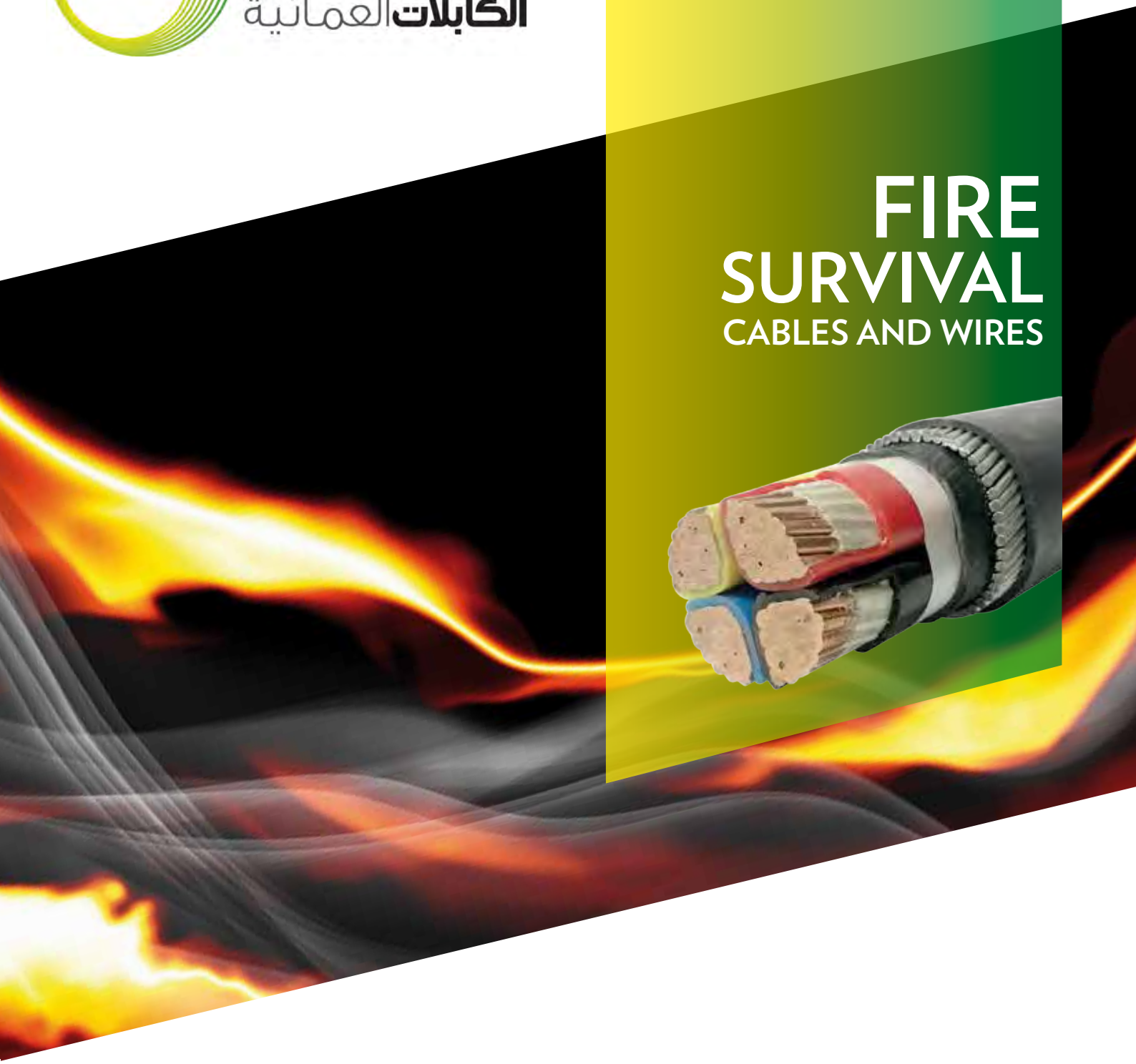
OmanCables
الكابلات العمانية

# FIRE SURVIVAL
## CABLES AND WIRES



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# OUR VISION, MISSION AND VALUES

## Our Vision

We at OCI ensure that through our product offering, we remain the leader in our industry in quality and performance, exceeding the expectations of our customers and stakeholders

## Our Mission

We continuously strive for excellence in all aspects of our business through the integration of sustainable business development and innovation, enhancing shareholder value and outstanding customer service

## Our Values

- Build sustainable growth through innovation
- Transparency in all our actions
- Promoting an environment of open communication for all
- Integrity driven by accountability
- Continued integration of world class quality management
- Safety is not compromised
- Responsible corporate citizenship in compliance with environmental norms

# OMAN CABLES INDUSTRY - OCI

Oman Cables Industry (SAOG) develops, manufactures and markets a totally integrated variety of electrical cables, which include medium voltage power cables, low voltage power and control cables, pilot cables, overhead power transmission line conductors and building wires.

OCI offers cables with special features suitable for different types of applications, environmental conditions or as per customer requirement.

- FLAME RETARDANT PROPERTIES
- CIRCUIT INTEGRITY CABLES
- LOW SMOKE AND FUME (LSF) PROPERTIES
- CABLES WITH ANTI-TERMITE SHEATHS
- UV RESISTANT OUTER SHEATH
- LEAD SHEATH

The manufacturing facilities are situated within the largest industrial complex in Muscat, The Sultanate of Oman, with its offices and factory presently occupying an area of 135000 $m^2$ with future expansion plans in mind. OCI have equivalent facilities in Sohar, Oman at its Aluminum manufacturing facility and together has a capacity of copper and aluminum of more than 120,000 metric ton annually.

Oman Cables Industry (SAOG) has its offices in Oman, UAE, Qatar, and KSA and has an extensive network of distributors and agents throughout MENA, Asia and Europe.

# OCI'S MARKET SEGMENTS AND PRODUCT RANGE

UTILITIES

OIL, GAS & PETROCHEMICAL

TRANSPORTATION

INDUSTRIAL & MANUFACTURING

HOUSING, BUILDING & CONSTRUCTION

Building Wire

Medium Voltage Power Cables

Low Voltage Power Cables

# 1. CABLES IN FIRE SITUATIONS

## 1.1 INTRODUCTION

Since the beginning of civilization, modifications that we have made to our own environment, in combination with fire, have frequently resulted in increased dangers. The structures we build can restrict our abilities to flee fire, they can also concentrate heat, smoke and dangerous fumes. They can also restrict the flow of oxygen that would otherwise replenish the oxygen they consume.

In current times we have added a further complication. Throughout the modern world, almost all of the buildings constructed contain cables, sometimes in large quantities. These are there to provide energy, lighting, telecommunications and control, and are installed in ducts, cable trays, plenum cavities, floor cavities and service shafts. As such they are distributed throughout our buildings, and therefore can be a major contributor to the spread of building fire.

As if this doesn't compound the dangers of a fire enough, many of the popular compounds used to manufacture cables emit huge quantities of smoke, toxic fumes and halogen gasses, the latter forming acids when they come into contact with water. As their insulation is consumed by fire the conductors come into contact with one another, and the cables cease to function, rendering useless any electrical equipment being used to fight the fire.

Cables have therefore been developed that address these issues. In various combinations they reduce flame propagation, reduce the smoke emitted, reduce the dangerous gasses emitted, and even maintain an electrical supply while burning. Of course, "reduce" is very much a relative measurement, and it is also true that no two fires are the same. Many international and national standards authorities have therefore devised standard repeatable tests that test each of these issues under narrowly defined conditions, and that can be used to grade cables according to their performance.

The various features in fire performance cables add to the cost of the cables. It is therefore important that the design features appropriate to each situation are the ones chosen, and cost-adding features not needed are omitted.

This brochure has been written to provide guidance for the selection of cables most appropriate to end users' needs, specifically in fixed installations, with particular emphasis on the fire performance characteristics. Also provided are the details and explanation of the tests to which the cables are subjected.

## 1.2 FLAME PROPAGATION

Simply put, this is the property of an object whereby that object can contribute to the spread of fire.

Most buildings include cabling, which usually burns in the unfortunate event of a fire. The often incorrect perception has therefore developed that cables are frequently the cause of the fire, and that they certainly help a fire to propagate.

Most of the materials in cables do not burn readily at room temperature. However, in the heat of a fire this can change significantly, and it is therefore a good idea to rate a cable according to a set of recognised norms. As stated earlier, no two fires are ever the same, so for such ratings to have meaning, the "fires" in which cables are tested must be standardised and closely controlled.

Cables designs can be optimised to enhance their performance in fires, and one of the enhancements is to use materials that burn less readily. To this end, the limiting oxygen index (LOI) of materials can be measured, and the higher this index the better the material. This is the percentage of oxygen that must be present in an oxygen nitrogen mix for a material to sustain flame. It must be stressed that the LOI refers to the material only, and it does not measure a material's performance in the heat of a fire. The cable property that is of interest to us relates to the performance of cables holistically, and for this reason LOI should only be used as an indicator as to which materials' performance is better.

Another useful measurement when choosing optimum materials for a particular need is the heat released by a material as it burns. The lower the heat release, the less a cable is likely to contribute to a fire.

## 1.3 HALOGEN GAS EMISSION

Halogens are a group of highly reactive chemically related elements, the commonly encountered ones being fluorine, chlorine, bromine and iodine. Fluorine and chlorine are gasses under normal conditions, bromine is a liquid and iodine is a solid. With a little amount of heating, they all turn to gas. All halogens readily form acids, and this can happen when a halogen released as a gas by a fire comes into contact with water used to extinguish the fire. Much of the damage that occurs after a fire can be caused by these acids, as they will attack anything from the circuit boards in computers to the structural steel giving the building strength.

The halogen gasses can also form acids when they come into contact with moist living surfaces such as eyes and lungs, causing serious injury.

Halogens are also good fire retardants, meaning that some of the options available for making a cable flame retardant can also mean that the cable will emit dangerous gasses in a fire. Where this is not important it is quite easy to make a cable flame retardant by using halogenated materials.

## 1.4 TOXIC GAS EMISSION

All cables release toxic gasses when burned, although some gases are worse than others. Carbon dioxide, for example, is relatively benign, but in sufficient quantity and for sufficient time it will still cause fatalities. Chlorine gas, as discussed above, is definitely not benign.

There are standard tests that have been devised that can be used to calculate, for example, a toxicity index for a product. However, this is seldom required of cables.

## 1.5 SMOKE EMISSION

Smoke is a major cause of fatalities in a building fire.

Smoke is a mixture of heated gasses and liquid droplets, and particles released by combustion. It is a major hindrance to people trying to escape a fire simply because they cannot see where they are going. While this is obvious, smoke also worsens our survivability in a fire by displacing oxygen, transferring heat and conveying toxic gasses and soot as well as acids resulting from the presence of halogen gasses.

Finally it can also accumulate in areas removed from the actual fire, effectively increasing the dangerous areas resulting from the fire.

It is possible to design cables to produce “no-smoke.” Unfortunately, there can be a trade-off in that the relatively cheap material that produced “no-smoke” also burns quite easily.

## 1.6 CIRCUIT INTEGRITY

Fires are very destructive, and one of the first things to go in a fire is the cabling. The sheathing and insulation is burned off, and the cores then comes into contact with one another with the resulting fault either destroying the conductors, or tripping the power supply. Where the cabling is used to power emergency services, such as fire-fighting equipment and lighting, or to provide Public Address General Alarm (PAGA) systems and vital communications. These facilities are lost as soon as the cable fails. It is therefore advantageous to design such cables with the ability to survive a fire much longer than ordinary cables.

Circuit integrity cables are sometimes referred to as "fire survival cables", but in reality no cables will survive indefinite fires. The tests used to rate such cables are therefore designed to subject the cables to closely defined fires, while being subjected to other equally closely defined traumas, for minimum periods.

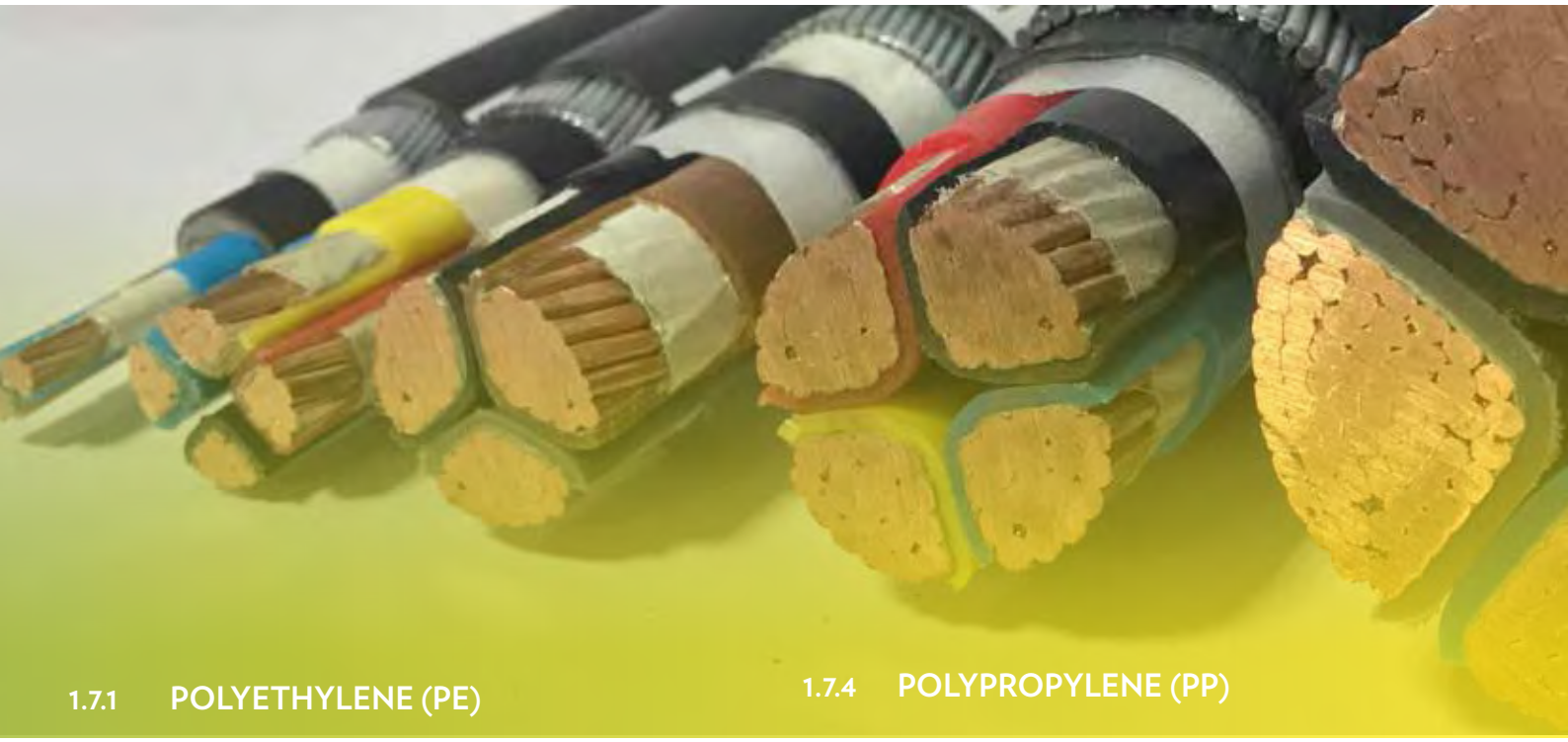
Many tests have been devised for rating these cable, and they range from relatively simple cooler flames with no other traumas, to hot flames (950°C) with both water and mechanical shock.

## 1.7 FIRE PERFORMANCE OPTIMISATION

So far we have alluded to the possibility of trade-offs being required to achieve the essential features. The trade-offs are that the cheaper materials are good in some areas but poor in others. Materials that are good in more than one area are more expensive, adding a further dimension. The features must be chosen that are most suitable to the intended use, balancing:

- Basic performance as a cable,
- Flame retardance,
- Halogen gas emission,
- Toxic gas emission,
- Smoke emission,
- Circuit integrity,
- Cost.

Many standard materials can be modified to achieve the features required, and these modification invariably add some costs to the material. The base materials that are commonly used in cables are described below.



### 1.7.1 POLYETHYLENE (PE)

This is not commonly used as an insulation, but is often used as a bedding and sheathing material. It is an environmentally friendly material, in that it does not add toxic chemicals to the environment as it decays. When burned it produces mostly carbon dioxide and water, and it does this without producing smoke. It is thermoplastic, meaning that it softens as it is heated, and melts into a very fluid waxy liquid. It burns well and can sustain a flame in free air.

### 1.7.2 POLYVINYL CHLORIDE (PVC)

For many years this has been the most popular insulation, bedding and sheathing material used for cables. On its own PVC is tough and stiff, and various additives are therefore compounded into it to give it the properties we need for cables. It will readily accept fillers, such as chalk, without much loss of properties, and this brings down the cost considerably. From a fire performance point of view it doesn't burn easily, but when it is burned, it produces thick smoke and chlorine gas.

### 1.7.3 ETHYLENE VINYL ACETATE (EVA)

This can be used as an insulating, bedding and sheathing material. It doesn't burn easily, and when it is burned it produces little smoke and no halogen gasses. All this makes it a very desirable material for enhanced fire performance cables. Unfortunately the trade-off is that it is mechanically relatively weak, and degrades quite badly when exposed to sunlight.

### 1.7.4 POLYPROPYLENE (PP)

A very tough material, this is usually used only as an interstice filler in multicore cable. It is similar to PE in that it is an environmentally friendly material and in that it does not add toxic chemicals to the environment as it decays. When burned, it also produces mostly carbon dioxide and water, without smoke. It is thermoplastic, meaning that it softens as it is heated, and melts into a very fluid waxy liquid. It burns well and can sustain a flame in free air.

### 1.7.5 CROSS-LINKED POLYETHYLENE (XLPE)

This has all the characteristics of PE, except that it is cross-linked, meaning that at a molecular level its PE chains are bonded together. (In the old days of sulphur cross-linked rubber, this used to be termed "vulcanising".) Its burning characteristics are the same, but it is not a thermoplastic material any more, having become a thermosetting material. As it is heated it softens a little but it does not melt unless extreme heat is applied. It is commonly used as an insulation.

# 1.8 "LSF" TERMINOLOGY

The description "LSF stands for "Low Smoke and Fume". An important point concerning "LSF" is that it is a characteristic of a material, and not a separate polymer as described below. Specifically "LSF" is any material that emits low smoke and low halogen gas when burned. When materials such as EVA, and PE are modified to be low smoke and low halogen gas release we call them LSF or LSZH material.

Different names can be used to describe these materials such as the following:
- Low smoke zero halogen (LSZH, LSOH, LS0H )
- Low smoke free of halogen (LSFH)

Consequently, this modified material can be used as a bedding or as an outer sheath to the cable to prevent it from emitting smoke and toxic gases when burned.

OCI has developed the OCIFLAM® range of low voltage fire performance cables which are mainly LSZH (low smoke zero halogen) to accommodate the rising needs of safety cables in confined spaces such as Hospitals, Shopping Centers, High-rise Building, Hotels, Tunnels and Airports.

# 1.9 FIRE PERFORMANCE STANDARDS

While the actual test methods used are described in some detail below, the standards most in use in the GCC region are given in the table below.

| | |
|---|---|
| **Flame propagation** | |
| IEC 60332-1 | Single cable subjected to a 1 kW (bunsen type) burner. |
| IEC 60332-2 | Single small cable subjected to a 1 kW (bunsen type) burner. |
| IEC 60332-3 | Groups of cables subjected to a 20 kW burner. |
| **Smoke emission** | |
| IEC 61034 | Standard 3 m cube. |
| **Halogen gas emission** | |
| IEC 60754-1 | Direct measurement of halogen gas for low concentrations. |
| IEC 60754-2 | Measurement of pH and conductivity for not-as-low concentrations. |
| IEC 60754-3 | (Still draft.) Direct measument using ion chromatography. |
| **Circuit integrity** | |
| IEC 60331 | IEC circuit integrity tests. |
| EN 50200 | European circuit integrity tests, suitability for PH120. |
| BS 6387 | Early British circuit integrity tests, defined as "CWZ". |
| BS 7846 | British circuit integrity tests, including defining "F120". |
| BS 8434-2 | Similar to EN 50200 (PH120), but more stringent. |
| BS 8491 | Similar to BS 7846. |
| BS 8519 | Similar to BS 8519 (F120), but more stringent. |
| **Toxicity** | |
| DStan 02-713 | Not often performed on cables. |
| **Limiting Oxygen Index** | |
| ASTM D 2863-09 | Direct measurement of LOI. |

# 2. OCIFLAM CABLES

The OCIFLAM range of cables are LV cables that have specific enhancement for fire conditions. As stated earlier, choosing the correct features is a balance between that of enhancement and cost, therefore different cables have been developed for different needs. OCI's circuit integrity cables are divided into 4 different types, depending on the standards with which they comply.

## REFERENCE TABLE TO FIRE CABLES

| Cable OCI Brand | Type | Cable Size Range (mm) | Standard | Circuit Integrity Category/Type | Table Reference |
|---|---|---|---|---|---|
| OCIFLAM-LSHA® | LV Power Cable Single Core | 10 - 1000 | BS 6724 | Only LSZH Circuit Integrity not Applicable | Table 1 |
| | LV Power Cable Multi-Core (2c, 3c, & 4c) | 1.5 - 400 | | | Table 2 |
| | LV Power Cable Multi- Core (5c) | 1.5 - 70 | | | Table 3 |
| OCIFLAM-LSHU® | LV Power Cable Single Core | 1.5 - 1000 | IEC 60502-1 | Only LSZH Circuit Integrity not Applicable | Table 4 |
| | LV Power Cable Multi-Core (2c, 3c & 4c) | 1.5 - 400 | | | Table 5 |
| | LV Power Cable Multi-Core (3.5c) | 25 - 400 | | | Table 5 |
| | LV Power Cable Multi- Core (5c) | 1.5 - 70 | | | Table 5 |
| OCIFLAM-FS1® | Wire/ LV Power Cable Single Core | 1.5 - 630 | BS 6387 | F2 | Table 6 |
| OCIFLAM-FSA® | Wire/ LV Power Cable Multi-Core | 1.5 - 400 | BS 7846 | F2 | Table 7 & 8 |
| OCIFLAM1-PREMIUM® | Wire/ LV Power Cable Multi-Core | 1.5 - 400 | BS 7846 & BS EN 50200 | F2 & PH120 | Table 9 |
| OCIFLAM2-PREMIUM® | LV Power Cable Multi-Core | 10 - 400 | BS 7846 | F2 & F120 | Table 9 |

| Cable Type | Fire Characteristic | | | | OCI Brand |
|---|---|---|---|---|---|
| | Flame retardancy | Halogen gas emission | Smoke emission | Maintain circuit integrity | |
| LV PVC | Yes | High | High | No | Standard |
| LV XLPE | No | Low | Low | No | Standard |
| Flame retardant (PVC) | Yes | High | High | No | FR PVC |
| Flame retardant (XLPE) | Yes | Low | Low | No | FR XLPE |
| LSF Unarmoured | Yes | Low | Low | No | OCIFLAM-LSHU |
| LSF Armoured | Yes | Low | Low | No | OCIFLAM-LSHA |
| Circuit integrity | Yes | Low | Low | Yes | OCIFLAM-FS1<br>OCIFLAM-FSA<br>OCIFLAM1 PREMIUM<br>OCIFLAM2 PREMIUM |

Green = Standard cables

Yellow = Intrinsic fire properties

Orange = Enhanced fire properties

# 3. OCIFLAM LOW SMOKE ZERO HALOGEN CABLES

## 3.1 PURPOSE

OCIFLAM LSZH cables are divided into two main categories. The first category is unarmoured low smoke halogen free cables, with the name of OCIFLAM-LSHU® and the second category is armoured low smoke halogen free cables, with the name of OCIFLAM-LSHA®. Those cables are used for different applications such as electric power, and control cables to be able to eliminate the emission of corrosive halogen gases and the emission of low smoke during combustion. Further, they can resist the propagation of flames when burned.

## 3.2 SPECIFICATIONS

| | | |
|---|---|---|
| 1 | Conductors | Stranded copper, stranded aluminium |
| 2 | Sizes | 1.5 $mm^2$ to 1 000 $mm^2$ |
| 3 | Number of cores | 1, 2, 3, 3½, 4, and 5 |
| 4 | Insulation materials | XLPE |
| 5 | Bedding material | EVA/ PE (polyolefin) |
| 6 | Armour | Armoured or Unarmoured |
| 7 | Outer serving | EVA/ PE (polyolefin) |
| 8 | Cable specification | IEC 60502, BS 6724, BS 5467 |
| 9 | Test method (Halogen Emission) | IEC 60754, IEC 60754, BS EN 60754 |
| 10 | Additional test methods (Flame Propagation) | IEC 60332, BS EN 60332 |
| 11 | Additional test methods (Reduce Smoke) | IEC 61034, BS EN 61034 |

## 3.3 APPLICATIONS

OCIFLAM-LSHU® and OCIFLAM-LSHA® are meant to be used in situations where large numbers of people are gathered in confined spaces such as at airports, hotels, malls, hospitals, tunnels and the like. Moreover, these cables are suitable for places where sensitive equipment is installed such as main frame computer rooms, data server rooms, distribution substations and medical equipment rooms and similar areas of critical importance.

## 3.4 CABLE MARKINGS

OCIFLAM-LSHU® and OCIFLAM-LSHA® are both marked with the letters “LSZH” embossed on the outer sheath.

# 3.5 ELECTRICAL AND MECHANICAL PROPERTIES

| OCIFLAM-LSHA SINGLE-CORE ARMOURED CABLES<br>ELECTRICAL AND PHYSICAL PROPERTIES<br><br>Description: PLAIN ANNEALED COPPER CONDUCTORS, XLPE INSULATION, LSF BEDDING, ALUMINIUM WIRE ARMOUR, LSF SHEATH | | | | | | | |
|---|---|---|---|---|---|---|---|
| Cable size $mm^2$ | ELECTRICAL PROPERTIES | | | | | MECHANICAL PROPERTIES | |
| | Current ratings | | | Impedance | Volt drop | Typical overall diameter | Approximate mass |
| | Ground | Duct | Air | 1 c Ω/km | 1 c mV/A/m | 1 c mm | 1 c kg/km |
| | 1 c A | 1 c A | 1 c A | | | | |
| 10 | 82 | 78 | 67 | 2.33 | 4.0 | 12.0 | 220 |
| 16 | 108 | 101 | 92 | 1.48 | 2.6 | 13.0 | 285 |
| 25 | 139 | 134 | 123 | 0.936 | 1.6 | 14.5 | 395 |
| 35 | 165 | 154 | 146 | 0.679 | 1.18 | 15.5 | 495 |
| 50 | 199 | 199 | 180 | 0.507 | 0.878 | 18.0 | 630 |
| 70 | 244 | 239 | 230 | 0.358 | 0.620 | 20.0 | 890 |
| 95 | 292 | 281 | 282 | 0.267 | 0.463 | 22.0 | 1165 |
| 120 | 332 | 315 | 328 | 0.220 | 0.382 | 23.0 | 1415 |
| 150 | 371 | 341 | 377 | 0.188 | 0.326 | 26.0 | 1790 |
| 185 | 417 | 376 | 433 | 0.160 | 0.277 | 28.0 | 2180 |
| 240 | 480 | 421 | 510 | 0.135 | 0.234 | 31.0 | 2760 |
| 300 | 536 | 459 | 581 | 0.121 | 0.210 | 34.0 | 3375 |
| 400 | 594 | 488 | 664 | 0.110 | 0.191 | 38.0 | 4370 |
| 500 | 658 | 529 | 751 | 0.103 | 0.179 | 42.0 | 5400 |
| 630 | 723 | 571 | 846 | 0.097 | 0.168 | 46.0 | 6915 |
| 800 | 764 | 595 | 919 | 0.094 | 0.163 | 52.0 | 9030 |
| 1000 | 810 | 632 | 997 | 0.091 | 0.157 | 57.0 | 11015 |

Ambient temp. 50 °C
Ground temp. 35 °C
Depth of laying in ground 0.5 Mtr.
Thermal resistivity of soil 1.2 K·m/W
Trefoil Touching

Table 1 OCIFLAM-LSHA SINGLE-CORE ARMOURED CABLES

## OCIFLAM-LSHA 2, 3 AND 4 CORE ARMOURED CABLES
## ELECTRICAL AND PHYSICAL PROPERTIES

**Description: PLAIN ANNEALED COPPER CONDUCTORS, XLPE INSULATION, LSF BEDDING,GALVANISED STEEL WIRE ARMOURED, LSF SHEATH**

| Cable size mm² | ELECTRICAL PROPERTIES | | | | | | | | | MECHANICAL PROPERTIES | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Current ratings | | | | | | Impedance | Volt drop | Volt drop | Typical overall diameter | | | Approximate mass | | |
| | Ground | | Duct | | Air | | | | | | | | | | |
| | 2 c | 3 & 4 c | 2 c | 3 & 4 c | 2 c | 3 & 4 c | 2, 3 & 4 c Ω/km | 2 c mV/A/m | 3 & 4 c mV/A/m | 2 c mm | 3 c mm | 4 c mm | 2 c kg/km | 3 c kg/km | 4 c kg/km |
| | A | A | A | A | A | A | | | | | | | | | |
| 1.5 | 33 | 28 | 27 | 22 | 24 | 20 | 15.4 | 30.9 | 26.7 | 13 | 13 | 14 | 265 | 295 | 330 |
| 2.5 | 42 | 36 | 35 | 29 | 32 | 27 | 9.45 | 18.9 | 16.4 | 14 | 14 | 15 | 310 | 350 | 405 |
| 4 | 56 | 47 | 46 | 39 | 43 | 37 | 5.88 | 11.8 | 10.2 | 15 | 15 | 16 | 380 | 435 | 500 |
| 6 | 70 | 59 | 58 | 48 | 55 | 46 | 3.93 | 7.86 | 6.81 | 16 | 17 | 18 | 455 | 530 | 730 |
| 10 | 94 | 79 | 77 | 65 | 74 | 64 | 2.33 | 4.66 | 4.04 | 18 | 19 | 21 | 610 | 825 | 950 |
| 16 | 121 | 102 | 99 | 83 | 98 | 83 | 1.47 | 2.94 | 2.55 | 20 | 21 | 23 | 830 | 1025 | 1230 |
| 25 | 157 | 131 | 127 | 107 | 128 | 109 | 0.931 | 1.86 | 1.61 | 20 | 23 | 26 | 975 | 1450 | 1835 |
| 35 | 188 | 157 | 153 | 128 | 158 | 134 | 0.673 | 1.35 | 1.17 | 23 | 25 | 29 | 1385 | 1815 | 2285 |
| 50 | 223 | 187 | 181 | 152 | 190 | 163 | 0.500 | 1.00 | 0.866 | 25 | 28 | 31 | 1705 | 2270 | 2845 |
| 70 | 273 | 229 | 224 | 187 | 239 | 205 | 0.350 | 0.700 | 0.606 | 28 | 32 | 37 | 2220 | 3005 | 4115 |
| 95 | 328 | 274 | 269 | 226 | 295 | 253 | 0.258 | 0.515 | 0.446 | 32 | 36 | 40 | 3050 | 4160 | 5280 |
| 120 | 372 | 312 | 307 | 258 | 341 | 293 | 0.210 | 0.419 | 0.363 | 34 | 40 | 47 | 3655 | 5045 | 6910 |
| 150 | 417 | 349 | 345 | 291 | 389 | 335 | 0.176 | 0.352 | 0.305 | 38 | 45 | 51 | 4340 | 6475 | 8210 |
| 185 | 470 | 394 | 391 | 329 | 449 | 386 | 0.147 | 0.294 | 0.254 | 42 | 48 | 56 | 5590 | 7705 | 9980 |
| 240 | 544 | 455 | 453 | 380 | 530 | 456 | 0.122 | 0.243 | 0.211 | 49 | 54 | 62 | 7080 | 9705 | 12540 |
| 300 | 609 | 509 | 509 | 427 | 605 | 519 | 0.107 | 0.214 | 0.186 | 53 | 60 | 68 | 8540 | 11845 | 15160 |
| 400 | 687 | 574 | 575 | 490 | 696 | 597 | 0.095 | 0.190 | 0.165 | 58 | 64 | 78 | 10475 | 14465 | 19860 |

Ambient temp. 50 °C
Ground temp. 35 °C
Depth of laying in ground 0.5 Mtr.
Thermal resistivity of soil 1.2 K·m/W
Trefoil Touching

Table 2 OCIFLAM-LSHA MULTI-CORE ARMOURED CABLES

## OCIFLAM-LSHA 5 CORE ARMOURED CABLES ELECTRICAL AND PHYSICAL PROPERTIES

**Description: PLAIN ANNEALED COPPER CONDUCTORS, XLPE INSULATION, LSF BEDDING,GALVANISED STEEL WIRE ARMOURED, LSF SHEATH**

| Cable size mm² | ELECTRICAL PROPERTIES | | | | | | |
|---|---|---|---|---|---|---|---|
| | Current ratings | | | Impedance | Volt drop | Typical overall diameter | Approximate mass |
| | Ground | Duct | Air | 5 c Ω/km | 5 c mV/A/m | 5 c mm | 5 c kg/km |
| | 5 c | 5 c | 5 c | | | | |
| | A | A | A | | | | |
| 1.5 | 24 | 19 | 17 | 15.4 | 26.7 | 15.0 | 380 |
| 2.5 | 30 | 25 | 23 | 9.45 | 16.4 | 16.0 | 460 |
| 4 | 40 | 33 | 31 | 5.88 | 10.2 | 18.0 | 580 |
| 6 | 50 | 42 | 40 | 3.93 | 6.81 | 20.0 | 845 |
| 10 | 68 | 55 | 53 | 2.33 | 4.04 | 23.0 | 1125 |
| 16 | 87 | 71 | 71 | 1.47 | 2.55 | 26.0 | 1640 |
| 25 | 113 | 91 | 92 | 0.931 | 1.61 | 30.0 | 2285 |
| 35 | 135 | 110 | 114 | 0.673 | 1.17 | 33.0 | 2865 |
| 50 | 161 | 130 | 137 | 0.500 | 0.867 | 38.0 | 3935 |
| 70 | 197 | 161 | 172 | 0.350 | 0.606 | 43.0 | 5240 |

Table 3 OCIFLAM-LSHA 5-CORES CABLES

Ambient temp. 50 °C
Ground temp. 35 °C
Depth of laying in ground 0.5 Mtr.
Thermal resistivity of soil 1.2 K·m/W
Trefoil Touching

## OCIFLAM-LSHU SINGLE-CORE UNARMOURED CABLES
## ELECTRICAL AND PHYSICAL PROPERTIES

**Description: PLAIN ANNEALED COPPER CONDUCTORS, XLPE INSULATION, LSF BEDDING, LSF SHEATH**

| Cable size mm² | ELECTRICAL PROPERTIES | | | | | MECHANICAL PROPERTIES | |
|---|---|---|---|---|---|---|---|
| | Current ratings | | | Impedance | Volt drop | Typical overall diameter | Approximate mass |
| | Ground | Duct | Air | 1 c Ω/km | 1 c mV/A/m | 1 c mm | 1 c kg/km |
| | 1 c A | 1 c A | 1 c A | | | | |
| 1.5 | - | - | 22 | 15.4 | 26.7 | 10.5 | 115 |
| 2.5 | - | - | 30 | 9.45 | 16.4 | 10.5 | 120 |
| 4 | - | - | 39 | 5.88 | 10.2 | 11.0 | 135 |
| 6 | - | - | 49 | 3.93 | 6.81 | 11.0 | 145 |
| 10 | - | - | 67 | 2.33 | 4.04 | 11.5 | 185 |
| 16 | - | - | 92 | 1.47 | 2.55 | 12.0 | 245 |
| 25 | - | - | 123 | 0.933 | 1.62 | 12.0 | 305 |
| 35 | - | - | 146 | 0.676 | 1.17 | 13.0 | 400 |
| 50 | - | - | 174 | 0.504 | 0.873 | 14.5 | 520 |
| 70 | - | - | 222 | 0.354 | 0.613 | 16.0 | 725 |
| 95 | - | - | 275 | 0.263 | 0.455 | 18.0 | 980 |
| 120 | - | - | 321 | 0.215 | 0.373 | 20.0 | 1220 |
| 150 | - | - | 371 | 0.182 | 0.315 | 21.5 | 1495 |
| 185 | - | - | 430 | 0.154 | 0.268 | 24.0 | 1855 |
| 240 | - | - | 513 | 0.129 | 0.223 | 26.5 | 2410 |
| 300 | - | - | 594 | 0.115 | 0.200 | 29.5 | 3000 |
| 400 | - | - | 692 | 0.103 | 0.179 | 32.5 | 3815 |
| 500 | - | - | 801 | 0.095 | 0.164 | 36.0 | 4785 |
| 630 | - | - | 925 | 0.090 | 0.156 | 40.5 | 6255 |
| 800 | - | - | 1051 | 0.086 | 0.149 | 45.5 | 8045 |
| 1000 | - | - | 1172 | 0.083 | 0.144 | 50.0 | 9935 |

Ambient temp. 50 °C
Ground temp. 35 °C
Depth of laying in ground 0.5 Mtr.
Thermal resistivity of soil 1.2 K·m/W
Trefoil Touching

Table 4 OCIFLAM-LSHU SINGLE-CORE UNARMOURED CABLE

## OCIFLAM LSHU MULTI-CORE UNARMOURED CABLES ELECTRICAL AND PHYSICAL PROPERTIES

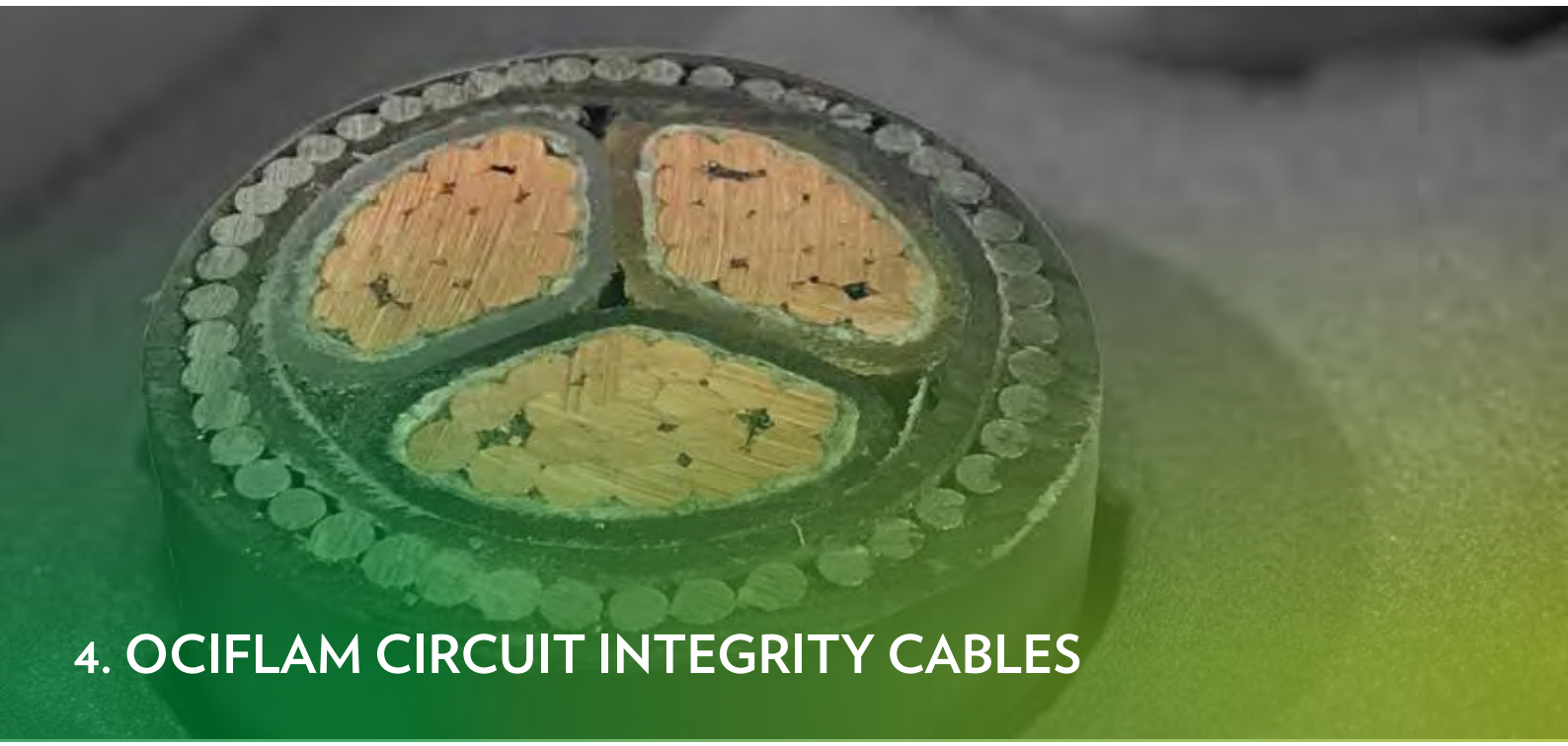
Description: PLAIN ANNEALED COPPER CONDUCTORS, XLPE INSULATION, LSF BEDDING, LSF SHEATH

| Cable size $mm^2$ | ELECTRICAL PROPERTIES Current ratings in Air | | | | | Impedance | Volt drop | Volt drop |
|---|---|---|---|---|---|---|---|---|
| | 2 c A | 3 c A | 3 1/2 c A | 4 c A | 5 c A | Ω/km | 2 c mV/A/m | 3, 3 1/2 c, 4 c & 5 c mV/A/m |
| 1.5 | 22 | 19 | - | 19 | 16 | 15.4 | 30.9 | 26.7 |
| 2.5 | 30 | 27 | - | 27 | 22 | 9.45 | 18.9 | 16.4 |
| 4 | 39 | 34 | - | 34 | 28 | 5.88 | 11.8 | 10.2 |
| 6 | 50 | 44 | - | 44 | 36 | 3.93 | 7.86 | 6.81 |
| 10 | 67 | 58 | - | 58 | 48 | 2.33 | 4.66 | 4.04 |
| 16 | 97 | 83 | - | 83 | 70 | 1.47 | 2.94 | 2.55 |
| 25 | 122 | 105 | 105 | 105 | 88 | 0.931 | 1.86 | 1.61 |
| 35 | 151 | 129 | 129 | 129 | 109 | 0.674 | 1.35 | 1.17 |
| 50 | 183 | 157 | 157 | 157 | 132 | 0.500 | 1.00 | 0.866 |
| 70 | 232 | 200 | 200 | 200 | 167 | 0.351 | 0.702 | 0.608 |
| 95 | 287 | 246 | 246 | 246 | - | 0.258 | 0.516 | 0.447 |
| 120 | 335 | 288 | 288 | 288 | - | 0.210 | 0.419 | 0.363 |
| 150 | 383 | 330 | 330 | 330 | - | 0.176 | 0.352 | 0.305 |
| 185 | 444 | 381 | 381 | 381 | - | 0.148 | 0.296 | 0.256 |
| 240 | 529 | 454 | 454 | 454 | - | 0.122 | 0.245 | 0.212 |
| 300 | 611 | 524 | 524 | 524 | - | 0.108 | 0.216 | 0.187 |
| 400 | 711 | 608 | 608 | 608 | - | 0.096 | 0.192 | 0.166 |

Ambient temp. 50 °C
Ground temp. 35 °C
Depth of laying in ground 0.5 Mtr.
Thermal resistivity of soil 1.2 K·m/W
Trefoil Touching

| | Typical overall diameter | | | | | Approximate mass | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | 2 c mm | 3 c mm | 3 1/2 c mm | 4 c mm | 5 c mm | 2 c kg/km | 3 c kg/km | 3 1/2 c kg/km | 4 c kg/km | 5 c kg/km |
| | 12.5 | 13.0 | - | 14.0 | 15.0 | 170 | 190 | - | 220 | 255 |
| | 13.5 | 14.0 | - | 15.0 | 16.0 | 205 | 235 | - | 275 | 320 |
| | 14.5 | 15.0 | - | 16.0 | 17.5 | 255 | 300 | - | 355 | 420 |
| | 15.5 | 16.5 | - | 17.5 | 19.0 | 320 | 385 | - | 460 | 550 |
| | 17.5 | 18.5 | - | 18.0 | 19.5 | 440 | 540 | - | 575 | 705 |
| | 17.5 | 18.5 | - | 20.0 | 22.0 | 470 | 630 | - | 805 | 990 |
| | 17.0 | 19.0 | 22.0 | 22.0 | 26.0 | 625 | 890 | 1080 | 1170 | 1505 |
| | 19.0 | 21.5 | 24.5 | 24.5 | 28.5 | 820 | 1180 | 1365 | 1545 | 1980 |
| | 21.5 | 24.0 | 27.0 | 27.0 | 33.0 | 1070 | 1545 | 1815 | 2035 | 2650 |
| | 24.0 | 27.5 | 31.0 | 31.5 | 38.0 | 1485 | 2175 | 2545 | 2870 | 3735 |
| | 26.5 | 30.5 | 35.0 | 35.0 | - | 2015 | 2945 | 3455 | 3890 | - |
| | 29.0 | 34.5 | 40.0 | 40.0 | - | 2510 | 3685 | 4400 | 4890 | - |
| | 32.5 | 38.5 | 44.0 | 44.5 | - | 3080 | 4545 | 5255 | 6005 | - |
| | 35.0 | 41.5 | 49.5 | 49.5 | - | 3820 | 5640 | 6645 | 7510 | - |
| | 42.0 | 47.5 | 55.0 | 55.5 | - | 5010 | 7365 | 8605 | 9775 | - |
| | 46.0 | 53.0 | 61.0 | 61.0 | - | 6225 | 9175 | 10685 | 12160 | - |
| | 51.5 | 57.5 | 68.5 | 69.0 | - | 7920 | 11670 | 13565 | 15515 | - |

Table 5 OCIFLAM LSHU MULTI-CORE UNARMOURED CABLES ELECTRICAL AND PHYSICAL PROPERTIES



# 4. OCIFLAM CIRCUIT INTEGRITY CABLES

In situations where it is necessary to maintain circuit integrity for an extended period during a fire, for example where maintaining electricity supply is vital for both the safety of people and the safety of valuable equipment, circuit integrity cable is recommended. The OCIFLAM® circuit integrity cable range of electric power, and control cable is specially designed to reduce the risk of failures of these special situations.

In addition to their circuit integrity operation during fire, they also are flame retardant, emit small amounts of smoke and no corrosive gasses emission.

The OCIFLAM circuit integrity cables are divided into 4 categories as per the following table:

| Cable OCI Brand | Type | Circuit Integrity Category/Type |
|---|---|---|
| OCIFLAM-FS1® | Wire / LV Power cable Single-Core | PH30/ F2 |
| OCIFLAM-FSA® | LV Power cable Multi-Core | F2 |
| OCIFLAM1 PREMIUM® | Wire / LV Power Cable Multi-Core | PH120 / F120 |
| OCIFLAM2 PREMIUM® | LV Power cable Multi Core | F120 |

## 4.1 SPECIFICATIONS

Each conductor of OCIFLAM® circuit integrity cable is wrapped with a layer of fire resisting **mica glass tape** in order to prevent phase to phase, and phase to earth contact, even if the insulation is burnt.

| | | |
|---|---|---|
| 1 | Conductors | Stranded copper |
| 2 | Sizes | 1.5 $mm^2$ to 400 $mm^2$ |
| 3 | Number of cores | 1, 2, 3, and 4 |
| 4 | Insulation materials | XLPE plus mica glass tape |
| 5 | Bedding material | EVA/ PE (polyolefin) |
| 6 | Armour | Armoured or Unarmoured |
| 7 | Outer serving | EVA/ PE (polyolefin) |
| 8 | Cable specification | IEC 60502, BS 6724, BS 5467, BS 7846 |
| 9 | Test methods (Circuit Integrity) | IEC 60331, BS EN 50200, BS 6387, BS 8491 |
| 10 | Additional Test method (Halogen Emission) | IEC 60754, IEC 60754, BS EN 60754 |
| 11 | Additional test methods (Flame Propagation) | IEC 60332, BS EN 60332 |
| 12 | Additional test methods (Reduce Smoke) | IEC 6134, BS EN 61034 |

## 4.2 APPLICATIONS

OCIFLAM® Circuit integrity cables are intended to be used in situation in which some special circuits need to be maintained for a specific time despite being burned. These circuits include the following:

- Lighting circuits in factories, shopping centers, hotels, airports, and public buildings
- Circuit that supplies AC and fans
- Data and control circuits
- Circuits supplying emergency firefighting plant such as water pumps and sprinklers
- Circuits of lifts and escalators

## 4.3 CABLE MARKING

Apart from the standard cables markings, OCIFLAM cables are all marked with their respective trade names, these being "OCIFLAM-FS1", "OCIFLAM-FSA", "OCIFLAM1 PREMIUM" and "OCIFLAM2 PREMIUM", excepting with OCIFLAM-LSHA and OCIFLAM-LSHU, were we usually add "LSF". Where the cable is covered by an Loss Prevention Certification Board (LPCB) certificate, the certificate number is included, and if the cable includes harmonized core colours, in accordance with BS 7846, then the letter "H" is added after the year of manufacture.

## 4.4 ELECTRICAL AND MECHANICAL PROPERTIES

OCIFLAM-FS1 SINGLE-CORE SINGLE CORE FIRE RESISTANT WIRES
ELECTRICAL AND PHYSICAL PROPERTIES

Description: PLAIN ANNEALED COPPER CONDUCTORS, XLPE INSULATION, LSF BEDDING,GALVANISED STEEL WIRE ARMOURED, LSF SHEATH

| Cable size mm² | ELECTRICAL PROPERTIES | | | | | MECHANICAL PROPERTIES | |
|---|---|---|---|---|---|---|---|
| | Current ratings | | | Impedance | Volt drop | Typical overall diameter | Approximate mass |
| | Ground | Duct | Air | | | | |
| | 1 c | 1 c | 1 c | 1 c Ω/km | 1 c mV/A/m | 1 c mm | 1 c kg/km |
| | A | A | A | | | | |
| 10 | 82 | 78 | 67 | 2.33 | 4.0 | 12.0 | 235 |
| 16 | 108 | 101 | 92 | 1.48 | 2.6 | 12.5 | 305 |
| 25 | 139 | 134 | 123 | 0.935 | 1.6 | 14.0 | 415 |
| 35 | 165 | 154 | 146 | 0.678 | 1.17 | 15.0 | 520 |
| 50 | 199 | 199 | 180 | 0.506 | 0.876 | 16.5 | 655 |
| 70 | 244 | 239 | 230 | 0.358 | 0.620 | 19.0 | 920 |
| 95 | 292 | 281 | 282 | 0.266 | 0.461 | 21.0 | 1195 |
| 120 | 332 | 315 | 328 | 0.219 | 0.379 | 22.5 | 1450 |
| 150 | 371 | 341 | 377 | 0.188 | 0.326 | 25.5 | 1840 |
| 185 | 417 | 376 | 433 | 0.159 | 0.275 | 27.5 | 2230 |
| 240 | 480 | 421 | 510 | 0.135 | 0.234 | 30.5 | 2820 |
| 300 | 536 | 459 | 581 | 0.120 | 0.208 | 33.0 | 3435 |
| 400 | 594 | 488 | 664 | 0.110 | 0.191 | 37.5 | 4440 |
| 500 | 658 | 529 | 751 | 0.102 | 0.177 | 41.0 | 5480 |
| 630 | 723 | 571 | 846 | 0.096 | 0.166 | 45.5 | 7025 |
| 800 | 764 | 595 | 919 | 0.093 | 0.161 | 51.5 | 9125 |
| 1000 | 810 | 632 | 997 | 0.0900 | 0.156 | 56.5 | 11120 |

Table 6 OCIFLAM-FS1 SINGLE-CORE CABLES

Ambient temp. 50 °C
Ground temp. 35 °C
Depth of laying in ground 0.5 Mtr.
Thermal resistivity of soil 1.2 K·m/W
Trefoil Touching

## OCIFLAM-FSA 2, 3 AND 4 CORE ARMOURED ABLES
## ELECTRICAL AND PHYSICAL PROPERTIES

**Description: PLAIN ANNEALED COPPER CONDUCTORS, XLPE INSULATION, LSF BEDDING,GALVANISED STEEL WIRE ARMOURED, LSF SHEATH**

| Cable size mm2 | ELECTRICAL PROPERTIES | | | | | | | | | MECHANICAL PROPERTIES | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Current ratings | | | | | | Impedance | Volt drop | Volt drop | Typical overall diameter | | | Approximate mass | | |
| | Ground | | Duct | | Air | | | | | | | | | | |
| | 2 c | 3 & 4 c | 2 c | 3 & 4 c | 2 c | 3 & 4 c | 2, 3 & 4 c Ω/km | 2 c mV/ A/m | 3 & 4 c mV/ A/m | 2 c mm | 3 c mm | 4 c mm | 2 c kg/km | 3 c kg/km | 4 c kg/km |
| | A | A | A | A | A | A | | | | | | | | | |
| 1.5 | 33 | 28 | 27 | 22 | 24 | 20 | 15.4 | 30.9 | 26.7 | 14.0 | 15.0 | 16.0 | 320 | 355 | 400 |
| 2.5 | 42 | 36 | 35 | 29 | 32 | 27 | 9.45 | 18.9 | 16.4 | 15.5 | 16.0 | 17.0 | 380 | 420 | 485 |
| 4 | 56 | 47 | 46 | 39 | 43 | 37 | 5.88 | 11.8 | 10.2 | 17.0 | 17.5 | 19.0 | 530 | 595 | 675 |
| 6 | 70 | 59 | 58 | 48 | 55 | 46 | 3.93 | 7.9 | 6.81 | 18.0 | 19.0 | 20.5 | 625 | 710 | 830 |
| 10 | 94 | 79 | 77 | 65 | 74 | 64 | 2.33 | 4.7 | 4.04 | 20.0 | 21.0 | 23.0 | 795 | 915 | 1075 |
| 16 | 121 | 102 | 99 | 83 | 98 | 83 | 1.47 | 2.9 | 2.55 | 22.0 | 23.0 | 25.0 | 945 | 1155 | 1360 |
| 25 | 157 | 131 | 127 | 107 | 128 | 109 | 0.931 | 1.9 | 1.61 | 21.5 | 25.0 | 28.5 | 1020 | 1520 | 1910 |
| 35 | 188 | 157 | 153 | 128 | 158 | 134 | 0.674 | 1.3 | 1.17 | 25.0 | 27.5 | 31.0 | 1430 | 1885 | 2365 |
| 50 | 223 | 187 | 181 | 152 | 190 | 163 | 0.501 | 1.0 | 0.867 | 27.5 | 30.5 | 33.5 | 1775 | 2350 | 2935 |
| 70 | 273 | 229 | 224 | 187 | 239 | 205 | 0.352 | 0.703 | 0.609 | 30.5 | 34.0 | 39.0 | 2295 | 3090 | 4210 |
| 95 | 328 | 274 | 269 | 226 | 295 | 253 | 0.258 | 0.516 | 0.447 | 34.0 | 38.5 | 42.5 | 3145 | 4245 | 5370 |
| 120 | 372 | 312 | 307 | 258 | 341 | 293 | 0.210 | 0.421 | 0.364 | 36.5 | 42.0 | 49.0 | 3730 | 5155 | 7035 |
| 150 | 417 | 349 | 345 | 291 | 389 | 335 | 0.176 | 0.353 | 0.305 | 40.0 | 47.5 | 53.5 | 4425 | 6590 | 8380 |
| 185 | 470 | 394 | 391 | 329 | 449 | 386 | 0.148 | 0.296 | 0.257 | 44.0 | 50.0 | 58.5 | 5700 | 7830 | 10125 |
| 240 | 544 | 455 | 453 | 380 | 530 | 456 | 0.124 | 0.247 | 0.214 | 50.5 | 56.0 | 64.5 | 7185 | 9820 | 12720 |
| 300 | 609 | 509 | 509 | 427 | 605 | 519 | 0.108 | 0.217 | 0.188 | 55.0 | 62.0 | 70.0 | 8655 | 11975 | 15315 |
| 400 | 687 | 574 | 575 | 490 | 696 | 597 | 0.097 | 0.193 | 0.167 | 60.5 | 66.5 | 80.0 | 10600 | 14610 | 20065 |

Table 7 OCIFLAM-FSA MULTI-CORE CABLES

Ambient temp. 50 °C
Ground temp. 35 °C
Depth of laying in ground 0.5 Mtr.
Thermal resistivity of soil 1.2 K·m/W
Trefoil Touching

| OCIFLAM-FSA 5 CORE ARMOURED CABLES<br>ELECTRICAL AND PHYSICAL PROPERTIES<br><br>Description: PLAIN ANNEALED COPPER CONDUCTORS, XLPE INSULATION,<br>LSF BEDDING,GALVANISED STEEL WIRE ARMOURED, LSF SHEATH | | | | | | | |
|---|---|---|---|---|---|---|---|
| Cable size $mm^2$ | ELECTRICAL PROPERTIES | | | | | | |
| | Current ratings | | | Impedance | Volt drop | Typical overall diameter | Approximate mass |
| | Ground | Duct | Air | 5 c<br>Ω/km | 5 c<br>mV/A/m | 5 c<br>mm | 5 c<br>kg/km |
| | 5 c | 5 c | 5 c | | | | |
| | A | A | A | | | | |
| 1.5 | 24 | 19 | 17 | 15.4 | 26.7 | 17.0 | 465 |
| 2.5 | 30 | 25 | 23 | 9.45 | 16.4 | 18.0 | 550 |
| 4 | 40 | 33 | 31 | 5.88 | 10.2 | 20.5 | 780 |
| 6 | 50 | 42 | 40 | 3.93 | 6.81 | 22.0 | 950 |
| 10 | 68 | 55 | 53 | 2.33 | 4.04 | 24.5 | 1265 |
| 16 | 87 | 71 | 71 | 1.47 | 2.55 | 28.0 | 1785 |
| 25 | 113 | 91 | 92 | 0.931 | 1.61 | 32.5 | 2370 |
| 35 | 135 | 110 | 114 | 0.674 | 1.17 | 35.5 | 2945 |
| 50 | 161 | 130 | 137 | 0.501 | 0.867 | 40.5 | 4035 |
| 70 | 197 | 161 | 172 | 0.352 | 0.609 | 45.5 | 5335 |

Table 8 OCIFLAM-FSA MULTI-CORE CABLES

Ambient temp. 50 °C
Ground temp. 35 °C
Depth of laying in ground 0.5 Mtr.
Thermal resistivity of soil 1.2 K·m/W
Trefoil Touching

## OCIFLAM1 PREMIUM AND OCIFLAM2 PREMIUM 2, 3 AND 4 ARMOURED ABLES
## ELECTRICAL AND PHYSICAL PROPERTIES

Description: PLAIN ANNEALED COPPER CONDUCTORS, XLPE INSULATION, LSF BEDDING,GALVANISED STEEL WIRE ARMOURED, LSF SHEATH

| Cable size mm² | ELECTRICAL PROPERTIES | | | | | | | | | MECHANICAL PROPERTIES | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Current ratings | | | | | | Imped-ance | Volt drop | Volt drop | Typical overall diameter | | | Approximate mass | | |
| | Ground | | Duct | | Air | | | | | | | | | | |
| | 2 c | 3 & 4 c | 2 c | 3 & 4 c | 2 c | 3 & 4 c | 2, 3 & 4 c Ω/km | 2 c mV/ A/m | 3 & 4 c mV/ A/m | 2 c mm | 3 c mm | 4 c mm | 2 c kg/km | 3 c kg/km | 4 c kg/km |
| | A | A | A | A | A | A | | | | | | | | | |
| 1.5 | 33 | 28 | 27 | 22 | 24 | 20 | 15.4 | 30.9 | 26.7 | 12.5 | 13.0 | 14.0 | 300 | 350 | 400 |
| 2.5 | 42 | 36 | 35 | 29 | 32 | 27 | 9.45 | 18.9 | 16.4 | 13.6 | 14.1 | 15.0 | 350 | 400 | 450 |
| 4 | 56 | 47 | 46 | 39 | 43 | 37 | 5.88 | 11.8 | 10.2 | 14.7 | 15.3 | 16.4 | 400 | 450 | 550 |
| 6 | 70 | 59 | 58 | 48 | 55 | 46 | 3.93 | 7.86 | 6.81 | 15.9 | 16.6 | 18.7 | 500 | 550 | 800 |
| 10 | 94 | 79 | 77 | 65 | 74 | 64 | 2.33 | 4.66 | 4.04 | 18.0 | 19.5 | 21.1 | 965 | 1100 | 1430 |
| 16 | 121 | 102 | 99 | 83 | 98 | 83 | 1.47 | 2.94 | 2.55 | 20.0 | 21.2 | 22.9 | 1280 | 1500 | 1785 |
| 25 | 157 | 131 | 127 | 107 | 128 | 109 | 0.933 | 1.87 | 1.616 | 20.0 | 23.7 | 25.4 | 1200 | 1755 | 2200 |
| 35 | 188 | 157 | 153 | 128 | 158 | 134 | 0.675 | 1.35 | 1.169 | 22.1 | 25.3 | 27.7 | 1655 | 2155 | 2675 |
| 50 | 223 | 187 | 181 | 152 | 190 | 163 | 0.502 | 1.00 | 0.869 | 24.6 | 27.5 | 30.9 | 1995 | 2635 | 3270 |
| 70 | 273 | 229 | 224 | 187 | 239 | 205 | 0.353 | 0.706 | 0.611 | 27.4 | 31.2 | 36.2 | 2535 | 3385 | 4610 |
| 95 | 328 | 274 | 269 | 226 | 295 | 253 | 0.260 | 0.520 | 0.450 | 31.2 | 35.9 | 39.8 | 3310 | 4470 | 5635 |
| 120 | 372 | 312 | 307 | 258 | 341 | 293 | 0.212 | 0.424 | 0.367 | 33.9 | 38.8 | 44.9 | 3930 | 5400 | 7365 |
| 150 | 417 | 349 | 345 | 291 | 389 | 335 | 0.178 | 0.356 | 0.308 | 37.0 | 43.8 | 49.0 | 4635 | 6855 | 8690 |
| 185 | 470 | 394 | 391 | 329 | 449 | 386 | 0.150 | 0.300 | 0.260 | 41.8 | 47.8 | 53.6 | 5930 | 8105 | 10500 |
| 240 | 544 | 455 | 453 | 380 | 530 | 456 | 0.124 | 0.248 | 0.215 | 45.5 | 52.7 | 59.3 | 7485 | 10180 | 13105 |
| 300 | 609 | 509 | 509 | 427 | 605 | 519 | 0.110 | 0.220 | 0.191 | 49.6 | 57.4 | 65.5 | 8920 | 12300 | 15745 |
| 400 | 687 | 574 | 575 | 490 | 696 | 597 | 0.098 | 0.196 | 0.170 | 55.1 | 65.0 | 73.5 | 10885 | 15005 | 20545 |

Table 9 OCIFLAM1 PREMIUM & OCIFLAM2 PREMIUM MULTI

Ambient temp. 50 °C
Ground temp. 35 °C
Depth of laying in ground 0.5 Mtr.
Thermal resistivity of soil 1.2 K·m/W
Trefoil Touching

# 5. COMMON TESTS

As discussed earlier in this brochure, specific tests are done on OCIFLAM Cables so that they can meet the fire performance standards. A detailed explanation of these tests follows below:

## 5.1 FLAME PROPAGATION TESTS

### 5.1.1 GENERAL

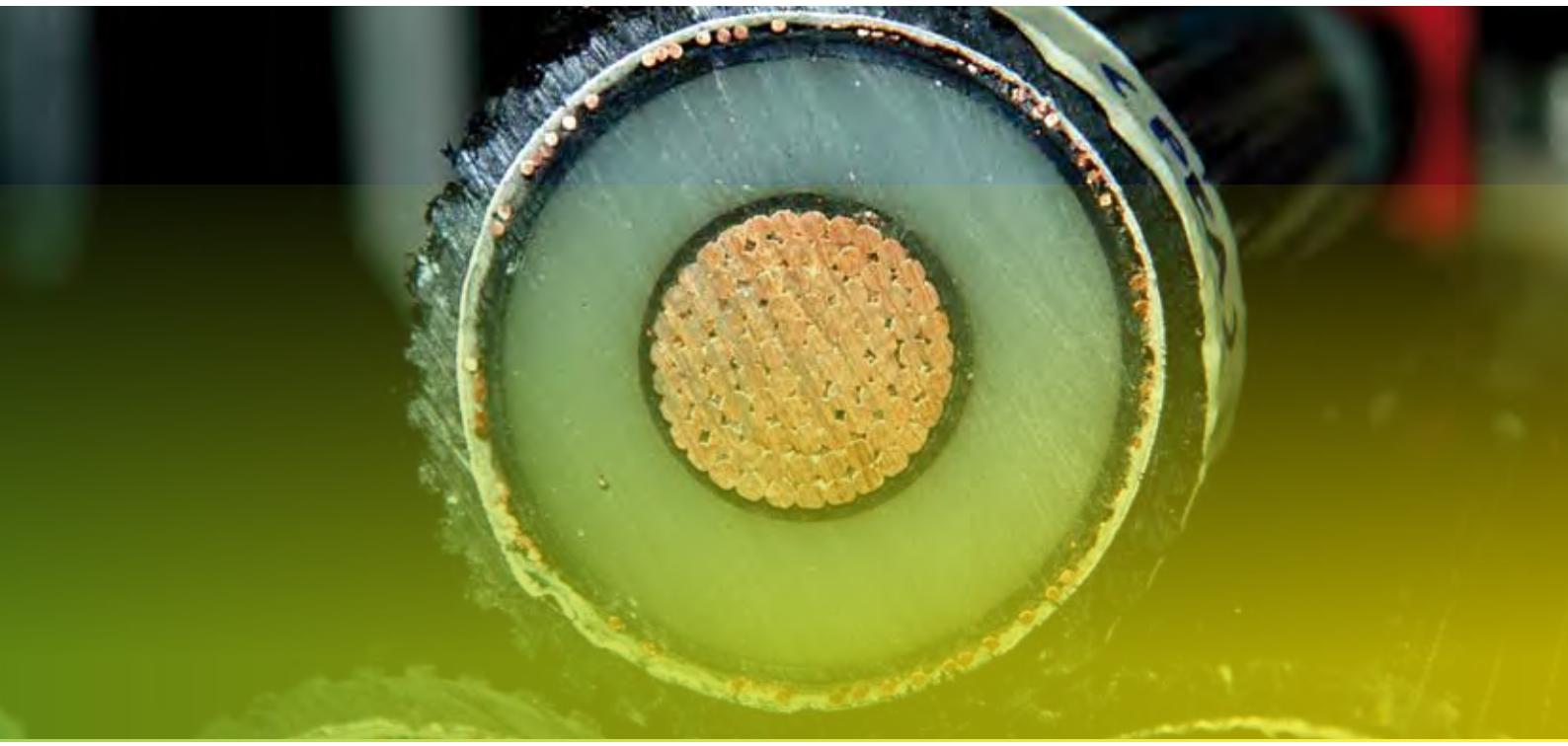
Flame propagation tests are done to confirm a cable's ability to resist spreading fire. These tests can be divided into two main types depending on the number of cables tested at once. One type of test is done on single cable mounted vertically in a standard test chamber of 1.2 m high 0.3 m wide and 0.45 m deep. The other type of test is done on a bunched cables mounted vertically in test chamber of 4 m high, 1 m wide, and 2 m deep. With both types the test samples are subjected to a standard flame for a defined time.

Different categories for single and bunched cables are covered with different standards. Table 1 shows the categories covered by each standard. Cables are rated for specific categories depending on the tests passed, with adequate cables mounted together in the test chamber in order to comply with the volume of combustible material per linear meter agrees to the stated values in the category.

### 5.1.2 STANDARDS TESTS

IEC 60332: Test for vertical flame propagation for a single insulated wire or a cable. Part 1 & 2 cable/ wire is subjected to a 1 KW (Bunsen type) burner. Part 3 covers groups of cables subjected to a 20 kW burner. It has been divided into different parts, the first is covering the apparatus and the others each covering the remaining categories.

BS EN 60332: This British Standard is identical IEC 60332 Standard and it supersedes BS EN 50265 & BS EN 50266.



Standards used to test flame propagation for different cable categories

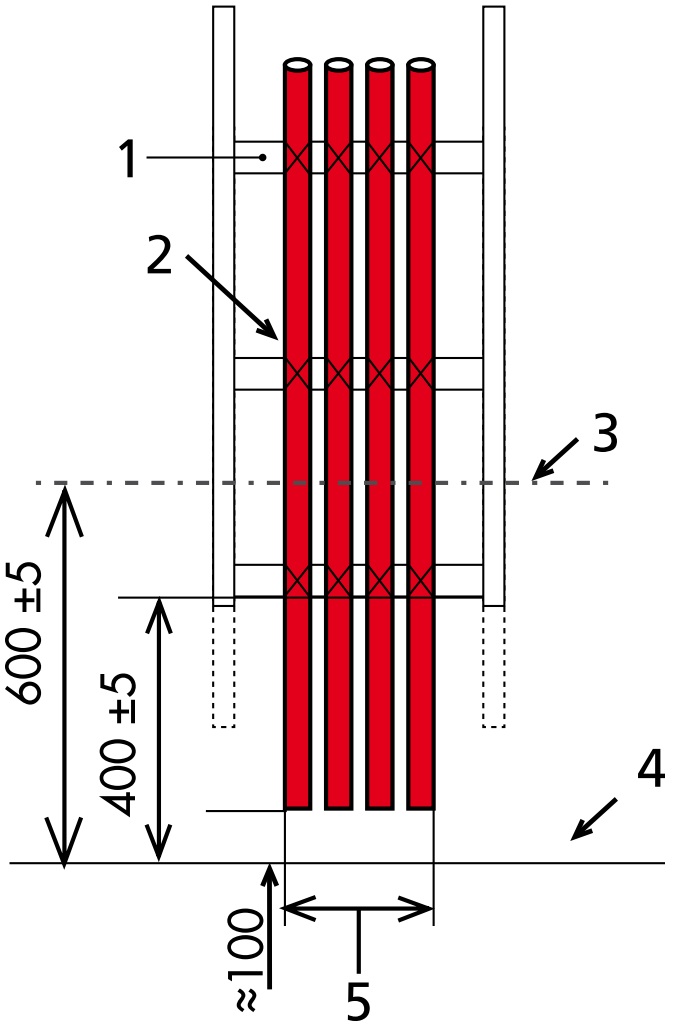
| Specifications, Parts and Sections (1) | | Category | Type (2) | Volume (3) l/m | Burner | Burn Time | Char Length (m) |
|---|---|---|---|---|---|---|---|
| IEC 60332 | BS 60332 | | | | | | |
| Part 1 | Part 1 | Single | A | | 1 kW | >1 s (4) | 0.5 (4) |
| Part 1 | Part 1 | | P | | | | |
| Part 2 | Part 2 | Small Single | A | | 1 kW | ~ 20 +/- 1 s (4) | 0.5 (4) |
| Part 2 | Part 2 | | P | | | | |
| Part 3-10 | Part 3-10 | Bunched | A | - | 20 kW | - | 2.5 |
| Part 3-21 | Part 3-21 | A F/R | P | 7 | | 40 min | |
| Part 3-22 | Part 3-22 | A | P | 7 | | 40 min | |
| Part 3-23 | Part 3-23 | B | P | 3.5 | | 40 min | |
| Part 3-24 | Part 3-24 | C | P | 1.5 | | 20 min | |
| Part 3-25 | Part 3-25 | D | P | 0.5 | | 20 min | |

Notes:

1. Accurate at date of publication
2. Type A – Apparatus, Type P - Procedure
3. Volume of combustible material per linear meter of the test setup
4. For information only – refer to the specification for details

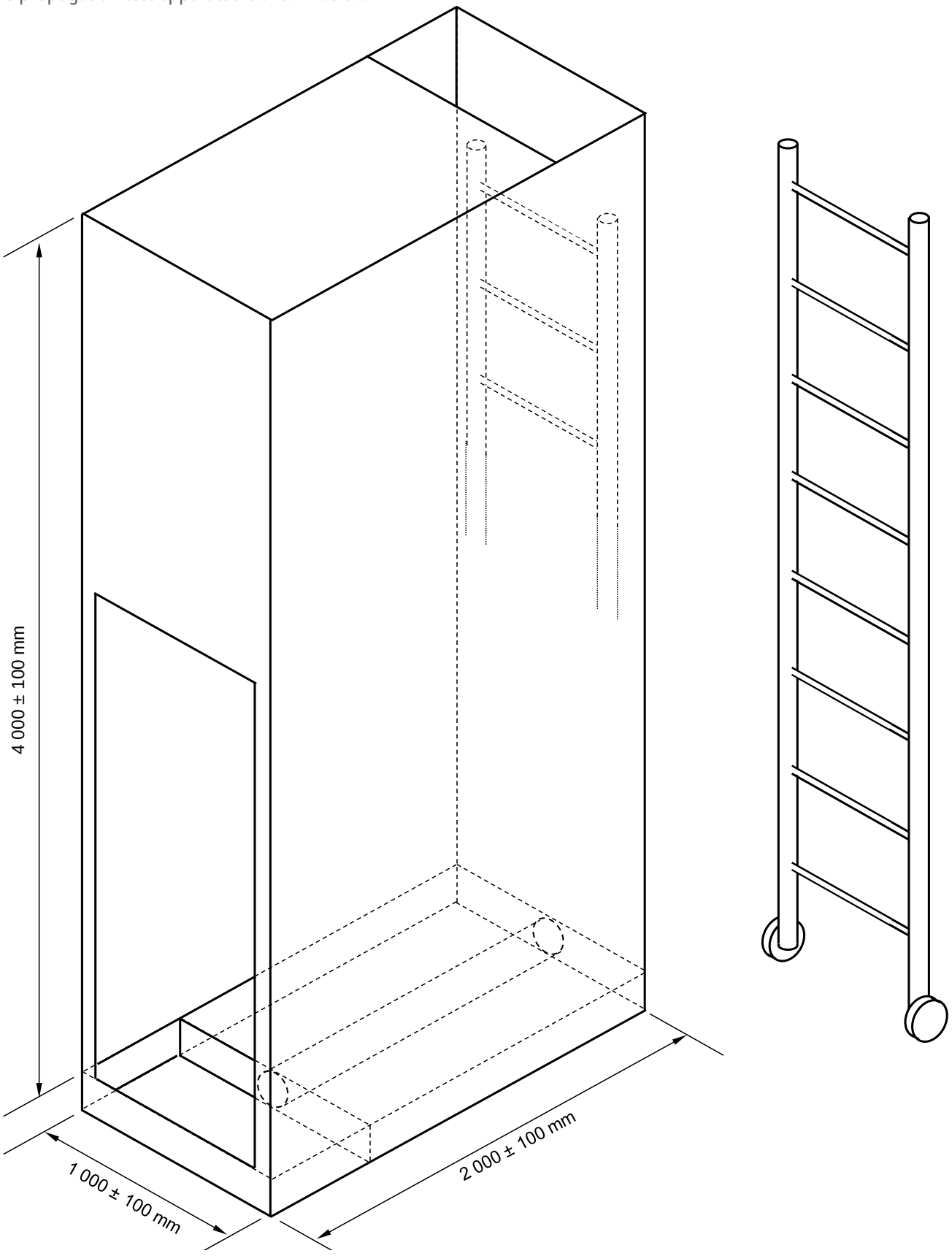
## 5.1.3 TEST SETUP AND APPARATUS

Suspension of cable test setup is shown below:




1. Round steel rungs
2. Metal wire ties
3. Centre line of burner
4. Floor
5. Maximum width (according to test category)

Flame propagation test apparatus is shown below:




1. Smoke outlet (300 ± x 30 x 1000 ± 100)
2. Metal wire ties (800 ± x 20 x 400 ± 10)
3. Rig Raised above ground level

# 5.2 HALOGEN EMISSION TEST

## 5.2.1 GENERAL

During a fire, a halogenated polymer cable will emit halogen gasses which will react with the atmospheric moisture to form corrosive halogen acids. These halogen acids will endanger human life by hindering breathing and eyesight. Further, it will damage the equipment and building structure. Hence, three different tests are performed in OCI in order to determine the quantity of those halogenated gasses emitted during a fire. Those tests and their required passing criteria are shown in the below table:

| Test method | Unit | Requirement |
|---|---|---|
| Acid gas emission test (IEC 60754-1 & BS EN 60754-1 )<br>Bromine and Chlorine Content (both are expressed as HCl) | % | ≤0.5 |
| Fluorine Content Test (IEC 60684-1)<br>Fluorine content | % | ≤0.1 |
| pH and Conductivity test (IEC 60754-2 & BS EN 60754-2) | pH | ≥4.3 |
| Conductivity | μS/mm | ≤10 |

In this test a sample of (750 ± 250) mg is placed inside a special glass tube fed with air flow from one side and resulting gasses are drawn from the other side of the tube through three wash bottles. Then the amount of halogen gas that dissolved in the water is measured as per the values in the above table.

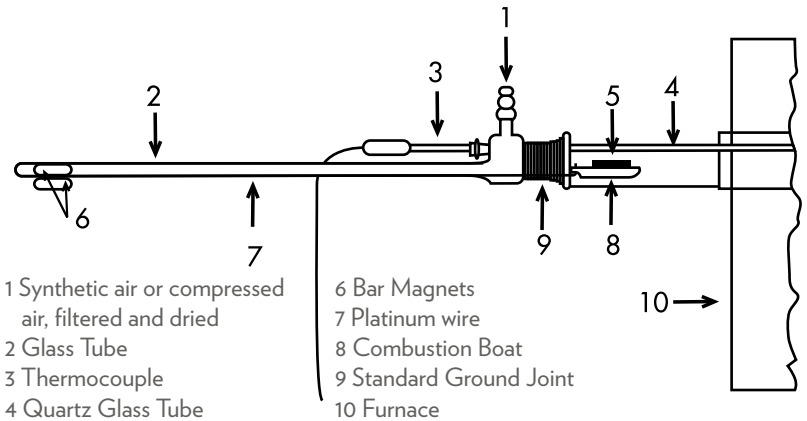
For a cable to be regarded as a Halogen free all the requirement shown in the above table are required to be met.

## 5.2.2 STANDARD TESTS

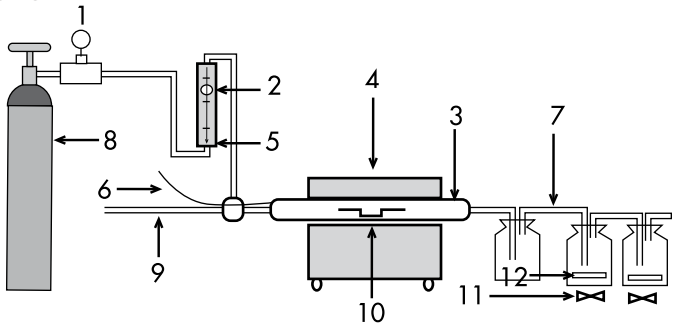
IEC 60754: Tests on gasses emitted through combustion of materials from cables. The first part covers the method using titration to measure the amount of gas released, while the second part covers the method required to measure the pH and conductivity.

BS EN 60754: This standard replaces the older BS EN 50267, which was withdrawn. It is the same as IEC 60754

The laboratory equipment required to measure acid gas emission is shown below:




1 Synthetic air or compressed air, filtered and dried
2 Glass Tube
3 Thermocouple
4 Quartz Glass Tube
5 Test Specimen
6 Bar Magnets
7 Platinum wire
8 Combustion Boat
9 Standard Ground Joint
10 Furnace




1 Pressure reducing valve
2 Flow meter
3 Quartz glass tube
4 Needle valve
6 Thermocouple
7 Gas washing bottles
8 Synthetic air
9 Device for inserting combustion boat & sample
10 Combustion boat containing test specimen
11 Magnetic stirrer
12 Magnetic stirrer bar

# 5.3 SMOKE EMISSION TEST

## 5.3.1 GENERAL

One of the most important aspects in the evaluation of the burning performance of cables is the smoke emission due to the fact that it affects directly the evacuation of people and accessibility of firefighting squad during a fire. Hence the importance of the Smoke Emission Test.

In this test, a cable is burned horizontally and light transmittance is measured in a defined cubic chamber at atmospheric pressure to maintain standardization and repeatability of the test. To avoid adding smoke from other sources, the cable sample is burned using an alcohol flame as it has zero smoke emission.

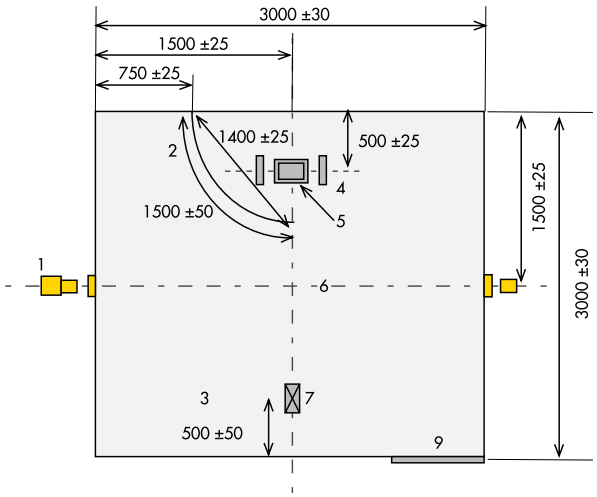
In order to evaluate the smoke emitted, a beam of light is shone across the enclosure/chamber and the light received on the far side is measured. The test is considered completed when there is no decrease in light transmittance for 5 min after the fire source has extinguished or when the test duration reaches 40 minutes.

## 5.3.2 STANDARD TESTS

**IEC 61034:** Measurement of smoke density of electric cables burning under defined conditions. Part 1 covers the apparatus while part 2 covers the procedure. It is noted that the criteria for passing should be given by the relative cable standard, however; the recommendation is that the light transmittance should not be less than 60%.

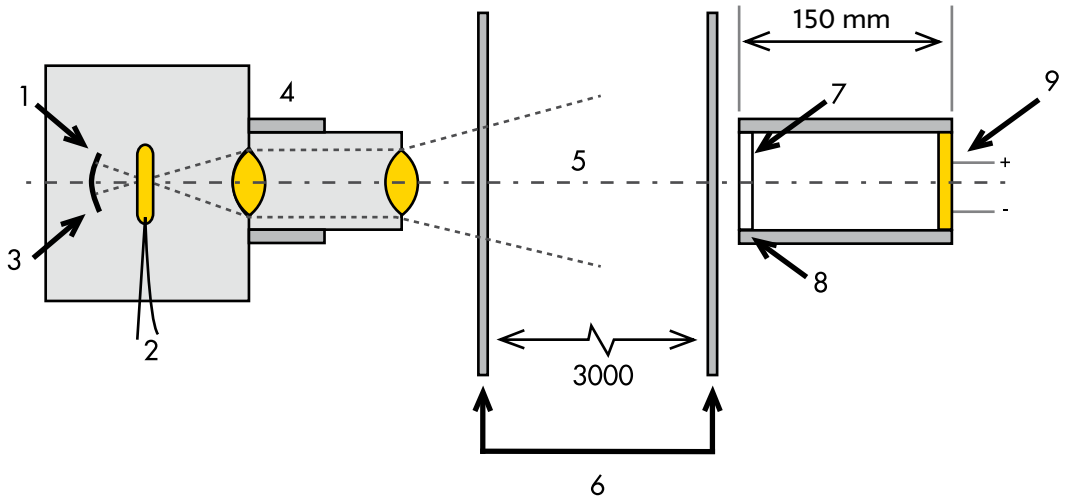
**BS EN 61034:** This standard is the same as the IEC standard.

## 5.3.3 TYPICAL APPARATUS




1 Light Source
2 Draught screen (Height 1000 ± 50)
3 Direction of air flow from fan
4 Cable support
5 Alcohol tray
6 Optical path height (2150 ± 100)
7 Fan Flow (7m³/min to 15m³/min)
8 Photocell
9 Door

Layout of a typical smoke chamber. The height of the chamber is 3000 +/- 30 mm. The door has an inspection window as well as a shutter to exclude all outside light from the chamber during the measurements.




1 Reflector
2 Voltage supply (12V ± 0,1)
3 Quartz halogen bulb
4 Lens system
5 Light beam crossing the cube
6 Windows of cube
7 window for dust protection
8 Tube, mat finish inside
9 Photocel

**The photometric system comprises of a light source, lens system and a photocell receiver. This system is used to measure the light transmittance through the smoke emitted by the cable when it is burned.**

# 5.4 CIRCUIT INTEGRITY TESTS

## 5.4.1 GENERAL

The strictest tests used in OCI for testing the OCIFLAM cables is the circuit integrity test.. These tests are applicable to the British standard BS 6387 and IEC standard IEC 60331. In addition to that, OCI's cables are in accordance to BS 7846 which will be applied after the tests in BS 6387 have been passed successfully.

In case, the cable has passed all the above tests of BS 6387 successfully, another test will be applied which is BS 7846 to designate the cable to a specific category based on its fire resistance characteristics. The categories divided in OCI as follows:

- **Category F2:** Resistance to fire, resistance to fire with water, resistance to fire with mechanical shock, assed separately, when tested in accordance with BS 7846 (CWZ protocols).

- **Category F120:** Resistance to fire with direct mechanical impact and water jet assessed in combination, when tested in accordance with BS 8491 for 120 min.

The circuit integrity test shall be applied as well on wires, where the standard used is BS EN 50200 and the categories of the wire will be divided as follows:

- **Category PH30:** Resistance to fire, resistance to fire with water, resistance to fire with mechanical shock, assed separately, when tested in accordance with BS EN 50200

- **Category PH120:** Resistance to fire with direct mechanical impact and water jet assessed in combination, when tested in accordance with BS EN 50200 for 120 min.

However, before we start with the test procedures of circuit integrity, a brief of the cable classification will be explained as below:

## 5.4.2 CABLE CLASSIFICATION

A cable is categorized by a series of letter symbols, indicating the performance tests to which the cable complies. These categories are shown in the next table

| Resistance to Fire Alone | |
|---|---|
| 950 °C for 3 h | C |
| **Resistance to Fire with Water** | |
| 650 °C for 15 min followed by a 15 min of water sprinkled | W |
| **Resistance to Fire with Mechanical Shock** | |
| 950 °C for 15 min | Z |

To determine the category of the cable from the cable marking, let's assume the following categories:

- **"CW":** in order to meet this category; the requirement for the cable is to resist fire alone at 950 °C for 3 hours (C), and resist fire with a 15 minutes spray of water (W)

- **"CZ":** in order to meet this category; the requirement for the cable is to resist fire alone at 950 °C for 3 hours (C), and resist fire with mechanical shock for 15 minutes (Z)

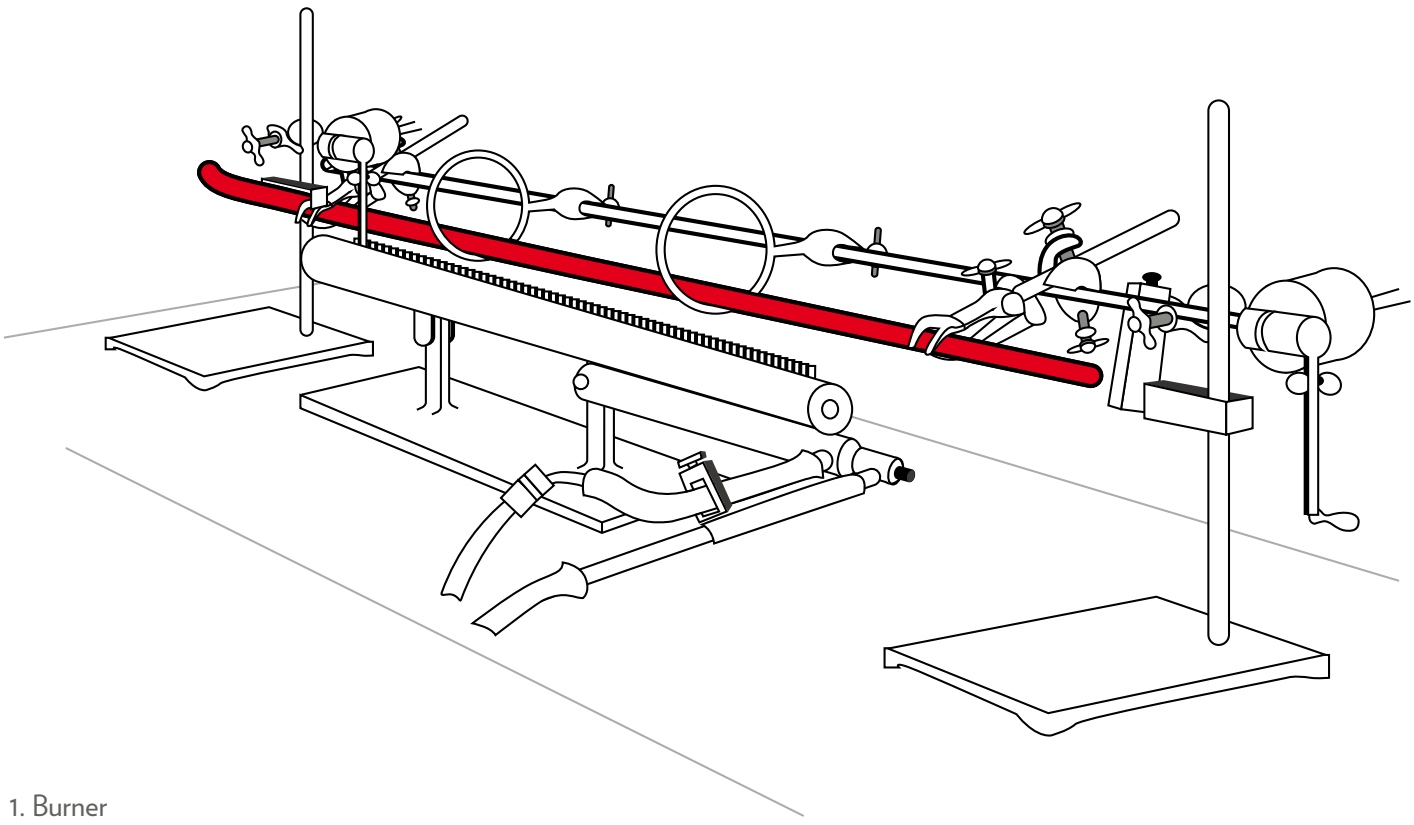
- **"CWZ":** the requirement for the cable to meet this requirement is to resist fire alone at 950 °C for 3 hours (C), resist fire with a 15 minutes spray of water (W), and resist fire with mechanical shock for 15 minutes (Z)

## 5.4.3 FIRE RESISTANCE CATEGORY F2

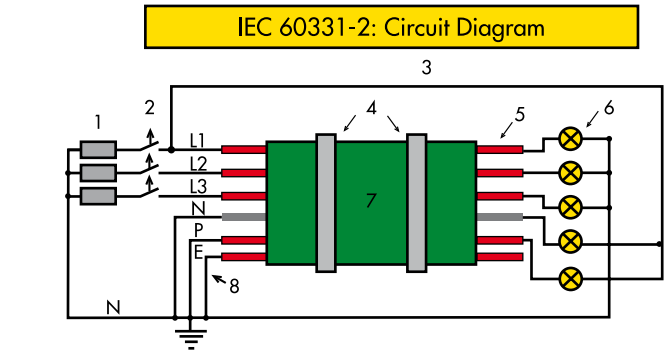
### Circuit integrity (Resistance to Fire Alone: Protocol C of BS 6387)

In this a test, a cable is mounted horizontally on a cable supporting apparatus (shown below), and a temperature controlled flame is applied on it for a duration of time.

The flame temperature used and the duration of the test shall be selected
950 ± 40°C for 3 hours



1. Burner
2. Cable Sample
3. Earthed Metallic Support




L1, L2, L3 Pahse conductor (L2,L3 if present)
N Neutral conductor (if present)
PE Protective conductor (if present)
1. Transformer
2. Fuse, 2A
3. L1 or L2 or L3
4. Metal clips
5. Test conductor or group
6. Load and indicating device
7. Test specimen
8. Metal screen (if present)

The test cable is connected in a certain arrangement to check the continuity of the operation during a fire (as shown above). The circuit integrity is monitored through lamps and fuses.

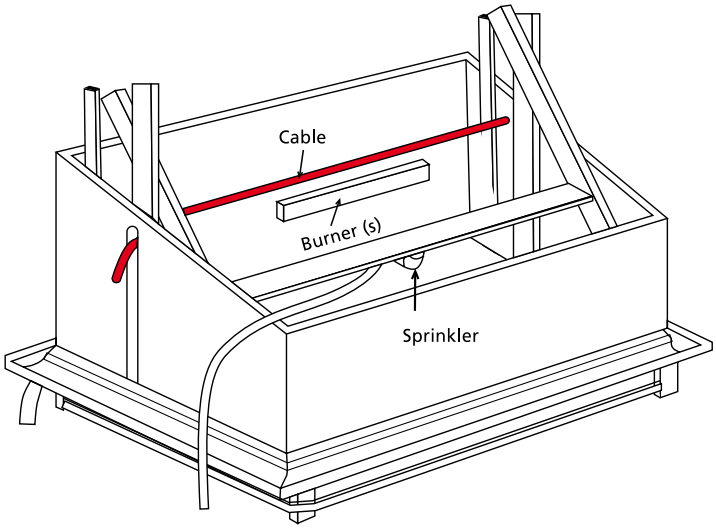
For the cable to preserve the circuit integrity characteristics; the following conditions shall be applied:
i. The voltage is maintained, i.e. no fuse fails or circuit breaker is interrupted
ii. The conductor does not rapture, i.e. the lamp is not extinguished

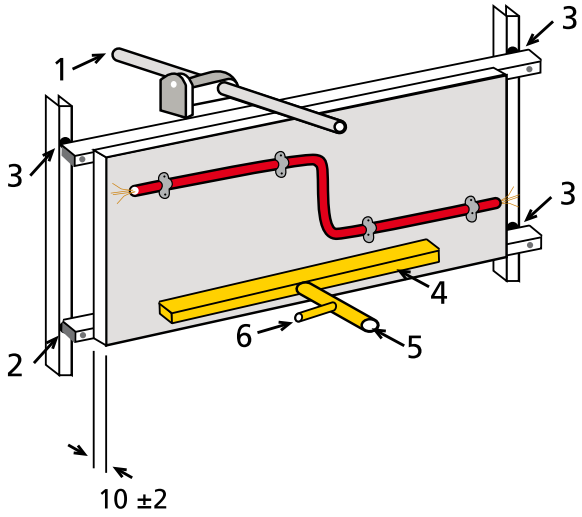
## Continuity Checking Arrangement

During the test a current is passed through all cores of the cable as provided by a suitable transformer arrangement. The transformer capacity must be able to maintain the test voltage up to a maximum leakage current of 3 A.

## Circuit Integrity (Resistance to fire with water spray: Protocol W of BS 6387)

In this test the temperature of the flame is 650 +/- 40°C, and after 15 minutes of burning the water is turned on and the test continues for another 15 minutes with both flame and water applied.
The cable is mounted on the supporting apparatus with the water sprinkler (shown opposite).
The cable shall maintain its circuit integrity for the duration of the test.

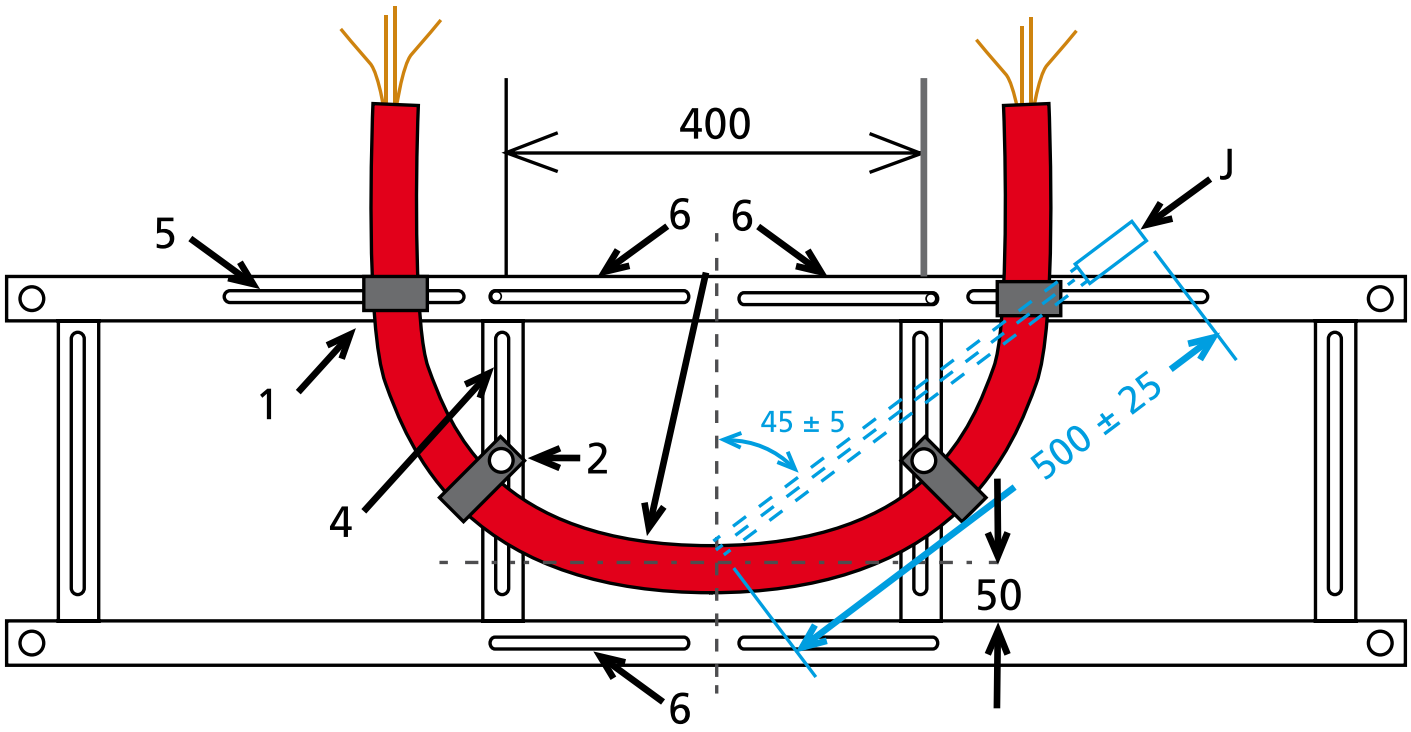




1. Shock producing devices
2. Steel test ladder
3. Rubber bush
4. Ribbon gas burner
5. Air inlet pipe
6. Propane inlet pipe

## Circuit integrity test (Resistance to Fire with Mechanical Shock: Protocol Z of BS 6387)

In this test the cable is mounted on vertical wall above a gas burner, and is connected to the circuit integrity monitoring equipment (as shown above). The flame temperature shall be 950 +/- 40°C. During the test, a shock producing device drops under its own weight every 30 seconds, and strikes at the midpoint of the mounted cable.

The cable shall maintain its circuit integrity for the duration of the test.




1. U-bolt
2. P-clip
3. Adjustable vertical elements
4. Slot for P-clip fixing
5. Slot for U-bolt
6. Slot for movement of adjustable vertical elements

R. Minimum bending radius of cable
J. Water jet

### 5.4.4 FIRE RESISTANCE CATEGORY F120

Circuit Integrity (Resistance to fire with direct mechanical impact and water jet as per BS 8491)

In this part, three different tests are combined together to assess the circuit integrity of the cable. The cable is mounted in a U shaped formation on a test ladder (as shown above). The test will start by applying the flames, then an impact from the impact device that shall be applied every 10 minutes during the duration of the test. Toward the end of the test, specifically, before 5 min of the end, a water jet device shall apply a burst of water for 5 seconds duration that will be repeated 5 times (one burst every 60 seconds for 5 minutes duration).

The cable shall maintain its circuit integrity for the duration of the test.

# 6. GENERAL TABLES

## 6.1 STANDARD CONDITIONS

Standard Conditions used in the Gulf area are shown in the below table

| | |
|---|---|
| Ground temperature | 35.0 °C |
| Ambient air temperature | 50.0 °C |
| Conductor temperature | 90.0 °C |
| Thermal resistivity of ground | 1.2 K·m/W |
| Depth of laying | 0.5 m |

## 6.2 RE- RATING TABLES

The current rating values mentioned in the previous current rating tables are based on the standard conditions mentioned in the table opposite. For different ground temperature, ambient temperature, thermal resistivity of the ground and for more than one cable in the same trench, the following factors shall be applicable:

Correction factors for ambient air temperature other than 50 °C

| Maximum conductor temperature °C | Ambient air temperature °C | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | 20 | 25 | 30 | 35 | 40 | 45 | 55 | 60 |
| 90 °C | 1.35 | 1.28 | 1.23 | 1.18 | 1.13 | 1.06 | 0.94 | 0.89 |

Correction factors for ambient ground temperatures other than 35°C

| Maximum conductor temperature °C | Ground temperature °C | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | 10 | 15 | 20 | 25 | 30 | 40 | 45 | 50 |
| 90 °C | 1.21 | 1.16 | 1.13 | 1.08 | 1.03 | 0.95 | 0.9 | 0.86 |

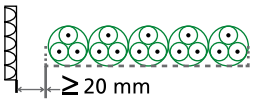
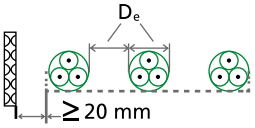
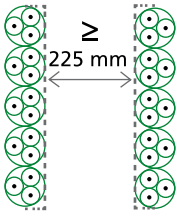
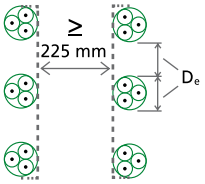
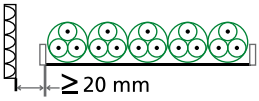
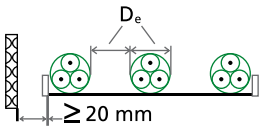
Correction factors for depth of laying other than 0.5 m for cables in ducts

| Depth of laying m | 4-core cables |
|---|---|
| 0.5 | 1 |
| 0.6 | 0.99 |
| 0.45 | 0.98 |
| 1 | 0.96 |
| 1.25 | 0.95 |
| 1.5 | 0.94 |
| 1.75 | 0.94 |
| 2 | 0.93 |
| 2.5 | 0.92 |

Correction factors for soil thermal resistivities other than 1.2 K·m/W for 4-cores in ducts

| Nominal area of conductors mm² | Values of Soil thermal resistivity K·m/W | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | 0.7 | 0.8 | 0.9 | 1 | 1.5 | 2.0 | 2.5 | 3 |
| 16 | 1.06 | 1.04 | 1.03 | 1.02 | 0.96 | 0.92 | 0.88 | 0.84 |
| 35 | 1.06 | 1.05 | 1.03 | 1.02 | 0.95 | 0.92 | 0.87 | 0.83 |
| 50 | 1.07 | 1.05 | 1.03 | 1.02 | 0.95 | 0.91 | 0.87 | 0.83 |
| 70 | 1.07 | 1.05 | 1.04 | 1.02 | 0.95 | 0.91 | 0.86 | 0.82 |
| 120 | 1.08 | 1.06 | 1.05 | 1.03 | 0.95 | 0.90 | 0.85 | 0.81 |
| 185 | 1.09 | 1.07 | 1.05 | 1.04 | 0.96 | 0.89 | 0.84 | 0.80 |
| 240 | 1.09 | 1.07 | 1.05 | 1.04 | 0.96 | 0.89 | 0.84 | 0.79 |

## RATING FACTORS FOR GROUPS OF MORE THAN ONE MULTI CORE CABLE IN AIR

| Method of Installation | | Number of trays | Number of cables | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | 1 | 2 | 3 | 4 | 6 | 9 |
| Cables on perforated trays |  Touching | 1 | 1.00 | 0.88 | 0.82 | 0.79 | 0.76 | 0.73 |
| | | 2 | 1.00 | 0.87 | 0.80 | 0.77 | 0.73 | 0.68 |
| | | 3 | 1.00 | 0.86 | 0.79 | 0.76 | 0.71 | 0.66 |
| |  Spaced | 1 | 1.00 | 1.00 | 0.98 | 0.95 | 0.91 | - |
| | | 2 | 1.00 | 0.99 | 0.96 | 0.92 | 0.87 | - |
| | | 3 | 1.00 | 0.98 | 0.95 | 0.91 | 0.85 | - |
| Cables on vertical perforated trays |  Touching | 1 | 1.00 | 0.88 | 0.82 | 0.78 | 0.73 | 0.72 |
| | | 2 | 1.00 | 0.88 | 0.81 | 0.76 | 0.71 | 0.70 |
| |  Spaced | 1 | 1.00 | 0.91 | 0.89 | 0.88 | 0.87 | - |
| | | 2 | 1.00 | 0.91 | 0 .88 | 0.87 | 0.85 | - |
| Cables on ladder supports, cleats, etc. |  Touching | 1 | 1.00 | 0.87 | 0.82 | 0.80 | 0.79 | 0.78 |
| | | 2 | 1.00 | 0.86 | 0.80 | 0.78 | 0.76 | 0.73 |
| | | 3 | 1.00 | 0.85 | 0.79 | 0.76 | 0.73 | 0.70 |
| |  Spaced | 1 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | - |
| | | 2 | 1.00 | 0.99 | 0.98 | 0.97 | 0.96 | - |
| | | 3 | 1.00 | 0.98 | 0.97 | 0.96 | 0.93 | - |

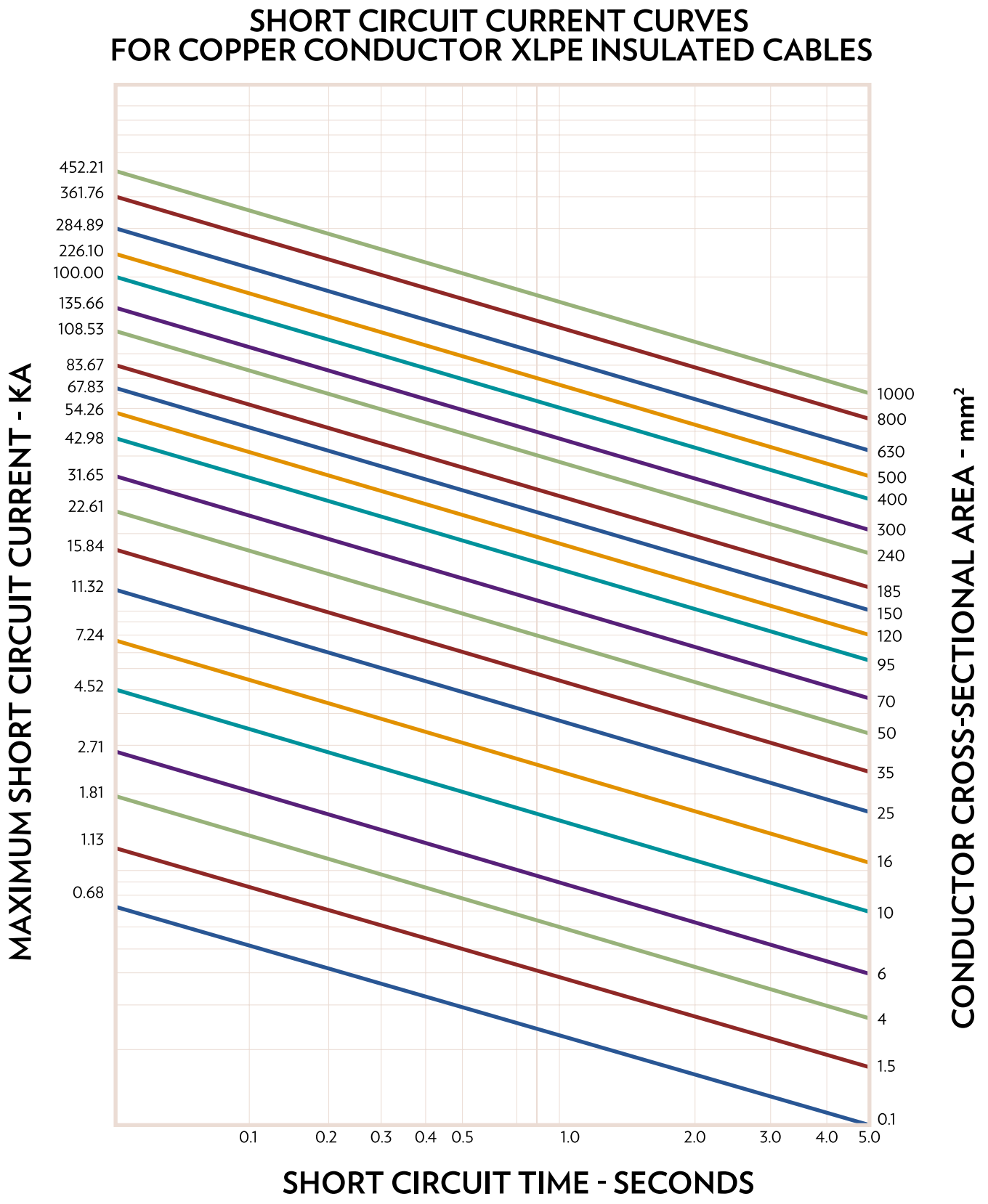
NOTE 1: Values are given for vertical spacings between trays of 300 mm and at least 20 mm between trays and wall. For closer spacing, the factors should be reduced.

NOTE 2: Values are given for horizontal spacing between trays of 225 mm with trays mounted back to back. For closer spacing, the factors should be reduced.

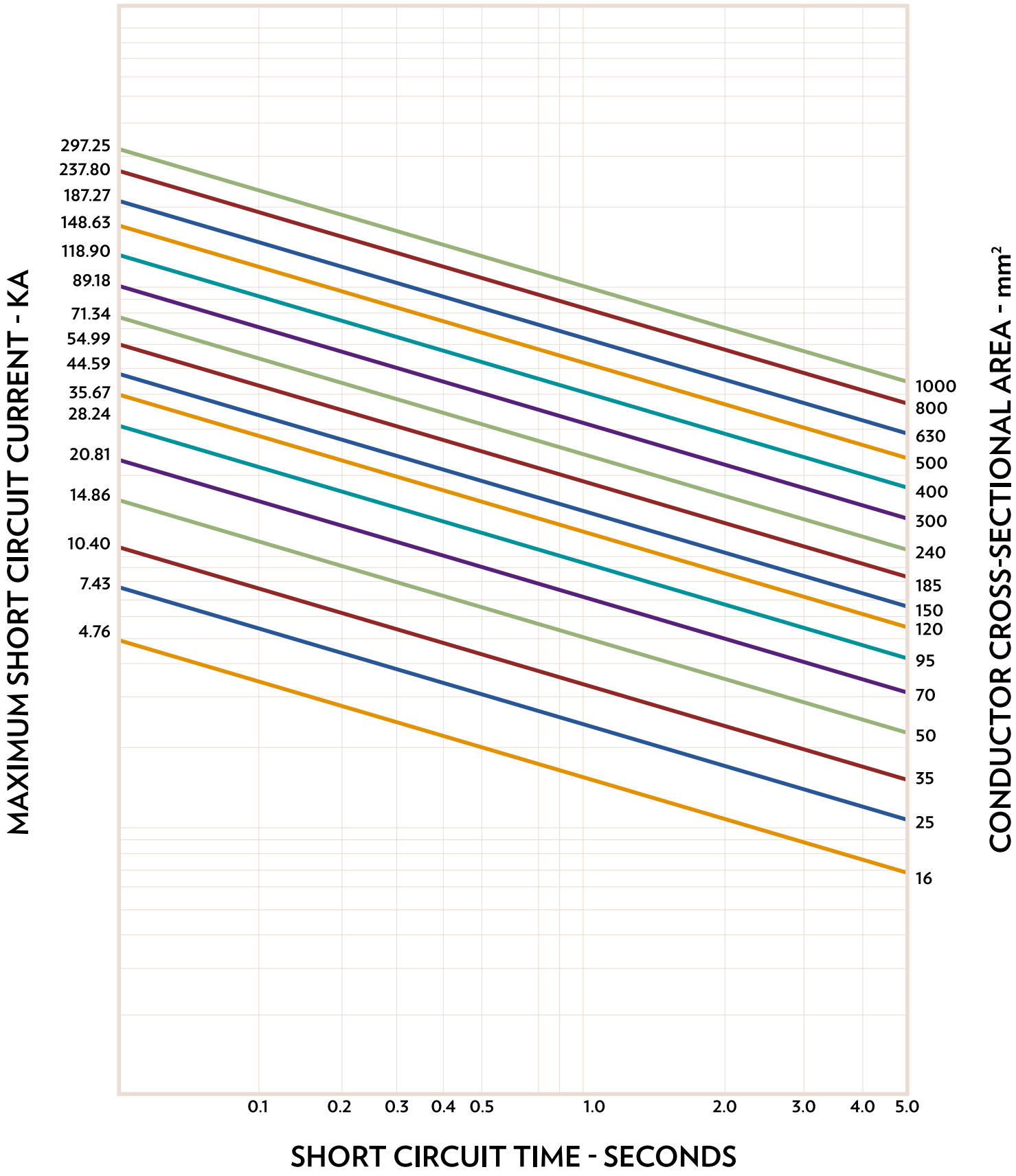
NOTE 3: De = Overall diameter of Cable in 'mm'

## 6.3 FAULT RATING

It is very important to note that the conductor size necessary for an installation is decided by its ability to carry short circuit current rather than the sustained current. For that, below you can find the permissible short circuit current of XLPE insulated power cables:



# SHORT CIRCUIT CURRENT CURVES
# FOR COPPER CONDUCTOR XLPE INSULATED CABLES



## 6.4 BENDING RADIUS

Over-bending will damage electric cables and care must be taken to ensure that minimum bending radii limits are not exceeded during installation:-

| Cable Type | Bending radius (mm) | |
|---|---|---|
| | ≤ 11 kV | 22 kV & 33 kV |
| PILC (MV) | | |
| Single-core | 20×D | 25×D |
| Multicore | 12×D | 15×D |
| XLPE (MV) | | |
| Single core | 17×D | 17×D |
| Multicore | 15×D | 15×D |
| PVC & XLPE (LV) | 600/1000 V | |
| Single & multicore 16 $mm^2$-50 $mm^2$ | 8×D | |
| Armored single & multicore ≥ 70 $mm^2$ | 10×D | |
| Where D is the cable diameter (mm) | | |

A further reduction in bending radius described as 'set' value can sometimes be applied where no further manipulation of the cable takes place. This information should be obtained from the cable manufacturer.

## 6.5 PULLING FORCES

### 6.5.1 PULLING SOCKS

One of the limitations that we should consider when installing a cable is not to exceed the maximum pulling force of the cable. The specific type of cable construction imposes this limitation. When a cable pulling sock is placed on a lead sheathed cable; the maximum force that can be tolerated to overall cable diameter is given by the following equation:

$$T = 3.33\ t\ (D-t) \quad (kgf)$$

Where,
T = maximum pulling load (kgf)
D = Diameter over lead sheath (mm)
t = Lead sheath thickness (mm)

In the case of wire armored cables, higher loads of pulling are possible and can be described with the following equation:

$$T = K \cdot D^2$$

Where:
K = 0.92 $kg/mm^2$
D = outside Diameter of the cable (mm)

In case of an unarmoured cable, the pulling forces can be calculated through the following equation:

$$T = K.\ A\ (kgf)$$

Where:
T = maximum pulling load
K = 5.1 $kg/mm^2$ for copper conductors
30.6 $kg/mm^2$ for Aluminum conductors
A = Total cross-sectional area of all conductors ($mm^2$)

## 6.5.2 PULLING EYES

If the cable is to be laid by means of a pulling eye arrangement, many advantages can be achieved including the following:

1. Larger pulling force can be applied on a cable which is useful for long runs or where there are lots of bends on the route.
2. Unarmoured cables and steel armoured cables can be pulled without being damaged

As a guideline the following maximum pulling tensions are recommended:

$$T = K. A (kgF)$$

Where:
T = Maximum pulling load
K = 6 kg/mm$^2$ for copper conductors
3 kg/mm$^2$ for Aluminium conductors
A = Total cross-sectional area of all conductors (mm$^2$)

The above figures are based on the ultimate tensile strength of the materials with a safety factor of 2.5. an absolute maximum load of 2000 kgF should be used, as such a load would indicate an obstruction somewhere along the route. By using a 2T (2000 kgF) winch would ensure this value is not exceeded.

When pulling a cable using a cable with pulling eyes, it is important to seal the end of the cable to prevent moisture entering the cable, and to clamp all conductor wires so that all are equally loaded.

## 6.5.3 THE USE OF WINCHES

When a power winch is used to pull cables, it is necessary to pay more attention to the maximum permissible pulling load applied. For that, it is recommended to use a pulling eye and the maximum pulling load can be calculated with the above equation.

When using a winch, additional precautions should be followed:
• A shear pin calibrated to maximum permissible tensile force could be used
• Always use roller guides and/or skid-plates, especially where there are a lot of bends along the route
• The tensile force can be monitored by means of a tensometer

## 6.5.4 THE USE OF ROLLERS AND SKID PLATES

It is very important to choose the right accessories when cable pulling is applied to maintain the smoothness of the outer sheath of cable and reduce damage that can occur during the pulling process. It has been proven that the optimum accessory for cable pulling at bends is the horizontal rollers combined with skid plates.

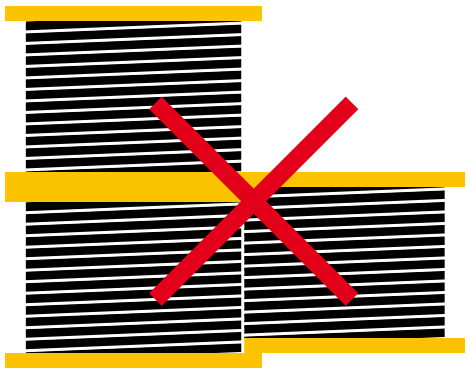
# 7. STORAGE AND HANDLING

## 7.1 INDOOR STORAGE

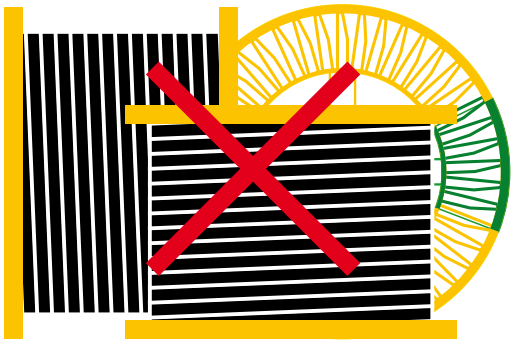
LSZH cable drums shall be only stored indoors as they do not have the same mechanical strength as the other cables with PVC or PE sheathing. The following storage condition shall be applied:

- Stack flange to flange and preferably not one on top of the other. Do not lay the cable drum flat.
- Stack so that drums are easily accessible.
- Observe fire precaution rules.
- Cable ends must be sealed at all times.
- If drums are expected to be stored for a long time they should be specially treated, or, if applicable, use pesticides at regular intervals in the storage area to avoid termite and rodent attack on wooden drums.
- Dispatch on a "first in – first out" basis.

Warning: Failure to store or install in a proper manner, not in-line with the above may void factory warranty.



NOT RECOMMENDED



NOT RECOMMENDED


RECOMMENDED

# 8. SPECIAL GUIDELINES FOR HANDLING LSZH SHEATHED CABLES

## 8.1 PROPERTIES OF LSZH SHEATHED CABLES

The sheaths of Low Smoke Halogen Free (LSZH, LSZH) cables do not have the same mechanical strength as other sheathing materials, particularly at higher temperatures. It is therefore strongly recommended by OCI that LSF sheathed cables be used mainly indoors, and only where cables have been specified to have low smoke and toxic gas emission property.

## 8.2 INSTALLATION

We recommend the following special guidelines, in conjunction with the standard installation instructions.

- The LSZH cables must be stored in proper packed condition, in the shade. Direct exposure to sun must be avoided.
- As LSZH sheaths have lower tear strength property when compared to PVC and PE sheaths, special care must be taken during installation to avoid any damage. Even a small cut on the LSZH sheath could result in the sheath splitting.
- Use pay-in rollers and corner rollers of non-metallic material (Nylon or Teflon) at least every 4 meters when laying the cable.
- Where possible installation must be under cover or indoors. Where outdoor installation is unavoidable, direct exposure to sunlight must be avoided by using suitable cable trays with suitable covers.
- The cables must not come into contact with hot surfaces.
- The installation bending radius must not be less than that stated on the cable data sheet. (Care must be taken, particularly if cable is installed by the flaking method, that this minimum bending radius is not compromised)
- Any clamping device must not be applied directly onto the outer sheath. There must be some form of cushion (for instance a rubber pad of approximately 3 mm thickness) between the cable's outer sheath and the clamps.
- The distance of unsupported length of cable for horizontal and vertical run must not exceed the figures given in the table below:

| Overall Diameter of Cable (mm) | Maximum Spacing Between the Supports for Horizontal Run (mm) | Maximum Spacing Between the Support for Vertical Run (mm) |
|---|---|---|
| Up to 14.9 | 350 | 450 |
| 15- 19.9 | 400 | 550 |
| 20 – 39.9 | 450 | 600 |
| 40 -59.9 | 700 | 900 |
| 60 and above | 1100 | 1300 |

## 8.3 RE-WINDING

Where re-winding is necessary, extreme caution must be taken during the process to avoid damage. The following must be adhered to:

- The winding must be done equally and uniformly with no over-riding of the coils or pinching on the sides of the drum.
- The pay-off drum must have an adequate breaking system to prevent the cable from becoming loose on the drum.

# 9. PRODUCT CERIFICATION AND APPROVALS

BASEC

Product Certification Schedule

| | |
|---|---|
| Schedule No: | 158/001/077 |
| Licensee: | OMAN CABLES INDUSTRY (SAOG), P.O. BOX NO. 25, RUSAYL, POSTAL CODE - 124, SULTANATE OF OMAN |
| Factory: | OMAN CABLES INDUSTRY (SAOG), P.O. BOX NO. 25, RUSAYL, POSTAL CODE - 124, SULTANATE OF OMAN |
| Specification: | BS 7846:2015 Electric Cables - Thermosetting insulated, armoured, fire-resistant cables of rated voltage 600/1 000 V for fixed installations, having low emission of smoke and corrosive gases when affected by fire - Specification |
| Type of Cable: | Table 4 Two core 600/1000V cables with copper conductors |
| HAR Document: | Not applicable |
| HAR Specification: | Not applicable |
| Range of Approval: | 1.5sqmm to 400sqmm nominal cross-sectional area of conductors inclusive. Two core. Resistance to fire - Category F2. Sheath - LTS1. Insulation - GP8. |
| Origin Thread: | Not applicable |
| Origin Mark: | OMAN CABLES |

PERMISSIBLE MARKS

BASEC

YELLOW ACETATE THREAD

Please refer to the BASEC Product Certification Requirements

Expiry Date: 22/04/2018

Signed for and on behalf of the British Approvals Service for Cables

Date: 25/01/2017

BASEC

Product Certification Schedule

| | |
|---|---|
| Schedule No: | 158/001/078 |
| Licensee: | OMAN CABLES INDUSTRY (SAOG), P.O. BOX NO. 25, RUSAYL, POSTAL CODE - 124, SULTANATE OF OMAN |
| Factory: | OMAN CABLES INDUSTRY (SAOG), P.O. BOX NO. 25, RUSAYL, POSTAL CODE - 124, SULTANATE OF OMAN |
| Specification: | BS 7846:2015 Electric Cables - Thermosetting insulated, armoured, fire-resistant cables of rated voltage 600/1 000 V for fixed installations, having low emission of smoke and corrosive gases when affected by fire - Specification |
| Type of Cable: | Table 5 Four core 600/1000V cables with copper conductors |
| HAR Document: | Not applicable |
| HAR Specification: | Not applicable |
| Range of Approval: | 1.5sqmm to 400sqmm nominal cross-sectional area of conductors inclusive. Four core. Resistance to fire - Category F2. Sheath - LTS1. Insulation - GP8. |
| Origin Thread: | Not applicable |
| Origin Mark: | OMAN CABLES |

PERMISSIBLE MARKS

BASEC

YELLOW ACETATE THREAD

Please refer to the BASEC Product Certification Requirements

Expiry Date: 22/04/2018

Signed for and on behalf of the British Approvals Service for Cables

Date: 25/01/2017

BASEC

Product Certification Schedule

| | |
|---|---|
| Schedule No: | 158/001/075 |
| Licensee: | OMAN CABLES INDUSTRY (SAOG), P.O. BOX NO. 25, RUSAYL, POSTAL CODE - 124, SULTANATE OF OMAN |
| Factory: | OMAN CABLES INDUSTRY (SAOG), P.O. BOX NO. 25, RUSAYL, POSTAL CODE - 124, SULTANATE OF OMAN |
| Specification: | BS 7846:2015 Electric Cables - Thermosetting insulated, armoured, fire-resistant cables of rated voltage 600/1 000 V for fixed installations, having low emission of smoke and corrosive gases when affected by fire - Specification |
| Type of Cable: | Table 5 Three core 600/1000V cables with copper conductors |
| HAR Document: | Not applicable |
| HAR Specification: | Not applicable |
| Range of Approval: | 1.5sqmm to 400sqmm nominal cross-sectional area of conductors inclusive. Three core. Resistance to fire - Category F2. Sheath - LTS1. Insulation - GP8. |
| Origin Thread: | Not applicable |
| Origin Mark: | OMAN CABLES |

PERMISSIBLE MARKS

BASEC

YELLOW ACETATE THREAD

Please refer to the BASEC Product Certification Requirements

Expiry Date: 22/04/2018

Signed for and on behalf of the British Approvals Service for Cables

Date: 25/01/2017

BASEC

Product Certification Schedule

| | |
|---|---|
| Schedule No: | 158/001/081 |
| Licensee: | OMAN CABLES INDUSTRY (SAOG), P.O. BOX NO. 25, RUSAYL, POSTAL CODE - 124, SULTANATE OF OMAN |
| Factory: | OMAN CABLES INDUSTRY (SAOG), P.O. BOX NO. 25, RUSAYL, POSTAL CODE - 124, SULTANATE OF OMAN |
| Specification: | BS 6724: 2016 Incorporating Corrigenda Nos 1 and 2 Electric cables - Thermosetting insulated, armoured cables of rated voltages of 600/1000V and 1900/3300V for fixed installations, having low emission of smoke and corrosive gases when affected by fire - Specification |
| Type of Cable: | Table 4 - Single-core 600/1000V cables with copper conductor |
| HAR Document: | Not applicable |
| HAR Specification: | Not applicable |
| Range of Approval: | 50sqmm to 630sqmm nominal cross-sectional area of conductors inclusive. Single core. Sheath - LTS1. Insulation - GP8. |
| Origin Thread: | Not applicable |
| Origin Mark: | OMAN CABLES |

PERMISSIBLE MARKS

BASEC

YELLOW ACETATE THREAD

Please refer to the BASEC Product Certification Requirements

Expiry Date: 22/04/2018

Signed for and on behalf of the British Approvals Service for Cables

Date: 18/07/2017

BASEC

Product Certification Schedule

Schedule No: 158/0021/002

Licensee: OMAN CABLES INDUSTRY (SAOG), P.O. BOX NO. 25, RUSAYL, POSTAL CODE - 124, SULTANATE OF OMAN

Factory: OMAN CABLES INDUSTRY (SAOG), P.O. BOX NO. 25, RUSAYL, POSTAL CODE - 124, SULTANATE OF OMAN

Specification: BS 6724: 2016 Incorporating Corrigenda Nos. 1 and 2 Electric cables - Thermosetting insulated, armoured cables of rated voltages of 600/1000V and 1900/3300V for fixed installations, having low emission of smoke and corrosive gases when affected by fire - Specification

Type of Cable: Table 7 - Four-core 600/1000V cables with copper conductors

HAR Document: Not applicable

HAR Specification: Not applicable

Range of Approval: 1.5sqmm to 400sqmm nominal cross-sectional area of conductors inclusive Four-core. Sheath - LTS1. Insulation - GP8.

Origin Thread: Not applicable

Origin Mark: OMAN CABLES

PERMISSIBLE MARKS

BASEC

YELLOW ACETATE THREAD

Expiry Date: 22/04/2018

BASEC

Product Certification Schedule

Schedule No: 158/0021/009

Licensee: OMAN CABLES INDUSTRY (SAOG), P.O. BOX NO. 25, RUSAYL, POSTAL CODE - 124, SULTANATE OF OMAN

Factory: OMAN CABLES INDUSTRY (SAOG), P.O. BOX NO. 25, RUSAYL, POSTAL CODE - 124, SULTANATE OF OMAN

Specification: BS 6724: 2016 Incorporating Corrigenda Nos. 1 and 2 Electric cables - Thermosetting insulated, armoured cables of rated voltages of 600/1000V and 1900/3300V for fixed installations, having low emission of smoke and corrosive gases when affected by fire - Specification

Type of Cable: Table 9 - Two-core 600/1000V cables with copper conductors

HAR Document: Not applicable

HAR Specification: Not applicable

Range of Approval: 1.5sqmm to 400sqmm nominal cross-sectional area of conductors inclusive Two-core. Sheath - LTS1. Insulation - GP8.

Origin Thread: Not applicable

Origin Mark: OMAN CABLES

PERMISSIBLE MARKS

BASEC

YELLOW ACETATE THREAD

Expiry Date: 22/04/2018

BASEC

Product Certification Schedule

Schedule No: 158/0021/008

Licensee: OMAN CABLES INDUSTRY (SAOG), P.O. BOX NO. 25, RUSAYL, POSTAL CODE - 124, SULTANATE OF OMAN

Factory: OMAN CABLES INDUSTRY (SAOG), P.O. BOX NO. 25, RUSAYL, POSTAL CODE - 124, SULTANATE OF OMAN

Specification: BS 6724: 2016 Incorporating Corrigenda Nos. 1 and 2 Electric cables - Thermosetting insulated, armoured cables of rated voltages of 600/1000V and 1900/3300V for fixed installations, having low emission of smoke and corrosive gases when affected by fire - Specification

Type of Cable: Table 8 - Three-core 600/1000V cables with copper conductors

HAR Document: Not applicable

HAR Specification: Not applicable

Range of Approval: 1.5sqmm to 400sqmm nominal cross-sectional area of conductors inclusive Three-core. Sheath - LTS1. Insulation - GP8.

Origin Thread: Not applicable

Origin Mark: OMAN CABLES

PERMISSIBLE MARKS

BASEC

YELLOW ACETATE THREAD

Expiry Date: 22/04/2018

BASEC

CERTIFICATE OF CONFORMITY

This is to certify that the

Quality Management System

of

Oman Cables Industry (SAOG)
P.O. Box 25
Rusayl
Postal Code - 124
Sultanate of Oman

conforms to the requirements of

ISO 9001: 2008

SCOPE OF CERTIFICATION

The design, manufacture and supply of the following cable types

Medium Voltage Power Cables up to 66kV, Low Voltage Power Cables up to 3.3kV, Control Cables, Instrumentation Cables, Pilot Cables, Building Wires and Flexible Cords, Aerial Bunched Cables, Overhead Line Conductors (Bare and Insulated), Other Wires and Cables for Electrical Power and Control Applications, Fire Integrity LV Power Cables and PVC Compounds.

Certificate No: CS1-214

Issue Date: 16th April 2015

Date of original certification: 23rd April 2009

Expiry Date: 22nd April 2018

This certificate is valid subject to and in accordance with BASEC Regulations and continued compliance

BUREAU VERITAS
Certification

Certification

Awarded to

**OMAN CABLES INDUSTRY S.A.O.G**

Road No.2, Rusayl Industrial Estate

P. O. Box. 25, P.C. 124, Rusayl

**SULTANATE OF OMAN**

*Bureau Veritas Certification Holding SAS – UK Branch certify that the Management System of the above organisation has been audited and found to be in accordance with the requirements of the management system standards detailed below*

Standard

**OHSAS 18001:2007**

*Scope of Certification*

**DESIGN, MANUFACTURING AND SUPPLY OF ELECTRIC MEDIUM VOLTAGE POWER CABLES UPTO 66KV, LOW VOLTAGE POWER CABLES UPTO 3.3 KV AND MANUFACTURE OF PVC COMPOUNDS**

Certification cycle start date: **23.Apr.2015**

Subject to the continued satisfactory operation of the organisation's Management System, this certificate expires on: **22.Apr.2018**

Original certification date: **22.Feb.2012**

**Certificate No.BNO15.6208 H/S** Version 1, Issue date: 21.Apr.2015

***Signed on behalf of BVCH SAS UK Branch***



BUREAU VERITAS
Certification

Certification

Awarded to

**OMAN CABLES INDUSTRY S.A.O.G**

Road No.2, Rusayl Industrial Estate

P. O. Box. 25, P.C. 124, Rusayl

**SULTANATE OF OMAN**

*Bureau Veritas Certification Holding SAS – UK Branch certify that the Management System of the above organisation has been audited and found to be in accordance with the requirements of the management system standards detailed below*

Standard

**ISO 14001:2004**

*Scope of Certification*

**DESIGN, MANUFACTURING AND SUPPLY OF ELECTRIC MEDIUM VOLTAGE POWER CABLES UPTO 66KV, LOW VOLTAGE POWER CABLES UPTO 3.3 KV AND MANUFACTURE OF PVC COMPOUNDS**

Certification cycle start date: **23.Apr.2015**

Subject to the continued satisfactory operation of the organisation's Management System, this certificate expires on: **22.Apr.2018**

Original certification date: **11.Jun.2011**

**Certificate No.BNO15.6208 U/E** Version 1, Issue date: 21.Apr.2015

***Signed on behalf of BVCH SAS UK Branch***

UKAS

LPCB

Certificate of Product Approval

Certificate Number: 995a Issue: 04

OMAN CABLES INDUSTRY (SAOG)

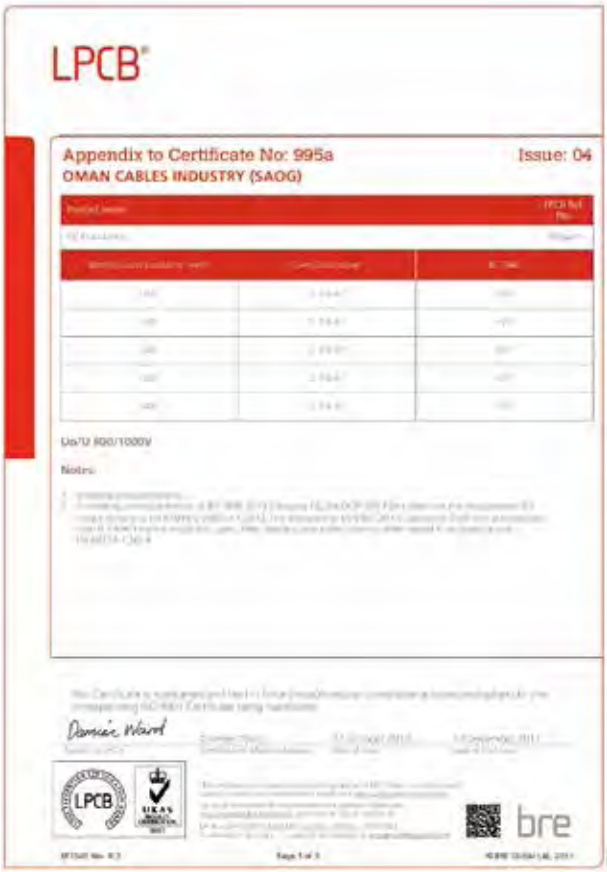
Product(s)

Standard(s) (see Appendix for details)

LPCB

Appendix to Certificate No: 995a Issue: 04

OMAN CABLES INDUSTRY (SAOG)



LPCB

Appendix to Certificate No: 995a Issue: 04

OMAN CABLES INDUSTRY (SAOG)

Uo/U 600/1000V

Notes:

LPCB

Certificate of Product Approval

Certificate Number: 995b Issue: 02

OMAN CABLES INDUSTRY (SAOG)

Road No 7, Factory No 206
Rusayl Industrial Estate
Rusayl
Muscat
Sultanate of Oman

Product(s)

Cable Types as listed below:
OCFLAM-FR
See Certificate Appendix for details

Standard(s) (see Appendix for details)

BS 6387:2013 Category (CWZ)
EN 50267-2-1:1998
EN 61034-2:2005
IEC 60332-3-24:2008
IEC 60331-21:1999

LPCB bre

LPCB

Appendix to Certificate No: 995b Issue: 02

OMAN CABLES INDUSTRY (SAOG)

LPCB bre

LPCB

Appendix to Certificate No: 995b Issue: 02

OMAN CABLES INDUSTRY (SAOG)

Uo/U 600/1000 V

Notes:

LPCB bre

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# Certificate of Product Approval

Certificate Number: 995c Issue: 03

LOSS PREVENTION CERTIFICATION BOARD LPCB

## OMAN CABLES INDUSTRY (SAOG)

Road No. 2, Factory No. 206
Rusayl Industrial Estate
Rusayl
Muscat
Sultanate of Oman

is authorised to use the LPCB mark in association with the product(s) listed in this certificate and appendix having complied with the requirements of the standard(s) detailed below.

**Product(s)**

Cable Types as listed below:
OCIFLAM1 PREMIUM and OCIFLAM2 PREMIUM
See Certificate Appendix for details

**Standard(s) (see Appendix for details)**

BS 7846 2015 Category F2 & F120
EN 50200:2015 (Class PH120)
EN 50200:2015 Annex E (30 mins)
BS 8434-2:2003+A2:2009 (120 mins)
IEC 60331-21:1999

This Certificate is maintained and held in force through regular surveillance activities and subject to the corresponding ISO 9001 Certificate being maintained.

| Signed for LPCB | Karen Coull<br>Certification Scheme Manager | 05 May 2017<br>Date of Issue | 24 January 2017<br>Date of First Issue |
|---|---|---|---|

LPCB LOSS PREVENTION CERTIFICATION BOARD

UKAS PRODUCT CERTIFICATION 0007

This certificate and appendix remain the property of BRE Global Ltd and is issued subject to terms and conditions. See details at: www.redbooklive.com/terms

To check the validity of this certificate and appendix please visit www.redbooklive.com/check, scan the QR tag or contact us.

LPCB is part of BRE Global Ltd, Garston, Watford, WD25 9XX
T: +44 (0)333 321 8811 F: +44 (0)1923 664603 E: enquiries@breglobal.com

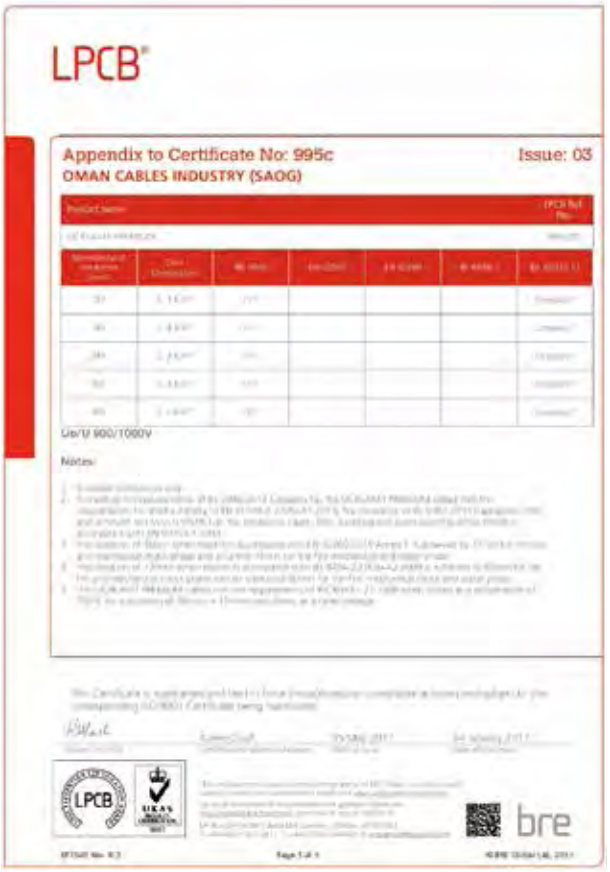
bre

BF1345 Rev. 0.3 Page 1 of 5 © BRE Global Ltd, 2015


LPCB

Appendix to Certificate No: 995c Issue: 03

OMAN CABLES INDUSTRY (SAOG)


LPCB

Appendix to Certificate No: 995c Issue: 03

OMAN CABLES INDUSTRY (SAOG)

Uo/U 600/1000V

Notes:


LPCB

Appendix to Certificate No: 995c Issue: 03

OMAN CABLES INDUSTRY (SAOG)


LPCB

Appendix to Certificate No: 995c Issue: 03

OMAN CABLES INDUSTRY (SAOG)

Uo/U 600/1000V

Notes:

消 防 處
牌 照 及 審 批 總 區
通 風 系 統 課
香港九龍尖沙咀東謝莊道 1 號
消防總部大廈 5 樓

FIRE SERVICES DEPARTMENT
LICENSING & CERTIFICATION COMMAND
Ventilation Division
5/F, Fire Services Headquarters Building,
No. 1 Hong Chong Road,
Tsim Sha Tsui East, Kowloon,
Hong Kong

本處檔號 Our Ref.: FP(LC) 317/21
來函檔號 Your Ref.: hie/pe/17/fsd03
圖文傳真 Fax: 2367 3206
電 話 Tel. No.: 2733 1557

12 September 2017

Oman Cables Industry (SAOG)
Unit 6, 16/F., Fu Lee Commercial Building
14-20 Pilkem Street, Jordan, Kowloon
Hong Kong
(Attn.: Mr. Swee Keong LIM / Mr. Antony LAU)

Dear Sirs,

**Oman Cables Industry (SAOG)**
**"OCIFLAM1 Premium" and "OCIFLAM2 Premium" Fire Resistant Armoured Cables**

I refer to your letter dated 17.5.2017 enclosing a set of catalogues and certificates and supplementary information submitted on 31.8.2017 with respect to the captioned fire resistant cables.

We have no objection in principle to the use of "OCIFLAM1 Premium" and "OCIFLAM2 Premium" fire resistant armoured cables for fire service installations in Hong Kong subject to compliance with the Codes of Practice for Minimum Fire Service Installations and Equipment and Inspection, Testing and Maintenance of Installations and Equipment, 2012 Edition, relevant FSD Circular Letters and according to the following details:

| | | |
|---|---|---|
| Manufacturer | : | Oman Cables Industry (SAOG), Sultanate of Oman |
| Model | : | OCIFLAM1 Premium and OCIFLAM2 Premium |
| Construction | : | <u>OCIFLAM1 Premium</u><br>Stranded annealed plain copper conductor / mica-glass tape covered with XLPE insulation / polyester tape / OHLS bedding / galvanized steel wire armour / OHLS sheath<br><br><u>OCIFLAM2 Premium</u><br>Stranded annealed plain copper conductor / mica-glass tape covered with XLPE insulation / polypropylene tape / OHLS bedding / flame retardant tape / galvanized steel wire armour / OHLS sheath |

/2...

| | | |
|---|---|---|
| Conductor Size | : | OCIFLAM1 Premium<br>1.5 to 6 $mm^2$ with 2, 3 & 4 core<br><br>OCIFLAM2 Premium<br>10 to 400 $mm^2$ with 2, 3 & 4 core |
| Test Certificate | : | Certificate No. 995c (Issue: 03) of 5.5.2017 issued by Loss Prevention Certification Board (LPCB) |
| Test Standard & Result | : | OCIFLAM1 Premium<br>(a) For cable size 1.5 to 6 $mm^2$ with 2, 3 & 4 core,<br>(i) BS 7846: 2015, Category F2<br>(b) For cable size 1.5 to 2.5 $mm^2$ with 2, 3 & 4 core,<br>(i) EN 50200: 2015 (Class PH 120 and Annex E)<br>(ii) BS 8434-2: 2003+A2: 2009 (120 mins)<br><br>OCIFLAM2 Premium<br>(a) For cable size 10 to 400 $mm^2$ with 2, 3 & 4 core,<br>(i) BS 7846: 2015, Category F2 & F120 |
| Quality Assurance Scheme | : | The manufacturer operates a quality management system to ISO 9001: 2008 certified by BASEC under Certificate No. CS1-214 of 16.4.2015. |
| Remark | : | a) The cables shall remain LPCB listed and valid certificates shall be maintained;<br>b) The cables shall bear appropriate markings of the manufacturer and certification body for identification purpose; and<br>c) This assessment is subject to review by August 2022. |

Yours faithfully,

(LAM Sui-hang)
for Director of Fire Services

SHL/chl
FileCode: oman ociflam 1 & 2 premium 20170912.doc

REF. NUMBER AND DATE SHOULD BE QUOTED IN REFERENCE TO THIS LETTER
凡提及本信時請引述編號及日期

سلطنة عمان
الهيئة العامة للدفاع المدني والإسعاف
الإدارة العامة للحماية المدنية

رقم الشهادة(هـ . ع . د. م . إ / حماية / ٢٠١٧/٠١٥٥م)

## شهادة مطابقة للمعدات والأجهزة والمواد الخاصة بالحماية المدنية للمواصفات القياسية

تشهد الإدارة العامة للحماية المدنية بأن الأجهزة والمعدات والمواد المبينة أدناه :

١- كابلات مقاومة للحريق

٢- رقم الشهادة(LPCB(E١٢١٨٩٨/١,١

المصنعة من قبل : شركة صناعة الكابلات العمانية ش. م.ع.ع ، وقد تم فحصها من قبل مختبرات دولية معتمدة لدينا.

وعليه يصرح للوكيل المحلى : شركة صناعة الكابلات العمانية ش. م.ع.ع ، بتصنيعها والإتجار فيها.

هذه الشهادة صالحة اعتباراً من :٢٠١٧/٠٦/٠٥م إلى : ٢٠١٩/٠١/١٣م

إمضاء القائمبالدراسة : النقيب.مهندس/هيثم بن محمد السيابي

النقيب / أحمد بن ناصر الكندي
عن / مدير عام الحماية المدنية

أي كشط أو تعديل يلغي هذه الشهادة.

ملاحظات :
* يجب تجديد هذه الشهادة عند إنتهاء المدة المحددة دون تأخير .

وزارة الداخلية
الإدارة العامة للدفاع المدني
إدارة الوقاية

تاريخ المعاينة : 2016-05-23
وقت المعاينة : AM 8:55
رقم الطلب : PAC16007361

## شهـــادة عدم ممانعة

نوع الشهادة : إعتماد منتج

**بيانات المنشأة**

الإسم التجاري : شركة النجارة الكويتية
رقم السجل التجاري : 18/2 رقم الرخصة التجارية : 4055
رقم قيد المنشأة : 10-1313-05 رقم الهاتف :
البريد الإلكتروني :
التصنيف : Fire alarm systems
إسم المنتج : Cables (Fire Rated, Electrical and Communication) and Wiring Accessories

**تفاصيل الشهادة**

تم مراجعة الطلب المقدم والمنتج بأنه لا مانع من اعتماد المنتج والمنتجات الموضحه في التقرير الفني المرفق بناء على اعتماده من قبل الجهة المختبرية الموضحه في التقرير الفني المرفق .

ملاحظات :

تاريخ الاعتماد : 2016-05-23 تاريخ الإنتهاء : 2018-05-22

مدير إدارة الوقاية
الإدارة العامة للدفاع المدني

Page 1 of 1

بسم الله الرحمن الرحيم

وزارة الداخلية
الإدارة العامة للدفاع المدني
إدارة الوقاية

DATE : 2016-05-23 التاريخ :
PERMIT # PAC16007361 رقم الطلب :

TECHNICAL REPORT التقرير الفني

| | | |
|---|---|---|
| PRODUCT | Cables (Fire Rated, Electrical and Communication) and Wiring Accessories | المنتج : |
| PRODUCT APPLICATION | Fire alarm systems | تصنيف المنتج : |
| APPLICANT / P.O .Box | شركة النجارة الكويتية | مقدم الطلب : |
| MANUFACTURER / LOCATION | Oman Cables Industry (SAOG) / OMAN | الشركة المصنعة / بلد المنشأ : |
| PRODUCT / MODEL | الوصف: Fire Resistant Cables Cable Sizes (mm²): 1.5 - 630 Single Core, Shielded Voltage Rating: 600 / 1000v | الموديل: OCIFLAM-FRT |
| 3RD PARTY CERTIFICATE / APPROVAL | LPCB-BRE | شهادة المختبرات المعتمدة (إن وجدت معتمدة) : |

RECOMMENDATIONS: التوصيات

Notes: Meets the requirements of BS 6387:2015 EN 50200:2015 Class PH120 EN 50200:2015 Annex E (30 mins) BS 8434-2:2003+A2:2008 (120 mins) IEC 60331-21:1999

مدير إدارة الوقاية
الإدارة العامة للدفاع المدني

Page 2 of 2

بسم الله الرحمن الرحيم

وزارة الداخلية
الإدارة العامة للدفاع المدني
إدارة الوقاية

DATE : 2017-05-16 التاريخ :
PERMIT # PAC17007380 رقم الطلب :

TECHNICAL REPORT التقرير الفني

| | | |
|---|---|---|
| PRODUCT : | Cables (Fire Rated, Electrical and Communication) and Wiring Accessories | المنتج : |
| PRODUCT APPLICATION : | Fire alarm systems | تصنيف المنتج : |
| APPLICANT / P.O .Box : | شركة النجارة الكويتية | مقدم الطلب : |
| MANUFACTURER / LOCATION : | Oman Cables Industry (SAOG) / OMAN | الشركة المصنعة / بلد المنشأ : |

| الوصف | الموديل |
|---|---|
| Fire Resistant Cables<br>Fire Rating: 950C for 60mins<br>Conductor Sizes (mm): 1.5 and 400<br>No. of Core. 2, 3 and 4.<br>Voltage Rating: 600 / 1000v | OCIFLAM1 PREMIUM |
| Fire Resistant Cables<br>Fire Rating: 950C for 90mins<br>Conductor Sizes (mm): 95 and 400<br>No. of Core. 3 and 4.<br>Voltage Rating: 600 / 1000v | OCIFLAM2 PREMIUM |

| | | | |
|---|---|---|---|
| RD PARTY ERTIFICATE / PPROVAL : | 950c | LPCB-BRE | شهادة المختبرات المعتمدة (إن وجدت معتمدة) : |

RECOMMENDATIONS التوصيات

Notes: Meets the requirements of BS 7846:2015 Category FZ & F120 EN 50200:2015 Class PH120 EN 50200:2015 Annex E (30 mins) BS 8434-2:2003+A2:2008 (120 mins) IEC 60331-21:1999

مدير إدارة الوقاية
الإدارة العامة للدفاع المدني

Page 2 of 2

وزارة الداخلية
الإدارة العامة للدفاع المدني
إدارة الوقاية

تاريخ المعاينة : 2017-05-16
وقت المعاينة : 11:44
رقم الطلب : PAC17007380

## شهـــادة عدم ممانعة

نوع الشهادة : إعتماد منتج

**بيانات المنشأة**

الإسم التجاري : شركة النجارة الكويتية
رقم السجل التجاري : 18/2 رقم الرخصة التجارية : 4055
رقم قيد المنشأة : 10-1313-05 رقم الهاتف :
البريد الإلكتروني :
التصنيف : Fire alarm systems
إسم المنتج : Cables (Fire Rated, Electrical and Communication) and Wiring Accessories

**تفاصيل الشهادة**

تم مراجعة الطلب المقدم والمنتج بأنه لا مانع من اعتماد المنتج والمنتجات الموضحه في التقرير الفني المرفق بناء على اعتماده من قبل الجهة المختبرية الموضحه في التقرير الفني المرفق .

ملاحظات :

تاريخ الاعتماد : 2017-05-18 تاريخ الإنتهاء : 2019-05-18

مدير إدارة الوقاية
الإدارة العامة للدفاع المدني

Page 1 of 2


رقم الترخيص: K60

سنة الترخيص: 2017

عدد التراخيص: (09 – 13)

اسم الشركة: ساين تكنيك

| م | اسم البضاعة | الاسم التجاري | رقم الشهادة | اسم المعتمد المصدر للشهادة | بلد الصنع | منطقة الرحلة | تاريخ انتهاء الرحلة |
|---|---|---|---|---|---|---|---|
| 1 | لوحة تحكم رئيسية لنظام الإنذار<br>Control Panel<br>Model: 4100,<br>1 Loop Addressable Control and Indicating Equipment with Integrated Power Supply. | PROTEC | KM 975025 | BSI Kitemark-UK | بريطانيا | عبر | 9136 |
| 2 | أجهزة إنذار مركبة – مصوت<br>Fire Alarm Devices-Sounders<br>Model: 4900/ASO2,<br>Addressable Indoor Sounder Base for use with 4000 Series Devices. | PROTEC | KM 97087 | BSI Kitemark-UK | بريطانيا | عبر | 9136 |
| 3 | كبلات مقاومة الحريق<br>Fire Resistant Cables<br>• Fire Resistant Cables ( OCIFLAM-PSA ):<br>Type: Stranded Conductors,<br>Rated Voltage: 600/1000 V,<br>Cross-sectional Area: 1.5, 2.5, 4.0, 6.0, 10, 16, 25, 35, 50, 70, 95, 120, 150, 185, 240, 300, 400 mm²<br>Core construction: ( 2, 3 & 4 ). | OCIFLAM-PSA | 995a/01 | LPCB - UK | عمان | عبر | 15741 |
| 4 | كبلات مقاومة الحريق<br>Fire Resistant Cables<br>Model: OCIFLAM-PSH,<br>Rated Voltage: 450/750 V,<br>Type: Stranded Conductor Only,<br>Cross-sectional Area: 1.5, 2.5, 4.0, 6.0, 10, 16, 25, 35, 50, 70, 95, 120, 150, 185, 240, 300, 400, 500, 630 mm²<br>Core construction: One. | OCIFLAM-PSA | 995b/01 | LPCB - UK | عمان | عبر | 15741 |

ملاحظة :

يعتمد/ عن مدير الإدارة العامة للدفاع المدني/دبي

دولة الإمارات العربية المتحدة
وزارة الداخلية
الإدارة العامة للدفاع المدني - دبي
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United Arab Emirates

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# ترخيص وكيل - بإمارة دبي

رقم الترخيص: K60

سنة الترخيص: 2017

عدد التراخيص: 09 - 13

تم إصدار الترخيص استناداً إلى القرار الوزاري رقم(24) لسنة 2012 ، في شأن تنظيم خدمات الدفاع المدني

| | | | | | |
|---|---|---|---|---|---|
| اسم الشركة | ساين تكنيك | رقم الرخصة | 201660 | رقم السجل | 73910 |
| اسم صاحب الترخيص | عيسى صالح الفرق | الجنسية | الامارات | | |
| أطراف الرخصة | رجاء عيسى صالح الفرق | الجنسية | الامارات | | |
| رقم الهاتف | 04-2666000 | رقم الفاكس | 04-2666176 | ص.ب: | 325 |
| عنوان الشركة | محل خاص – ديرة – الخبيصي | | | | |
| الموقع /البريد الالكتروني | www.scientechnic.com | | | | |
| تأسست بتاريخ | 1973/02/07م | تاريخ الإصدار | 2017/03/15م | تاريخ الانتهاء | 2017/11/28م |
| عدد المعدات والأجهزة المعتمدة | 35 | | | | |
| عدد المهندسين المعتمدين | 4 | عدد الفنيين المعتمدين | | | |

يعتمد/ عن مدير الإدارة العامة للدفاع المدني/دبي

دولة الإمارات العربية المتحدة
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