

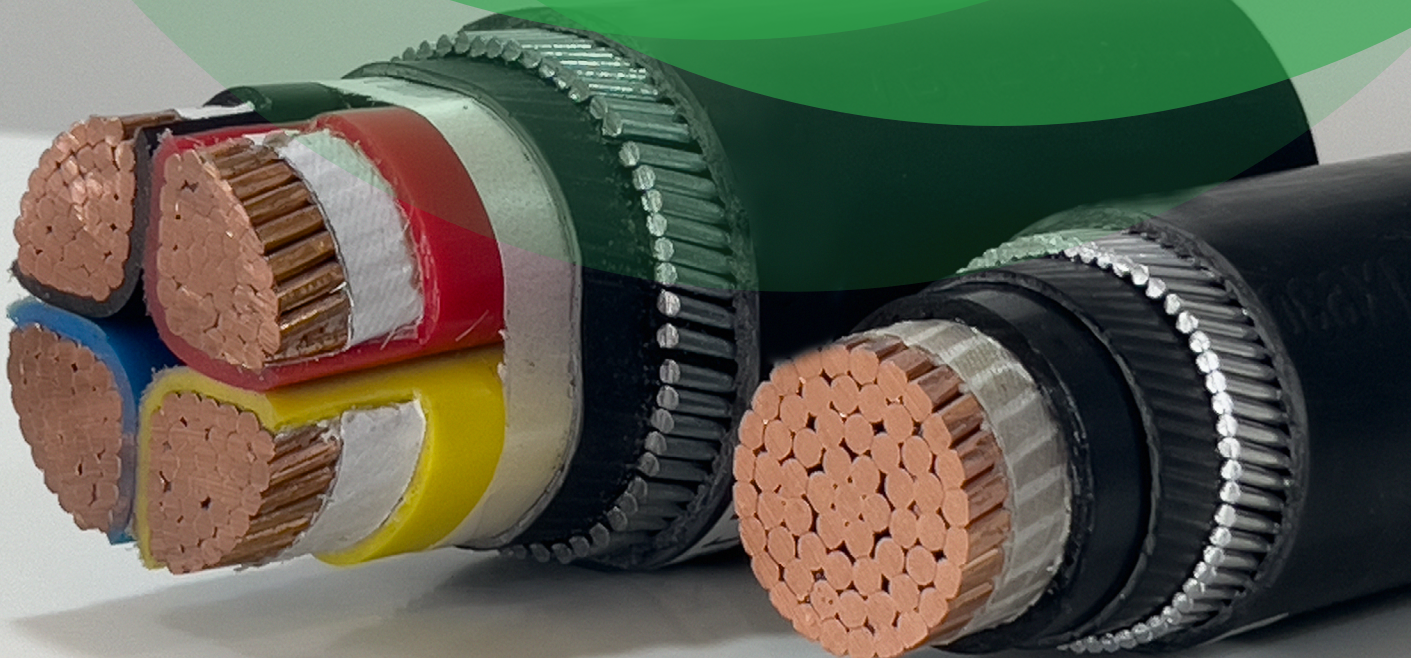


**OmanCables**  
الكابلات العمانية

**BUILDING  
SUSTAINABLE  
GROWTH**

---

## **OCIFLAM FIRE SURVIVAL CABLES AND WIRES**





# CONTENTS

Introduction ..... 02

Cables in Fire Situation ..... 05

Fire and Flame Performance Standards ..... 09

OCIFLAM Cables ..... 11

OCIFLAM Product Range ..... 14

Technical Section ..... 16

Advanced Testing Laboratory ..... 51

Common Tests ..... 55

Quality Assurance ..... 69

Cable Installation Practice ..... 75

Certificates ..... 82


# OMAN CABLES INDUSTRY

DEDICATED TO  
DELIVERING EXCELLENCE  
IN THE CABLE  
MANUFACTURING  
INDUSTRY

Oman Cables Industry manufactures, and markets a totally integrated variety of electrical products, which include medium voltage power cables, low voltage power & control cables, instrumentation cables , solar cables, pilot cables, overhead power transmission line conductors and building wires. Oman Cables also offers cables with special features and customized solutions.

Our cable and wire products provide a comprehensive range of construction material putting quality, compliance and a strong customer focus at the heart of operations.

## MARKET SEGMENTS



Utilities  
(Power & Water)




Building and  
Construction  
Industries



Oil & Gas and  
Petrochemicals



Industrial, Mining  
& Processing  
Plants



Transportation  
& Infrastructure



Renewables

Being a leading cable supplier, we believe cables are fundamental to every project. By sharing our technical expertise and creating a highly customer-centric approach to how we operate, we can help our clients create cable connections that deliver the performance their projects demand.



# PREFACE

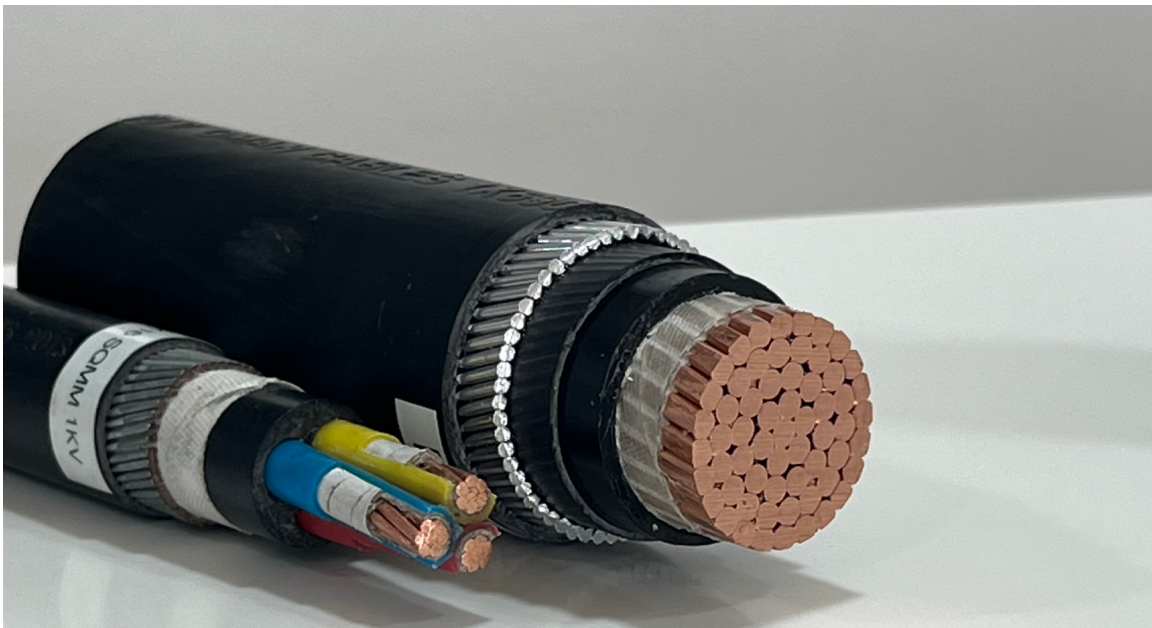
For the past years, several regulations and safety standards were updated to address the increased demand on safety of both human beings and assets. Cables can contribute significantly to the spread of fire, heat emission and toxic gases. Fire safety of cables can be achieved by different methods, depending on the degree of fire resistance required for the given application.

Due to the large volume of cables in modern buildings, cables can represent a high risk as they cross fireproof walls, link occupied spaces to service areas, ceiling voids and other parts of buildings.

In the event of a fire, cables that are not fire safe can emit dense smoke that will obscure fire exit routes resulting in fumes choking and suffocating people. Moreover, burning cables might release hazardous gases due to the presence of halogen element in the PVC compound. When in contact with moisture, such gases cause corrosion damage to electrical circuit or equipment as well as harm the human respiratory system or eyes.

With the increasing demand for safe buildings, more attention is being paid to the types of cables being installed, and the potential risks in the event of fire. Oman Cables has developed its OCIFLAM range of cables and wires for providing customers with products of the highest quality and safety standards.

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.



# COMMITMENT FOR SAFETY

Oman Cables’ commitment is to supply customers with the most appropriate, innovative and technologically advanced cables for each application where safety is concerned and a reliable solution is needed.








OCIFLAM Fire Cables are used in various indoor and outdoor applications. The product range conforms to various IEC and BS standards. These include BASEC approved and LPCB-certified cables. Our products are tested at leading laboratories and approved by many utility companies, ministries, and major industries.

Our fire resistant cable range is designed as fire resistant cables or flame retardant cables and are subjected to various fire performance tests in order to earn their respective classification.

We add value by delivering end-to-end technical support, uncompromising customer focus and unsurpassed product quality. The quality of our cables is underpinned by the Advanced Testing Lab (ATL), our in-house cable testing laboratory.

Our complete cable solutions make Oman Cables the partner of choice for national and international companies around the world.

## RELEVANT APPLICATIONS

 High Rise Buildings	 Airports	 Hospitals	
 Educational Institutions	 Tunnels	 Shopping Centres	 Hotels



# CABLES IN FIRE SITUATIONS

## CABLES IN FIRE SITUATIONS

The hazard from cables involved in a fire can take many forms, from the ease of ignition and flame propagation to the evolution of smoke and toxic gases. Many tests have been developed over the years in an attempt to evaluate the potential performance of both individual materials and complete cables.

### FLAME PROPAGATION

Flame Retardant cable indicates a cable that will inhibit or resist the spread of fire along the cable run. Most buildings include cabling, which usually burns in the unfortunate event of a fire. Flame propagation test IEC 60332-1, BS EN 60332-1, is used to measure the resistance to vertical flame propagation for a single vertical electrical insulated conductor or cable under fire conditions. While the flame propagation test following IEC 60332-3 is used to test the vertical flame spread of vertically-mounted bunched wires or cables. Safer cables can help by preventing the propagation of a fire from one room to adjacent rooms.

Cable designs can be optimized to enhance their performance in fires, such as the use of 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 minimum 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 materials only, and it does not measure the cable performance in the presence of fire. LOI should only be used as an indicator of which material's performance is better.



### 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 gases under normal conditions, bromine is a liquid and iodine is a solid. With a little heat, they all turn to gas. 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 gases can also form acids when they come into contact with moist living surfaces such as eyes and lungs, causing serious injury. To overcome the problems associated with the release of chlorine gas, halogen-free cables are used.

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



TOXIC GAS EMISSION

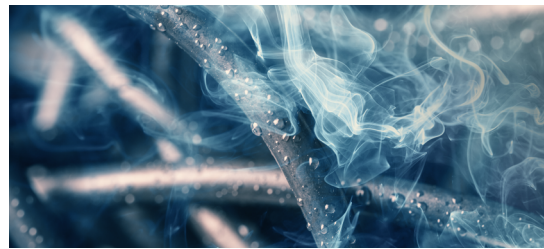
Burning cables will release different toxic gasses when burned with different levels of toxicity. An increase in the concentration of any other gases that are not oxygen can lead to a situation where individuals are at risk. The emission of toxic gases is highly poisonous and can be a larger threat than the heat as it can cause damage to the lungs, living tissue, the central nervous system, severe illness, or even death. Carbon dioxide is considered benign, however when it is present in larger quantities for longer sufficient time, it might pose a risk by displacing the required amount of oxygen reaching the body. There are standard tests that have been devised that can be used to calculate the toxicity index for a product.



SMOKE EMISSION

Smoke evolution is another critical performance indicator. It is important that the cable produces as low amounts of opaque smoke and harmful emissions as possible. Smoke impairs the visibility of the fire exit routes causing hindrance to people trying to escape a fire. It is also the cause of displacing oxygen & inhaling of toxic gases with damage to the respiratory system.

Lower emissions of acids and smoke can also help to reduce panic and physical harm to people and are essential in aiding the location and use of emergency exits.



FIRE CABLES PERFORMANCE

FLAME RETARDANT CABLES

Cables can, depending on their installation conditions or their installation locations, impact the fire by different means. They might be the source of propagating the fire from one room to another, between different floors and even across different buildings. Flame retardant cables can help by preventing the propagation of a fire from one room to adjacent rooms, and produce as low amounts of opaque smoke and harmful emissions as possible.

These cables have special properties that will restrict flames propagating and contain low-smoke zero halogen jacketing / outer sheaths composed of thermoplastic compounds that emit limited smoke and no halogen gases when exposed to high sources of heat. This material tends to self-extinguish, which limits fire spreading in such fire conditions.

CIRCUIT INTEGRITY CABLES/ FIRE RESISTANCE CABLE

In the event of a fire or similar emergency, circuit integrity cables are meant to continue delivering power for a period of time. OCIFLAM Circuit integrity cables are intended to be used in situations where special circuits need to be maintained for a specific time despite being burned. These include places with fire hazards and a high concentration of people or material assets, and also in places which have high safety level requirements.

The performance of these cables is assessed through different fire-resistance tests, where different standardized fire conditions are simulated for specific periods of time. Fire alarms, sprinkler systems, emergency lighting and smoke ventilation systems are all examples, of where fire resistant cables are essential. In addition, those cables are verified against low smoke evolution and no toxic or halogen gases emissions.

Circuit integrity cables have a significant role in applications where the cables need to continue to operate even in the event of a fire.

CABLES ARE A KEY CONTRIBUTOR TO A SAFE AND HEALTHY BUILT ENVIRONMENT, ADDING SAFETY BENEFITS AND PROTECTING ASSETS

Life Protection

More time to escape

Less hazardous environment for rescue teams

Buildings protection

# FIRE AND FLAME PERFORMANCE STANDARDS

## FIRE & FLAME 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 RETARDANCY	
BSEN/ IEC 60332-1	Test for vertical flame propagation for a single insulated wire or cable.
BSEN/ IEC 60332-3	Test for vertical flame spread of vertically-mounted bunched wires or cables. [Category A, B or C]
SMOKE EMISSION	
BSEN/ IEC 61034	Measurement of smoke density of cables burning under defined conditions.
HALOGEN GAS EMISSION	
BSEN/ IEC 60754-1	Determination of the halogen acid gas content.
BSEN/ IEC 60754-2	Determination of acidity (by pH measurement) & conductivity.
CIRCUIT INTEGRITY TEST / FIRE RESISTANCE TEST	
IEC 60331	IEC circuit integrity tests.
EN 50200	European circuit integrity tests, suitability for PH120.
BS 6387	Test method for resistance to fire of cables required to maintain circuit integrity under fire conditions. [Category "CWZ"]
BS 7846	Fire-resistant armoured cables of rated voltage 600/1000 V for fixed installations, having low emission of smoke & corrosive gases when affected by fire. [Category "F2", "F30", "F60" & "F120".]
BS 8434-2	Methods of test for assessment of the fire integrity of electric cables – BS EN 50200 with a 930 C flame and with water spray.
BS 8491	Method for assessment of fire integrity of large diameter power cables for use as components for smoke and heat control systems and certain other active fire safety systems
LIMITING OXYGEN INDEX	
ISO 4589/ ASTMD 2863	Measurement of Minimum Oxygen Index (LOI)



# OCIFLAM CABLES

## OCIFLAM CABLES

OCIFLAM cables are Low Voltage cables that are designed and tested to perform under different fire conditions. Selecting the right OCIFLAM cables depends on different installation requirements, safety regulations and whether a cable is required to maintain circuit integrity or not. OCIFLAM LSZH as an example, is the suitable option for places where, emission of smoke and toxic halogen gases can pose risks to personnel and equipment. OCIFLAM Circuit integrity cables which are also named as fire survival cables are tested to maintain electrical power, while they are burning, for a specific period of time. In addition, these cables have the previously mentioned characteristic of low smoke, no halogen emissions, and flame retardancy.

REFERENCE TABLE TO FLAME RETARDANT & CIRCUIT INTEGRITY CABLES

CABLE TYPE	SPECIFICATIONS	CABLE SIZE RANGE (mm²)	STANDARD	CIRCUIT INTEGRITY CATEGORY	TABLE REFERENCE
OCIFLAM-LSHU	LV Power Cable Single Core	1.5 - 1000	IEC 60502-1	Not Applicable	Table 1
	LV Power Cable Multi-Core (2c, 3c & 4c)	1.5 - 400			Table 1
	V Power Cable Multi-Core (3.5c)	25 - 400			Table 1
	LV Power Cable Multi-Core (5c)	1.5 - 70			Table 1
OCIFLAM-LSHA	LV Power Cable Single Core	10 - 1000	BS 6724*	Not Applicable	Table 2
	LV Power Cable Multi-Core (2c, 3c, & 4c)	1.5 - 400			Table 2
	LV Power Cable Multi-Core (5c)	1.5 - 70			Table 2
OCIFLAM X	Alarm cable 2C	1.5-2.5	BS 7629-1 STANDARD 60 & BS EN 50200 &BS EN 50200 & BS 6387	PH120 & ANNEX E & CWZ	Table 3
OCIFLAM-FS1	Wire/ Single Core	1.5 - 630	BS 6387	CWZ	Table 4
OCIFLAM-FSA	LV Power Cable Multi-Core	1.5 - 400	BS 7846	F2	Table 5
OCIFLAM1-PREMIUM	LV Power Cable Multi-Core	1.5 - 6	BS 7846 & BS EN 50200	PH120	Table 6
OCIFLAM2-PREMIUM	LV Power Cable Multi-Core	10 - 400	BS 7846	F120	Table 6

\*Can be offered as per IEC 60502-1

CABLE TYPE	FIRE CHARACTERISTIC				INSULATION	OUTER SHEATH
	FLAME RETAR-DANCY	HALOGEN GAS EMISSION	SMOKE EMISSION	MAINTAIN CIRCUIT INTEGRITY		
Standard PVC	Poor	High	High	No	XLPE	PVC
Standard PE	Poor	Low	Low	No	XLPE	PE
FR PVC	Good	High	High	No	XLPE	Flame retardant PVC
FR PE	Good	Low	Low	No	XLPE	Flame retardant PE
OCIFLAM-LSHU	Good	Low	Low	No	XLPE	LSZH
OCIFLAM-LSHA	Good	Low	Low	No	XLPE	LSZH
OCIFLAM-FS1	Good	Low	Low	Yes	LSZH	NA
OCIFLAM-FSA	Good	Low	Low	Yes	XLPE	LSZH
OCIFLAM1-PREMIUM						
OCIFLAM2-PREMIUM						
OCIFLAM-X	Good	Low	Low	Yes	LSZH	LSZH

- Black = Standard cables
- Yellow = Intrinsic fire properties
- Green = Enhanced fire properties

# OCIFLAM

## PRODUCT RANGE

# OCIFLAM

## PRODUCT RANGE

### OCIFLAM LOW SMOKE ZERO HALOGEN CABLES

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

### CONSTRUCTIONAL FEATURES

#### CONDUCTOR

The conductor is the metallic part of cables that carries the electric current. The better the material, the better the conductivity. Cables Conductor material shall be of copper or Aluminium. The conductor structure shall comply to the requirements of BS EN 60228 / IEC 60228.

#### INSULATION

Each core conductor is insulated by extruded cross-linked polyethylene. The insulating compound is a developed material suitable for application through extrusion process. The insulation thickness is selected based on the designated voltage grade complying with IEC 60502-1/ BS 6724.

#### CORE IDENTIFICATION

Core identification is provided by colored insulation or number printing. Depending upon the customer's project requirement, Oman Cables has the capability to provide color identification.

#### CORE ASSEMBLY

In case of multi-core cables, the insulated cores are laid up together with non-hygroscopic polypropylene (PP) filler followed by binder tape. PP Fillers are generally used to maintain cable circularity whereas binder tape is provided to hold the laid-up assembly together.

#### BEDDING

The extruded bedding layer serves as a bedding for armour wires. This helps to protect the laid-up core assembly from damage.

#### ARMOURING

Armouring provides mechanical protection against crushing forces. Armour also can serve as an Earth Continuity Conductor (ECC). For fire retardant cables, shall be of round wire. Armouring material can be galvanized steel for multi-core cables and aluminum for single core cables.

#### OUTER SHEATH

This is the outer layer of the cable which protects against the surrounding environment. Depending upon the special properties & the application area, special additives are added to meet below properties:

- Anti-rodent & termite resistant property.
- UV resistant property.
- Oil resistant property.
- Flame retardant property.

# TECHNICAL SECTION



# OCIFLAM-LSHU

## COPPER CONDUCTOR, XLPE INSULATION, UNARMoured & LSZH SHEATH, LOW VOLTAGE CABLE.

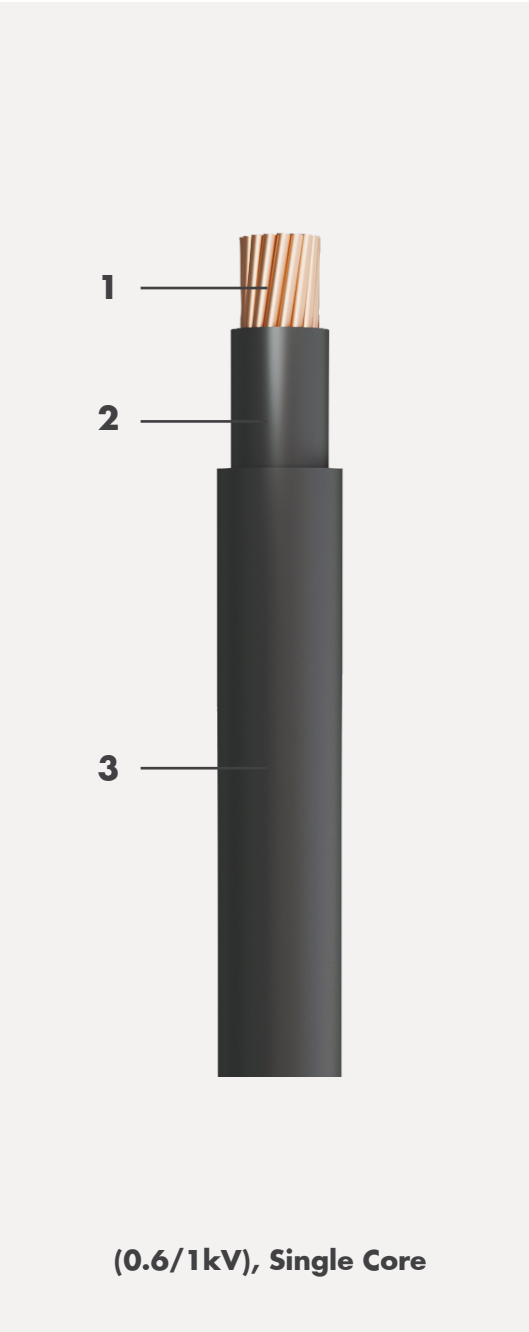
### APPLICATION

OCIFLAM-LSHU are installed in areas where smoke and acid gas evolution could pose a hazard to personnel or sensitive equipment, but where circuit integrity is not needed. They are meant to be used in a situation where large numbers of people are gathered in confined spaces such as airports, hotels, malls, hospitals, and similar areas of critical importance.

### CONSTRUCTION

Stranded annealed plain copper conductor, XLPE insulation, and overall extruded LSZH outer sheath.

- 1. **Conductor**  
Copper conductor
- 2. **Insulation**  
XLPE
- 3. **Outer Sheath**  
Extruded overall LSZH outer sheath.

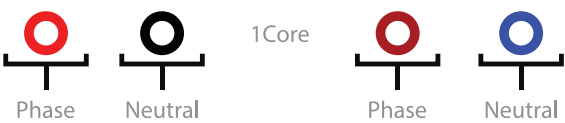


### APPLICATION STANDARDS

OCIFLAM-LSHU wires are designed & tested to meet the requirements of below standard:  
IEC 60502-1

Oman Cables can also supply a range of alternative designs to meet customer specified requirements.

### CORE COLOUR IDENTIFICATION:



Note: Oman Cables has the capability to provide colour identification as per project requirements.

### CHARACTERISTICS

MAX. Operating Temperature	MAX. short circuit Temperature	Flame Propagation IEC 60332-1	Flame Spread IEC 60332-3-24(c)	Low smoke emission IEC 61034	Halogen free IEC 60754-1	Acidity and toxicity IEC 60754-2	Oxygen Index ASTM D2863

### CABLE INSTALLATION

In Ground With Protection	In Free Air Ladders/Trays	In Duct	In Trench	Internal Cabling	Minimum Bending Radius 8 X OD

# OCIFLAM-LSHU

## COPPER CONDUCTOR, XLPE INSULATION, UNARMOURED & LSZH SHEATH, LOW VOLTAGE CABLE.

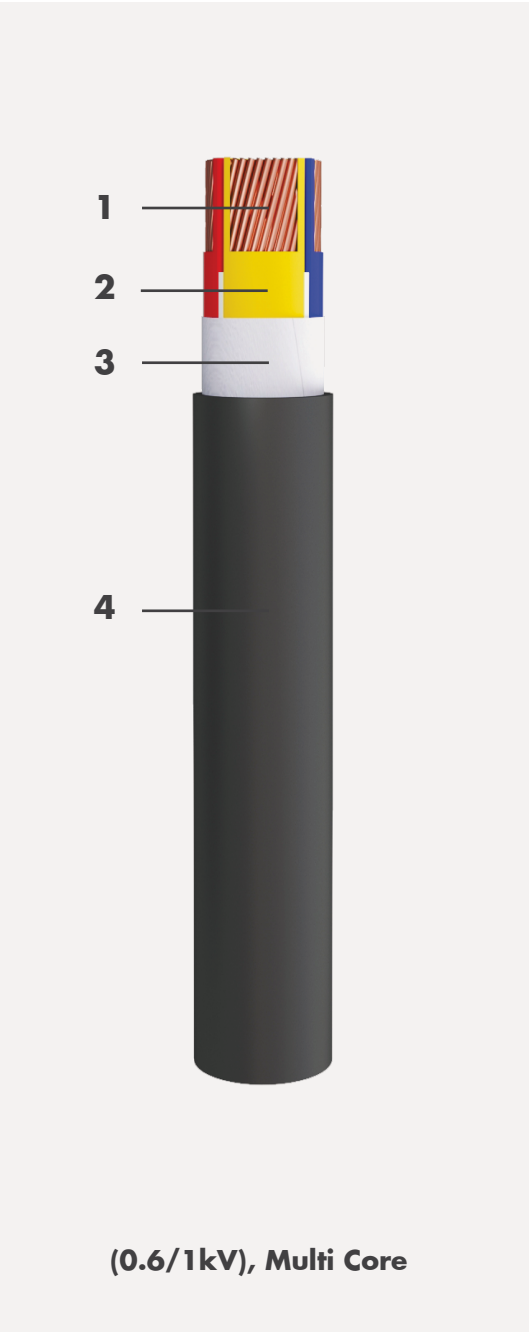
### APPLICATION

OCIFLAM-LSHU are installed in areas where smoke and acid gas evolution could pose a hazard to personnel or sensitive equipment, but where circuit integrity is not needed. They are meant to be used in a situation where large numbers of people are gathered in confined spaces such as airports, hotels, malls, hospitals, and similar areas of critical importance.

### CONSTRUCTION

Stranded annealed plain copper conductor, XLPE insulation, non-hygroscopic fillers & binder tape (as required) and overall extruded LSZH outer sheath.

- 1. Conductor**  
Copper conductor
- 2. Insulation**  
XLPE
- 3. Fillers & Binder Tape**  
Non-hygroscopic fillers & binder tape (as required)
- 4. Outer Sheath**  
Extruded overall LSZH outer sheath.

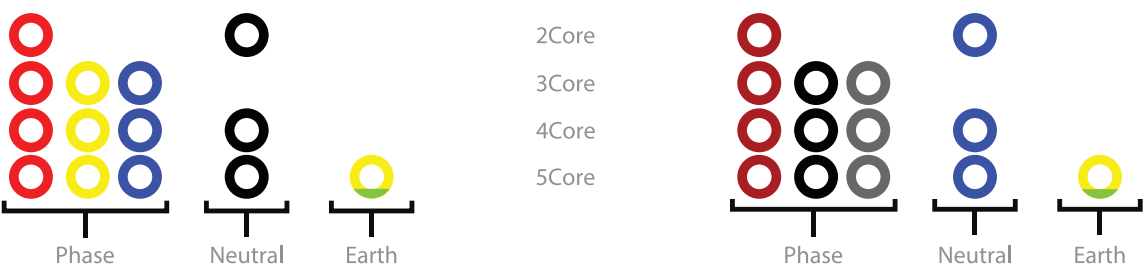


### APPLICATION STANDARDS

OCIFLAM-LSHU wires are designed & tested to meet the requirements of below standard:  
IEC 60502-1

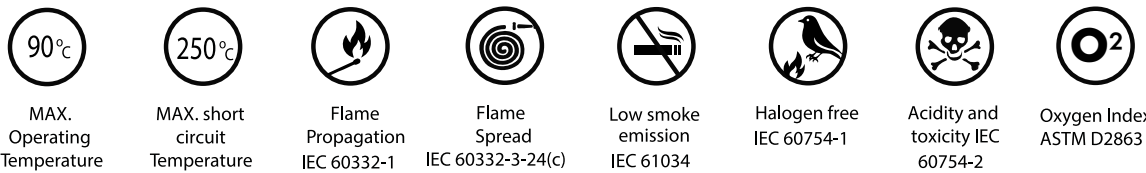
Oman Cables can also supply a range of alternative designs to meet customer specified requirements.

### CORE COLOUR IDENTIFICATION

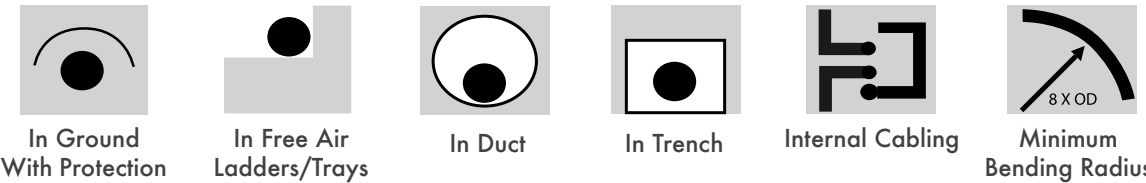


Note: Oman Cables has the capability to provide colour identification as per project requirements.

### CHARACTERISTICS



### CABLE INSTALLATION



OCIFLAM-LSHU Electric cables – Thermosetting insulated, unarmoured cables of rated voltages of 600/1000 V having low emission of smoke and corrosive gases when affected by flame.

Table 1

Cable size	Electrical Parameters						Current Rating										
	DC Resistance (Ω/km)	AC Resistance (Ω/km)	Reactance (Approx.) at 50Hz. (Ω/km)	Impedance (Approx.) at 50Hz. (Ω/km)		Voltage Drop (Approx.) (mV/A/m)			Ground at 35°C, (A)			Air at 50°C, (A)					
				1 C	Multi-core	1 C	2 C	3C/4C/5 C	1 C	2 C	3 C/4 C	5 C	1 C	2 C	3 C/4 C	5 C	
1.5	12.1	15.43	0.172	0.105	15.431	15.43	26.73	30.86	26.72	-	33	28	24	22	22	19	16
2.5	7.41	9.45	0.158	0.099	9.451	9.451	16.37	18.90	16.37	-	42	36	30	30	30	27	22
4	4.61	5.88	0.144	0.093	5.882	5.881	10.19	11.76	10.19	-	56	47	40	39	39	34	28
6	3.08	3.93	0.131	0.089	3.932	3.931	6.81	7.86	6.81	-	70	59	50	49	50	44	36
10	1.83	2.33	0.118	0.084	2.333	2.332	4.04	4.66	4.04	82	94	79	68	67	67	58	48
16	1.15	1.47	0.112	0.081	1.474	1.472	2.55	2.94	2.55	108	121	102	87	92	97	83	70
25	0.727	0.927	0.099	0.081	0.932	0.931	1.61	1.86	1.61	139	157	131	113	123	122	105	88
35	0.524	0.668	0.095	0.079	0.675	0.673	1.17	1.35	1.17	165	188	157	135	146	151	129	109
50	0.387	0.494	0.092	0.078	0.502	0.5	0.87	1.00	0.87	199	223	187	161	174	183	157	132
70	0.268	0.342	0.087	0.074	0.353	0.35	0.61	0.70	0.61	244	273	229	197	222	232	200	167
95	0.193	0.247	0.084	0.072	0.261	0.257	0.45	0.51	0.45	292	328	274	-	275	287	246	207
120	0.153	0.197	0.082	0.072	0.213	0.21	0.37	0.42	0.36	332	372	312	-	321	335	288	241
150	0.124	0.16	0.082	0.073	0.18	0.176	0.31	0.35	0.30	371	417	349	-	371	383	330	276
185	0.0991	0.128	0.081	0.072	0.151	0.147	0.26	0.29	0.25	417	470	394	-	430	444	381	320
240	0.0754	0.099	0.079	0.071	0.127	0.122	0.22	0.24	0.21	480	544	455	-	513	529	454	381
300	0.0601	0.080	0.078	0.071	0.112	0.107	0.19	0.21	0.19	536	609	509	-	594	611	524	440
400	0.047	0.065	0.077	0.07	0.101	0.096	0.17	0.19	0.17	594	687	574	-	692	711	608	512
500	0.0366	0.053	0.076	0.07	0.093	0.088	0.16	0.18	0.15	658	-	-	-	801	784	671	-
630	0.0283	0.043	0.076	0.07	0.087	0.082	0.15	0.16	0.14	723	-	-	-	925	873	746	-
800	0.0221	0.038	0.075	-	0.084	-	0.15	--	--	764	-	-	-	1051	-	-	-
1000	0.0176	0.032	0.074	-	0.081	-	0.14	--	--	810	-	-	-	1172	-	-	-

Table 1 Continued

Physical Dimensions														
Approx. Cable OD, mm					Approx. Cable Weight, kg/km					Standard Drum Length, m				
1 C	2 C	3 C	4 C	5 C	1 C	2 C	3 C	4 C	5 C	1 C	2 C	3 C	4 C	5 C
8.7	11.0	11.5	12.5	13.5	100	160	175	205	235	1000	1000	1000	1000	1000
8.8	12.0	12.5	13.5	14.5	105	190	220	255	300	1000	1000	1000	1000	1000
8.9	13.0	13.5	15.0	16.0	115	240	280	330	390	1000	1000	1000	1000	1000
9.0	14.5	15.0	16.0	17.5	130	300	360	430	515	1000	1000	1000	1000	1000
10.0	16.0	17.0	17.0	18.5	170	415	505	540	635	1000	1000	1000	1000	1000
10.5	16.0	17.0	18.5	20.5	230	465	635	785	920	1000	1000	1000	1000	1000
10.5	15.5	17.5	21.0	25.0	290	600	875	1130	1395	1000	1000	1000	1000	1000
11.5	17.5	20.0	23.5	27.5	380	790	1160	1500	1855	1000	1000	1000	1000	1000
13.0	20.0	23.0	25.5	31.5	500	1040	1530	1985	2600	1000	1000	1000	1000	500
15.0	22.5	26.5	30.0	36.5	695	1445	2145	2800	3645	1000	1000	1000	1000	500
16.5	25.5	29.5	33.5	41.5	950	1960	2900	3800	4990	1000	1000	1000	500	500
18.5	27.5	33.0	39.0	46.0	1185	2445	3630	4785	6275	1000	1000	500	500	500
20.5	31.0	37.0	43.0	51.5	1460	3020	4495	5905	7715	1000	500	500	500	500
22.5	33.5	40.0	48.0	57.0	1810	3735	5560	7355	9635	1000	500	500	500	500
25.0	40.5	46.0	53.5	64.0	2355	4885	7240	9560	12555	1000	500	500	250	250
27.5	44.5	51.5	59.5	71.0	2935	6090	9040	11930	15650	1000	500	500	250	250
31.0	50.0	56.0	67.5	80.5	3720	7775	11540	15285	19900	500	500	250	250	250
34.5	53.5	62.0	73.0	90.0	4755	9940	14800	19580	25400	500	500	250	250	250
39.0	60.0	69.5	82.0	-	6135	12800	19025	25220	-	500	500	250	-	-
43.5	-	-	-	-	7835	-	-	-	-	500	-	-	-	-
48.5	-	-	-	-	9775	-	-	-	-	500	-	-	-	-

Applicable standard : IEC 60502-1  
Flame retardant property : IEC 60332-3-24 (C)  
Fire resistant property : Not Applicable  
Oxygen Index, LOI : ASTM D-2863  
Smoke Density : BS EN / IEC 61034  
Halogen gas emission : BS EN / IEC 60754-1 & BS EN / IEC 60754-2

Installation conditions :  
Depth of Laying in Ground: 0.5 Mtr  
Thermal resistivity of soil : 1.2 Km/W  
1 core cables are considered with Trefoil touching  
Unarmoured cables are not recommended for underground application.



# OCIFLAM-LSHA

## COPPER CONDUCTOR, XLPE INSULATION, LSZH BEDDING, WIRE ARMoured & LSZH SHEATH, LOW VOLTAGE CABLE.

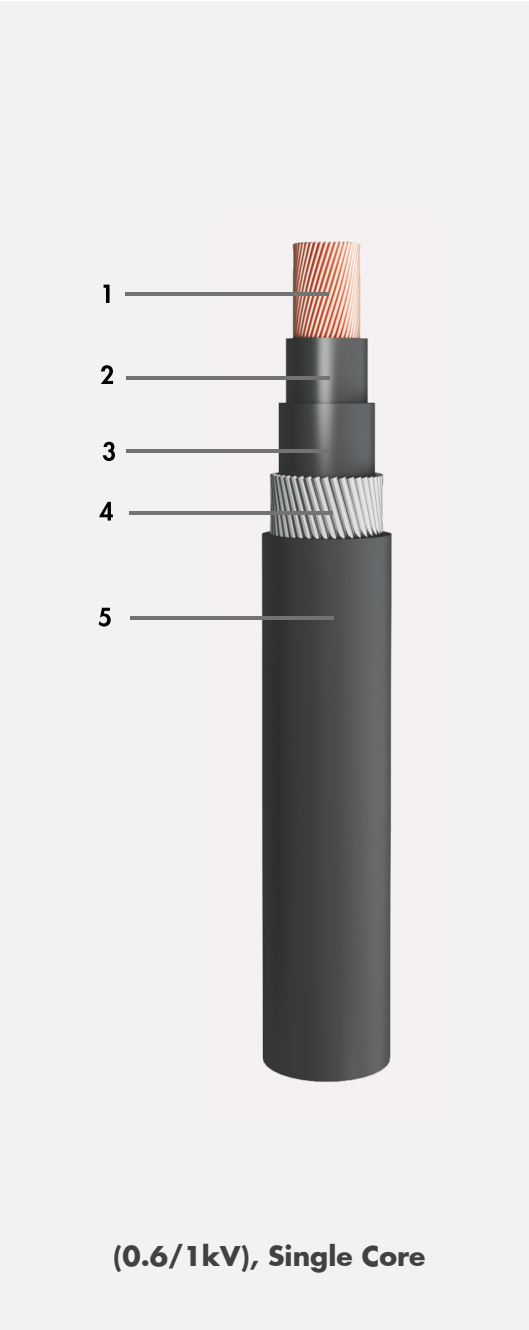
### APPLICATION

OCIFLAM-LSHA are installed in areas where smoke and acid gas evolution could pose a hazard to personnel or sensitive equipment, but where circuit integrity is not needed. They are meant to be used in a situation where large numbers of people are gathered in confined spaces such as airports, hotels, malls, hospitals, and where mechanical protection is essential.

### CONSTRUCTION

Stranded annealed plain copper onductor, XLPE insulation, extruded LSZH bedding, round wire armour and overall extruded LSZH outer sheath.

- 1. **Conductor**  
Copper conductor
- 2. **Insulation**  
XLPE
- 3. **Bedding**  
Extruded LSZH
- 4. **Armour**  
Wire armour
- 5. **Outer Sheath**  
Extruded overall LSZH outer sheath.



### APPLICATION STANDARDS

OCIFLAM-LSHA wires are designed & tested to meet the requirements of below standard:  
BS 6724  
IEC 60502-1 (Non BASEC)



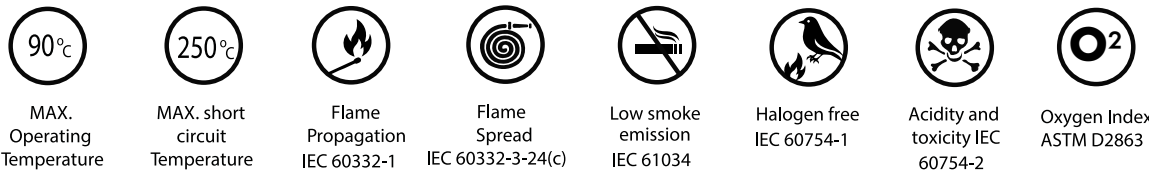
Oman Cables can also supply a range of alternative designs to meet customer specified requirements.

### CORE COLOUR IDENTIFICATION:

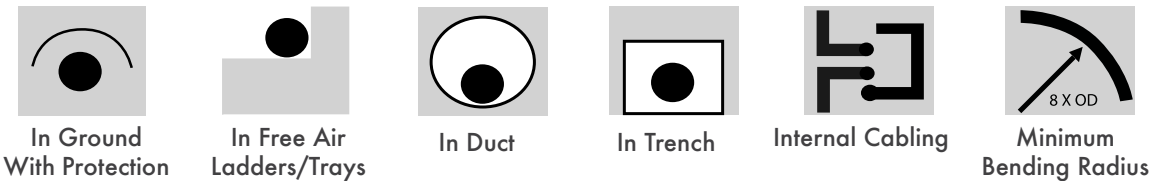


Note: Oman Cables has the capability to provide colour identification as per project requirements.

### CHARACTERISTICS



### CABLE INSTALLATION



# OCIFLAM-LSHA

## COPPER CONDUCTOR, XLPE INSULATION, LSZH BEDDING, WIRE ARMoured & LSZH SHEATH, LOW VOLTAGE CABLE.

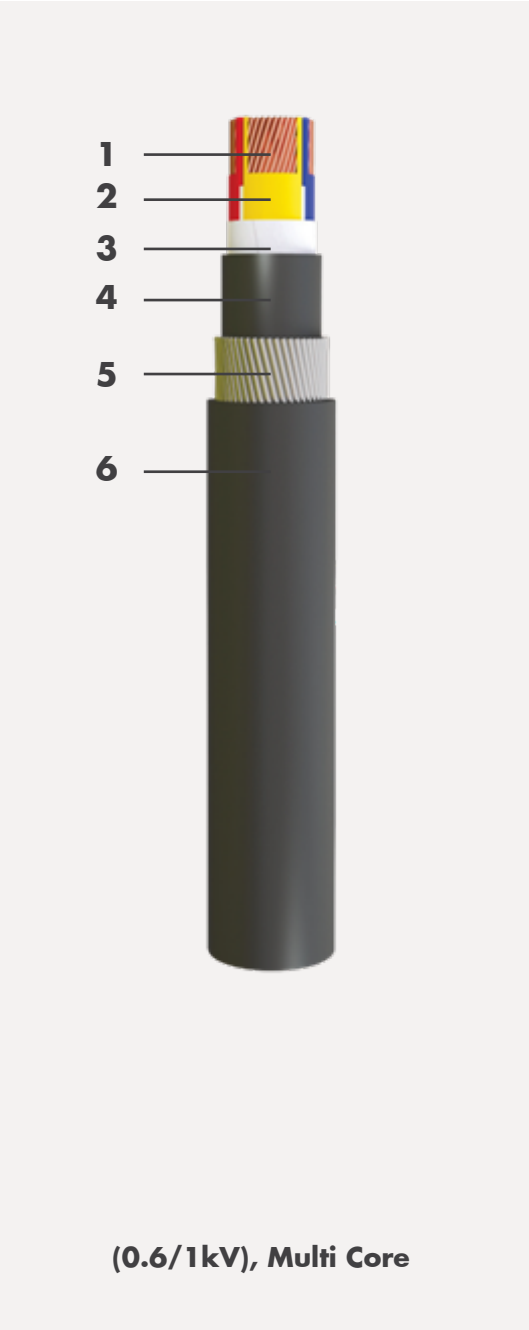
### APPLICATION

OCIFLAM-LSHA are installed in areas where smoke and acid gas evolution could pose a hazard to personnel or sensitive equipment, but where circuit integrity is not needed. They are meant to be used in a situation where large numbers of people are gathered in confined spaces such as airports, hotels, malls, hospitals, and where mechanical protection is essential.

### CONSTRUCTION

Stranded annealed plain copper conductor, XLPE insulation, non-hygroscopic fillers & binder tape (as required), extruded LSZH bedding, round wire armour and overall extruded LSZH outer sheath.

- 1. Conductor**  
Copper conductor
- 2. Insulation**  
XLPE
- 3. Fillers & Binder Tape**  
Non-hygroscopic fillers & binder tape (as required)
- 4. Bedding**  
Extruded LSZH
- 5. Armour**  
Wire armour
- 6. Outer Sheath**  
Extruded overall LSZH outer sheath.



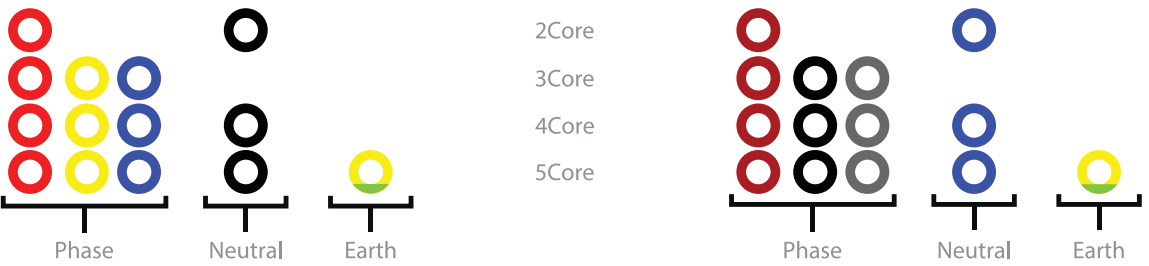
### APPLICATION STANDARDS

OCIFLAM-LSHA wires are designed & tested to meet the requirements of below standard:  
BS 6724  
IEC 60502-1 (Non BASEC)



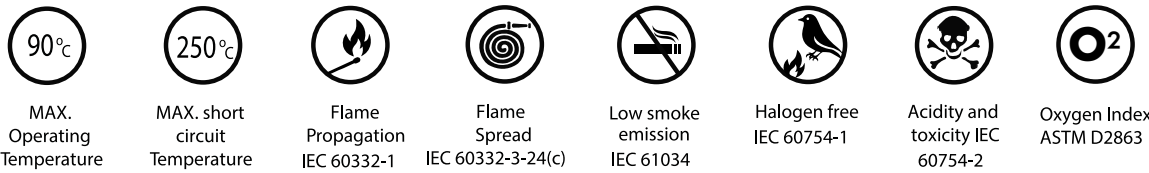
Oman Cables can also supply a range of alternative designs to meet customer specified requirements.

### CORE COLOUR IDENTIFICATION

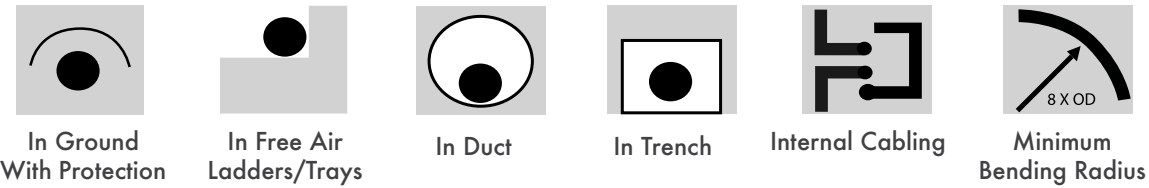


Note: Oman Cables has the capability to provide colour identification as per project requirements.

### CHARACTERISTICS



### CABLE INSTALLATION



OCIFLAM-LSHA Electric cables – Thermosetting insulated, armoured cables of rated voltages of 600/1000 V having low emission of smoke and corrosive gases when affected by flame.

Table 2

Cable size	Electrical Parameters						Current Rating													
	DC Resistance (/km)	AC Resistance (/km)	Reactance (Approx.) at 50Hz. (/km)	Impedance (Approx.) at 50Hz. (/km)	Voltage Drop (Approx.) (mV/A/m)		Ground at 35 °C, (A)					Ground at 35 °C, (A)					Air at 50 °C, (A)			
(mm )			1 C	Multi-core	1 C	2 C	3 C /4 C	1 C	2 C	3 C/4 C	5 C	1 C	2 C	3 C /4 C	5 C	1 C	2 C	3 C /4 C	5 C	
1.5	12.1	15.43	-	0.106	-	30.86	26.72	-	33	28	24	-	27	22	19	-	24	20	17	
2.5	7.41	9.45	-	0.1	-	18.90	16.37	-	42	36	30	-	35	29	25	-	32	27	23	
4	4.61	5.88	-	0.093	-	11.76	10.19	-	56	47	40	-	46	39	33	-	43	37	31	
6	3.08	3.93	-	0.089	-	7.86	6.81	-	70	59	50	-	58	48	42	-	55	46	40	
10	1.83	2.33	0.138	0.084	2.334	4.66	4.04	82	94	79	68	78	77	65	55	67	74	64	53	
16	1.15	1.47	0.131	0.081	1.476	2.94	2.55	108	121	102	87	101	99	83	71	92	98	83	71	
25	0.727	0.927	0.126	0.081	0.936	1.62	1.61	139	157	131	113	134	127	107	91	123	128	109	92	
35	0.524	0.668	0.12	0.079	0.679	1.18	1.17	165	188	157	135	154	153	128	110	146	158	134	114	
50	0.387	0.494	0.114	0.078	0.507	1.00	0.87	199	223	187	161	199	181	152	130	180	190	163	137	
70	0.268	0.342	0.106	0.074	0.358	0.70	0.61	244	273	229	197	239	224	187	161	230	239	205	172	
95	0.193	0.247	0.102	0.073	0.267	0.52	0.45	292	328	274	-	281	269	226	-	282	295	253	-	
120	0.153	0.197	0.099	0.072	0.22	0.42	0.36	332	372	312	-	315	307	258	-	328	341	293	-	
150	0.124	0.16	0.099	0.073	0.188	0.33	0.30	371	417	349	-	341	345	291	-	377	389	335	-	
185	0.0991	0.128	0.096	0.072	0.16	0.29	0.25	417	470	394	-	376	391	329	-	433	449	386	-	
240	0.0754	0.099	0.093	0.071	0.136	0.24	0.21	480	544	455	-	421	453	380	-	510	530	456	-	
300	0.0601	0.080	0.091	0.071	0.121	0.21	0.19	536	609	509	-	459	509	427	-	581	605	519	-	
400	0.047	0.065	0.09	0.07	0.111	0.19	0.17	594	687	574	-	488	575	490	-	664	696	597	-	
500	0.0366	0.053	0.089	-	0.104	-	-	658	-	-	-	529	-	-	-	751	-	-	-	
630	0.0283	0.043	0.087	-	0.097	-	-	723	-	-	-	571	-	-	-	846	-	-	-	
800	0.0221	0.038	0.086	-	0.094	-	-	764	-	-	-	595	-	-	-	919	-	-	-	
1000	0.0176	0.032	0.085	-	0.091	-	-	810	-	-	-	632	-	-	-	997	-	-	-	

Table 2 Continued

Physical Dimensions																
Approx. Cable OD, mm					Approx. Cable Weight, kg/km					Standard Drum Length, m						
1 C	2 C	3 C	4 C	5 C	1 C	2 C	3 C	4 C	5 C	1 C	2 C	3 C	4 C	5 C		
-	11.5	12.0	13.0	14.0	-	255	280	315	355	-	1000	1000	1000	1000	1000	
-	12.5	13.0	14.0	15.0	-	305	345	390	450	-	1000	1000	1000	1000	1000	
-	13.5	14.5	15.5	16.5	-	370	415	480	560	-	1000	1000	1000	1000	1000	
-	15.0	15.5	17.5	19.0	-	450	510	685	790	-	1000	1000	1000	1000	1000	
12.5	17.0	18.5	20.0	21.5	230	590	780	885	1020	1000	1000	1000	1000	1000	1000	
13.0	19.5	20.5	22.0	25.0	295	810	995	1200	1525	1000	1000	1000	1000	1000	1000	
14.5	19.0	22.0	25.5	29.5	405	950	1395	1720	2135	1000	1000	1000	1000	1000	1000	
15.5	22.0	25.0	28.0	32.5	505	1305	1740	2170	2690	1000	1000	1000	1000	1000	500	
17.0	25.0	27.5	30.5	37.5	645	1635	2175	2725	3795	1000	1000	1000	500	500	500	
19.5	27.5	31.0	36.0	42.5	900	2125	2865	3935	5050	1000	1000	500	500	500	500	
21.5	31.0	35.5	39.5	-	1175	2910	3930	5020	-	1000	500	500	500	-	-	
22.0	33.5	39.0	46.0	-	1400	3480	4770	6525	-	1000	500	500	500	-	-	
25.0	37.0	44.5	50.0	-	1760	4140	6155	7855	-	1000	500	500	500	-	-	
27.5	41.0	47.0	55.5	-	2155	5345	7385	9525	-	1000	500	500	500	-	-	
30.0	47.5	53.0	61.0	-	2730	6705	9280	12005	-	1000	500	500	250	-	-	
32.5	52.0	59.0	66.5	-	3345	8060	11270	14595	-	500	500	500	250	-	-	
37.0	57.0	63.0	76.5	-	4285	10005	14000	18990	-	500	500	250	250	-	-	
40.5	-	-	-	-	5375	-	-	-	-	500	-	-	-	-	-	
44.5	-	-	-	-	6815	-	-	-	-	500	-	-	-	-	-	
51.0	-	-	-	-	8780	-	-	-	-	500	-	-	-	-	-	
55.5	-	-	-	-	10805	-	-	-	-	500	-	-	-	-	-	

Applicable standard : BS 6724 (Can be offered in line with IEC 60502-1 also)  
Flame retardant property : IEC 60332-3-24 (C)  
Fire resistant property : Not Applicable  
Oxygen Index, LOI : ASTM D-2863  
Smoke Density : BS EN / IEC 61034  
Halogen gas emission : BS EN / IEC 60754-1 & BS EN / IEC 60754-2

Installation conditions:  
Depth of laying in ground : 0.5 Mtr.  
Thermal resistivity of soil : 1.2 Km/W  
1 core cables are considered with Trefoil touching  
Unarmoured cables are not recommended for underground application.



# OCIFLAM FIRE SURVIVAL / 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. In addition to their circuit integrity operation during a fire, they are also flame retardant, and only emit small amounts of smoke, with no corrosive gas emissions.

### APPLICATIONS

OCIFLAM Circuit integrity cables are intended to be used in situations 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 fire fighting facilities such as water pumps and sprinklers
- Circuits of lifts and escalators

Cable OCI Brand	Type	Circuit Integrity Category
OCIFLAM-FS1	Wire	BS 6387 (CWZ)
OCIFLAM-FSA	LV Power Cable Multi-Core	F2
OCIFLAM1 PREMIUM	LV Power Cable Multi-Core	PH120
OCIFLAM2 PREMIUM	LV Power Cable Multi-Core	F120
OCIFLAM X	LV Power Cable Multi-Core	BS 6387 (CWZ) BS EN 50200 PH 120 BS EN 50200 ANNEX E

# OCIFLAM PRODUCT RANGE OCIFLAM X FIRE ALARM CABLE

OCIFLAM X is a highly durable and dressable fire alarm cable using unique damage resistant insulation that is easy to terminate and install. Approved for fire alarm systems, emergency lighting systems, critical signal paths and voice alarm systems for ‘Standard’ application areas.

### CONSTRUCTIONAL FEATURES

**Conductor:** The conductor is the metallic part of the cable that carries the electric current. The better the material, the better the conductivity. Conductor shall be of solid annealed copper meeting the requirements of BS EN 60228 / IEC 60228.

**Insulation:** Insulation shall be applied directly over copper conductor. Insulation material shall be of EI5 type.

**Core identification:** Core identification is provided by coloured insulation.

**Overall Metallic screen and CPC:** Polyester backed laminated aluminum tape bonded to outer sheath to provide overall screen. This layer is in contact with full sized, tinned annealed copper circuit protective conductor and laid-up with the cores to provide screen earthing.

**Outer Sheath:** This is the outer part of the cable, which protects against the surrounding environment. Outer sheath shall be LSZH material meeting the requirements of LTS-3 type.

# OCIFLAM PRODUCT RANGE

## OCIFLAM CIRCUIT INTEGRITY CABLES AND WIRES

OCIFLAM Circuit Integrity cables are divided into two main categories. The first category is circuit integrity wires, with the name OCIFLAM-FS1 and the second category is armoured Circuit Integrity cables, with the names OCIFLAM-FSA, OCIFLAM1-PREMIUM & OCIFLAM2-PREMIUM.

OCIFLAM Circuit Integrity cables are used for electric power supply, and as control cables for different applications, where maintenance of power supply during a fire is required for a defined period of time. These cables will eliminate the emission of corrosive halogen gases and they are of low smoke emission during combustion. Furthermore, they can resist the propagation of flames when burned.

### CONSTRUCTIONAL FEATURES

**Conductor:** The conductor is the metallic part of cables that is carrying the electric current. The better the material, the better the conductivity. For Fire Resistance Cables, the conductor material is copper. The conductor structure shall comply to the requirements of BS EN 60228 / IEC 60228.

**Glass Mica Tape:** Each individual conductor is wrapped with layer of Glass Mica Tape with suitable overlap. Glass Mica tape consists of laminated mica paper. Such tape provides excellent Insulation characteristics under fire.

**Insulation:** Each core conductor is insulated by extruded cross-linked polyethylene. The insulating compound is a developed material suitable for application through extrusion process. The insulation thickness is selected based on the designated voltage grade complying with IEC 60502-1/ BS 7846.



### CONSTRUCTIONAL FEATURES CONT'D

**Core identification:** Core identification is provided by coloured insulation or number printing. Depending upon the customer's project requirement, Oman Cables has the capability to provide colour identification.

**Core Assembly:** In case of multi-core cables, the insulated cores are laid up together followed by binder tape.

**Bedding:** An extruded bedding layer serves as a bedding for armour wires. This helps to protect the laid-up core assembly from damage.

**Armouring:** The armouring provides mechanical protection against crushing forces. Armouring can also serve as an Earth Continuity Conductor (ECC). For Fire Resistant cables, armouring takes the form of a round wire. Armouring material can be galvanized steel for multi-core cables and aluminum for single core cables.

**Outer Sheath:** This is the outer layer of the cable that protects against the surrounding environment. Depending upon the special properties & the application area, special additives are added to meet below properties:

- Anti-rodent & termite resistant property.
- UV resistant property.
- Oil resistant property.
- Flame retardant property.



# OCIFLAM-FS1

## SINGLE CORE, COPPER CONDUCTOR, GLASS MICA TAPE, LSZH INSULATED FIRE RESISTANT WIRES.

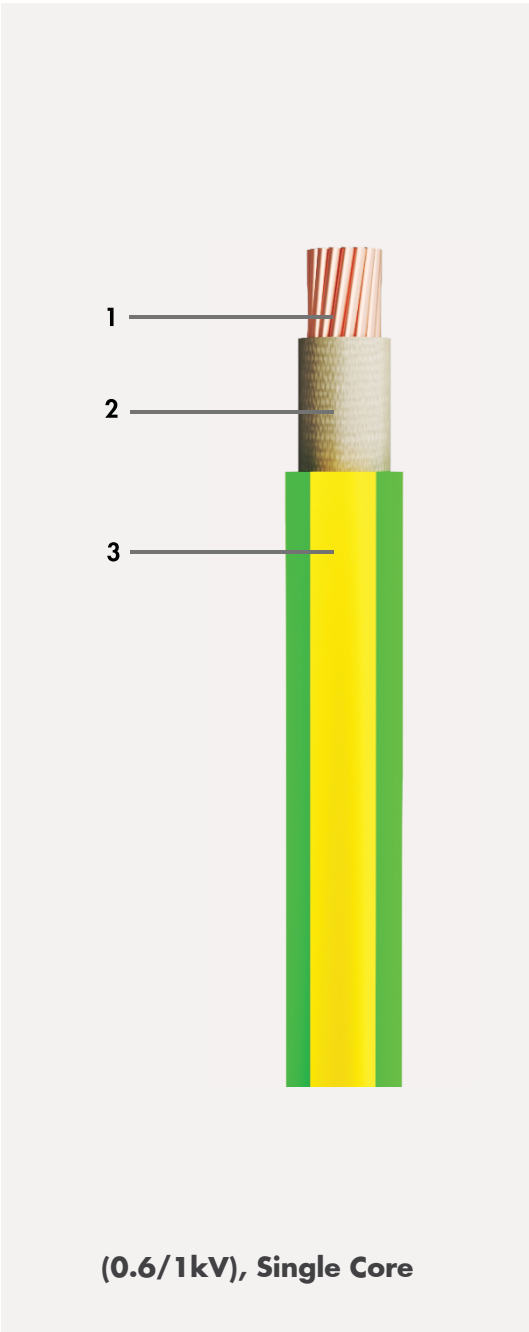
### APPLICATION

OCIFLAM-FS1 Circuit Integrity cables are suitable for use in fixed installations, in applications where maintenance of power supply during a fire is required for a defined period of time, such as for essential safety circuits and in areas where smoke and gas evolution could pose a hazard to personnel or sensitive equipment such as in high-rise buildings, schools, hospitals, hotels, shopping centres, subways, etc.

### CONSTRUCTION

Stranded annealed plain copper conductor, Glass Mica Tape & LSZH (EI-5) insulation.

- 1. **Conductor**  
Copper conductor
- 2. **Fire Barrier Tape**  
Glass Mica Tape
- 3. **Insulation**  
LSZH (Low Smoke Zero Halogen, Type EI-5)



### APPLICATION STANDARDS

OCIFLAM-FS1 wires are designed & tested to meet the requirements of below standard:

- BS EN 60228 (For conductor)
- EN 50525-3-41 (For general construction and testing)
- BS EN 50363-5 (For insulation property)



### CORE COLOUR IDENTIFICATION



Note: Oman Cables has the capability to provide colour identification as per project requirements.

### CHARACTERISTICS

MAX. Operating Temperature	MAX. short circuit Temperature	Flame Propagation IEC 60332-1	Low smoke emission IEC 61034	Halogen free IEC 60754-1	Acidity and toxicity IEC 60754-2	Oxygen Index ASTM D2863	Fire Resistance BS 6387 (C/W/Z)

### CABLE INSTALLATION

In Ground With Protection	In Free Air Ladders/Trays	In Duct	In Trench	Internal Cabling	Minimum Bending Radius 8 X OD



OCIFLAM-FS1 Electric cables – Single core fire-resistant cables with halogen-free insulation of rated voltages of 600/1000 V.

Table 4

Cable size	Electrical Parameters					Current Rating in Air at 50 °C	Physical Dimensions		
	DC Resistance at 90 °C (Max)	AC Resistance at 90 °C (Approx.)	Reactance (Approx.) at 50Hz.	Impedance (Approx.) at 50Hz.	Voltage Drop (Approx.)		Approx. Cable OD	Approx. Cable Weight	Standard Drum Length
(mm²)	(Ω/km)	(Ω/km)	(Ω/km)	(Ω/km)	(mV/A/m)	(A)	(mm)	(kg/km)	(m)
1.5	12.1	15.43	0.133	15.431	26.73	22	5.0	40	1000
2.5	7.41	9.45	0.126	9.451	16.37	30	5.5	50	1000
4	4.61	5.88	0.117	5.881	10.19	39	6.0	70	1000
6	3.08	3.93	3.93	3.932	6.81	49	6.5	90	1000
10	1.83	2.33	0.105	2.332	4.04	67	8.0	140	1000
16	1.15	1.47	0.101	1.473	2.55	92	9.0	195	1000
25	0.727	0.927	0.095	0.932	1.61	123	10.0	285	1000
35	0.524	0.668	0.092	0.674	1.17	146	11.0	380	1000
50	0.387	0.494	0.088	0.502	0.87	174	12.0	495	1000
70	0.268	0.342	0.082	0.352	0.61	222	14.0	685	1000
95	0.193	0.247	0.079	0.259	0.45	275	15.5	930	1000
120	0.153	0.197	0.077	0.212	0.37	321	17.0	1160	1000
150	0.124	0.16	0.077	0.178	0.31	371	18.5	1425	1000
185	0.0991	0.128	0.076	0.149	0.26	430	21.0	1780	1000
240	0.0754	0.099	0.075	0.124	0.21	513	23.5	2330	500
300	0.0601	0.08	0.081	0.114	0.2	594	26.0	2910	500
400	0.047	0.065	0.089	0.11	0.19	692	29.5	3695	500
500	0.0366	0.053	0.096	0.11	0.19	801	33.0	4725	500
630	0.0283	0.043	0.103	0.112	0.19	925	36.5	6050	500
800	0.0221	0.038	0.11	0.116	0.2	1051	40.5	7700	500
1000	0.0176	0.032	0.116	0.12	0.21	1172	45.0	9625	500

Applicable standard : BS EN 60228, BS EN 50363-5, BS EN 50525-3-41 & BS 6387  
Voltage Grade : 600/1000 V  
Flame retardant property : IEC 60332-1 or IEC 60332-3-24 (C) (as per project requirement)  
Fire resistant property : BS 6387, IEC 60331-21  
Oxygen Index, LOI : ASTM D-2863  
Smoke Density : BS EN / IEC 61034  
Halogen gas emission : BS EN / IEC 60754-1 & BS EN / IEC 60754-2

Note: 800mm² and 1000mm² are not covered in LPCB approval.

# OCIFLAM-FSA

## COPPER CONDUCTOR, GLASS MICA TAPE, XLPE INSULATION, LSZH BEDDING, WIRE ARMoured & LSZH SHEATH, LOW VOLTAGE FIRE RESISTANT CABLES.

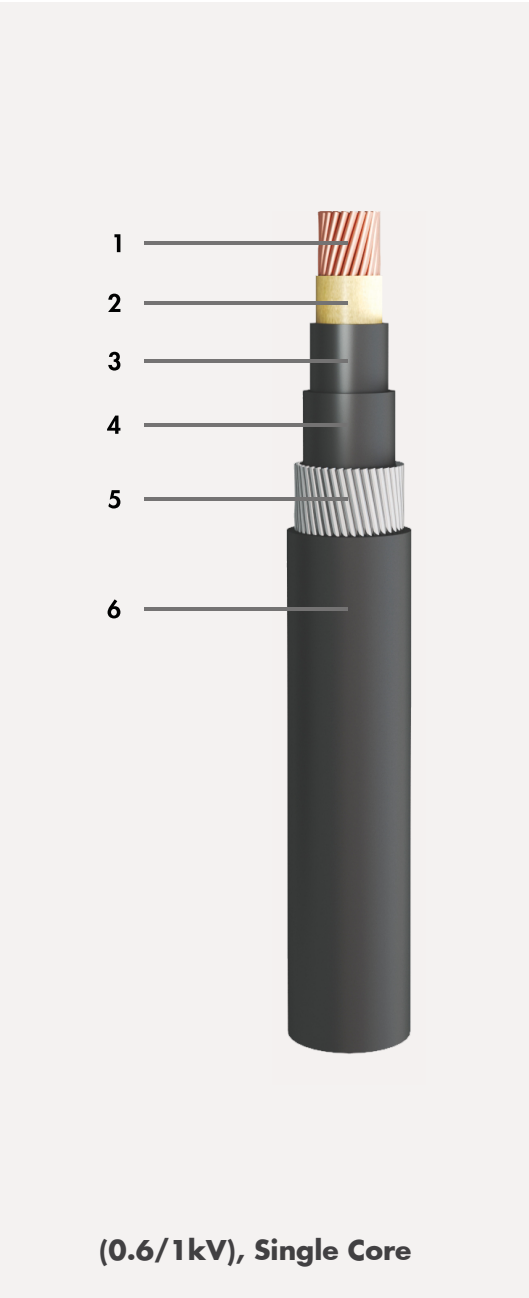
### APPLICATION

OCIFLAM-FSA Circuit Integrity cables are suitable for use in fixed installations, in applications where maintenance of power supply during a fire is required for a defined period of time, such as for essential safety circuits and in areas where smoke and gas evolution could pose a hazard to personnel or sensitive equipment such as in high-rise buildings, schools, hospitals, hotels, shopping centres, subways, etc.

### CONSTRUCTION

Stranded annealed plain copper conductor, Glass Mica Tape, XLPE insulation, extruded LSZH bedding, round wire armour and overall extruded LSZH outer sheath.

- 1. Conductor**  
Copper conductor
- 2. Fire Barrier Tape**  
Glass Mica Tape
- 3. Insulation**  
XLPE
- 4. Bedding**  
Extruded LSZH
- 5. Armour**  
Wire armour
- 6. Outer Sheath**  
Extruded overall LSZH outer sheath.



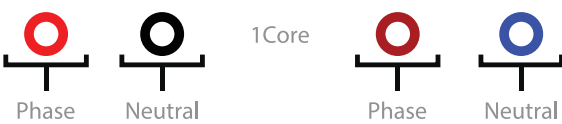
### APPLICATION STANDARDS

OCIFLAM-FSA Cables are designed & tested to meet the requirements of below standard:

BS 7846 - F2 (in general)  
IEC 60502-1 & IEC 60331-21

**Note:** Oman Cables has the capability to provide colour identification as per project requirements.

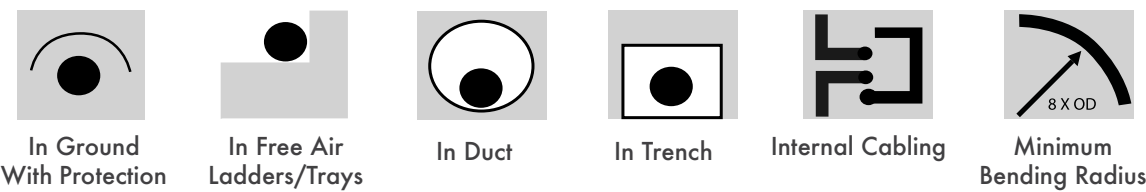
### CORE COLOUR IDENTIFICATION:



### CHARACTERISTICS



### CABLE INSTALLATION





# OCIFLAM-FSA

## COPPER CONDUCTOR, GLASS MICA TAPE, XLPE INSULATION, LSZH BEDDING, WIRE ARMoured & LSZH SHEATH, LOW VOLTAGE FIRE RESISTANT CABLES.

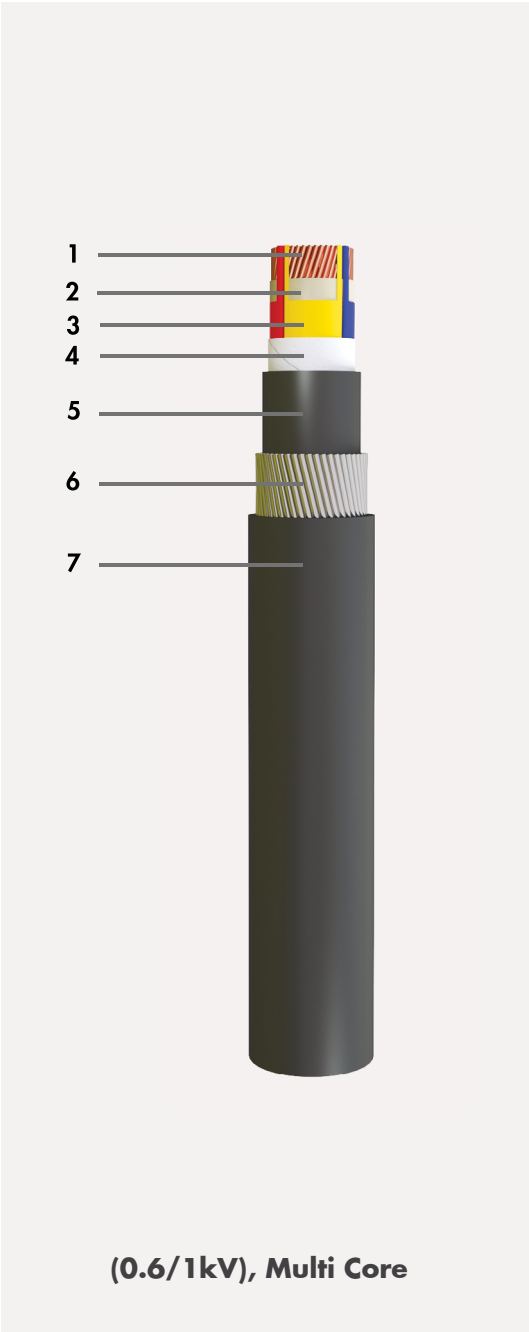
### APPLICATION

OCIFLAM-FSA Circuit Integrity cables are suitable for use in fixed installations, in applications where mechanical protection and maintenance of power supply during fire is required for a defined period of time, such as for essential safety circuits and in areas where smoke and gas evolution could pose a hazard to personnel or sensitive equipment such as in high-rise buildings, schools, hospitals, hotels, shopping centres, subways, etc.

### CONSTRUCTION

Stranded annealed plain copper conductor, Glass Mica Tape, XLPE insulation, non-hygroscopic fillers & binder tape (as required), extruded LSZH bedding, round wire armour and overall extruded LSZH outer sheath.

- 1. **Conductor**  
Copper conductor
- 2. **Fire Barrier Tape**  
Fire barrier tape
- 3. **Insulation**  
XLPE
- 4. **Fillers & Binder Tape**  
Non-hygroscopic fillers & binder tape (as required)
- 5. **Bedding**  
Extruded LSZH
- 6. **Armour**  
Wire armour
- 7. **Outer Sheath**  
Extruded overall LSZH outer sheath.



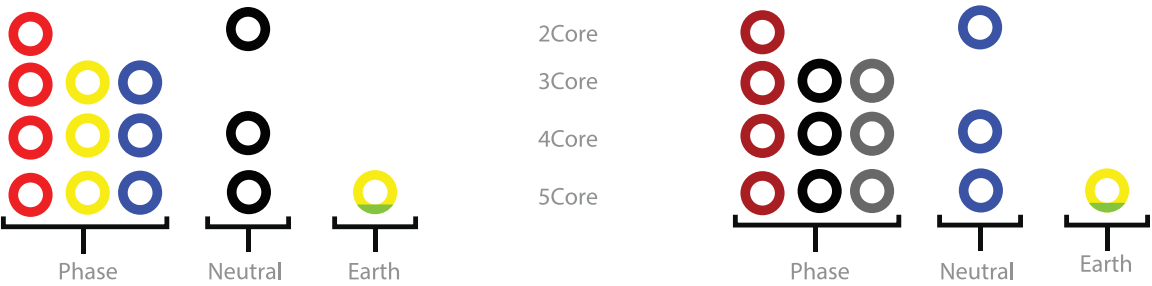
### APPLICATION STANDARDS

OCIFLAM-FSA Cables are designed & tested to meet the requirements of below standard:

BS 7846 - F2  
IEC 60502-1 (non-LPCB & BASEC).



### CORE COLOUR IDENTIFICATION:

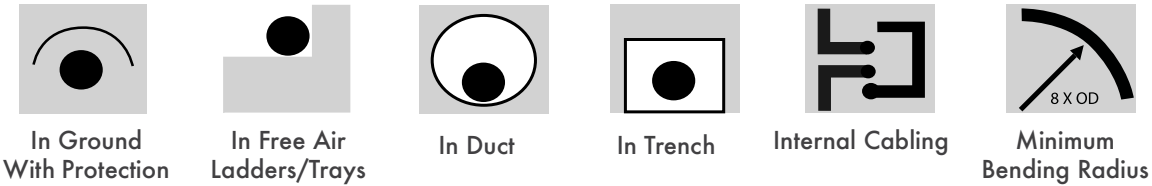


Note: Oman Cables has the capability to provide colour identification as per project requirements.

### CHARACTERISTICS



### CABLE INSTALLATION



**OCIFLAM-FSA Electric cables – Thermosetting insulated, armoured, fire-resistant cables of rated voltages of 600/1000 V having low emission of smoke and corrosive gases when affected by fire (F2 Grade).**

Table 5

Cable size	Electrical Parameters						Current Rating																
	DC Resistance	AC Resistance (Ω/km)	Reactance (Approx.) at 50Hz. ( / km)		Impedance (Approx.) at 50Hz. ( / km)		Voltage Drop (Approx.) mV/A/m			Ground at 35 °C, (A)				Duct at 35 °C, (A)									
			1 C	Multi-core	1 C	Multi-core	1 C	2 C	3C/4C /5C	1 C	2 C	3 C/4 C	5 C	1 C	2 C	3 C/4 C	5 C						
(mm²)	(Ω/km)	(Ω/km)																					
1.5	12.1	15.43	-	0.126	-	15.431	-	0.25	26.73	-	33	28	24	-	27	22	19	-	24	20	17		
2.5	7.41	9.45	-	0.117	-	9.451	-	0.23	16.37	-	42	36	30	-	35	29	25	-	32	27	23		
4	4.61	5.88	-	0.109	-	5.881	-	0.22	10.19	-	56	47	40	-	46	39	33	-	43	37	31		
6	3.08	3.93	-	0.103	-	3.931	-	0.21	6.81	-	70	59	50	-	58	48	42	-	55	46	40		
10	1.83	2.33	0.14	0.096	2.334	2.332	4.04	0.19	4.04	82	94	79	68	78	77	65	55	67	74	64	53		
16	1.15	1.47	0.131	0.092	1.476	1.473	2.56	0.18	2.55	108	121	102	87	101	99	83	71	92	98	83	71		
25	0.727	0.927	0.122	0.085	0.935	0.931	1.62	0.17	1.61	139	157	131	113	134	127	107	91	123	128	109	92		
35	0.524	0.668	0.117	0.082	0.678	0.673	1.17	0.16	1.17	165	188	157	135	154	153	128	110	146	158	134	114		
50	0.387	0.494	0.112	0.081	0.507	0.501	0.88	0.16	0.87	199	223	187	161	199	181	152	130	180	190	163	137		
70	0.268	0.342	0.106	0.077	0.358	0.351	0.62	0.15	0.61	244	273	229	197	239	224	187	161	230	239	205	172		
95	0.193	0.247	0.102	0.075	0.267	0.258	0.46	0.15	0.45	292	328	274	-	281	269	226	-	282	295	253	-		
120	0.153	0.197	0.096	0.074	0.219	0.21	0.38	0.15	0.36	332	372	312	-	315	307	258	-	328	341	293	-		
150	0.124	0.16	0.098	0.075	0.188	0.177	0.33	0.15	0.31	371	417	349	-	341	345	291	-	377	389	335	-		
185	0.0991	0.128	0.096	0.074	0.16	0.148	0.28	0.15	0.26	417	470	394	-	376	391	329	-	433	449	386	-		
240	0.0754	0.099	0.093	0.073	0.136	0.123	0.24	0.15	0.21	480	544	455	-	421	453	380	-	510	530	456	-		
300	0.0601	0.08	0.090	0.072	0.12	0.108	0.21	0.14	0.19	536	609	509	-	459	509	427	-	581	605	519	-		
400	0.047	0.065	0.090	0.071	0.111	0.096	0.19	0.14	0.17	594	687	574	-	488	575	490	-	664	696	597	-		
500	0.0366	0.053	0.088	-	0.103	-	0.18	-	-	658	-	-	-	529	-	-	-	751	-	-	-		
630	0.0283	0.043	0.086	-	0.096	-	0.17	-	-	723	-	-	-	571	-	-	-	846	-	-	-		
800	0.0221	0.038	0.086	-	0.094	-	0.16	-	-	764	-	-	-	595	-	-	-	919	-	-	-		
1000	0.0176	0.032	0.084	-	0.09	-	0.16	-	-	810	-	-	-	632	-	-	-	997	-	-	-		

Table 5 Continued

Physical Dimensions													Standard Drum Length, m				
Approx. Cable OD, mm						Approx. Cable Weight, kg/km							1 C				
1 C	2 C	3 C	4 C	5 C	Multi-core	1 C	2 C	3 C	4 C	5 C	Multi-core	1 C	2 C	3 C	4 C	5 C	Multi-core
-	14.0	14.5	15.5	14.5	-	-	335	370	420	480	-	-	1000	1000	1000	1000	-
-	15.0	15.5	17.0	15.5	-	-	385	435	495	565	-	-	1000	1000	1000	1000	-
-	16.5	17.5	19.0	17.5	-	-	520	585	680	775	-	-	1000	1000	1000	1000	-
-	18.0	18.5	20.5	18.5	-	-	615	700	820	945	-	-	1000	1000	1000	1000	-
13.5	20.0	21.0	22.5	21.0	21.0	260	770	890	1060	1250	1000	1000	1000	1000	1000	1000	1000
14.0	21.5	22.5	24.5	22.5	22.5	325	950	1145	1370	1775	1000	1000	1000	1000	1000	1000	1000
15.0	20.0	23.5	27.0	23.5	23.5	425	975	1430	1780	2365	1000	1000	1000	1000	1000	1000	1000
16.0	23.0	26.0	29.5	26.0	26.0	525	1340	1780	2235	2970	1000	1000	1000	1000	1000	1000	500
17.5	26.0	29.0	32.0	29.0	29.0	665	1670	2225	2800	4045	1000	1000	1000	1000	500	500	500
20.0	29.0	32.0	37.5	32.0	32.0	925	2165	2935	4005	5365	1000	1000	1000	500	500	500	500
22.0	32.5	36.5	41.0	36.5	-	1200	2955	4010	5090	-	1000	500	500	500	500	-	-
25.5	38.0	45.5	51.5	45.5	-	1790	4195	6225	7950	-	1000	500	500	500	500	-	-
28.0	42.0	48.0	56.5	48.0	-	2185	5410	7465	9630	-	1000	500	500	500	500	-	-
30.5	48.5	54.0	62.5	54.0	-	2765	6765	9355	12105	-	500	500	500	500	250	-	-
33.0	53.0	60.0	68.0	60.0	-	3380	8170	11395	14705	-	500	500	500	500	250	-	-
37.5	58.5	64.5	77.5	64.5	-	4330	10085	14100	19190	-	500	500	500	250	250	-	-
41.0	-	-	-	-	-	5420	-	-	-	-	500	-	-	-	-	-	-
45.5	-	-	-	-	-	6865	-	-	-	-	500	-	-	-	-	-	-
51.5	-	-	-	-	-	8840	-	-	-	-	500	-	-	-	-	-	-
56.0	-	-	-	-	-	10870	-	-	-	-	500	-	-	-	-	-	-

Applicable standard : BS 7846 (Can be offered in line with IEC 60502-1 also)

Flame retardant property : IEC 509 60332-3-24 (C)

Fire resistant property : BS 7846 Category F2, BS 6387

Oxygen Index, LOI : ASTM D-2863

Smoke Density : BS EN / IEC 61034

Halogen gas emission : BS EN / IEC 60754-1 & BS EN / IEC 60754-2

Installation conditions:

Depth of laying in ground: 0.5 Mtr.

Thermal resistivity of soil : 1.2 Km/W

1 core cables are considered with Trefoil touching

Note:

1- Single Core Cable will be generally conforming to BS 7846.

2- LPCB approval is applicable to 2C, 3C & 4C for sizes 1.5 mm² to 400 mm² as per BS 7846 only

# OCIFLAM1-PREMIUM & OCIFLAM2-PREMIUM

## COPPER CONDUCTOR, GLASS MICA TAPE, XLPE INSULATION, LSZH BEDDING, WIRE ARMoured & LSZH SHEATH, LOW VOLTAGE FIRE RESISTANT CABLES.

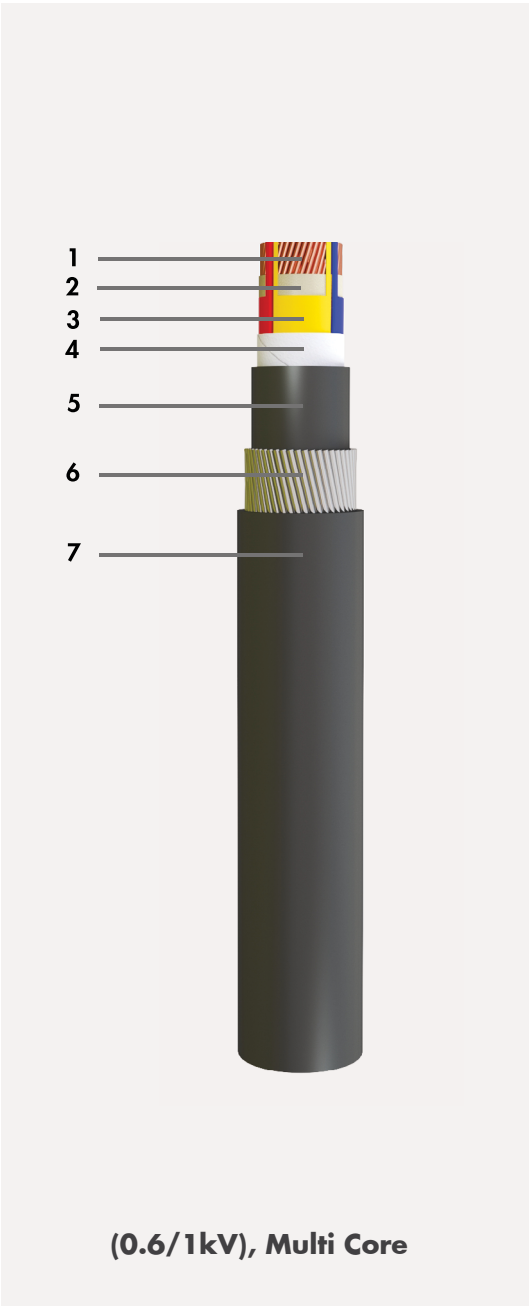
### APPLICATION

OCIFLAM PREMIUM Circuit Integrity cables are suitable for use in fixed installations, in applications where mechanical protection and maintenance of power supply during fire is required a fire is required for a defined period of time, such as for essential safety circuits and in areas where smoke and gas evolution could pose a hazard to personnel or sensitive equipment such as in high-rise buildings, schools, hospitals, hotels, shopping centres, subways, etc.

### CONSTRUCTION

Stranded annealed plain copper conductor, Glass Mica Tape, XLPE insulation, non-hygroscopic fillers & binder tape (as required), extruded LSZH bedding, round wire armour and overall extruded LSZH outer sheath.

- 1. Conductor**  
Copper conductor
- 2. Fire Barrier Tape**  
Glass Mica Tape
- 3. Insulation**  
XLPE
- 4. Fillers & Binder Tape**  
Non-hygroscopic fillers & binder tape (as required).
- 5. Bedding**  
Extruded LSZH
- 6. Armour**  
Wire armour
- 7. Outer Sheath**  
Extruded overall LSZH outer sheath.



### APPLICATION STANDARDS

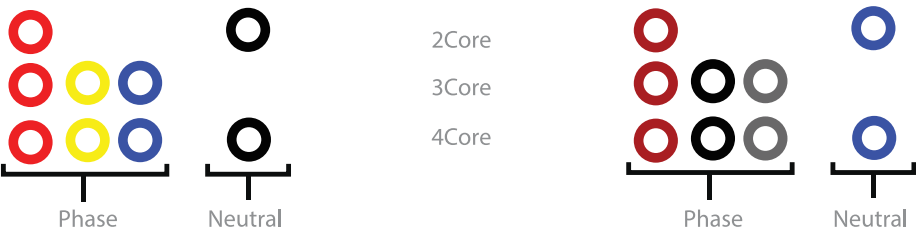
OCIFLAM1-PREMIUM & OCIFLAM2-PREMIUM Cables are designed & tested to meet the requirements of below standard:

BS 7846 and BS EN 50200 (PH120)  
BS 7846 as per F2 and F120



**Note: Oman Cables has the capability to provide colour identification as per project requirements.**

### CORE COLOUR IDENTIFICATION:

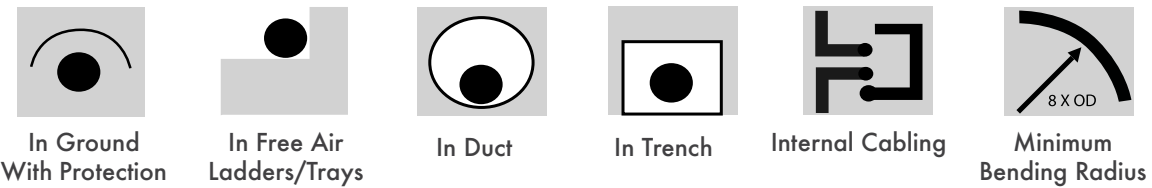


**Note: Oman Cables has the capability to provide colour identification as per project requirements.**

### CHARACTERISTICS



### CABLE INSTALLATION



OCIFLAM-LSHA Electric cables – Thermosetting insulated, armoured cables of rated voltages of 600/1000 V having low emission of smoke and corrosive gases when affected by fire.

Table 6

Cable size	Electrical Parameters					Current Rating				
	DC Resistance at 20°C (Max)	AC Resistance at 90°C (Approx.)	Reactance (Approx.) at 50Hz	Impedance (Approx.) at 50Hz	Voltage Drop (Approx.) (mV/A/m)	Ground at 35°C, (A)		Duct at 35°C, (A)		Air at 50°C, (A)
(mm²)	(Ω/km)	(Ω/km)	(Ω/km)	(Ω/km)	2 C	3 C/4 C		2 C	3 C/4 C	
1.5	12.1	15.43	0.122	15.43	30.86	26.72		27	22	
2.5	7.41	9.45	0.114	9.451	18.9	16.37		35	29	
4	4.61	5.88	0.107	5.881	11.76	10.19		46	39	
6	3.08	3.93	0.1	3.931	7.86	6.81		58	48	
10	1.83	2.33	0.103	2.332	4.66	4.04		77	65	
16	1.15	1.47	0.099	1.473	2.95	2.55		99	83	
25	0.727	0.927	0.107	0.933	1.87	1.62		127	107	
35	0.524	0.668	0.101	0.676	1.35	1.17		153	128	
50	0.387	0.494	0.097	0.503	1.01	0.87		181	152	
70	0.268	0.342	0.091	0.354	0.71	0.61		224	187	
95	0.193	0.247	0.085	0.261	0.52	0.45		269	226	
120	0.153	0.197	0.084	0.214	0.43	0.37		307	258	
150	0.124	0.16	0.084	0.181	0.36	0.31		345	291	
185	0.0991	0.128	0.083	0.153	0.31	0.26		391	329	
240	0.0754	0.099	0.08	0.127	0.25	0.22		453	380	
300	0.0601	0.080	0.079	0.112	0.22	0.19		509	427	
400	0.047	0.065	0.078	0.102	0.2	0.18		575	490	

Table 6 Continued

Physical Dimensions						
Approx. Cable OD, mm		Approx. Cable Weight, kg/km			Standard Drum Length, m	
2 C	3 C	4 C	2 C	3 C	4 C	2 C
13.0	13.5	14.5	340	370	425	1000
14.0	14.5	16.0	395	440	505	1000
15.5	16.5	18.0	555	625	720	1000
17.0	18.0	19.5	640	740	860	1000
21.5	23.0	21.5	880	1010	1195	1000
23.0	24.5	23.0	1070	1275	1515	1000
23.0	26.5	23.0	1120	1625	2040	1000
26.0	29.0	26.0	1510	2005	2500	1000
29.0	32.0	29.0	1855	2465	3085	500
31.5	35.5	31.5	2380	3200	4320	500
34.0	38.5	34.0	3070	4205	5315	500
36.5	42.0	36.5	3650	5065	6855	500
40.0	47.5	40.0	4350	6450	8170	500
43.5	50.0	43.5	5525	7625	9875	500
50.5	56.0	50.5	6940	9575	12375	500
54.5	62.0	54.5	8355	11675	14995	500
60.0	66.0	60.0	10325	14360	19535	500

Applicable standard : BS 7846  
Flame retardant property : IEC 60332-3-24 (C)  
Fire resistant property : BS 7846, BS EN 50200, BS 8434-2, BS 6387, BS 8491 & IEC 60331-21 (as applicable)  
Oxygen Index, LOI : ASTM D-2863  
Smoke Density : BS EN / IEC 61034  
Halogen gas emission : BS EN / IEC 60754-1 & BS EN / IEC 60754-2

Installation conditions:  
Depth of laying in ground: 0.5 Mtr.  
Thermal resistivity of soil : 1.2 Km/W

# OCIFLAM X

## COPPER CONDUCTOR, LSZH INSULATION, POLYESTER PACKED LAMINATED TAPE & CPC, & LSZH SHEATH, LOW VOLTAGE FIRE RESISTANT CABLES (300/500V), MULTI CORE.

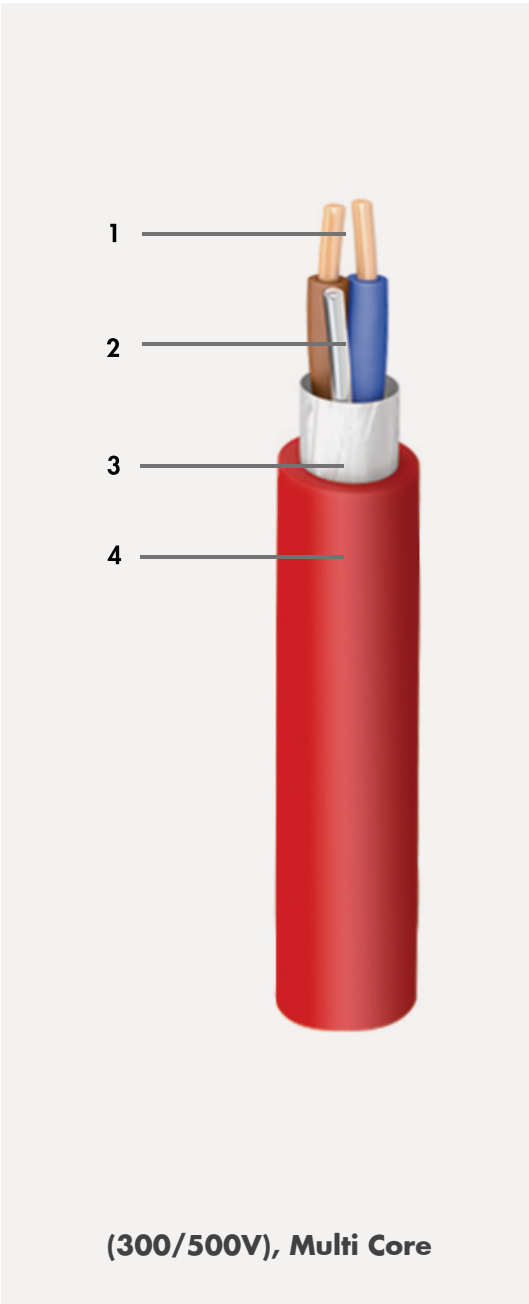
### APPLICATION

OCIFLAM X fire alarm cables are suitable for use in fixed installations, in applications where maintenance of power supply during a fire is required for a defined period of time, such as Voice Alarm, Fire Detection, and Fire Alarm systems, and for buildings' emergency and lighting systems.

### CONSTRUCTION

Solid annealed plain copper conductor, LSZH insulation, polyester backed laminated tape & full sized, tinned annealed CPC, extruded LSZH outer sheath.

- 1. Conductor**  
Copper conductor
- 2. Insulation**  
LSZH insulation – Type EI5.
- 3. Overall Metallic Screen and CPC**  
Polyester backed laminated tape bonded to outer sheath & full sized, tinned annealed CPC
- 4. Outer Sheath**  
Extruded overall LSZH outer sheath-type LTS-3



### APPLICATION STANDARDS

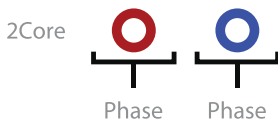
OCIFLAM X cables are designed & tested to meet the requirements of below standard:

- BS 7629-1 STANDARD 60
- BS 5839-1, 6, 8 & 9 (Standard fire resisting cable)
- BS 5266-1 (Standard fire resisting cable)
- BS 8519 Category 1 (Control cable)
- BS 6387 (CWZ)
- BS EN 50200 PH 30, PH 60, PH120
- BS EN 50200 (ANNEX E)



Note: Approved at BASEC for BS 7629-1 STANDARD 60 and BS 6387 (CWZ) approved at LPCB for BS 7629-1 STANDARD 60, in addition to BS 50200 PH120, BS 6387 (CWZ) and BS 5839-1.

### CORE COLOUR IDENTIFICATION



Note: Oman Cables has the capability to provide colour identification as per project requirements.

### CHARACTERISTICS



### CABLE INSTALLATION





**OCIFLAM X COPPER CONDUCTOR, LSZH INSULATION, POLYESTER PACKED LAMINATED TAPE & CPC, & LSZH SHEATH, LOW VOLTAGE FIRE RESISTANT CABLES (300/500V), MULTI CORE**

**Table 3**

Nominal Cross Sectional Area	Nominal Conductor Construction	Approximate Overall Diameter	Approximate Cable Weight	Maximum Conductor at 20 °C Resistance	Current Rating DC or Single Phase AC Enclosed	Current Single Phase Rating DC or AC Clipped Direct	Voltage Drop DC or Single Phase AC
mm²	no/mm	mm	kg/km	Ω/km	Amps	Amps	mV/A/m
1.5	1/1.38	8.1	95	12.1	16.5	19.5	29
2.5	1/1.78	9.7	140	7.41	23	27	18

# ADVANCED TESTING LABORATORY

## ADVANCED TESTING LABORATORY



Oman Cables' Advanced Testing Laboratory (ATL) is a one-of-a-kind laboratory equipped with modern cable testing equipment. ATL has the capability to perform complete cable testing as per the international standards. This includes regular tests like complete cable type test, special tests like accelerated ageing test, flame retardancy, smoke density, toxic gas emission, fire tests as per various IEC & BS standards and many more. This lab is fully dedicated to new product developments & specialized cable's testing. Some key highlights of the ATL are:

- Capable of doing complete type test, research and development and specifically Accelerated Ageing test for MV cable which only a few labs in the GCC are capable of.
- Independent building spanned over 1500 m<sup>2</sup>.
- ATL follows certifications of ISO 9001, ISO 14001, OHSAS 18001 & BASEC Product Certification Requirements (PCR).

### CONSTRUCTION



• **FIRE AND SMOKE TESTING EQUIPMENTS:**

- Smoke density – 3m cube test chamber.
- Vertical flame propagation test chamber.
- Fire survival circuit integrity test BS-6387 'CW&Z'.
- Fire survival circuit integrity test F120 & PH120.
- Cone Calorimeter.
- Oxygen Index test apparatus.

**ACCELERATED AGEING & HV BREAKDOWN TEST.**

• **ELECTRICAL:**

- Volume resistivity.
- Conductivity.

• **MECHANICAL TESTING:**

- Tensile & Elongation.
- Hot set test for insulation.
- Hardness.
- Microscopy.

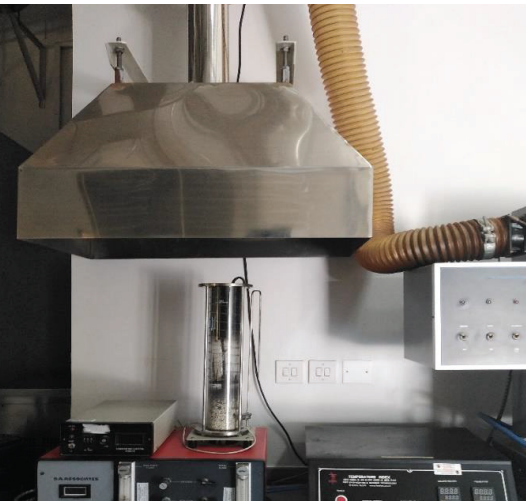
• **WEATHERABILITY:**

- UV testing
- Moisture content testing
- Halogen & fluorine content
- Aging Capability

**ATL Testing Equipment**

**LIMITING OXYGEN INDEX (LOI) APPARATUS**

The Limiting Oxygen Index Apparatus measures the minimum percentage of oxygen in the test atmosphere that is required to marginally support combustion as per ASTM D2863. The unit gives continuous digital readouts of oxygen concentrations in the test atmosphere to facilitate quick settings of test concentration. Characteristic features of this test apparatus are a digital display of oxygen percentage in the atmosphere during the test (no calculations needed) & digital display of temperature of gas mixture entering the test chimney.



**SMOKE DENSITY 3M TEST CUBE**

The 3 meter cube is used for measuring smoke emission when electric cables are burned under defined conditions (IEC 61034). An example would be a few cables burned horizontally. These units are produced to meet the specification used in many electric cable tests.



**VERTICAL FLAME PROPAGATION TEST CHAMBER**

This test chamber is used for assessment of vertical flame spread of vertically mounted bunched wires or cables (electrical or optical) under defined conditions.



# COMMON TESTS

## COMMON TESTS



Specific tests are done on OCIFLAM Cables so that they can meet the fire performance standards. A detailed explanation of these tests follows below:

### FLAME PROPAGATION TESTS

#### 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 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. The next table 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 ensure the volume of combustible material per linear meter agrees to the stated values in the category.

#### 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:

STANDARDS	Category	Volume (l/m)	Burn time (min)	Char length (m)
BS EN / IEC 60332-1	Single	-	1~4 mins	0.5
BS EN / IEC 60332-3-22	A	7	40	2.5
BS EN / IEC 60332-3-23	B	3.5	40	2.5
BS EN / IEC 60332-3-24	C	1.5	20	2.5
BS EN / IEC 60332-3-25	D	0.5	20	2.5

Standards, 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	P	-	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	

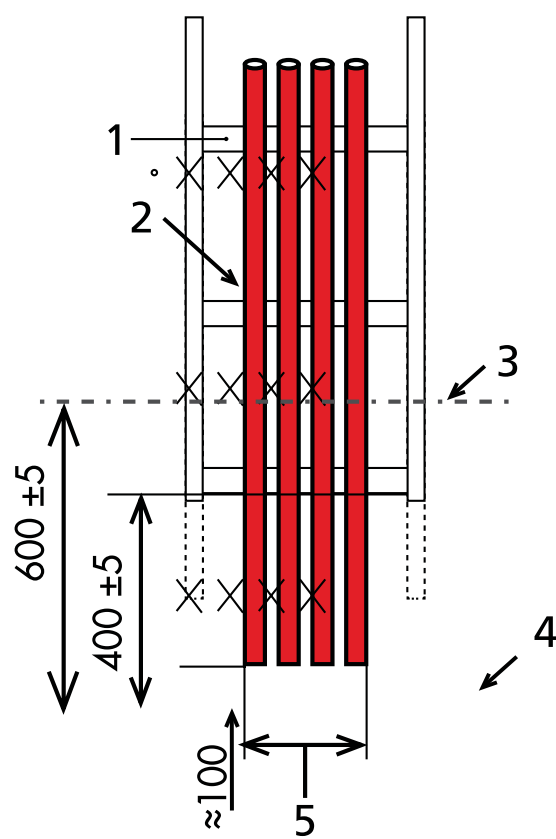
NOTES:

- 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



FLAME PROPAGATION TESTS  
TEST SETUP AND APPARATUS

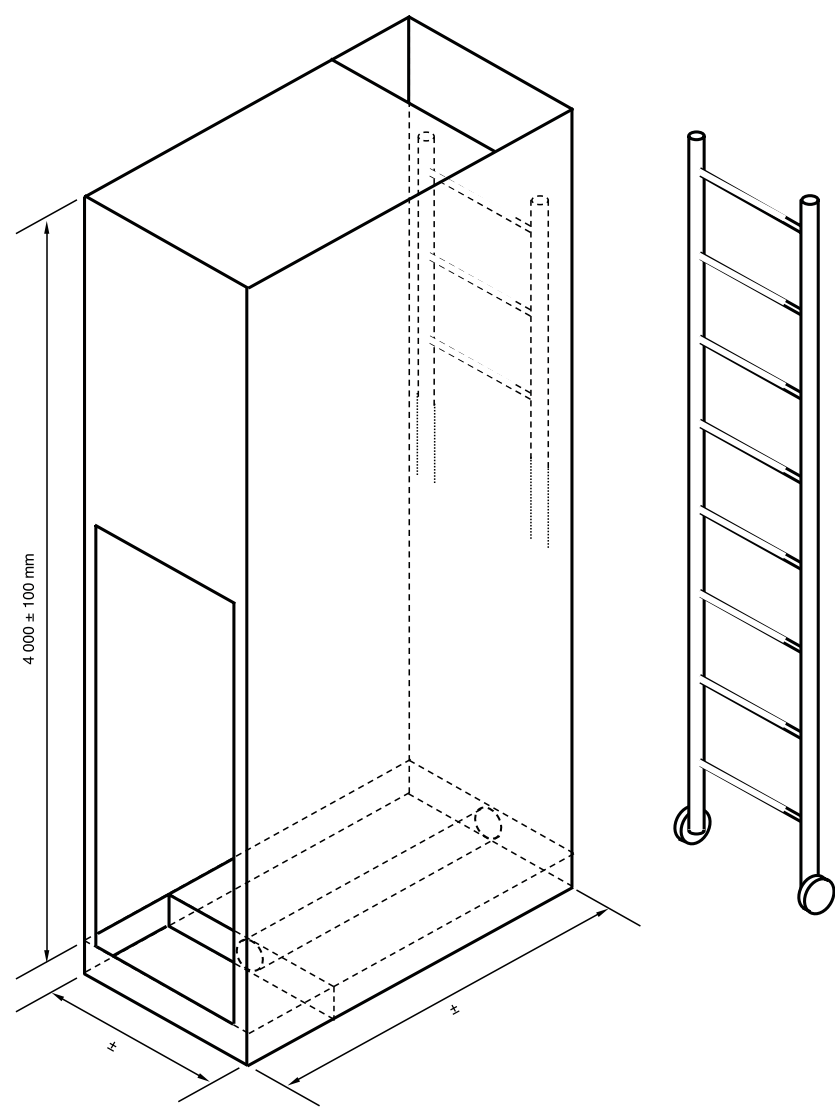
Suspension of cable test setup is shown below:



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



Flame propagation test apparatus is shown below:



- 1- Test Chamber : 1000 ±m 100 (W) x 2000 ± 100 (D) x 4000 ±100 (H) mm

2- Air Inlet Hole : 800 ± 20 (W) x 400 ± 10 (D) mm

3- Exhaust Hole : 1000 ± 100 (W) x 300 ± 30 (D) mm
- 4- Ladder for testing cables

5- Access door and observation window

HALOGEN EMISSION TEST



ACID GAS EMISSION (HCL)

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 ) Bromine and Chlorine Content (both are expressed as HCl)	%	≤0.5
Fluorine Content Test (IEC 60684-1) Fluorine content	%	≤0.1
pH and Conductivity test (IEC 60754-2 & BS EN 60754-2)	pH	≥4.3
Conductivity	µS/mm	≤10

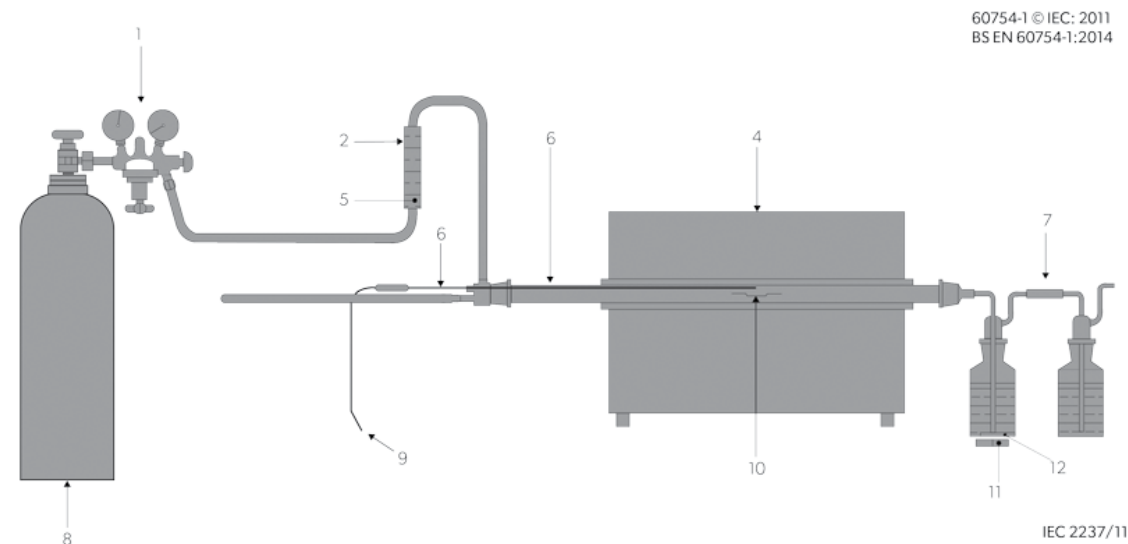
In this test a sample of (750 +- 250) mg is placed inside a special glass tube fed with air flow from one side and resulting gasses are drawn from the other side of the tube through three wash bottles. Then, the amount of halogen gas that has dissolved in the water is measured as per the values in the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

For a cable to be regarded as Halogen free, all the requirements shown in the above table must be met.

## 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:



## Key

1. Pressure reducing valve
2. Flow meter
3. Quartz glass tube
4. Furnace
5. Needle valve
6. Thermocouple
7. Inlet gas
8. Inlet gas
9. Device for inserting combustion boat containing test specimen
10. Combustion boat containing test specimen
11. Magnetic stirrer
12. Magnetic stirring bar

**Test apparatus:** Use of synthetic or compressed air from a bottle

## SMOKE EMISSION TEST



## 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 fire fighting 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.

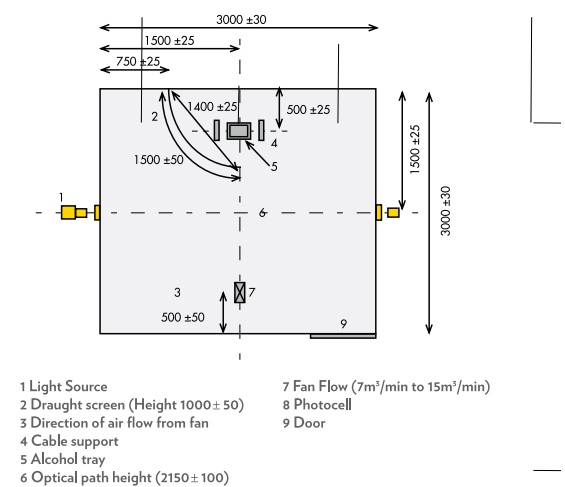
In order to evaluate the smoke emitted, a beam of light is shone across the enclosure/chamber and the light received on the far side is measured. The test is considered completed when there is no decrease in light transmittance for 5 min after the fire source has extinguished or when the test duration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

## STANDARD TESTS

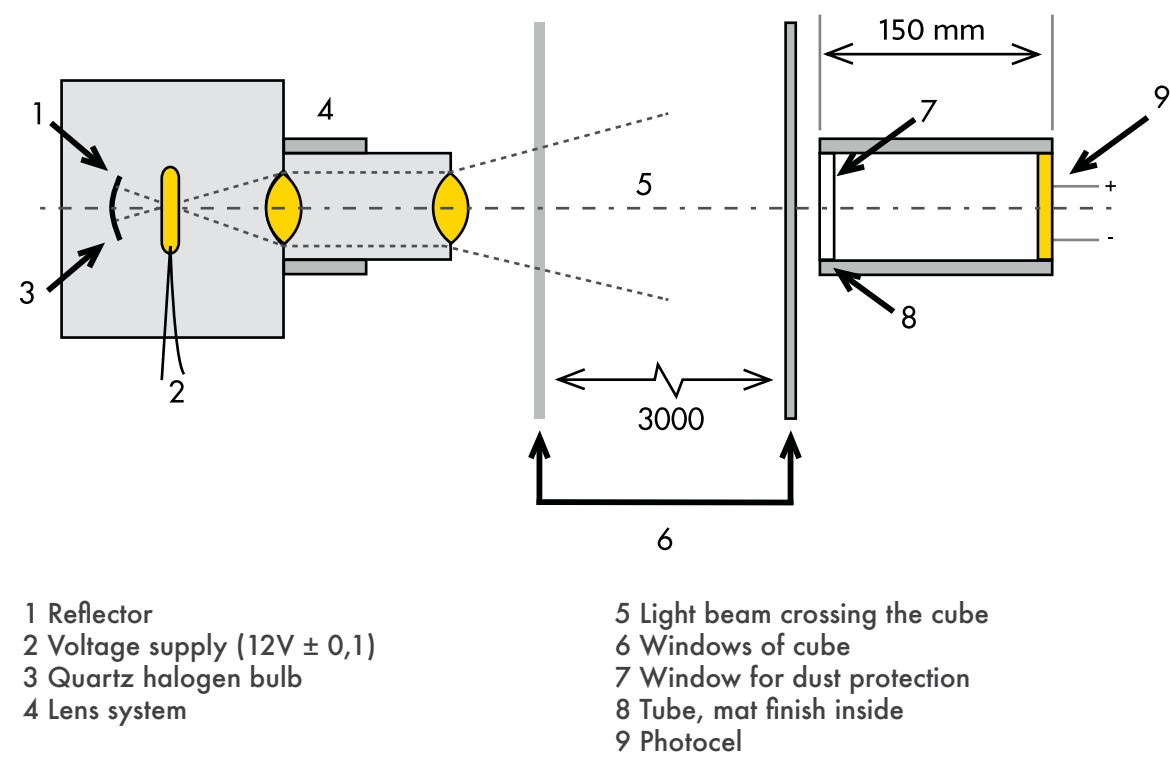
IEC 61034: Measurement of smoke density of electric cables burning under defined conditions. Part 1 covers the apparatus while part 2 covers the procedure. It is noted that the criteria for passing should be given by the relative cable standard, however; the recommendation is that the light transmittance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

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

## TYPICAL APPARATUS



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.



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.

# CIRCUIT INTEGRITY TESTS

## 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 the case that 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 Category F2: Resistance to fire, resistance to fire with water, resistance to fire with mechanical shock, are assessed 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, are assessed 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:

## 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 following 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).

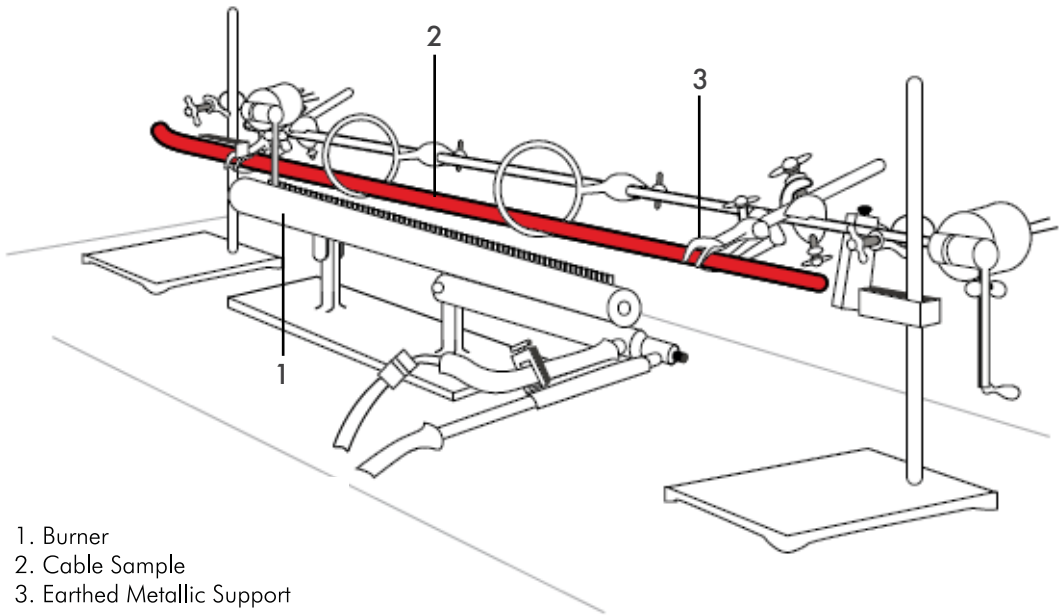
FIRE RESISTANCE CATEGORY F2



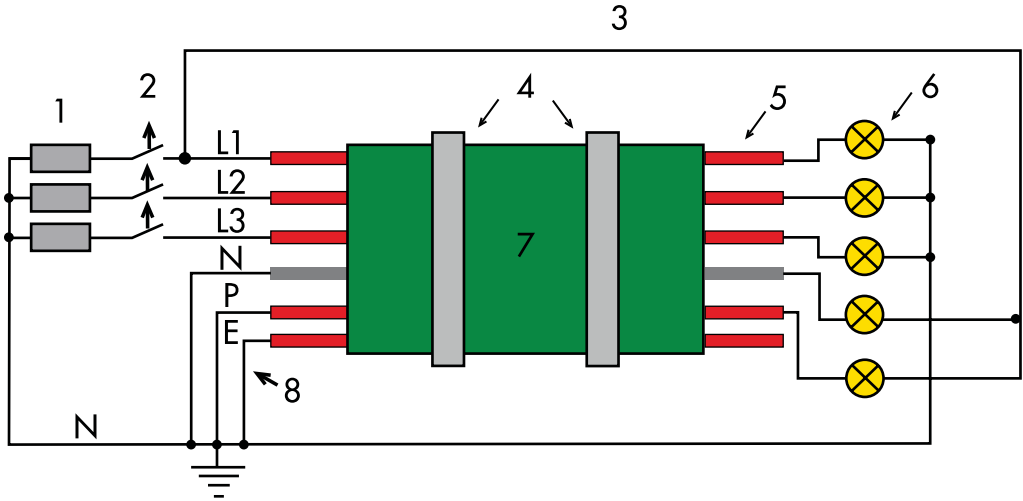
CIRCUIT INTEGRITY (RESISTANCE TO FIRE ALONE: PROTOCOL C OF BS 6387)

In this 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



IEC 60331-2: Circuit Diagram



- L1,L2,L3 Phase 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 interruptions
- ii. The conductor does not rupture, i.e. the lamp is not extinguished

Continuity Checking Arrangement

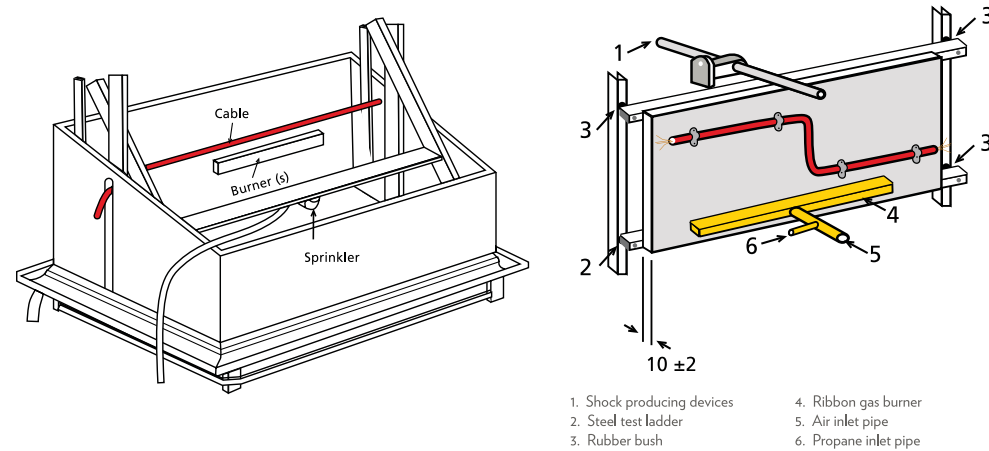
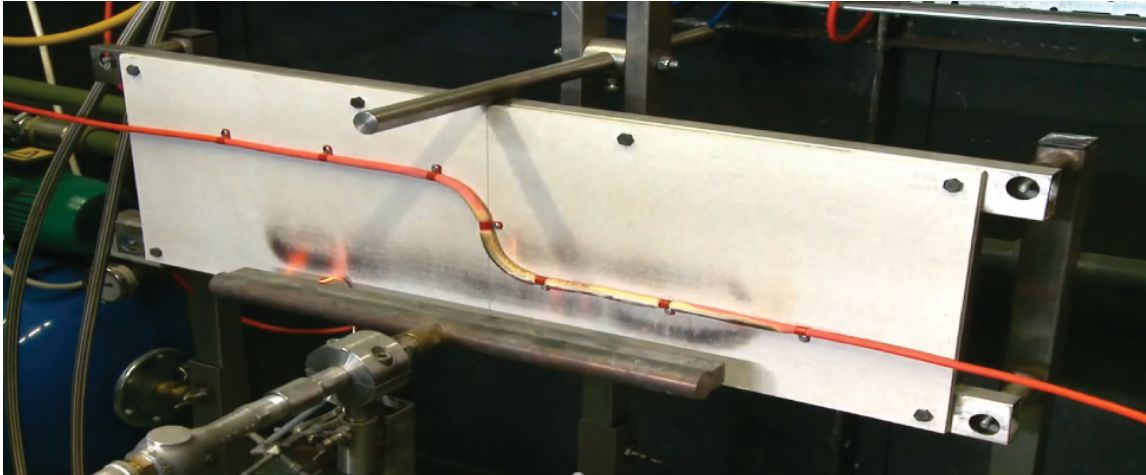
During the test, a current is passed through all cores of the cable as provided by a suitable transformer arrangement. The transformer capacity must be able to maintain the test voltage up to a maximum leakage current of 3 A.

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.

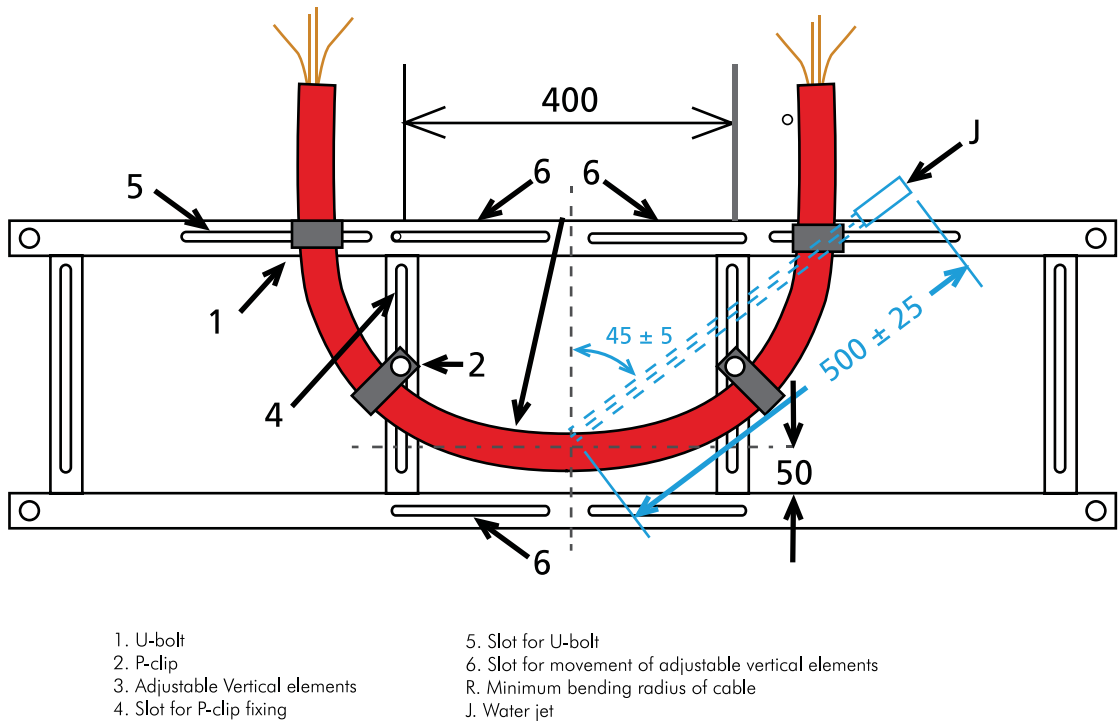




### Circuit Integrity Test (Resistance to Fire with Mechanical Shock: Protocol Z of BS 6387)

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  $950 \pm 40^\circ\text{C}$ . During the test, a shock producing device drops under its own weight every 30 seconds, and strikes at the midpoint of the top of the wall.

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



## 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.



# QUALITY ASSURANCE

## QUALITY ASSURANCE

In order to ensure the best quality products, it is essential to test and inspect the product at each stage of manufacturing including raw materials and finished product.

Oman Cables Quality Assurance System includes:

### Raw Materials Inspection:

All the raw materials are sourced from internationally approved companies, known for their quality products. Once the material is received with their product certificate, Oman Cables quality team tests and inspects the same again. Only those materials which meet Oman Cables internal standards are released for production.

### Finished Product Inspection:

Oman Cables products are fully tested to the applicable standard to which they are manufactured before leaving the factory.

### LV Cables Testing Procedure:

#### 1. Routine tests

Routine tests are normally carried out on each manufactured length of cable. The routine tests carried out in our manufacturing facilities are as follows:

- a) Measurement of the electrical resistance of conductors
- b) Voltage test

#### 2. Sample tests

The sample tests carried out in our manufacturing facilities are as follows:

- a) Conductor examination
- b) Check of dimensions
- c) Hot set test for XLPE insulations

#### 3. Type tests

When type tests have been successfully performed on a type of cable covered by this catalogue with a specific conductor cross sectional area and rated voltage, type approval shall be accepted as valid for cables of the same type with other conductor cross-sectional areas and/or rated voltages, provided the following three conditions are all satisfied:

- a) The same materials, i.e. insulation and manufacturing process are used
- b) The conductor cross-sectional area is not larger than that of the tested cable, with the exception that all cross-sectional areas up to and including 630 mm<sup>2</sup> are approved when the cross-sectional area of the previously tested cable is in the range of 95 mm<sup>2</sup> to 630 mm<sup>2</sup> inclusive
- c) The rated voltage is not higher than that of the tested cable

Approval shall be independent of the conductor material.

GENERAL TABLES

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

DE-RATING FACTOR TABLES

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

De-rating factors for variation in ambient air temperature:

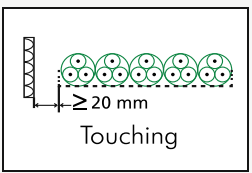
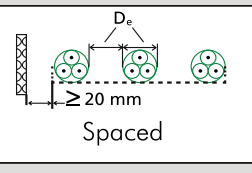
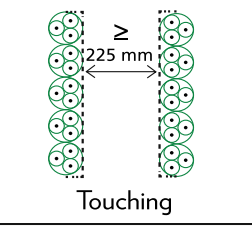
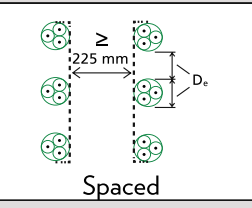
Ambient air temperature	20°C	25°C	30°C	35°C	40°C	45°C	55°C	60°C
De-rating factor	1.35	1.28	1.23	1.18	1.13	1.06	0.94	0.89

De-rating factors for variation in ground temperature:

Ground Temperature	10°C	15°C	20°C	25°C	30°C	40°C	45°C	50°C
De-rating factor	1.21	1.16	1.13	1.08	1.03	0.95	0.90	0.86

De-rating factors for depth of laying:

Depth of laying, m	Cables laid direct in ground			Cables laid in ducts	
	up-to 50mm²	70mm to 300mm	above 300mm²	1 Core	Multi-core
0.75	0.975	0.965	0.947	0.957	0.982
0.80	0.97	0.96	0.94	0.95	0.98
1.00	0.95	0.93	0.92	0.93	0.96
1.25	0.94	0.92	0.89	0.91	0.95
1.50	0.93	0.9	0.87	0.89	0.94
1.75	0.92	0.89	0.86	0.88	0.94
2.00	0.91	0.88	0.85	0.87	0.93
2.50	0.9	0.87	0.84	0.86	0.92
3 or more	0.89	0.85	0.82	0.85	0.91

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	-
		3	1.00	0.85	0.79	0.76	0.73	0.70
		4	1.00	0.99	0.98	0.97	0.96	-

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’

SHORT CIRCUIT CAPACITY

Short circuit rating is dependent upon various factors as listed below:  
a) Conductor material.  
b) Maximum continuous operating temperature & maximum temperature at short circuit.  
c) Fault duration.

I\_sc = (k \* A) / sqrt(t)

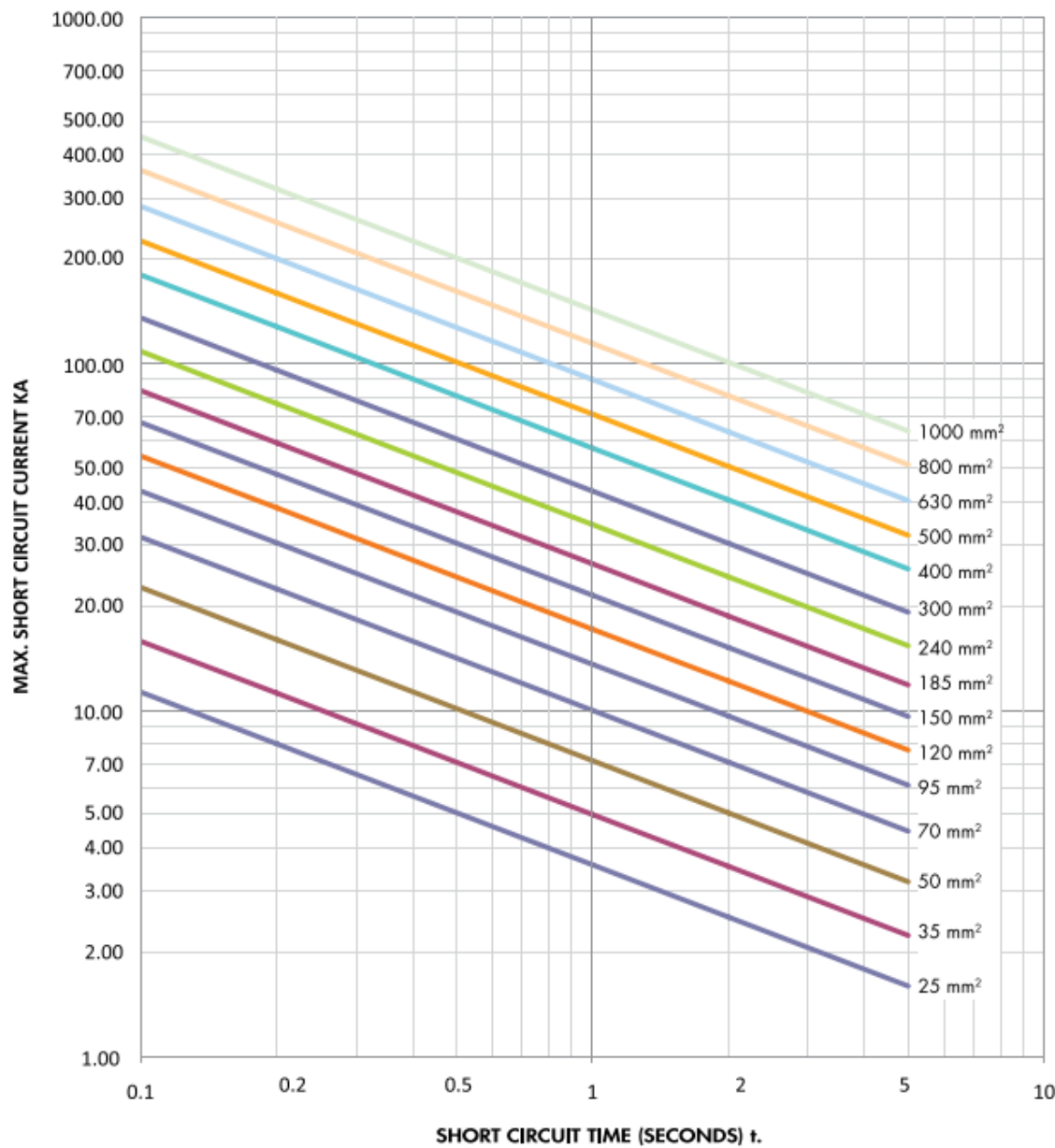
where,  
I\_sc : Short circuit current rating  
k : Constant (factor dependent upon operating temperature & short circuit temperature)  
A : Total cross-sectional area (mm²)  
t : Time duration (sec)

For XLPE insulated cables, the short circuit current rating of the copper conductor is calculated by the formula mentioned above, considering continuous operating temperature as 90°C and short circuit temperature as 250°C.

For Copper conductor, the constant 'k' is 0.143

Conductor Size	Copper Conductor	
	Short circuit rating for 1 sec.	Short circuit rating for 5 sec.
(mm²)	(kA)	(kA)
25	3.58	1.60
35	5.01	2.24
50	7.15	3.20
70	10.01	4.48
95	13.59	6.08
120	17.16	7.67
150	21.45	9.59
185	26.46	11.83
240	34.32	15.35
300	42.90	19.19
400	57.20	25.58
500	71.50	31.98
630	90.09	40.29
800	114.40	51.16
1000	143.00	63.95

SHORT CIRCUIT CURRENT RATING CURVE FOR COPPER CONDUCTOR, XLPE INSULATION.



# CABLE INSTALLATION PRACTICE

## SPECIAL GUIDELINES FOR HANDLING LSZH SHEATHED CABLES

### PROPERTIES OF LSZH SHEATHED CABLES

The sheaths of Low Smoke Zero Halogen (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 LSZH sheathed cables be used mainly indoors, and only where cables have been specified to have low smoke and toxic gas emission properties.

### 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 n 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

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 re-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.

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	Minimum Bending Radius
Single & Multi Core Cables (600/1000V)	8 x OD
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.

PULLING FORCES

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.

Where:  
T = maximum pulling load (kgf)  
D = Cable overall diameter (mm)

In the case of wire armoured/unarmoured cables, the pulling force can be described with the following equation:

T = K.D2

Where:  
K = 9  
D = Outside Diameter of the cable (mm)  
T = Maximum Pulling Force (Newton)

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. A 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:

Where:  
T = Maximum pulling load  
K = 6 kg/mm2 for copper conductors  
3 kg/mm2 for Aluminium conductors  
T = K. A (kgF)  
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. The use of 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.

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



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.

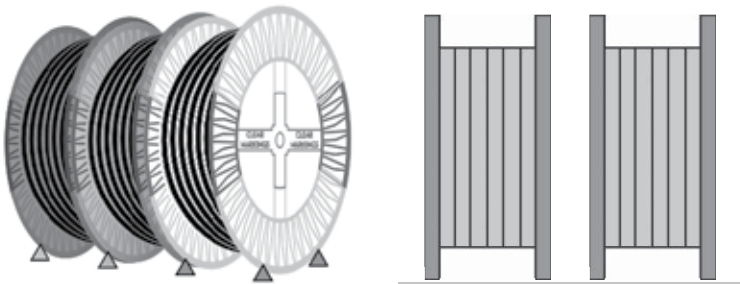


STORAGE

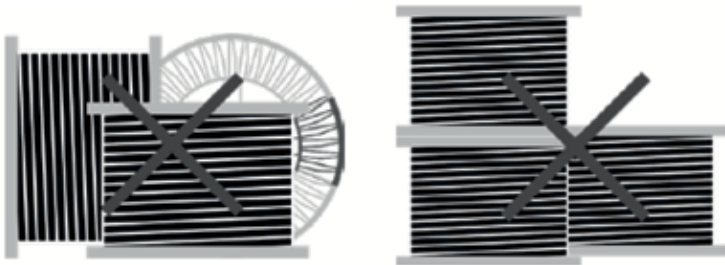
Cables should be stored with special care to prevent immediate as well as mid-term failures. The below recommendations are for both indoor and outdoor storage applications. Additional measures need to be considered for outdoor drum storage considering the surrounding environmental conditions and in accordance with cable specifications; LSZH, PVC or PE as applicable.

- Cables must be stored in proper packed condition, in the shade. Direct exposure to sun must be avoided.
- Drums should be stacked flange-to-flange and preferably not on top of each other.
- Drums should be stacked so that they are easily accessible.
- Fire prevention rules should be observed. Cable types shall be kept together and shall be easily identifiable.
- 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.
- Drums must be chocked to prevent inadvertent rolling during storage.
- Dispatch on a “first in – first out” (FIFO) basis.

RECOMMENDED



NOT RECOMMENDED



# DRUM HANDLING INSTRUCTIONS

## RECOMMENDED



Lift drums correctly onto/ from trucks while loading and unloading. Cradle both fringes between forks.



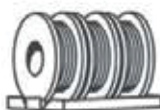
Lifting drums through both flanges using crane



Roll in the direction shown by the arrow



Lower reels from truck using hydraulic gate, hoist or fork lift. Lower carefully.



Always load with flanges on edge and check and block securely



Secure drums adequately before transportation

## NOT RECOMMENDED



Do not lift by top flange, Cable or reel



The reel flanges and mashes the cable



Upended heavy reels will often arrive damaged. Refuse or receive subject to inspection for hidden damage



Never allow forks to touch cable surface or reel wrap



Never drop reels



Do not lay drums flat on their sides, use proper wedges to prevent drums rolling

# CERTIFICATES

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

1. System Certifications

- ISO 9001:2015 – Quality Management System
- ISO 14001:2015 – Environment Management System
- ISO 45001 - Occupational Health and Safety



2. Product Certifications

- Product Certificate Requirements – BASEC
  - BS 7846 – Fire Resistance Cable Category F2
  - BS 6724
  - BS 5467
  - BS 6004
  - BS 7889
  - BS 7629-1
  - BS EN 50525-2-31 & BS EN 50525-3-41
- Fire Survival Cable Certificate – LPCB
  - 995a-OCIFLAM-FSA – Multicore Category F2
  - 995b-OCIFLAM-FS1 – Single Core CWZ
  - 995c-OCIFLAM1 PREMIUM (PH120) & OCIFLAM2 PREMIUM (F120)
  - 995d-OCIFLAM X
- Omani Quality Mark Approval for Cables
  - BS EN 50525-2-31 & BS EN 50525-3-41
  - BS 6724
  - BS 5467
  - IEC 60502-1 & 60502-2
- Emirates Quality Mark Approval for Cables
  - IEC 60502-1
  - BS 6724
  - BS 5467
  - BS EN 50525-2-31
  - BS 7846



BUILDING  
SUSTAINABLE  
GROWTH

Head Office and Factory

PO Box 25 Rusayl, Postal Code 124  
Sultanate of Oman  
Tel: + 968 2444 3100 Fax: + 968 2444 6096  
E-mail: [omancables@omancables.com](mailto:omancables@omancables.com)

UAE Office

PO Box 25864, Sharjah  
United Arab Emirates  
Tel: +971 6-5448445 Fax: +971 6 5447901  
[sharjah.office@omancables.com](mailto:sharjah.office@omancables.com)

Qatar Office

PO Box 24410, Salwa Road  
Doha (Qatar)  
Tel: +974 4468 8384 / + 974 4458 0482  
Fax: +974 4468 7663  
[doha.office@omancables.com](mailto:doha.office@omancables.com)

Saudi Arabia Office

P.O. Box 26993,Riyadh 11496  
Riyadh Kingdom of Saudi Arabia  
Tel: +966 11 2068055 Fax: +966 11 2142730  
[riyadh.office@omancables.com](mailto:riyadh.office@omancables.com)

Egypt Office

[egypt.office@omancables.com](mailto:egypt.office@omancables.com)



**Sultanate of Oman** - Muscat. Plot #206, Road 2, P.O. Box: 25, Rusayl, P.C. 124  
tel +968 2444 3100 | Fax +968 2444 6096

**omancables.com**