.1	18.8	44.3	42.3

Frequency	Min.RL	Max.Attenuation	NEXT	PSNEXT
MHz	dB	dB/100m	dB	dB
200	16	28	39.8	37.8
250	15.3	31.8	38.3	36.3

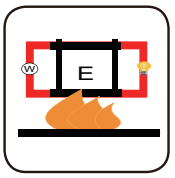
Frequency	ELFEXT	PSELFEXT	ACR
MHz	dB	dB	dB
1	67.8	64.8	72.3
4	55.8	52.8	61.5
8	49.7	46.7	55.5
10	47.8	44.8	53.3
16	43.7	40.7	48.6
20	41.8	38.8	46.3
25	39.8	36.8	43.8
31.25	37.9	34.9	41.2
62.5	31.9	28.9	32
100	27.8	24.8	24.5
200	21.8	18.8	10.8
250	19.8	16.8	5.5

CONSTRUCTION PARAMETERS

Cable Code	Conductor Diameter	Nominal Insulation Thickness	Nominal Overall Diameter	Approx. Weight
	mm	mm	mm	kg/km
CAT6UTP4P23FR	0.58	0.4	6.8±1.0	66

Rated Voltage

Standard



IEC 60331-23
Circuit Integrity


NF C32-070-2.2(C1)
IEC60332-3-24/EN50266-2-4
Reduced Fire Propagation


NES 02-713/NF C 20-454
Low Toxicity

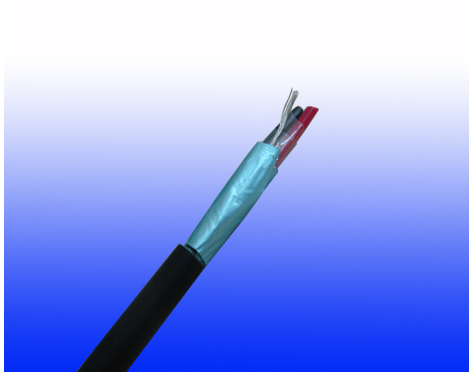

IEC60754-2
EN50267-2-2/3
NF C 32-074
Low Corrosivity

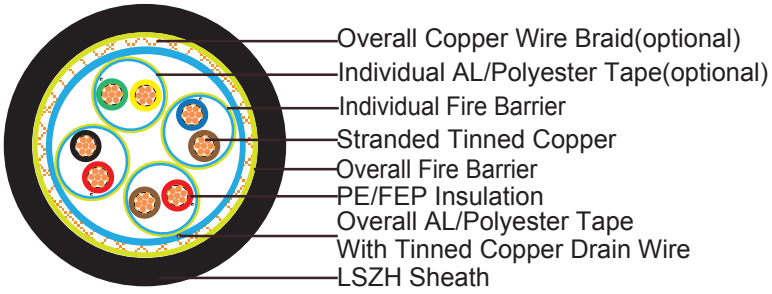

IEC 61034-1&2
EN 50268-1&2/NF C32-07
Low Smoke Emission

IEC60754-1
EN50267-2-1
Halogen Free


NF C32-070-2.1(C2)
IEC60332-1-2/EN50265-2-1
Flame Retardancy

Fire Resistant RS485 Databus Cables





APPLICATION

The cables are designed for RS485 data connections where continued functionality is required during a fire situation. This cable combines low capacitance insulation with one of the highest levels of screening to provide high speed, interference free, data transmission where continued functionality is required during a fire situation.

STANDARDS

Basic design to EIA/TIA 485

FIRE PERFORMANCE

Circuit Integrity	IEC 60331-23
Flame Retardance (Single Vertical Wire Test)	EN 60332-1-2; IEC 60332-1-2; BS EN 60332-1-2; VDE 0482-332-1; NBN C 30-004 (cat. F1); NF C32-070-2.1(C2); CEI 20-35/1-2; EN 50265-2-1*; DIN VDE 0482-265-2-1*
Reduced Fire Propagation (Vertically-mounted bundled wires & cable test)	EN 60332-3-24 (cat. C); IEC 60332-3-24; BS EN 60332-3-24; VDE 0482-332-3; NBN C 30-004 (cat. F2); NF C32-070-2.2(C1); CEI 20-22/3-4; EN 50266-2-4*; DIN VDE 0482-266-2-4
Halogen Free	IEC 60754-1; EN 50267-2-1; DIN VDE 0482-267-2-1; CEI 20-37/2-1; BS 6425-1*
No Corrosive Gas Emission	IEC 60754-2; EN 50267-2-2; DIN VDE 0482-267-2-2; CEI 20-37/2-2; BS 6425-2*
Minimum Smoke Emission	IEC 61034-1&2; EN 61034 -1&2; DIN VDE 0482-1034-1&2; CEI 20-37/3-1&2; EN 50268-1&2*; BS 7622-1&2*
No Toxic gases	NES 02-713; NF C 20-454

*Note: Asterisk * denotes superseded standard*

CABLE CONSTRUCTION

Multipair RS 485 Overall Screened Databus Cable

Conductors: Bare or tinned copper wire, stranded according to IEC 60228 class 2.
Insulation: PE or fluoropolymer(FEP) compound.

Individual Fire Barrier: Fire resistant tape wrapped around the individual pairs or core assembly.
Cabling Elements: Insulated cores are twisted to form pairs with varying lay length to minimize crosstalk. Two pair cable had four cores laid in quad formation.
Cabling: Pairs are cabled together in concentric layers.
Overall Screen: Aluminum/polyester tape with tinned copper drain wire.
Overall Fire Barrier: Fire resistant tape wrapped core assembly.
Sheath: Thermoplastic LSZH compound type LTS3 as per BS 7655-6.1 (Thermosetting LSZH compound type SW2-SW4 as per BS 7655-2.6 can be offered.). UV resistance, hydrocarbon resistance, oil resistance, anti rodent and anti termite properties can be offered as option.

Multipair RS 485 Overall Double Screened Databus Cable

Conductors: Bare or tinned copper wire, stranded according to IEC 60228 class 2.
Insulation: PE or fluoropolymer(FEP) compound.
Fire Barrier: Fire resistant tape wrapped around the individual pairs or core assembly.
Cabling Elements: Insulated cores are twisted to form pairs with varying lay length to minimize crosstalk. Two pair cable had four cores laid in quad formation.
Cabling: Pairs are cabled together in concentric layers.
Overall Screen: Aluminium/polyester tape plus copper wire braid.
Sheath: Thermoplastic LSZH compound type LTS3 as per BS 7655-6.1 (Thermosetting LSZH compound type SW2-SW4 as per BS 7655-2.6 can be offered.). UV resistance, hydrocarbon resistance, oil resistance, anti rodent and anti termite properties can be offered as option.

Multipair RS 485 Individual & Overall Screened Databus Cable

Conductors: Bare or tinned copper wire, stranded according to IEC 60228 class 2.
Insulation: PE or fluoropolymer(FEP) compound.
Fire Barrier: Fire resistant tape wrapped around the individual pairs or core assembly.
Cabling Elements: Insulated cores are twisted to form pairs with varying lay length to minimize crosstalk. Two pair cable had four cores laid in quad formation.
Cabling: Pairs are cabled together in concentric layers.
Individual Screen: Individual aluminium/polyester tape.
Overall Screen: Copper wire braid.
Sheath: Thermoplastic LSZH compound type LTS3 as per BS 7655-6.1 (Thermosetting LSZH compound type SW2-SW4 as per BS 7655-2.6 can be offered.). UV resistance, hydrocarbon resistance, oil resistance, anti rodent and anti termite properties can be offered as option.

Multipair RS 485 Overall Screened Databus Cable

Conductors: Bare or tinned copper wire, stranded according to IEC 60228 class 2.
Insulation: PE or fluoropolymer(FEP) compound.
Fire Barrier: Fire resistant tape wrapped around the individual pairs or core assembly.
Cabling Elements: Insulated cores are twisted to form pairs with varying lay length to minimize crosstalk. Two pair cable had four cores laid in quad formation.
Cabling: Pairs are cabled together in concentric layers.
Overall Screen: Copper wire braid.
Sheath: Thermoplastic LSZH compound type LTS3 as per BS 7655-6.1 (Thermosetting LSZH compound type SW2-SW4 as per BS 7655-2.6 can be offered.) . UV resistance, hydrocarbon resistance, oil resistance, anti rodent and anti termite properties can be offered as option.

PHYSICAL AND THERMAL PROPERTIES

Temperature range during operation (fixed state): -20°C - +90°C
Temperature range during installation (mobile state): -5°C - +60°C
Minimum bending radius: 8 x Overall Diameter

ELECTRICAL PROPERTIES

Dielectric test	1000 V r.m.s. for 5' (core-core)
	1000 V r.m.s. for 5' (core-screen)
Impedance	120Ω
Capacitance	4.5 nF/100m conductor to conductor
	9.0 nF/100m conductor to shield

CONSTRUCTION PARAMETERS

Multipair RS 485 Overall Screened Databus Cable

RE-m02Y(St)H-FR / RE-m02YS(St)H-FR / RE-m6Y(St)H-FR

AWG	No.of pair x2× Nominal Cross Sectional Area	No./Nominal Diameter of Strands	Nominal Insulation Thickness	Nominal Sheath Thickness	Nominal Overall Diameter	Approx. Weight
	mm^2	No/mm	mm	mm	mm	kg/km
24AWG	1×2×0.22	7/0.2	0.6	0.40	4.6	29
24AWG	2×2×0.22	7/0.2	0.6	0.40	8.1	60
24AWG	4×2×0.22	7/0.2	0.6	0.40	9.6	100
22AWG	1×2×0.50	16/0.2	0.8	0.50	5.2	44
22AWG	2×2×0.50	16/0.2	0.8	0.50	9.3	91
22AWG	4×2×0.50	16/0.2	0.8	0.50	11.1	158
18AWG	1×2×0.75	24/0.2	1.0	0.60	5.6	56
18AWG	2×2×0.75	24/0.2	1.0	0.60	10.3	117
18AWG	4×2×0.75	24/0.2	1.0	0.60	12.2	207
16AWG	1×2×1.00	30/0.2	1.2	0.80	5.8	61.4
16AWG	2×2×1.00	30/0.2	1.2	0.80	10.6	128
16AWG	4×2×1.00	30/0.2	1.2	0.80	12.5	228

Multipair RS 485 Overall Double Screened Databus Cable

RE-m02Y(St)CH-FR / RE-m02YS(St)CH-FR/ RE-m6Y(St)CH-FR

AWG	No.of pair x2× Nominal Cross Sectional Area	No./Nominal Diameter of Strands	Nominal Insulation Thickness	Nominal Sheath Thickness	Nominal Overall Diameter	Approx. Weight
	mm^2	No/mm	mm	mm	mm	kg/km
24AWG	1×2×0.22	7/0.2	0.6	0.40	5.0	45
24AWG	2×2×0.22	7/0.2	0.6	0.40	8.6	88
24AWG	4×2×0.22	7/0.2	0.6	0.40	10.1	134
22AWG	1×2×0.50	16/0.2	0.8	0.50	5.6	61
22AWG	2×2×0.50	16/0.2	0.8	0.50	9.8	124
22AWG	4×2×0.50	16/0.2	0.8	0.50	11.5	197
18AWG	1×2×0.75	24/0.2	1.0	0.60	6.1	75
18AWG	2×2×0.75	24/0.2	1.0	0.60	10.7	154
18AWG	4×2×0.75	24/0.2	1.0	0.60	12.7	250
16AWG	1×2×1.00	32/0.2	1.2	0.80	6.3	81
16AWG	2×2×1.00	32/0.2	1.2	0.80	11.0	166
16AWG	4×2×1.00	32/0.2	1.2	0.80	13.0	273

Multipair RS 485 Individual & Overall Screened Databus Cable

RE-m02Y(St)H PiMF-FR / RE-m02YS(St)H PiMF-FR / RE-m6Y(St)H PiMF-FR

AWG	No.of pair x2× Nominal Cross Sectional Area	No./Nominal Diameter of Strands	Nominal Insulation Thickness	Nominal Sheath Thickness	Nominal Overall Diameter	Approx. Weight
	mm^2	No/mm	mm	mm	mm	kg/km
24AWG	1×2×0.22	7/0.2	0.6	0.40	4.9	46
24AWG	2×2×0.22	7/0.2	0.6	0.40	8.6	91
24AWG	4×2×0.22	7/0.2	0.6	0.40	10.1	144
22AWG	1×2×0.50	16/0.2	0.8	0.50	5.5	62
22AWG	2×2×0.50	16/0.2	0.8	0.50	9.8	127
22AWG	4×2×0.50	16/0.2	0.8	0.50	11.6	209
18AWG	1×2×0.75	24/0.2	1.0	0.60	6.0	76
18AWG	2×2×0.75	24/0.2	1.0	0.60	10.7	157

AWG	No.of pair x2× Nominal Cross Sectional Area	No./Nominal Diameter of Strands	Nominal Insulation Thickness	Nominal Sheath Thickness	Nominal Overall Diameter	Approx. Weight
	mm^2	No/mm	mm	mm	mm	kg/km
18AWG	4×2×0.75	24/0.2	1.0	0.60	12.7	263
16AWG	1×2×1.00	32/0.2	1.2	0.80	6.2	83
16AWG	2×2×1.00	32/0.2	1.2	0.80	11.0	170
16AWG	4×2×1.00	32/0.2	1.2	0.80	13.0	286

Multipair RS 485 Overall Screened Databus Cable

RE-m02YCH-FR / RE-m02YSCH-FR/ RE-m6YCH-FR

AWG	No.of pair x2× Nominal Cross Sectional Area	No./Nominal Diameter of Strands	Nominal Insulation Thickness	Nominal Sheath Thickness	Nominal Overall Diameter	Approx. Weight
	mm^2	No/mm	mm	mm	mm	kg/km
24AWG	1×2×0.22	7/0.2	0.6	0.40	4.8	41
24AWG	2×2×0.22	7/0.2	0.6	0.40	8.4	82
24AWG	4×2×0.22	7/0.2	0.6	0.40	9.9	127
22AWG	1×2×0.50	16/0.2	0.8	0.50	5.4	57
22AWG	2×2×0.50	16/0.2	0.8	0.50	9.6	117
22AWG	4×2×0.50	16/0.2	0.8	0.50	11.4	189
18AWG	1×2×0.75	24/0.2	1.0	0.60	5.9	71
18AWG	2×2×0.75	24/0.2	1.0	0.60	10.5	146
18AWG	4×2×0.75	24/0.2	1.0	0.60	12.4	241
16AWG	1×2×1.00	32/0.2	1.2	0.80	6.0	77
16AWG	2×2×1.00	32/0.2	1.2	0.80	10.8	158
16AWG	4×2×1.00	32/0.2	1.2	0.80	12.8	264

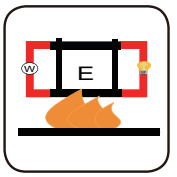
TYPE CODES for Fire Resistant RS485 Databus Cables

RE-A-B-D-FR

- FR: Fire Resisting
- D: Sheath
  - H: LSZH
- B: Screen
  - St: Aluminum/polyester tape
  - C: Copper braid
- A: Insulation
  - 02Y: Foam PE
  - 02YS: Foam Skin PE
  - 6Y: Fluoropolymer(FEP) compound

Rated Voltage

Standard



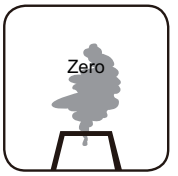
IEC 60331-23
Circuit Integrity

NF C32-070-2.2(C1)
IEC60332-3-24/EN50266-2-4
Reduced Fire Propagation

NES 02-713/NF C 20-454
Low Toxicity

IEC60754-2
EN50267-2-2/3
NF C 32-074
Low Corrosivity

IEC 61034-1&2
EN 50268-1&2/NF C32-07
Low Smoke Emission

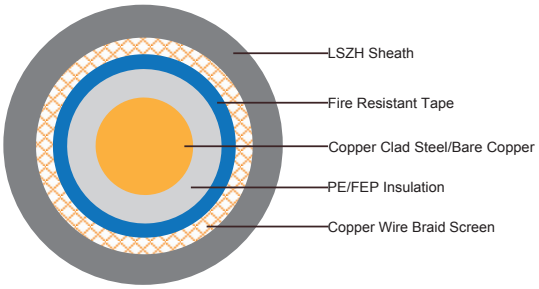


IEC60754-1
EN50267-2-1
Halogen Free

NF C32-070-2.1(C2)
IEC60332-1-2/EN50265-2-1
Flame Retardancy

Fire Resistant RG 59B/U Coaxial Cables

RG 59B/U FR



APPLICATION

The cables are designed for CCTV, security, smoke detection and evacuation monitoring applications, where continued functionality is required during a fire situation. Due to the zero halogen low smoke construction, this cable is ideal for use in public, commercial and industrial environments.

STANDARDS

Basic design to MIL-C-17

FIRE PERFORMANCE

Circuit Integrity	IEC 60331-23
Flame Retardance (Single Vertical Wire Test)	EN 60332-1-2; IEC 60332-1-2; BS EN 60332-1-2; VDE 0482-332-1; NBN C 30-004 (cat. F1); NF C32-070-2.1(C2); CEI 20-35/1-2; EN 50265-2-1*; DIN VDE 0482-265-2-1*
Reduced Fire Propagation (Vertically-mounted bundled wires & cable test)	EN 60332-3-24 (cat. C); IEC 60332-3-24; BS EN 60332-3-24; VDE 0482-332-3; NBN C 30-004 (cat. F2); NF C32-070-2.2(C1); CEI 20-22/3-4; EN 50266-2-4*; DIN VDE 0482-266-2-4
Halogen Free	IEC 60754-1; EN 50267-2-1; DIN VDE 0482-267-2-1; CEI 20-37/2-1; BS 6425-1*
No Corrosive Gas Emission	IEC 60754-2; EN 50267-2-2; DIN VDE 0482-267-2-2; CEI 20-37/2-2; BS 6425-2*
Minimum Smoke Emission	IEC 61034-1&2; EN 61034 -1&2; DIN VDE 0482-1034-1&2; CEI 20-37/3-1&2; EN 50268-1&2*; BS 7622-1&2*
No Toxic gases	NES 02-713; NF C 20-454

*Note: Asterisk * denotes superseded standard.*

CABLE CONSTRUCTION

Conductors: Copper clad steel or bare copper, solid according to IEC 60228 class 1.
Insulation: PE or fluoropolymer(FEP) compound.
Fire Barrier: Fire resistant tape wrapped around the cable core.
Binder: Glass tape
Overall Screen: Plain copper wire braid
Sheath: Thermoplastic LSZH compound type LTS3 as per BS 7655-6.1(Thermosetting LSZH compound type SW2-SW4 as per BS 7655-2.6 can be offered.). UV resistance, hydrocarbon resistance, oil resistance, anti rodent and anti termite properties can be offered as option.

PHYSICAL AND THERMAL PROPERTIES

Temperature range during operation (fixed state): -30°C - +70°C
Temperature range during installation (mobile state): -5ºC - +60ºC
Minimum bending radius: 10 x Overall Diameter

ELECTRICAL PROPERTIES

Impedance	75±5Ω
Capacitance	67 nF/km
Velocity ratio	66%
Insulation resistance	>2000 MΩ.Km
Shield coverage	95%
DC resistance	
Conductor	161 Ω/km
Outer conductor	8.5 Ω/km

ATTENUATION

Frequency	Attenuation	Attenuation
MHz	dB/100m	dB/100ft
50	7.4	2.26
100	10.7	3.26
200	15.7	4.79
400	22.7	6.92
500	25.7	7.84
600	28.7	8.75
860	34.8	10.61

Frequency	Attenuation	Attenuation
MHz	dB/100m	dB/100ft
1000	38.0	11.59

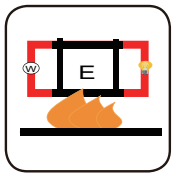
RETURN LOSS

Frequency	Return Loss
MHz	dB
30-300	>31
300-600	>28
600-900	>24

CONSTRUCTION PARAMETERS

Cable Code	Conductor Diameter	Nominal Insulation Diameter	Nominal Screen No.x Diameter	Nominal Overall Diameter	Approx. Weight
	mm	mm	No. x mm	mm	kg/km
RG 59B/U FR	0.58 ± 0.03	3.70 ± 0.10 m	120 x 0.15	6.20 ± 0.10	55

Standard

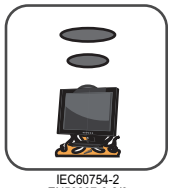


IEC 60331-23
Circuit Integrity


NF C32-070-2.2(C1)
IEC60332-3-24/EN50266-2-4
Reduced Fire Propagation


NF C32-070-2.1(C2)
IEC60332-1-2/EN50265-2-1
Flame Retardancy


NES 02-713/NF C 20-454
Low Toxicity

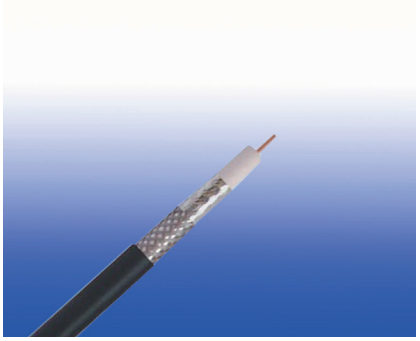

IEC60754-2
EN50267-2-2/3
NF C 32-074
Low Corrosivity

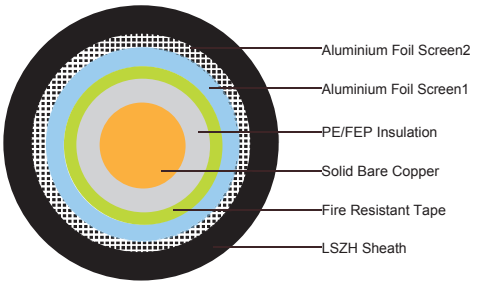

IEC 61034-1&2
EN 50268-1&2/NF C32-07
Low Smoke Emission

IEC60754-1
EN50267-2-1
Halogen Free

Fire Resistant RG 6/U Coaxial Cables

RG 6/U FR





APPLICATION

The cables are designed for CCTV, security, smoke detection and evacuation monitoring applications, where continued functionality is required during a fire situation. Due to the zero halogen low smoke construction, this cable is ideal for use in public, commercial and industrial environments.

STANDARDS

Basic design to MIL-C-17

FIRE PERFORMANCE

Circuit Integrity	IEC 60331-23
Flame Retardance (Single Vertical Wire Test)	EN 60332-1-2; IEC 60332-1-2; BS EN 60332-1-2; VDE 0482-332-1; NBN C 30-004 (cat. F1); NF C32-070-2.1(C2); CEI 20-35/1-2; EN 50265-2-1*; DIN VDE 0482-265-2-1*
Reduced Fire Propagation (Vertically-mounted bundled wires & cable test)	EN 60332-3-24 (cat. C); IEC 60332-3-24; BS EN 60332-3-24; VDE 0482-332-3; NBN C 30-004 (cat. F2); NF C32-070-2.2(C1); CEI 20-22/3-4; EN 50266-2-4*; DIN VDE 0482-266-2-4
Halogen Free	IEC 60754-1; EN 50267-2-1; DIN VDE 0482-267-2-1; CEI 20-37/2-1; BS 6425-1*
No Corrosive Gas Emission	IEC 60754-2; EN 50267-2-2; DIN VDE 0482-267-2-2; CEI 20-37/2-2; BS 6425-2*
Minimum Smoke Emission	IEC 61034-1&2; EN 61034 -1&2; DIN VDE 0482-1034-1&2; CEI 20-37/3-1&2; EN 50268-1&2*; BS 7622-1&2*
No Toxic gases	NES 02-713; NF C 20-454

*Note: Asterisk * denotes superseded standard.*

CABLE CONSTRUCTION

Conductors: 18AWG bare copper wire, solid according to IEC 60228 class 1.
Insulation: PE or fluoropolymer(FEP) compound.

Fire Barrier: Fire resistant tape wrapped around the cable core.
Binder: Glass tape
Overall Screen1: Aluminium foil
Overall Screen2: Aluminium foil
Sheath: Thermoplastic LSZH compound type LTS3 as per BS 7655-6.1 (Thermosetting LSZH compound type SW2-SW4 as per BS 7655-2.6 can be offered.). UV resistance, hydrocarbon resistance, oil resistance, anti rodent and anti termite properties can be offered as option.

PHYSICAL AND THERMAL PROPERTIES

Temperature range during operation (fixed state): -30°C - +70°C
Temperature range during installation (mobile state): -5ºC - +60ºC
Minimum bending radius: 8 x Overall Diameter

ELECTRICAL PROPERTIES

Impedance	75±5Ω
Capacitance	54 nF/km
Velocity ratio	82%
Insulation resistance	>5000 MΩ.Km
Shield coverage1	97%
Shield coverage2	95%
DC resistance	
Inner conductor	23.1 Ω/km
Outer conductor	31 Ω/km

ATTENUATION

Frequency	Attenuation	Attenuation
MHz	dB/100m	dB/100ft
50	5.8	1.77
100	8.5	2.59
200	12.5	3.81
400	18.0	5.49
500	20.3	6.19
600	22.6	6.89
860	27.5	8.38
1000	30.4	9.27

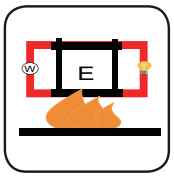
RETURN LOSS

Frequency	Return Loss
MHz	dB
30-300	>28
300-600	>24
600-900	>22

CONSTRUCTION PARAMETERS

Cable Code	Conductor Diameter	Nominal Insulation Diameter	Nominal Overall Diameter	Approx. Weight
	mm	mm	mm	kg/km
RG 6/U FR	1.02	4.57 ± 0.10	7.0 ± 0.10	43

Standard

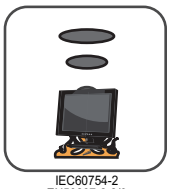


IEC 60331-23
Circuit Integrity


NF C32-070-2.2(C1)
IEC60332-3-24/EN50266-2-4
Reduced Fire Propagation


NF C32-070-2.1(C2)
IEC60332-1-2/EN50265-2-1
Flame Retardancy


NES 02-713/NF C 20-454
Low Toxicity

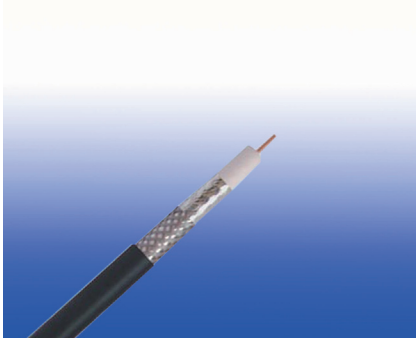

IEC60754-2
EN50267-2-2/3
NF C 32-074
Low Corrosivity

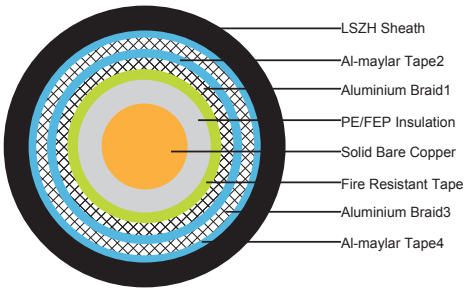

IEC 61034-1&2
EN 50268-1&2/NF C32-07
Low Smoke Emission

IEC60754-1
EN50267-2-1
Halogen Free

Fire Resistant RG 6QUAD Coaxial Cables

RG 6QUAD FR





APPLICATION

The cables are designed for CCTV, security, smoke detection and evacuation monitoring applications, where continued functionality is required during a fire situation. Due to the zero halogen low smoke construction, this cable is ideal for use in public, commercial and industrial environments.

STANDARDS

Basic design to MIL-C-17

FIRE PERFORMANCE

Circuit Integrity	IEC 60331-23
Flame Retardance (Single Vertical Wire Test)	EN 60332-1-2; IEC 60332-1-2; BS EN 60332-1-2; VDE 0482-332-1; NBN C 30-004 (cat. F1); NF C32-070-2.1(C2); CEI 20-35/1-2; EN 50265-2-1*; DIN VDE 0482-265-2-1*
Reduced Fire Propagation (Vertically-mounted bundled wires & cable test)	EN 60332-3-24 (cat. C); IEC 60332-3-24; BS EN 60332-3-24; VDE 0482-332-3; NBN C 30-004 (cat. F2); NF C32-070-2.2(C1); CEI 20-22/3-4; EN 50266-2-4*; DIN VDE 0482-266-2-4
Halogen Free	IEC 60754-1; EN 50267-2-1; DIN VDE 0482-267-2-1; CEI 20-37/2-1; BS 6425-1*
No Corrosive Gas Emission	IEC 60754-2; EN 50267-2-2; DIN VDE 0482-267-2-2; CEI 20-37/2-2; BS 6425-2*
Minimum Smoke Emission	IEC 61034-1&2; EN 61034 -1&2; DIN VDE 0482-1034-1&2; CEI 20-37/3-1&2; EN 50268-1&2*; BS 7622-1&2*
No Toxic gases	NES 02-713; NF C 20-454

*Note: Asterisk * denotes superseded standard.*

CABLE CONSTRUCTION

Conductors: 18AWG bare copper wire, solid according to IEC 60228 class 1.
Insulation: PE or fluoropolymer(FEP) compound.

Fire Barrier: Fire resistant tape wrapped around the cable core.
Overall Screen1: Al-maylar tape
Overall Screen2: Aluminium braid
Overall Screen3: Al-maylar tape
Overall Screen4: Aluminium braid
Sheath: Thermoplastic LSZH compound type LTS3 as per BS 7655-6.1 (Thermosetting LSZH compound type SW2-SW4 as per BS 7655-2.6 can be offered.). UV resistance, hydrocarbon resistance, oil resistance, anti rodent and anti termite properties can be offered as option.

PHYSICAL AND THERMAL PROPERTIES

Temperature range during operation (fixed state): -30°C - +70°C
Temperature range during installation (mobile state): -5ºC - +60ºC
Minimum bending radius: 8 x Overall Diameter

ELECTRICAL PROPERTIES

Impedance	75±5Ω
Capacitance	54 nF/km
Velocity ratio	82%
Insulation resistance	>5000 MΩ.Km
Shield coverage1	≥25%
Shield coverage2	≥60%
Shield coverage3	≥25%
Shield coverage4	≥40%
Max.conductor resistance	24.1 Ω/km

ATTENUATION

Frequency	Attenuation	Attenuation
MHz	dB/100m	dB/100ft
50	4.8	1.5
100	6.7	2.0
200	9.3	2.8
500	15.0	4.6
600	16.9	5.1
800	19.4	5.9
1000	21.6	6.6
1350	24.2	7.4
1750	28.0	8.4
2150	31.5	9.6
2400	32.8	10.0
3000	37.9	11.5

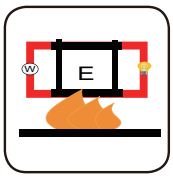
RETURN LOSS

Frequency	Return Loss
MHz	dB
30-300	>28
300-600	>24
600-900	>22

CONSTRUCTION PARAMETERS

Cable Code	Conductor Diameter	Nominal Insulation Diameter	Nominal Screen2 No.x Diameter	Nominal Screen4 No.x Diameter	Nominal Overall Diameter	Approx. Weight
	mm	mm	No. x mm	No. x mm	mm	kg/km
RG6 QUAD FR	1.02	4.60 ± 0.20	80 x 0.12	64 x 0.12	7.55 ± 0.20	92.4

Standard

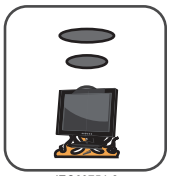


IEC 60331-23
Circuit Integrity


NF C32-070-2.2(C1)
IEC60332-3-24/EN50266-2-4
Reduced Fire Propagation


NF C32-070-2.1(C2)
IEC60332-1-2/EN50265-2-1
Flame Retardancy


NES 02-713/NF C 20-454
Low Toxicity

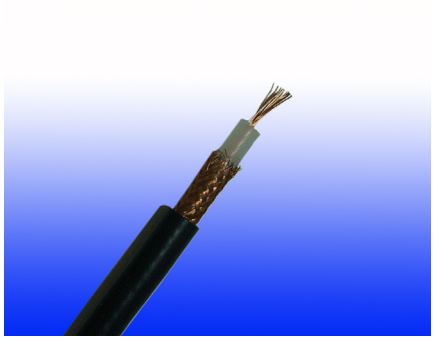

IEC60754-2
EN50267-2-2/3
NF C 32-074
Low Corrosivity

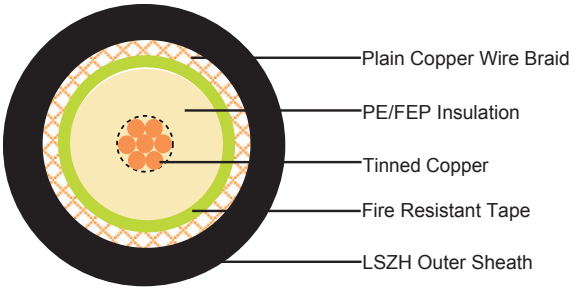

IEC 61034-1&2
EN 50268-1&2/NF C32-07
Low Smoke Emission

IEC60754-1
EN50267-2-1
Halogen Free

Fire Resistant RG 11A/U Coaxial Cables

RG 11A/U FR





APPLICATION

The cables are designed for CCTV, security, smoke detection and evacuation monitoring applications, where continued functionality is required during a fire situation. Due to the zero halogen low smoke construction, this cable is ideal for use in public, commercial and industrial environments.

STANDARDS

Basic design to MIL-C-17

FIRE PERFORMANCE

Circuit Integrity	IEC 60331-23
Flame Retardance (Single Vertical Wire Test)	EN 60332-1-2; IEC 60332-1-2; BS EN 60332-1-2; VDE 0482-332-1; NBN C 30-004 (cat. F1); NF C32-070-2.1(C2); CEI 20-35/1-2; EN 50265-2-1*; DIN VDE 0482-265-2-1*
Reduced Fire Propagation (Vertically-mounted bundled wires & cable test)	EN 60332-3-24 (cat. C); IEC 60332-3-24; BS EN 60332-3-24; VDE 0482-332-3; NBN C 30-004 (cat. F2); NF C32-070-2.2(C1); CEI 20-22/3-4; EN 50266-2-4*; DIN VDE 0482-266-2-4
Halogen Free	IEC 60754-1; EN 50267-2-1; DIN VDE 0482-267-2-1; CEI 20-37/2-1; BS 6425-1*
No Corrosive Gas Emission	IEC 60754-2; EN 50267-2-2; DIN VDE 0482-267-2-2; CEI 20-37/2-2; BS 6425-2*
Minimum Smoke Emission	IEC 61034-1&2; EN 61034 -1&2; DIN VDE 0482-1034-1&2; CEI 20-37/3-1&2; EN 50268-1&2*; BS 7622-1&2*
No Toxic gases	NES 02-713; NF C 20-454

*Note: Asterisk * denotes superseded standard.*

CABLE CONSTRUCTION

Conductors: Tinned copper copper wire, stranded according to IEC 60228 class 2.
Insulation: PE or fluoropolymer(FEP) compound.
Fire Barrier: Fire resistant tape wrapped around the cable core.
Binder: Glass tape
Overall Screen: Plain copper wire braid
Sheath: Thermoplastic LSZH compound type LTS3 as per BS 7655-6.1 (Thermosetting LSZH compound type SW2-SW4 as per BS 7655:section 2.6 can be offered.). UV resistance, hydrocarbon resistance, oil resistance, anti rodent and anti termite properties can be offered as option.

PHYSICAL AND THERMAL PROPERTIES

Temperature range during operation (fixed state): -30°C - +70°C
Temperature range during installation (mobile state): -5ºC - +60ºC
Minimum bending radius: 8 x Overall Diameter

ELECTRICAL PROPERTIES

Impedance	75±5Ω
Capacitance	6. nF/km
Velocity ratio(%)	66
Insulation resistance	>2000 MΩ.Km
Shield coverage	97%
DC resistance	
Inner conductor	20.5 Ω/km
Outer conductor	4.5 Ω/km

ATTENUATION

Frequency	Attenuation	Attenuation
MHz	dB/100m	dB/100ft
50	4.2	1.28
100	6.2	1.89
200	9.3	2.84
400	13.8	4.21
500	15.5	4.73
600	17.1	5.21
860	20.1	6.13
1000	23.4	7.13

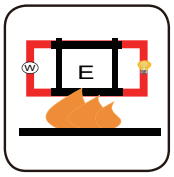
RETURN LOSS

Frequency	Return Loss
MHz	dB
30-300 MHz	>30dB
300-600 MHz	>27dB
600-900 MHz	>25dB

CONSTRUCTION PARAMETERS

Cable Code	Conductor Diameter	Nominal Insulation Diameter	Nominal Screen No.x Diameter	Nominal Overall Diameter	Approx. Weight
	mm	mm	No. x mm	mm	kg/km
RG 11A/U FR	7 x 0.40	7.25 ± 0.18	240 x 0.18	10.3 ± 0.18	142

Standard



IEC 60331-23
Circuit Integrity


NF C32-070-2.2(C1)
IEC60332-3-24/EN50266-2-4
Reduced Fire Propagation


NF C32-070-2.1(C2)
IEC60332-1-2/EN50265-2-1
Flame Retardancy


NES 02-713/NF C 20-454
Low Toxicity

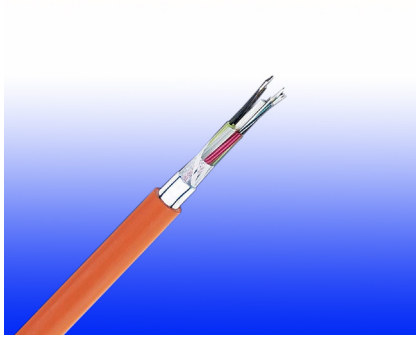

IEC60754-2
EN50267-2-2/3
NF C 32-074
Low Corrosivity

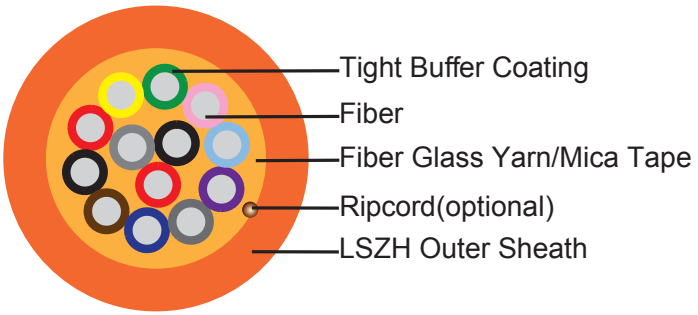

IEC 61034-1&2
EN 50268-1&2/NF C32-07
Low Smoke Emission

IEC60754-1
EN50267-2-1
Halogen Free

Fire Resistant Tight Buffered Distribution Fiber Optic cables

MTA-B-C-D-H-FR





APPLICATION

This cables are used for interconnection of distribution boxes and end devices, where continued functionality is required during a fire situation. The cables are very suitable for various indoor and outdoor applications, including routing between buildings within ducts and inside building up to riser shafts.

STANDARDS

Basic design to Telcordia GR409-CORE / TIA/EIA 568B.3 / ICEA-S-83-596

FIRE PERFORMANCE

Circuit Integrity	IEC 60331-25
Flame Retardance (Single Vertical Wire Test)	EN 60332-1-2; IEC 60332-1-2; BS EN 60332-1-2; VDE 0482-332-1; NBN C 30-004 (cat. F1); NF C32-070-2.1(C2); CEI 20-35/1-2; EN 50265-2-1*; DIN VDE 0482-265-2-1*
Reduced Fire Propagation (Vertically-mounted bundled wires & cable test)	EN 60332-3-24 (cat. C); IEC 60332-3-24; BS EN 60332-3-24; VDE 0482-332-3; NBN C 30-004 (cat. F2); NF C32-070-2.2(C1); CEI 20-22/3-4; EN 50266-2-4*; DIN VDE 0482-266-2-4
Halogen Free	IEC 60754-1; EN 50267-2-1; DIN VDE 0482-267-2-1; CEI 20-37/2-1; BS 6425-1*
No Corrosive Gas Emission	IEC 60754-2; EN 50267-2-2; DIN VDE 0482-267-2-2; CEI 20-37/2-2; BS 6425-2*
Minimum Smoke Emission	IEC 61034-1&2; EN 61034 -1&2; DIN VDE 0482-1034-1&2; CEI 20-37/3-1&2; EN 50268-1&2*; BS 7622-1&2*
No Toxic gases	NES 02-713; NF C 20-454

*Note: Asterisk * denotes superseded standard.*

CABLE CONSTRUCTION

Optical fibers: Singlemode and multimode tight fibers, with tight buffer coating.
Fire Barrier: The tight buffered fibers are wrapped with fire blocking fiber glass yarns or mica tape.
Inner Sheath(optional): Thermoplastic LSZH compound type LTS3 as per BS 7655-6.1

Ripcord(optional): An optional ripcord can be located under the outer sheath to facilitate jacket removal.

Armouring(optional):
STA: Corrugated steel tape armour
SWB: Steel wire braid

Outer Sheath: Thermoplastic LSZH compound type LTS3 as per BS 7655-6.1 (Thermosetting LSZH compound type SW2-SW4 as per BS 7655-2.6 can be offered.). UV resistance, hydrocarbon resistance, oil resistance, anti rodent and anti termite properties can be offered as option.

PHYSICAL AND THERMAL PROPERTIES

Temperature range during operation: -30°C - +70°C
Temperature range during storage: -50°C - +70°C
Minimum bending radius: 10 x Overall Diameter (unarmoured cables)
20 x Overall Diameter (armoured cables)

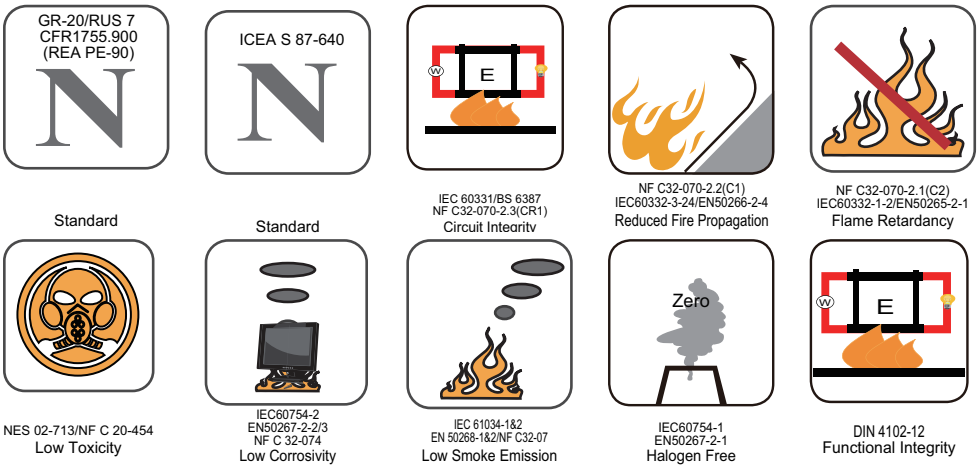
CONSTRUCTION PARAMETERS

Cable Code	No. of Fibers	Nominal Overall Diameter	Max Tensile Strength	Minimum Bending Radius	Approx. Weight
	No.	mm	N	mm	kg/km
MTA-B-2-0-H-FR	2	7,6	250	76	55
MTA-B-4-0-H-FR	4	7,8	250	78	67
MTA-B-6-0-H-FR	6	8,6	400	86	77
MTA-B-8-0-H-FR	8	8,8	400	88	81
MTA-B-12-0-H-FR	12	9,3	400	93	90

TYPE CODES

MTA-B-C-D-E-F-G-H-FR

- FR: Fire Resisting
- Outer Sheath
  - 2Y: PE
  - H: LSZH
- Armour
  - Blank: No armour
  - STA: Corrugated steel tape armour
  - SWB: Steel wire braid
- Inner Sheath
  - 2Y: PE
  - H: LSZH
- Central strength member
  - Blank: No Central strength member
  - A: Aramid yarn
  - F: Fiber reinforced plastic(FRP)
- Sub Unit
  - 0: No Sub Unit
  - Y: PVC
  - H: LSZH
- C No of Fibers
- Fiber Type
  - 4: 50/125 um(OM3)
  - 5: 50/125 um(OM2)
  - 6: 62.5/125um(OM1)
  - 7: NZDS SM fiber per ITU-T G.656
  - 8: NZDS SM fiber per ITU-T G.655
  - 9: Standard SM fiber per ITU-T G.652.D
- Sub Unit Diameter
  - A: 0.9mm (up to 12 fibers)
  - B: 3.6mm (12-36 fibers)
  - C: 4.2mm (24-72 fibers)



Fire Resistant Central Loose Tube Fiber Optic Cables

APPLICATION

These cables are characterized by light weight and small diameter, suitable for both aerial and duct installation. They are mainly installed inside buildings, tunnels,subways or closed areas in general, specially designed to guarantee the signal transmission even in case of fire. The cable can also be used for direct burial for armoured version.

STANDARDS

Basic design to Telcordia GR-20 / RUS 7 CFR 1755.900 (REA PE-90) / ICEA S 87-640

FIRE PERFORMANCE

Circuit Integrity	IEC 60331-25
Flame Retardance (Single Vertical Wire Test)	EN 60332-1-2; IEC 60332-1-2; BS EN 60332-1-2; VDE 0482-332-1; NBN C 30-004 (cat. F1); NF C32-070-2.1(C2); CEI 20-35/1-2; EN 50265-2-1*; DIN VDE 0482-265-2-1*
Reduced Fire Propagation (Vertically-mounted bundled wires & cable test)	EN 60332-3-24 (cat. C); IEC 60332-3-24; BS EN 60332-3-24; VDE 0482-332-3; NBN C 30-004 (cat. F2); NF C32-070-2.2(C1); CEI 20-22/3-4; EN 50266-2-4*; DIN VDE 0482-266-2-4
Halogen Free	IEC 60754-1; EN 50267-2-1; DIN VDE 0482-267-2-1; CEI 20-37/2-1; BS 6425-1*
No Corrosive Gas Emission	IEC 60754-2; EN 50267-2-2; DIN VDE 0482-267-2-2; CEI 20-37/2-2; BS 6425-2*
Minimum Smoke Emission	IEC 61034-1&2; EN 61034 -1&2; DIN VDE 0482-1034-1&2; CEI 20-37/3-1&2; EN 50268-1&2*; BS 7622-1&2*
No Toxic gases	NES 02-713; NF C 20-454

*Note: Asterisk * denotes superseded standard.*

CABLE CONSTRUCTION

Fibers: Singlemode and multimode fibers, with loose tube technology.
Structure: Central loose tube cable contains one tube with 2-24 single or multimode fibers, which are filled with water blocking gel.
Fire barrier: The jelly filled tube with up to 24 fibers is wrapped with a fire blocking mica glass tapes.
Water blocking: The jelly filled tube is waterblocked by using swellable tape and thread.
Reinforcement: Either aramid yarn or fiber glass is wound around the tube to provide physical protection and tensile strength, with added fire protection.
Inner Sheath (optional): The cable can be jacketed with either PE or thermoplastic LSZH inner sheath. PE is the preferred option in outdoor environment for water protection purpose.
Moisture Barrier Tape (optional): An aluminum moisture tape can be incorporated under the sheath for water blocking and shielding purpose.
Armouring(optional):
For diect burial, either galvanized steel wire braid, corrugated steel tape armour or galvanized steel wire armour is applied over an inner polyethylene or LSZH sheath. For steel tape armour,

the 0.15mm thick steel tape is coated with a copolymer and applied with an overlap. For steel wire braid or armour, single layer of galvanized steel wire braid or armour is applied.

Ripcord (optional): An optional ripcord can be located under the jacket to facilitate jacket removal.

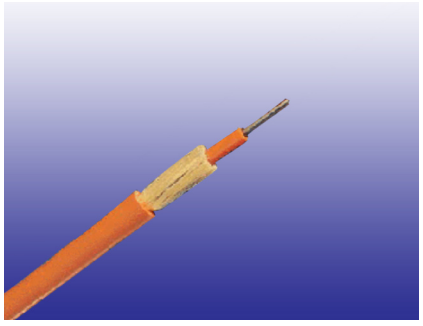
Outer Sheath: Thermoplastic LSZH compound type LTS3 as per BS 7655-6.1(Thermosetting LSZH compound type SW2-SW4 as per BS 7655-2.6 can be offered.). UV resistance, hydrocarbon resistance, oil resistance, anti rodent and anti termite properties can be offered as option.

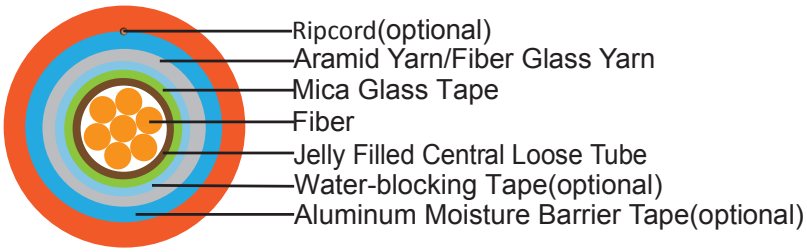
FIBER COLOUR CODE

Fiber colour code	1	Red	7	Brown
	2	Green	8	Violet
	3	Blue	9	Turquoise
	4	Yellow	10	Black
	5	White	11	Orange
	6	Grey	12	Pink

CONSTRUCTION

Unarmoured Type

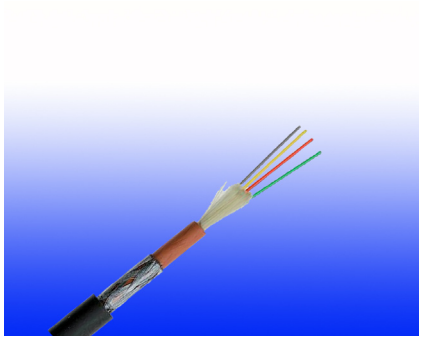


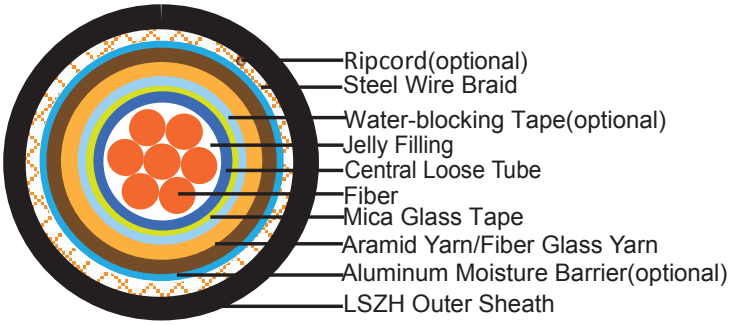


CONSTRUCTION PARAMETERS

Cable Code	Fiber Count	Tube Diameter	Nominal Overall Diameter	Approx. Weight	Tension load	Crush
	No.	mm	mm	kg/km	N	N/100mm
CLA-B-C-H-J-FR	02-06	2.7	8.0	70	1000	1500
CLB-B-C-H-J-FR	08-16	3.5	9.0	90	1200	1500
CLC-B-C-H-J-FR	18-24	4.2	10.0	100	1500	1500

Steel Wire Braid

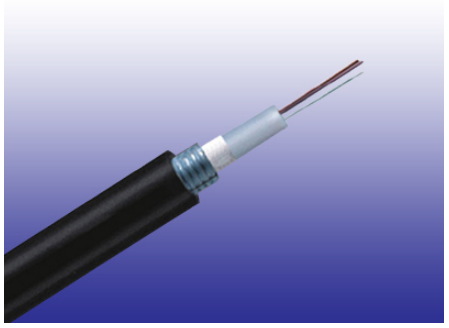


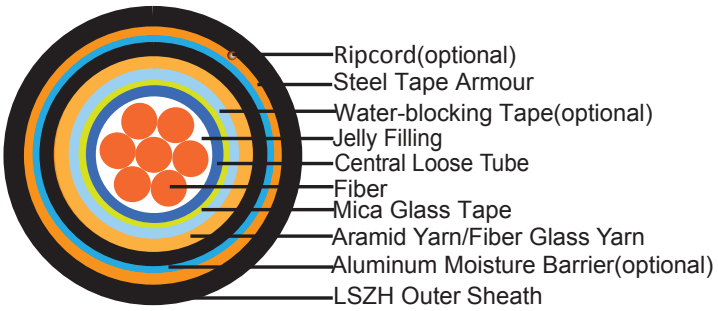


CONSTRUCTION PARAMETERS

Cable Code	Fiber Count	Tube Diameter	Nominal Overall Diameter	Approx. Weight	Tension load	Crush
	No.	mm	mm	kg/km	N	N/100mm
CLA-B-C-2Y(SWB)H-J-FR	02-06	2.7	11.5	160	1000	2000
CLB-B-C-2Y(SWB)H-J-FR	08-16	3.5	12.0	180	1200	2000
CLC-B-C-2Y(SWB)H-J-FR	18-24	4.2	13.0	200	1500	2000

Corrugated Steel Tape Armour

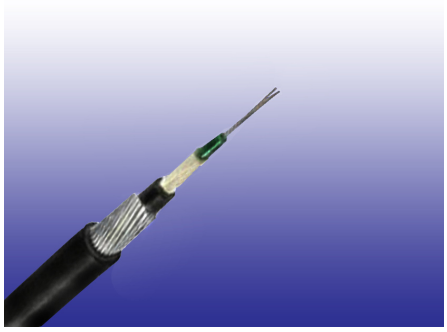


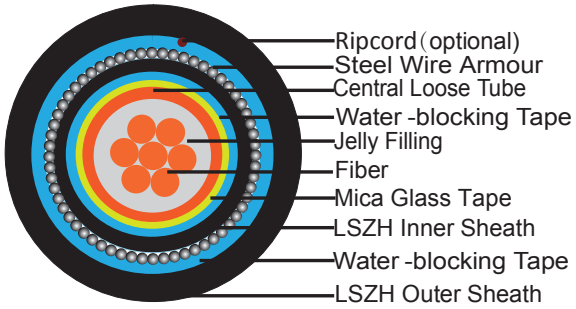


CONSTRUCTION PARAMETERS

Cable Code	Fiber Count	Tube Diameter	Diameter	Approx. Weight	Tension load	Crush
	No.	mm	mm	kg/km	N	N/100mm
CLA-B-C-2Y(STA)H-J-FR	02-06	2.7	13.0	200	1000	2500
CLB-B-C-2Y(STA)H-J-FR	08-16	3.5	14.0	220	1200	2500
CLC-B-C-2Y(STA)H-J-FR	18-24	4.2	14.5	250	1500	2500

Steel Wire Armour





CONSTRUCTION PARAMETERS

Cable Code	Fiber Count	Tube Diameter	Nominal Overall Diameter	Approx. Weight	Tension load	Crush
	No.	mm	mm	kg/km	N	N/100mm
CLA-B-C-2Y(SWA)H-J-FR	02-12	2.7	10.5	180	2500	4000
CLC-B-C-2Y(SWA)H-J-FR	16-24	4.2	11.0	210	2500	4000

PHYSICAL AND THERMAL PROPERTIES

Temperature range during operation: -30°C - +70°C
Temperature range during storage: -50°C - +70°C
Minimum bending radius: 10 x Overall Diameter (unarmoured cables)
20 x Overall Diameter (armoured cables)

MECHANICAL PROPERTIES

Maximum Compressive Load	4000N for unarmoured cables 5000N for armoured cables
Repeated Impact:	4.4 N.m (J)
Twist (Torsion):	180×10 times, 125×OD
Cyclic Flexing:	25 cycles for armoured cables; 100 cycles for unarmoured cables.
Crush Resistance:	263N/cm (150lb/in)

FIBER COMPLIANCE

Temperature Cycling	IEC60794-1-2-F2
Tensile Strength	IEC60794-1-2-E1A
Crush	IEC60794-1-2-E3
Impact	IEC60794-1-2-E4
Repeated Bending	IEC60794-1-2-E6

Torsion	IEC60794-1-2-E7
Kink	IEC60794-1-2-E10
Cable Bend	IEC60794-1-2-E11
Cool Bend	IEC60794-1-2-E11

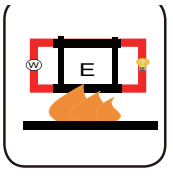
TYPE CODES

CLA-B-C-D-E-F-G-FR

- FR: Fire Resisting
- G: Water blocking gel in tubes
  X: No water-blocking J: Water blocking gel between jackets;
  D: Dry water-blocking between cable jackets
- F: Outer Sheath
  2Y: PE
  H: LSZH
- E: Armour
  Blank: No armour
  STA: Corrugated steel tape armour
  SWA: Steel wire armour
  SWB: Steel wire braid
- D: Inner Sheath
  2Y: PE
  H: LSZH
- C: No of Fibers
- B: Fiber Type
  4: 50/125 um(OM3) 7: NZDS SM fiber per ITU-T G.656
  5: 50/125 um(OM2) 8: NZDS SM fiber per ITU-T G.655
  6: 62.5/125um(OM1) 9: Standard SM fiber per ITU-T G.652.D
- A: Tube Diameter
  A: 2.7mm
  B: 3.5mm
  C: 4.2mm

Standard

Standard



IEC 60331/BS 6387
NF C32-070-2.3(CR1)
Circuit Integrity


Reduced Fire Propagation
NF C32-070-2.2(C1)
IEC60332-3-24/EN50266-2-4

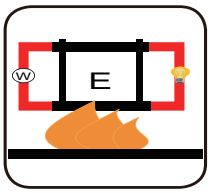

NF C32-070-2.1(C2)
IEC60332-1-2/EN50265-2-1
Flame Retardancy


NES 02-713/NF C 20-454
Low Toxicity


IEC60754-2
EN50267-2-2/3
NF C 32-074
Low Corrosivity


IEC 61034-1&2
EN 50268-1&2/NF C32-07
Low Smoke Emission

Halogen Free
IEC60754-1
EN50267-2-1



DIN 4102-12

Fire Resistant Multi Loose Tube Fiber Optic cables

APPLICATION

The multi loose tube non metallic cables are designed for outside plant, which is prone to electrical interference. They are mainly installed inside buildings, tunnels,subways or closed areas in general, specially designed to guarantee the signal transmission even in case of fire. The cable can also be used for direct burial for armoured version.

STANDARDS

Basic design to Telcordia GR-20 / RUS 7 CFR 1755.900 (REA PE-90) / ICEA S 87-640

FIRE PERFORMANCE

Circuit Integrity	IEC 60331-25
Flame Retardance (Single Vertical Wire Test)	EN 60332-1-2; IEC 60332-1-2; BS EN 60332-1-2; VDE 0482-332-1; NBN C 30-004 (cat. F1); NF C32-070-2.1(C2); CEI 20-35/1-2; EN 50265-2-1*; DIN VDE 0482-265-2-1*
Reduced Fire Propagation (Vertically-mounted bundled wires & cable test)	EN 60332-3-24 (cat. C); IEC 60332-3-24; BS EN 60332-3-24; VDE 0482-332-3; NBN C 30-004 (cat. F2); NF C32-070-2.2(C1); CEI 20-22/3-4; EN 50266-2-4*; DIN VDE 0482-266-2-4
Halogen Free	IEC 60754-1; EN 50267-2-1; DIN VDE 0482-267-2-1; CEI 20-37/2-1; BS 6425-1*
No Corrosive Gas Emission	IEC 60754-2; EN 50267-2-2; DIN VDE 0482-267-2-2; CEI 20-37/2-2; BS 6425-2*
Minimum Smoke Emission	IEC 61034-1&2; EN 61034 -1&2; DIN VDE 0482-1034-1&2; CEI 20-37/3-1&2; EN 50268-1&2*; BS 7622-1&2*
No Toxic gases	NES 02-713; NF C 20-454

*Note: Asterisk * denotes superseded standard.*

CABLE CONSTRUCTION

Fibers: Singlemode and multimode fibers, with loose tube technology.
Structure: The cable consists of 5 to 36 fibers containing tubes or fillers stranded in up to 3 layers around a central strength member and bound under a LSZH sheath. Each tube contains 4 -12 fibers, which is filled with water blocking gel.
Central Strength Member: Solid or stranded steel wire coated with polyethylene is usually used as central strength member. Fiber glass reinforced plastics (FRP) will be used as central strength member if non metallic construction is required.
Fire Barrier: The jelly filled tubes containing the fibers are individually wound with fire blocking mica glass tape and are cabled around a central strength member.
Overall Fire Barrier: The core assembly are wrapped with mica glass tape for added fire protection.
Water Blocking: The jelly filled tube is waterblocked by using swellable tape and thread.
Reinforcement: Either aramid yarn or fiber glass is wound around the tube to provide physical protection and tensile strength, with added fire protection.
Inner Sheath (optional): The cable can be jacketed with either PE or Thermoplastic LSZH inner

sheath. PE is the preferred option in outdoor environment for water protection purpose.

Armouring(optional): For diect burial, either galvanized steel wire braid, corrugated steel tape armour or galvanized steel wire armour is applied over an inner polyethylene or LSZH sheath. For steel tape armour, the 0.15mm thick steel tape is coated with a copolymer and applied with an overlap. For steel wire braid or armour, single layer of galvanized steel wire braid or armour is applied.

Moisture Barrier Tape (optional): An aluminum moisture tape can be incorporated under the sheath for water blocking and shielding purpose.

Ripcord (optional): An optional ripcord can be located under the jacket to facilitate jacket removal.

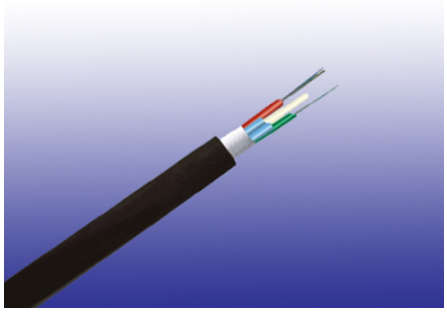
Outer Sheath: Thermoplastic LSZH compound type LTS3 as per BS 7655-6.1(Thermosetting LSZH compound type SW2-SW4 as per BS 7655-2.6 can be offered.). UV resistance, hydrocarbon resistance, oil resistance, anti rodent and anti termite properties can be offered as option.

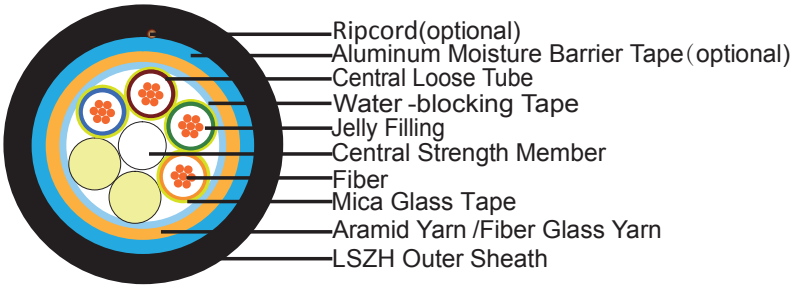
FIBER COLOUR CODE

Fiber colour code	1	Red	7	Brown
	2	Green	8	Violet
	3	Blue	9	Turquoise
	4	Yellow	10	Black
	5	White	11	Orange
	6	Grey	12	Pink

CONSTRUCTION

Unarmoured Type

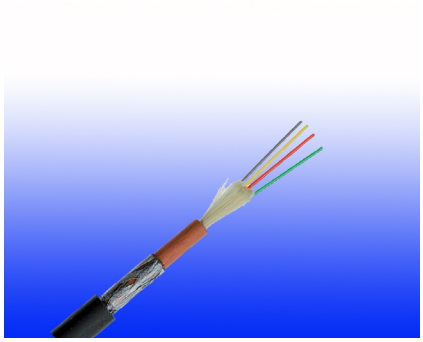


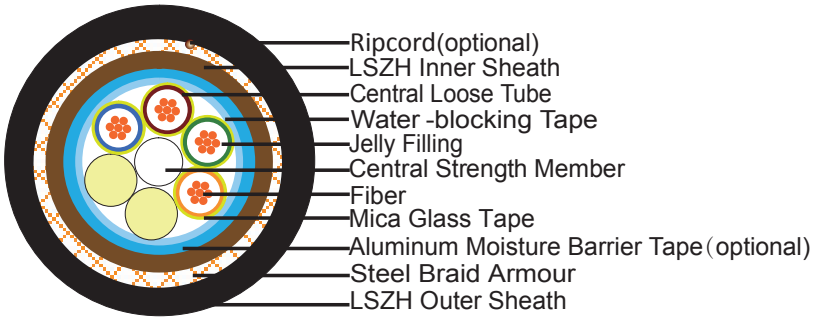


CONSTRUCTION PARAMETERS

Cable Code	Fiber Count	Tube Diameter	Nominal Overall Diameter	Approx. Weight	Tension load	Crush
	No.	mm	mm	kg/km	N	N/100mm
MLA-B-C×D-F-H-J-FR	72	2.5	15.0	230	4000	3000
MLA-B-C×D-F-H-J-FR	96	2.5	16.5	250	4000	3000
MLA-B-C×D-F-H-J-FR	144	2.5	20.5	280	4000	3000

Steel Wire Braid

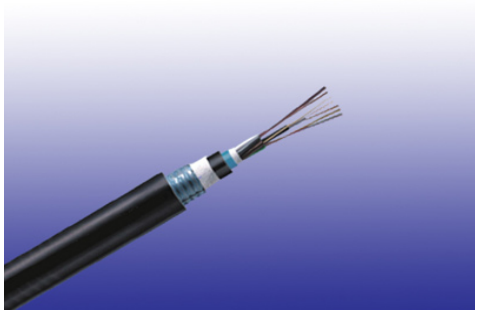


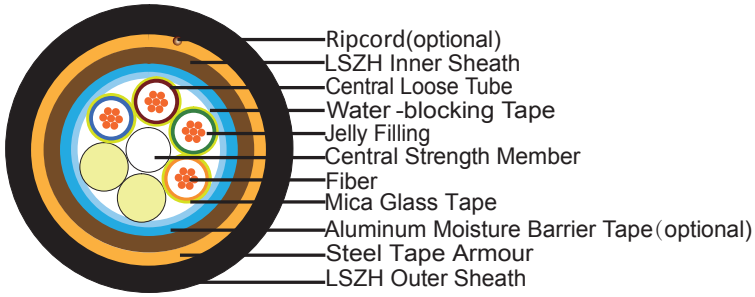


CONSTRUCTION PARAMETERS

Cable Code	Fiber Count	Tube Diameter	Nominal Overall Diameter	Approx. Weight	Tension load	Crush
	(n°)	mm	mm	kg/km	N	N/100mm
MLA-B-C×D-F-2Y(SWB)H-J-FR	72	2.5	15.0	280	3000	3500
MLA-B-C×D-F-2Y(SWB)H-J-FR	96	2.5	17.5	310	3000	3500
MLA-B-C×D-F-2Y(SWB)H-J-FR	144	2.5	21.5	350	3500	3500

Corrugated Steel Tape Armour

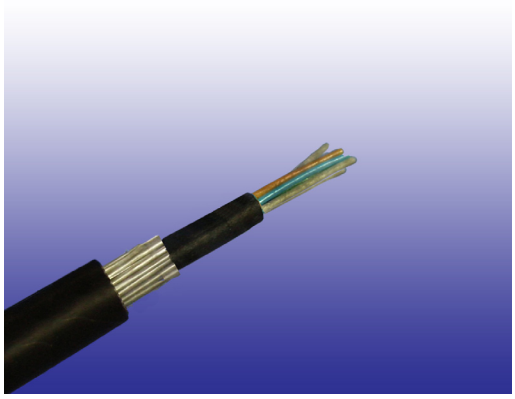


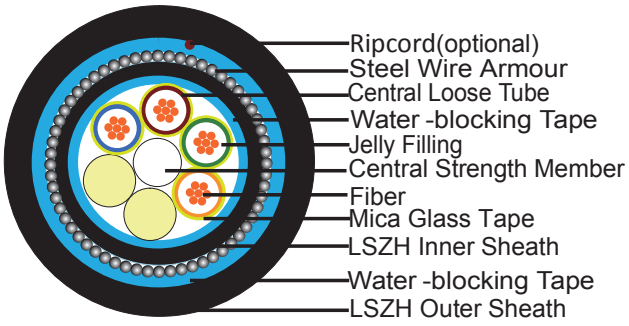


CONSTRUCTION PARAMETERS

Cable Code	Fiber Count	Tube Diameter	Nominal Overall Diameter	Approx. Weight	Tension load	Crush
	(n°)	mm	mm	kg/km	N	N/100mm
MLA-B-C×D-F-2Y(STA)H-J-FR	72	2.5	16.5	290	3000	7500
MLA-B-C×D-F-2Y(STA)H-J-FR	96	2.5	18.5	350	3000	7500
MLA-B-C×D-F-2Y(STA)H-J-FR	144	2.5	22.5	450	3500	7500

Steel Wire Armour





CONSTRUCTION PARAMETERS

Cable Code	Fiber Count	Tube Diameter	Nominal Overall Diameter	Approx. Weight	Tension load	Crush
	(n°)	mm	mm	kg/km	N	N/100mm
MLA-B-C×D-F-2Y(SWA)H-J-FR	72	2.0	15.0	360	3500	5000
MLA-B-C×D-F-2Y(SWA)H-J-FR	96	2.0	16.5	390	4000	5000
MLA-B-C×D-F-2Y(SWA)H-J-FR	144	2.0	18.5	430	4500	5000

PHYSICAL AND THERMAL PROPERTIES

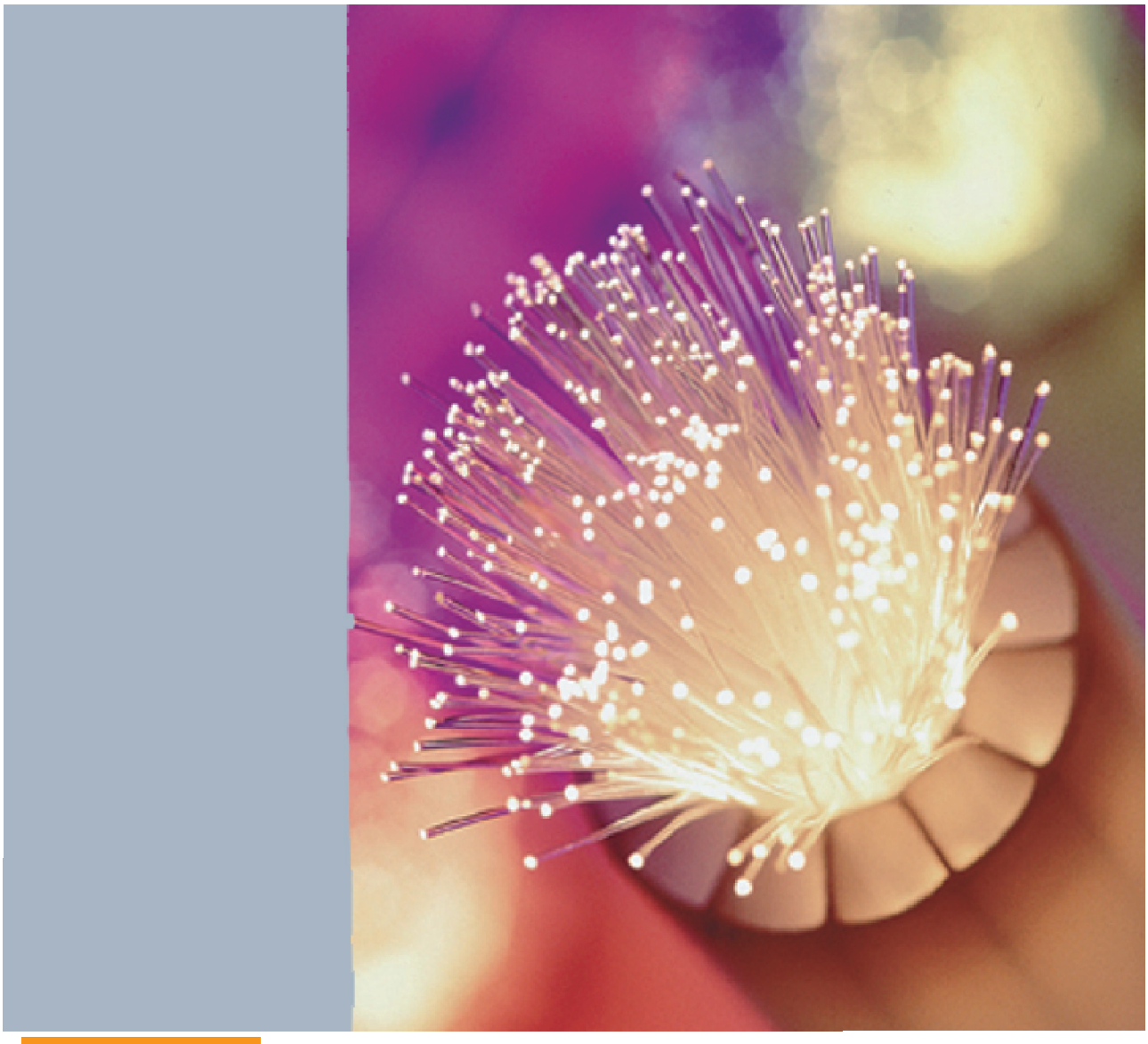
Temperature range during operation: -30°C - +70°C
Temperature range during storage: -50°C - +70°C
Minimum bending radius: 10 x Overall Diameter (unarmoured cables)
20 x Overall Diameter (armoured cables)

MECHANICAL PROPERTIES

Maximum Compressive Load	4000N for unarmoured cables 5000N for armoured cables
Repeated Impact:	4.4 N.m (J)
Twist (Torsion):	180×10 times, 125×OD
Cyclic Flexing:	25 cycles for armoured cables; 100 cycles for unarmoured cables.
Crush Resistance:	220N/cm (150lb/in)

FIBER COMPLIANCE

Temperature Cycling	IEC60794-1-2-F2
Tensile Strength	IEC60794-1-2-E1A
Crush	IEC60794-1-2-E3
Impact	IEC60794-1-2-E4
Repeated Bending	IEC60794-1-2-E6
Torsion	IEC60794-1-2-E7
Kink	IEC60794-1-2-E10
Cable Bend	IEC60794-1-2-E11
Cool Bend	IEC60794-1-2-E11



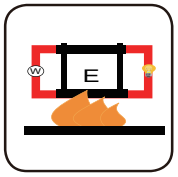
TYPE CODES

MLA-B-CxD-E-F-G-H-I-FR

- FR: Fire Resisting
- Water blocking gel in tubes
  X: No water-blocking J: Water blocking gel between jackets;
  D: Dry water-blocking between cable jackets
- Outer Sheath
  2Y: PE
  H: LSZH
- Armour
  Blank: No armour
  STA: Corrugated steel tape
  SWA: Steel wire
  SWB: Armour steel wire braided
- Inner Sheath
  2Y: PE
  H: LSZH
- Central strength member
  S: Solid steel
  SR: Stranded steel
  F: Fiber reinforced plastic(FRP)
- Fiber per Tubes: 2-12
- C No of tubes: 1-36
- Fiber Type
  4: 50/125 um(OM3) 7: NZDS SM fiber per ITU-T G.656
  5: 50/125 um(OM2) 8: NZDS SM fiber per ITU-T G.655
  6: 62.5/125um(OM1) 9: Standard SM fiber per ITU-T G.652.D
- Loose Tube Diameter
  A: 2.0mm D: 3.0mm
  B: 2.5mm E: 3.2mm
  C: 2.8mm

Standard

Standard



IEC 60331/BS 6387
NF C32-070-2.3(CR1)
Circuit Integrity

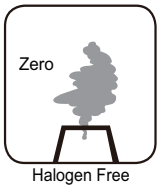

Reduced Fire Propagation
NF C32-070-2.2(C1)
IEC60332-3-24/EN50266-2-4


NF C32-070-2.1(C2)
IEC60332-1-2/EN50265-2-1
Flame Retardancy

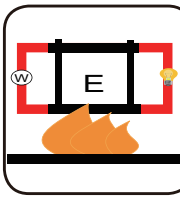

NES 02-713/NF C 20-454
Low Toxicity


IEC60754-2
EN50267-2-2/3
NF C 32-074
Low Corrosivity


IEC 61034-1&2
EN 50268-1&2/NF C32-07
Low Smoke Emission



Halogen Free
IEC60754-1
EN50267-2-1



DIN 4102-12

Technical Information For Fiber Optic Cable

Optical & Geometrical Properties for Single Mode Fibers

Parameter		Standard Single Mode Fiber per ITU-T G.652D	Non-zero Dispersion Shifted fiber per ITU-T G.655	Non-zero Dispersion Shifted fiber per ITU-T G.656	Units
Fiber Code		9	8	7	
Attenuation, Loose Tube Cables		Standard	Metro Area	Long Haul	
	@1310nm	≤0.35	-	-	dB/km
	@1550nm	≤0.22	≤0.22	≤0.22	dB/km
	@1625nm	≤0.25	≤0.26	≤0.26	dB/km
Attenuation, Tight Buffer or Semi-Tight Cables					
	@1310nm	≤0.38	-		dB/km
	@1550nm	≤0.28	-		dB/km
Chromatic Dispersion	between 1260 and 1360nm (O Band)	≤3.5	NA-	-	ps/(nm*km)
	between 1460 and 1530nm (S Band)	-	-	2.0-7.0	ps/(nm*km)
	between 1530 and 1565nm (C Band)	≤18	1.0-10.0	7.0-10.0	ps/(nm*km)
	between 1565 and 1625nm (L Band)	≤22	7.0-12.0	10.0-14.0	ps/(nm*km)
Zero Dispersion Wavelength		1310±11	≤1520	≤1420	nm
Zero Dispersion Slope		0.093	0.093	0.093	ps/(nm2.km)
Point Discontinuity at 1300nm& 1550nm		0.1	0.1	0.1	dB
Mode Field Diameter	@1300nm	9.3±0.5	-		um
	@1550nm	10.4±0.8	8.5±0.6	9.0±0.5	um
Cable Cut-off Wavelength		≤1260	≤1450	≤1310	nm

Parameter	Standard Single Mode Fiber per ITU-T G.652D	Non-zero Dispersion Shifted fiber per ITU-T G.655	Non-zero Dispersion Shifted fiber per ITU-T G.656	Units
PMD (Individual fiber)	≤0.2	≤0.2	≤0.2	ps/km 1/2
Cladding Diameter	125±1	125±1	125±1	um
Core/Cladding Concentricity Error	≤0.5	≤0.5	≤0.6	um
Cladding Non-Circularity	≤1.0	≤1.0	≤1.0	%
Coating Non-Circularity	≤6.0	≤6.0	≤6.0	%
Primary Coating Diameter	245±10	245±10	245±10	um
Proof-Test Level	100 (0.7)	100 (0.7)	100 (0.7)	Kpsi/GN/m^2
Fatigue Coefficient	≥20	≥20	≥20	
Temperature Dependence between 0°C ~ +70°C @ 1310 & 1550nm	0.1	0.1	0.1	Db/km

Optical & Geometrical Properties for Multimode Fibers

Parameter		50/125		62.5/125	Units
Fiber Code		5	4	6	-
ISO/IEC 11801 Classification(2)		**OM2**	**OM3**	**OM1**	-
Attenuation, Loose Tube Cables					
@850nm		≤3.0		≤3.0	dB/km
@1300nm		≤0.8		≤0.8	dB/km
Attenuation, Tight Buffer and Semi-tight Cables					
@850nm		≤3.0		≤3.5	dB/km
@1300nm		≤1.0		≤1.0	dB/km
Bandwidth*	@850nm	≥500	≥2000	≥200	MHz*km
	@1300nm	≥800/500	≥500	≥500/600	MHz*km
Numerical Aperture		0.20±0.015		0.275±0.015	-
Core Diameter		50±3		62.5±3	um

Parameter	50/125	62.5/125	Units
Cladding Diameter	125±2	125±2	um
Core/Cladding Concentricity	≤1.5	≤1.5	um
Core Non-Circularity	≤6	≤6	%
Cladding Non-Circularity	≤2 1	≤2 1	%
Core/Cladding Offset	≤3	≤3	um
Coating Diameter	245±10	245±10	um
Proof-Test Level	100 (0.7)	100 (0.7)	Kpsi (GN/m^2)
Fatigue Coefficient	≥20	≥20	
Temperature Dependence between 0°C ~ +70°C	0.1	0.1	dB

Mechanical & Environmental Properties for Single Mode Fiber

Testing Parameters	EIA/ TIA-455 FOTP Number	IEC-794-1 Test Method	EN 187000 Test Method	Maximum Increased loss
Tensile Load & Bending	33	E1	501	<0.05dB (90%); <0.15dB (100%)
Low & High Temperature Bend	37	E11		<0.05dB (90%); <0.15dB (100%)
Compression loading (Crush)	41	E3	504	<0.05dB (90%); <0.15dB (100%) 440N/km(250lb/in) load
Impact Resistance	25	E4	505	<0.05dB (90%); <0.15dB (100%)
Twist (Torson)	85	E7	508	<0.05dB (90%); <0.15dB (100%)
Cyclic Flexing (Repeated Bending)	104	E6	509	<0.05dB (90%); <0.15dB (100%)
External freezing	98	F6		<0.05dB (90%); <0.15dB (100%)
Temperature Cycling	3	F1	601	<0.05dB (90%); <0.15dB (100%)
Fiber Stripability	178	B6		<8.9N(2lbf) on unaged and aged fiber; >1.3N(0.3lbf) on unaged and aged fiber
Cable Aging	82	F5		<0.1dB (90%); <0.25dB (100%)

Testing Parameters	EIA/ TIA-455 FOTP Number	IEC-794-1 Test Method	EN 187000 Test Method	Maximum Increased loss
Water Penetration	82	F5		No flow after 24 hours from 1 meter length of cable
Compound Flow (Drip)	81	E14		80°C 24 hours duration, no drip

Mechanical & Environmental Properties for Multi Mode Fiber

Testing Parameters	EIA/TIA-455 FOTP Number	IEC-794-1 Test Method	EN 187000 Test Method	Maximum Increased loss
Tensile Load & Bending	33	E1	501	<0.2dB
Low & High Temperature Bend	37	E11		<0.4dB
Compression loading (Crush)	41	E3	504	<0.2dB 440N/km(250lb/in) load
Cyclic Impact	25	E4	505	<0.4dB
Twist (Torsion)	85	E7	508	<0.2dB
Cyclic Flexing (Repeated Bending)	104	E6	509	<0.2dB
External freezing	98	F6		<0.2dB
Temperature Cycling	3	F1	601	<0.05dB (90%); <0.15dB (100%)
Fiber Stripability	178	B6		<13.4N(3lbf) on unaged fiber
Cable Aging	82	F5		<0.1dB (90%); <0.25dB (100%)
Water Penetration	82	F5		No flow after 24 hours from 1 meter length of cable
Compound Flow (Drip)	81	E14		80°C 24 hours duration, no drip

ADDISON

Address:

Marchants Industrial Centre, Mill Lane, Laughton, Lewes,

East Sussex, BN8 6AJ, UK

Tel: 44(0) 207 4195087

Fax: 44(0) 207 8319489

E-mail: sales@caledonian-cables.co.uk

www.caledonian-cables.co.uk