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ADNOC

ADNOC GROUP PROJECTS AND ENGINEERING

INSTRUMENT AND CONTROL CABLES SPECIFICATION

Specification

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EFFECTIVE DATE:

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In addition, Group Projects & Engineering is responsible for communication and distribution of any changes to this Specification and its version control.

This specification will be reviewed and updated in case of any changes affecting the activities described in this document.

INTER-RELATIONSHIPS AND STAKEHOLDERS

a) The following are inter-relationships for implementation of this Specification:

   i. ADNOC Upstream and ADNOC Downstream Directorates and

   ii. ADNOC Onshore, ADNOC Offshore, ADNOC Sour Gas, ADNOG Gas Processing. ADNOC LNG, ADNOC Refining, ADNOC Fertilisers, Borouge, Al Dhafra Petroleum, Al Yasat

b) The following are stakeholders for the purpose of this Specification:

   ADNOC PT&CS Directorate.

c) This Specification has been approved by the ADNOC PT&CS is to be implemented by each ADNOC Group company included above subject to and in accordance with their Delegation of Authority and other governance-related processes in order to ensure compliance

d) Each ADNOC Group company must establish/nominate a Technical Authority responsible for compliance with this Specification.

DEFINED TERMS / ABBREVIATIONS / REFERENCES

"**ADNOC**" means Abu Dhabi National Oil Company.

"**ADNOC Group**" means ADNOC together with each company in which ADNOC, directly or indirectly, controls fifty percent (50%) or more of the share capital.

"**Approving Authority**" means the decision-making body or employee with the required authority to approve Policies & Procedures or any changes to it.

"**Business Line Directorates**" or "**BLD**" means a directorate of ADNOC which is responsible for one or more Group Companies reporting to, or operating within the same line of business as, such directorate.

"**Business Support Directorates and Functions**" or "**Non- BLD**" means all the ADNOC functions and the remaining directorates, which are not ADNOC Business Line Directorates.

"**CEO**" means chief executive officer.

"**Group Company**" means any company within the ADNOC Group other than ADNOC.

"Specification" means this Instrument and Control Cables Specification.

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GENERAL

1 PURPOSE

The purpose of this specification is to define the minimum mandatory technical requirements for design, procurement, manufacturing, installation, testing and packing of Instrument and Control cables.

2 SCOPE

2.1 The scope of this specification is limited to following types of Instrumentation and Control Cables:

1. Analogue and Digital Signal Cables
2. Thermocouple Extension Cables
3. Foundation Fieldbus Cables
4. Communication cables (such as RS-232, RS485, Ethernet etc.)
5. Optical fibre cables.

2.2 This specification excludes following types of cables:

1. Telecommunication cables.
2. Co-axial cables.
3. 230V AC Power Cables for powering Instruments and Control Equipment
4. Earthing Cables
5. Submarine Cables
6. Proprietary Control System's cables supplied by ICSS and Mechanical Package Vendors.

2.3 For project specific additional requirements, refer to instrumentation cable requirements stated in respective project's Purchase Requisition documentation.

3 DEFINED TERMS / ABBREVIATIONS / REFERENCES

Abbreviations	
AL/HDPE/PA	Aluminium / High Density Polyethylene / Polyamide (Nylon)
CSA	Cross Sectional Area
EPR	Ethylene Propylene Rubber
ESD	Emergency Shutdown System
FAT	Factory Acceptance Test
FF	Foundation Fieldbus
FGS	Fire and Gas System
FO	Fibre Optic
GSWA	Galvanised Steel Wire Armour
GSWB	Galvanised Steel Wire Braid
HOFR	Heat, Oil and Flame Retardant
I/O	Inputs/Outputs
I.S.	Intrinsically Safe
LSZH	Low Smoke Zero Halogen
MGT/EPR	Mica Glass Tape Ethylene Propylene Rubber
MGT/XLPE	Mica Glass Tape Cross Linked Polyethylene
PA	Public Address System
PTFE	Poly Tetra Fluoro Ethylene
S95	Silicone Rubber
XLPE	Cross Linked Polyethylene

Technical Definitions	
Term	**Definition**
Armour	Metallic wire mesh covering for protection against mechanical damage during cable installation and operation.
Bedding	Non-metallic layer applied between Armour and Lead Sheath to maintain electric isolation between metallic layers.
Buried	Cables that are required to go underground or laid underground.
Conductor	Metal used to transfer electrical energy from point to point.
Drain wire	Un-insulated wire laid in contact with an electrical screen or an electrical shield which has the specific function of earthing an electrostatic charge by ensuring a low resistive path throughout the length of the cable
Fibre Optics	A technology that transmits information as light pulses along a glass or plastic fibre.
Fillers	Non-conducting components cabled with the insulated conductors or optical fibres to impart roundness, flexibility, tensile strength or a combination of all three to the cable.
Fire Resistance	Ability of an electric cable to continue to operate in a designated manner whilst subjected to a specified flame source for a specified period under specified conditions.
Flame Resistance	The ability of a material not to fuel a flame once the source of heat is removed.
Inner Sheath	Non-metallic cover generally applied under a metallic sheath or armour.
Insulation	Non-conducting electrical isolation material between conductors
Laying Up	The cores of cables are laid up with suitable filling elements to form a compact circular assembly. Suitable binder tape(s) may be applied.
Outer Sheath	Non-metallic cover applied over armour ensuring the protection of the cable from the outside atmosphere.
Quad	A four conductor cable.
Screen/Shield	Earthed metallic layer surrounding a cable which confines the electric field generated by the cable within the cable cores, pair(s), triples(s) or quad(s),

	and/or protects the core(s), pair(s), triple(s) or quad(s) from external influence.
Stranded conductor	Conductor consisting of a number of individual wires all which generally have a helical form.

References
ADNOC Group Companies Instrument and Control Cable requirements documents part of Cable Purchase Order shall be referred for design and supply of equipment.

SECTION A

4 NORMATIVE REFERENCES

4.1 International Code(s) and Standards

The following codes and standards, to the extent specified herein, form a part of this specification. When an edition date is not indicated for a code or standard, the latest edition in force at the time of order placement shall apply.

Standard	Description
The International Electrotechnical Commission (IEC)	
IEC 60079	Explosive Atmospheres. All parts.
IEC 60092	Electrical installations in ships, covers power and instrumentation cables to be used on ships and in mobile marine environments.
IEC 60092-350	General construction and test methods of power, control and instrumentation cables for shipboard and offshore applications.
IEC 60092 -352	Electrical installations in ships: Choice and installation of electrical cables.
IEC 60092-360	Electrical, mechanical and particular characteristics of insulation and sheathing materials for shipboard and offshore units, power, control, instrumentation and telecommunications cables.
IEC 60092-376	Screened and unscreened cables for control and instrumentation circuits on ships and fixed/mobile offshore units. These cables have extruded solid insulation with a voltage rating of 150/250V.
IEC 60228	Conductors of Insulated cables.
IEC 60304	Standard colours for insulation for low-frequency cables and wires.
IEC 60331	Tests for Electric Cables under Fire Conditions - Circuit integrity. All series, all parts.
IEC 60332	Tests on electric and optical fibre cables under fire conditions. All series, all parts.
IEC 60529	Degrees of protection provided by enclosures (IP Code).
IEC 60584	Thermocouples. All parts.
IEC 60684-2	Flexible Insulating Sleeving Method of Test

IEC 60754	Tests on Gases Evolved during Combustion of Materials from Cables. All parts.
IEC 61784	Industrial communication networks – Fieldbus Profiles. All parts.
IEC 60793	Optical fibres: Measurement methods and test procedures. All parts.
IEC 60794	Optical fibre cables: Generic specification. All parts.
IEC 60811	Electrical and Optical Fibre Cables - Test Methods for Non-metallic material. All parts.
IEC 61034	Measurement of smoke density of cables burning under defined conditions. All parts.
IEC 61158-SER	Digital data communications for measurement and control - Fieldbus for use in industrial control systems – All parts.
IEC 61158-1	Industrial Communication Networks - Fieldbus specifications - Part 1: Overview and guidance for the IEC 61158 and IEC 61784 series.
IEC 61158-2	Industrial Communication Networks - Fieldbus specifications - Part2: Physical Layer Specification and Service Definition.
FF-844 H1	Foundation Fieldbus Type A H1 Cable Test Specification
IEC 61280	Fibre optic communication subsystem basic test procedures. All parts.
IEC 61281-1	Fibre optic communication subsystems. Generic specification.
IEC TR 61282	Fibre optic communication system design guide.
IEC 61315	Calibration of fibre optic power meters.
IEC 62033	Attenuation uniformity in optical fibres.
IEC TR 62221	Optical fibres - Measurement methods - Microbending sensitivity.
IEC TR 62222	Fire performance of communication cables installed in buildings.
IEC TR 63194	Guidance on colour coding of optical fibre cables.
British Standards Institution (BSI)	
BS 6004	Electric cables. PVC insulated and PVC sheathed cables for voltages up to and including 300/500 V, for electric power and lighting.

BS 6387	Test method for resistance to fire of cables required to maintain circuit integrity under fire conditions.
BS 6701	Telecommunication equipment and cabling.
BS 6883	Elastomer insulated cables for fixed wiring in ships and on mobile and fixed offshore units. Requirements and test methods.
BS 7655	Specification for insulating and sheathing materials for cables. All parts.
BS 7917	Elastomer insulated fire resistant (limited circuit integrity) cables for fixed wiring in ships and on mobile and fixed offshore units. Requirements and test methods.
European Standards (EN)	
EN 10204	Metallic products. Types of inspection documents.
EN 10218	Steel wire and wire products. General. All parts.
EN 10244-2	Steel wire and wire products. Non-ferrous metallic coatings on steel wire. Zinc or zinc alloy coatings.
EN 10257-1	Zinc or zinc alloy coated non-alloy steel wire for armouring either power cables or telecommunication cables. Land cables.
EN 12548	Lead and alloys. Lead alloy ingots for electric cable sheathing and for sleeves.
EN 50173	Information Technology – Generic Cabling Systems.
EN 50200	Method of test for resistance to fire of unprotected small cables for use in Emergency Circuits.
EN 50288	Multi-element metallic cables used in analogue and digital communication and control.
EN 50288-1	Part1: Generic specification.
EN 50288-7	Part7: Sectional specification for instrumentation and control cables.
EN 50289	Communication cables. Specifications for test methods. Electrical test methods. General requirements, all series and all parts.
EN 50290	Communication cables. Common design rules and construction. All parts.
EN 50290-4	Communication cables. General considerations for the use of cables - Guide to use.
EN 50307	Lead and lead alloys. Lead and lead alloy sheaths and sleeves of electric cables.
American Society for Testing and Materials (ASTM) International	

ASTM B3-13	Standard Specification for Soft or Annealed Copper Wire.
ASTM B33-10	Standard Specification for Tin-Coated Soft or Annealed Copper Wire for Electrical Purposes.
ASTM D2863-19	Standard Test Method for Measuring the Minimum Oxygen Concentration to Support Candle-Like Combustion of Plastics (Oxygen Index).
Underwriters Laboratories (UL)	
UL1581	Reference Standard for Electrical Wires, Cables, and Flexible Cords.
The Institute of Electrical and Electronics Engineers, Inc. (IEEE)	
IEEE-802	Standard for local and metropolitan area networks: Overview and architecture - IEEE Computer Society Document.
Engineering Equipment Materials Users Association (EEMUA)	
EEMUA 133	Specification for underground armoured cable protected against solvent penetration and corrosive attack.
Electronic Industries Association (EIA)	
EIA TIA-455	Standard Test Procedure for Fibre Optic Fibres, Cables, Transducers, Sensors, Connecting and Terminating Devices, and Other Fibre Optic Components.
EIA TIA-492 AAA-A	Detail Specification for 62.5-Micrometer Core Diameter/125-Micrometer Cladding Diameter Class Ia Graded-Index Multimode Optical Fibres.
EIA TIA-492AAA	Detail Specification for Class IVa Dispersion -Unshifted Single-Mode Optical Fibres.
EIA TIA-598	Optical Fibre Colour Coding
International Telecommunications Union (ITU)	
ITU-T G650	Definition and test methods for the relevant parameters of single mode fibres – Series G.
ITU-T G651	Characteristics of a 50/125 micrometer multimode graded index optical fibre cable – Series G.
ITU-T G-652	Characteristics of a Single-Mode Optical Fibre Cable Series G: Transmission Systems and Media, Digital Systems and Networks Transmission Media Characteristics - Optical Fibre Cables.
International Organization for Standardization (ISO)	

ISO 4589-2	Plastics. Determination of burning behaviour by oxygen index. Ambient-temperature test.
ISO 9001	Quality Management Systems - Requirements.
ISO 9004	Managing for the Sustained Success of an Organization – A Quality Management Approach
ISO 19011	Guidelines for Auditing Management Systems

5 REFERENCE DOCUMENTS

5.1 Standard Drawings

Not applicable.

5.2 Other References

This specification shall be read in conjunction with respective project specific Cable Purchase Order and its referenced documents and Cable Data Sheets which fully defines project specific requirements.

6 DOCUMENTS PRECEDENCE

The Codes and Standards referred to in this specification shall, unless stated otherwise, be the latest approved issue at the time of Purchase Order placement.

It shall be the VENDOR'S and CONTRACTORS'S responsibility to be, or to become, knowledgeable of the requirements of the referenced Codes and Standards.

The VENDOR/CONTRACTOR shall notify the COMPANY of any apparent conflict between this specification, the related data sheets, the Codes and Standards and any other specifications noted herein.

Resolution and/or interpretation precedence shall be obtained from the COMPANY in writing before proceeding with the design/manufacture.

In case of conflict, the order of document precedence shall be:

1. UAE Statutory requirements
2. ADNOC Codes of Practice
3. Equipment datasheets and drawings
4. Project Specifications and standard drawings
5. Company Specifications
6. National/International Standards

7 SPECIFICATION DEVIATION/CONCESSION CONTROL

Deviations from this specification are only acceptable where the VENDOR has listed in his quotation the requirements he cannot, or does not wish to comply with, and the COMPANY/CONTRACTOR has accepted in writing the deviations before the order is placed.

In the absence of a list of deviations, it will be assumed that the VENDOR complies fully with this specification.

Any technical deviations to the Purchase Order and its attachments including, but not limited to, the Data Sheets and Narrative Specifications shall be sought by the VENDOR only through Concession Request Format. Concession requests require CONTRACTOR'S and COMPANY'S review/approval, prior to the proposed technical changes being implemented. Technical changes implemented prior to COMPANY approval are subject to rejection.

8 PROCESS SAFETY REQUIREMENTS

Sr.No.	Description
1	Instrumentation Cables used for ESD and FGS applications and HSE Critical services shall be Fire Resistance in accordance with IEC 60331.
2	Instrumentation cables used for intrinsic safe applications shall be individually and overall shielded as per IEC 60079-14 Clause 16.2.2.8.

9 DESIGN CONSIDERATIONS / MINIMUM DESIGN REQUIREMENTS

9.1 Operation & Design Life

All Instrument and Control cables shall be suitable for continuous operation of 30 years under the environmental conditions at ADNOC facilities.

9.2 Environmental Requirements

Refer to Engineering Design Basis of ADNOC Group Company for respective Onshore or Offshore project environmental conditions. conditions. All cables shall be suitably designed for permanent operation under the prevailing environmental conditions specified in purchase order data sheets.

In general, the environment for outdoor installations shall be considered as high temperatures, high humidity, salty, sulphurous, dusty and corrosive. Cables shall be suitable for installation and operation over the full range of ambient temperature and humidity specified in the data sheets and in an environment containing trace amount of H2S, CO2 (sour & corrosive atmosphere) and HC gases.

Cables exposed to direct sunlight (outdoor above ground) shall be manufactured using the best suitable UV stabilizers which enables the long life without stress cracking suited to Middle East Environment Conditions. Cables resistance to UV shall meet requirements of UL 1581 art. 1200.

All indoor systems shall continue to operate in HVAC upset conditions during which the temperature can fall to 0ºC or rise to 60ºC, and the humidity can vary between 5% and 95% non-condensing.

All cables installed indoors shall have Low Smoke Zero Halogen (LSZH) sheath material.

9.3 Hazardous Area Protection

Unless otherwise specified, outdoor areas inside process plants shall be considered as hazardous. All cables laid outdoor shall be suitable for hazardous area specified in cable data sheet and shall comply with IEC 60079-11 & 25 requirements.

9.4 Engineering Units

Reference shall be made to Project Engineering Design basis for Units of Measurements.

SECTION B

10 TECHNICAL REQUIREMENTS

10.1 General

The Instrument and Control cables shall be suitable for process facilities situated at onshore desert and offshore marine locations, operating at high ambient temperatures and H2S/CO2 sour gas corrosive environments.

Cables shall be suitable to install for following laying arrangements:

(a) Outdoor directly buried in the ground

(b) Outdoor concrete trenches with soil backfill

(c) Outdoor on cable trays in the open air exposed to direct sunlight

(d) Inside building in cable trays, conduits and ducts

All cables shall be heat, oil, soil & UV resistant; non-hygroscopic and gas & vapor tight.

All cables shall be Flame Retardant and comply with IEC 60332-1-1&2 and IEC 60332-3-22, Category A as a minimum.

All cables used for ESD, FGS and safety functions shall be Fire Resistant and comply with IEC 60331-21 .

Onshore and Offshore, Instrument and Control Cables shall be rated for 300/500V i.e. 300 V r.m.s. core to earth and 500 V r.m.s. core to core.

Temperature rating of all cables shall be 90°C under normal operating conditions. For temperature above 90°C, cables shall be customised based on application and intended high temperature requirements.

The Thermocouple extension and compensating cables design shall comply to IEC 60584-3.

The Foundation Fieldbus cables design shall be comply to IEC 61158-2 Type A cables.

All outdoor cables buried in ground, laid in trenches or above ground in cable trays shall be armoured. All cables installed in the plant field areas and all cable runs from the plant areas to the cabinets located inside Instrument Equipment Room shall be considered as outdoor cables.

Indoor cables which are laid within the building between marshalling, system and other panels, should be unarmoured, shall have Low Smoke Zero Halogen (LSZH) sheaths and shall be suitable for installation within cable containment systems like cable trays or ducts. Unarmoured cables shall not be used for outdoor above ground or underground installations.

Mud resistant cables shall be considered for the entire wellhead platform at Offshore and Well pad area.

10.2 Cable Types and Selection Criteria

Following types of cables shall be provided based on service and installation requirements:

(1) Flame Retardant Cables and Fire Resistant Cables

(2) Underground and Above Ground Cables

(3) Armour and Unarmoured Cables

(4) Intrinsic Safe and Non-intrinsic Safe Cables

(5) Signal Cables (for 4-20 mA, Digital, Frequency, RTD, T/C, FF etc signals)

(6) Control Cables (for solenoid valves, beacons, hooter etc)

(7) Serial Communication Cables

(8) Fibre Optic Cables

To standardise cable construction, following number cores, pairs, triads and quads shall be used:

(1) Pair cables: 1P, 2P, 10P and 20P.

(2) Triad cables: 1T, 2T, 10T and 20T

(3) Quad cables: 1Q, 2Q and 10Q,

(4) Multi-core cables: 2, 3, 4, 7, 11, 19, 27 and 37

The selection of cable type and minimum conductor size for various signal types shall be as follows:

Signal Type	Cable Type	Conductor Size (Note 1)
Analogue 4-20 mA, Frequency, Foundation Fieldbus	1, 2, 10 & 20 Pair	1 Pair - 1.5 mm2 2, 10 & 20 Pair – 1 mm2
Digital Inputs- 24 VDC Potential Free contact, Proximity Namur, MCC/Switchgear contacts (Note 2)		
Thermocouple inputs		
RTD inputs, 3 Wire Transducers, F & G Detectors	1, 2, 10 & 20 Triad 1, 2 & 10 Quad	1 Triad/Quad - 1.5 mm2 2, 10 & 20 Triad/Quad- 1 mm2 or 1.5 mm2 based on voltage drop requirements
Digital Outputs to field devices 24 VDC for Solenoid Valves, Sounder, Beacon etc.	1, 2, 10 & 20 Pair	2.5 mm2
Serial Communication RS485/232/422	1, 2 Pair	1.5 mm2

Note 1: The conductor sizes mentioned above are the minimum requirements. CONTRACTOR shall verify conductor sizes based on cable length, voltage drop and power consumption requirements of instruments.

Note 2: CONTRACTOR shall ensure that signals to/from MCC/Switchgear are isolated from high voltage and their voltage levels are not greater than 24 VDC.

All instrument cables used for intrinsic safe I/O, vibration/frequency inputs, milli-volt signals, RTD signals, thermocouple signals, custody measurement signals etc shall be provided with individually and collectively screen with drain wire. All other instrument cables shall be provided with collective screen with drain wire.

Refer to Appendix 3 for construction details of various Cable Types. Summary of Cable types is as follows:

Applications	Cable Type	Cable Type Reference (A1, B5, C6)	
		Flame Retardant	Fire Resistant
2 Wire Signals- Analogue, Digital, Pulse, Voltage	Single Pair Cables 1 Pair	A1- Unarmoured A5 – Armoured A10- Armoured Buried	B1- Unarmoured B5 – Armoured B10- Armoured Buried
2 Wire Signals- Analogue, Digital, Pulse, Voltage	Multi Pair Cables 2, 10 & 20 Pair	A2 – Unarmoured A6, A7 – Armoured A11- Armoured Buried	B2 – Unarmoured B6, B7 – Armoured B11- Armoured Buried
3 Wire Signals- RTD, FGS	Single Triad Cables 1 Triad	A3 – Unarmoured A8 – Armoured A12- Armoured Buried	B3 – Unarmoured B8 – Armoured B12- Armoured Buried
3 Wire Signals- RTD, FGS	Multi Triad Cables 2, 10, 20 Triad	A4 – Unarmoured A9 – Armoured A13 – Armoured Buried	B4 – Unarmoured B9, B14 – Armoured B13, B15 – Armoured Buried
Thermocouple Signals	Single Pair T/C Cable 1 Pair	C1, C2, C3 – Unarmoured C4, C5, C6 - Armoured	D1, D2, D3 – Unarmoured D4, D5, D6 - Armoured
Thermocouple Signals	Multi Pair T/C Cable 2, 10, 20 Pair	C7, C8, C9 – Armoured C10, C11, C12 Armoured Buried	D7, D8, D9 – Armoured D10, D11, D12 Armoured Buried
Foundation Fieldbus, RS 485	Single Pair Cables 1 Pair	E1 – Unarmoured E3 – Armoured E5 – Armoured Buried	F1 – Unarmoured F3 – Armoured F5 – Armoured Buried
Foundation Fieldbus, RS 485	Multi Pair Cables 2, 10 & 20 Pair	E2 – Unarmoured E4 – Armoured E6 – Armoured Buried	F2 – Unarmoured F4 – Armoured F6 – Armoured Buried

Applications	Cable Type	Cable Type Reference (A1, B5, C6)	
		Flame Retardant	Fire Resistant
Communication Cables 4 Wire	Multi Pair Cable 2 Pair	E7 – Unarmoured E8 - Armoured	E7 – Unarmoured E8 - Armoured
Digital Outputs 24VDC – Solenoid, Beacons, Hooter	Single Pair Cables 1 Pair	A1- Unarmoured A5 – Armoured A10- Armoured Buried	B1- Unarmoured B5 – Armoured B10- Armoured Buried
Digital Outputs 24VDC – Solenoid, Beacons, Hooter	Multi Pair Cables 2, 10 & 20 Pair	A2 – Unarmoured A7 – Armoured A11- Armoured Buried	B2 – Unarmoured B7 – Armoured B11- Armoured Buried
Fibre Optic cables Unarmoured	24 fibre, multi-loose tube, single jacket	I1	J1
Fibre Optic cables Armoured	24 fibre, multi-loose tube, double jacket 24 fibre, multi-loose tube, armoured	I2, I3, I4,I5	J2, J3, J4

10.3 Cable Construction

Onshore Instrument and Control cable design and construction shall comply with BS EN 50288.

Offshore Instrument and Control cables design and construction shall comply with IEC 60092, BS 6883 and BS 7917.

Refer to Appendix 3 for construction details of each cable type.

10.3.1 Conductors

Conductors, with exception of thermocouple extension and compensating cables, shall be circular and multi-stranded tinned annealed copper wires conforming to IEC60228, Class 2.

Conductors for thermocouple extension and compensating cables shall be solid annealed type (Class 1), material and construction in accordance with IEC 60584-3.

10.3.2 Core Insulation Material

For temperature ratings up to 90°C the cable core insulation material shall be Halogen Free Ethylene Propylene Rubber (EPR) or Cross-Linked Polyethylene (XLPE). For Fire Resistant cables, insulation shall be Halogen Free Ethylene Propylene Rubber with Mica Glass Tape (MGT EPR) or Cross-Linked Polyethylene with Mica Glass Tape (MGT XLPE).

For operating temperature up to 180°C, the Halogen Free Silicone (S95) or equivalent insulation and sheath material cables shall be used. For operating temperature up to 250°C, the insulation material PTFE

or Mica glass with glass fibre braid shall be used. To enhance the heat resistance capacity of the cables suitably treated glass fibre braid shall be applied over insulation and sheath material.

Core insulation shall be extrusion type and shall be applied closely to the conductor. It shall be possible to remove the insulation without damaging the conductor or its metal coating. The average thickness of insulation shall not be less than 0.7 mm. This thickness does not include any separator or organic tape(s) (MGT and/or glass fibre braid) applied over the conductor.

10.3.3 Core Identification

Instrument signal and control cables cores shall be identified by insulation colour as follows:

Type of Cables	Core 1	Core 2	Core 3	Core 4
Pair	Black	White	-	-
Triad	Black	White	Red	-
Quad	Black	White	Red	Blue

For the multi-pair/ triad / quad cables, the pair / triad / quad numbers shall be additionally printed on the insulation of each core.

For multi-core cables containing more than four cores, the cores shall be numbered sequentially, starting with number one (1) printed in a colour contrasting with that of the insulation.

Thermocouple extension/compensation cables cores shall be identified by insulation colour as per IEC 60584-3 as follows:

Description	Colour
Thermocouple Type - B	(+) Grey, (-) White
Thermocouple Type – E	(+) Violet, (-) White
Thermocouple Type – J	(+) Black, (-) White
Thermocouple Type – K	(+) Green, (-) White
Thermocouple Type – N	(+) Pink, (-) White
Thermocouple Type – R or Type - S	(+) Orange, (-) White
Thermocouple Type - T	(+) Brown, (-) White

Multi-pair thermocouple cables shall be identified by having the same ‘pair’ number printed in a contrasting colour on the insulation of each core.

10.3.4 Pair / Triad / Quad formation

Twisted pair/triad/quad cables shall be used for transmission of all instrumentation signals. For Pair / Triad / Quad formation, the cores shall be twisted together in concentric layers with either left hand or right hand lay to form a pair, triad or quad cable.

The lay length of a pair, triad or quad shall not exceed 100 mm for conductor size up to 1.5 mm2 nor 150 mm for conductor size 2.5 mm2.

A non-hygroscopic binder tape(s) shall be helically applied (providing 100% coverage with 25% overlap) over each pair, triad or quad.

For cables with individual screens, each pair / triad / quad shall be provided with a laminated electrostatic screening tape applied with the metallic side in electrical contact with a drain wire.

The drain wire shall be 0.5 mm^2 size minimum and constructed with stranded tinned annealed copper material. Screen shall provide 100% coverage with minimum overlap of 25% of its width.

The laminated electrostatic screening tape shall be of aluminium material bonded to polyester (Mylar Tape) having a minimum thickness of aluminium of 0.008 mm and a minimum thickness of polyester of 0.010 mm.

The individual screens shall be electrically isolated both from each pair / triad / quad and also electrically isolated from the overall screen.

A polyester tape of 0.050 mm nominal thickness shall be applied over the screen with a minimum overlap 20% of its total width, in order for the screen to be insulated from the remaining cable components.

The multi-pairs / triads / quads of the cables shall be assembled in concentric layers using either an uni-directional or reverse lay. Cable fillers shall be solid, non-hygroscopic. They shall fill the cross section such that the transmission of gas and hydrocarbons along the length of the cable, under normal pressure, is not possible.

The overall screen of the cable shall be provided with drain wire and the construction of overall screen shall be similar to the individual screen.

Overall binder tape(s), non-hygroscopic, shall be helically applied similar to individual binder (providing 100% coverage with 25% overlap) over the multi-pair / triad / quad.

10.3.5 Inner Sheath

Inner sheath material shall be Low Smoke Zero Halogen Flame Retardant Compound. Inner sheath shall be suitable for specified service, operating temperatures, site conditions and cable design standard indicated in cable data sheets. Inner sheath shall be extrusion type.

10.3.6 Lead Sheath / Multi-layer Sheath

The lead sheath or multilayer sheath shall provide a barrier against moisture, chemicals, water, solvents, environment and hydrocarbon oil attacks.

All onshore underground buried cables shall be provided with Lead Sheath as a moisture and chemical barrier in accordance with BS EN 50288 and shall comply to EEMUA 133 for lead quality. Alternatively, Aluminum/high density polyethylene/polyamide (AL/HDPE/PA) multi-layer inner sheath can be acceptable subject to COMPANY prior approval. VENDOR shall provide ‘Type Test’ certificates, from a test house acceptable to COMPANY, for AL/HDPE/PA multi-layer inner sheath cables to validate degree of ingress protection against water, organic and non-organic chemicals.

10.3.7 Bedding Layer

The bedding layer shall be provided between lead sheath and armour for underground cables.

The material of construction for the bedding layer shall be same as that of the inner sheath material.

10.3.8 Steel Wire Armour

Armored cable shall have Galvanized Steel Wire Armour under outer sheath.

The galvanized steel wire armour shall comply to requirements of EN 10257-1 and, EN 10218-1.

The coating of steel wire shall comply with the requirements of EN 10244-2.

10.3.9 Outer Sheath

Outer sheath material shall be minimum PVC or better and comply with this specification requirements. Outer sheath shall be Low Smoke Zero Halogen Flame Retardant Compound. Outer sheath shall be suitable for specified service, operating temperature, site conditions and cable design standard indicated in cable data sheets. Outer sheath shall be extrusion type.

Outer sheath shall be anti-vermin impregnated and UV-resistant. Outer sheath shall be heat, oil and flame retardant (HOFR).

Outer sheath material shall be minimum PVC or better and comply with this specification requirements.

The colour of outer sheath shall be as follows:

Description	Outer Sheath Colour
Intrinsically safe cables for Instrument and Control	Blue
Non-intrinsically safe cables for Instrument and Control	Black
Non-intrinsically safe cables for FGS.	Red
Intrinsically safe cables for FGS.	Red with longitudinal blue strip
Non-intrinsically safe Foundation Fieldbus cables	Orange
Intrinsically safe Foundation Fieldbus cables	Orange with longitudinal blue strip

Outer sheath colour for Building Fire Alarm Panel's cables shall be as per purchase cable data sheets.

Thermocouple cables shall have overall sheath colour in accordance with IEC 60584-3 as follows:

Description	Outer Sheath Colour
Thermocouple Type - B	Blue
Thermocouple Type – E	Violet
Thermocouple Type – J	Black
Thermocouple Type – K	Green
Thermocouple Type – R or Type - S	Orange
Thermocouple Type - T	Brown

10.4 Cable Performance requirements

10.4.1 Physical and Mechanical Characteristics.

The physical and mechanical characteristics of the cable core, insulation, screens, sheaths, bedding, filler and armour materials shall be in accordance with the relevant standards that are referred to each type of cables.

10.4.2 Electrical Characteristics.

The electrical characteristics such as resistance, inductance and capacitance of the complete cables shall be in accordance with the relevant standards that are referred to each type of cables.

The electrical parameters such as L/R ratio and Mutual Capacitance for the I.S. cables shall be as per Control Systems VENDOR recommendation based on I.S. circuit design, which shall be specified in the project specific data sheet.

10.4.3 Flame Retardant Characteristics.

Flame retardant cables shall pass the tests as defined in IEC 60332-3-22 Category A (reduced propagation). In addition to above, refer to BS 6883 for Offshore flame retardant cables.

10.4.4 Fire Resistant Characteristics.

Fire resistant cables shall pass the tests as defined in IEC 60331-1, 2 & 3. Fire resistant test and mechanical shock test shall be carried out simultaneously with the flame temperature of 830°C and application time of 90 minutes.

In addition to above, refer to BS7917 for Offshore fire resistant cables.

10.4.5 Smoke Emission Level.

Smoke emission test shall be carried out in accordance with IEC 61034-1 & 2 and the smoke generated shall not result in transmittance value of lower than 60%.

10.4.6 Acid Gas Emission Level

Acid gas emission level test shall be carried out in accordance with IEC 60754-1 requirements. The maximum level of hydrogen chloride (HCl) emission during the combustion of insulation, sheath, bedding and filler materials shall not be greater than 0.5%.

10.4.7 Corrosivity Level

pH and conductivity tests shall be carried out in accordance with IEC 60754-2 requirements.

10.4.8 Fluorine Content Level

Fluorine content test shall be carried out in accordance with IEC 60684-2 requirements.

10.4.9 Oxygen Index.

As a minimum, the oxygen index value for cable shall be greater than 32.

10.4.10 Oil Resistance Characteristics.

Test method and its performance test results for the aboveground cables shall be as per IEC 60811 and Table 9 of IEC 60092-360 respectively.

Test method for the underground cables shall be as per EN 60811 and its performance test results shall be as per EN 50289 and EN 50290.

Refer to BS7655 Section 2.6 for the test requirements and the application details of Offshore / Marine oil-resisting cable, cross-linked elastomeric insulating and sheathing compound types SW1, SW2, SW3 and SW4. Refer to BS7655 Section 1.4 for oil-resisting compound type OR1.

10.4.11 Resistance to Solar Radiation.

Solar radiation (UV rays) resistant of the cables shall be tested in accordance with EN 50289-4-17.

10.4.12 Resistance to Heat Characteristics.

Thermal ageing tests for the cable insulation and sheaths, such as ageing in an air oven and ageing in an air bomb test, shall be carried out in accordance with IEC 60811-401.

10.4.13 Resistance to Water Treeing Characteristics

Cables resistant to water treeing characteristics shall be tested in accordance with the relevant method specified in cable construction standards.

10.4.14 Resistance to Drilling Fluids

Drilling fluids resistant of the cables shall be tested in accordance with IEC 60092-360.

10.4.15 Resistance to Chemicals and Solvents

Cables resistant to Chemicals and solvents test shall be carried out in accordance with the relevant standards that are referred in cable construction standards.

10.4.16 Ozone Resistance Characteristics

Ozone resistance test for insulation and sheath(s) shall be carried out in accordance with IEC 60811-403.

10.5 Marking and Traceability Requirements

Cables shall be supplied in continuous drum lengths without any cable or conductor joints.

No negative tolerance on drum length is permissible.

10.5.1 Cable Marking

The outer sheath of cable shall be embossed legibly every one meter along the entire cable length, on two sides, with the following data as a minimum:

(a) Manufacturer Name and year of manufacture

(b) Applicable Cable Standard (EN 50288-7 etc.)

(c) Flame retardant as per IEC 60332-3 or Fire Resistant as per IEC 60331

(d) Voltage rating (300V/500V etc.)

(e) Cable Type and Designation (construction) or Fibre quantity, size and type

(f) Cable length (in metres) and sequential length mark

(g) Number of cores (or pairs or fibres) and conductor size (CSA)

(h) Circuit Integrity Class (for Fire Resistant Cables)

The letters and figures on the outer sheath shall consist of upright block characters with a minimum height of 3 mm.

For FO cables, each buffer tube of the outdoor cable shall be a different colour in accordance with VENDOR standard.

The VENDOR shall include the following additional cable information on the cable datasheet for each cable type:

(a) Conductor resistance at 35°C ohms/1000 meters.

(b) Impedance at 50Hz in ohms/1000 meters.

(c) Mutual capacitance at 50Hz in nanofarads/1000 meters.

(d) L/R ratio in micro henry/ohm

(e) Weight in Kg/1000 meters.

(f) Diameter of cable under armour and tolerance.

(g) Thickness of armour and tolerance.

(h) Bending radius at minimum installation temperature.

(i) Minimum installation temperature.

(j) Overall Cable Diameter.

(k) Mutual inductance in millihenry/1000meters.

Refer to Appendix1 for the cable datasheet and Appendix 2 for the cable designation/numbering requirements.

10.5.2 DRUM MARKING

All cables shall be supplied and delivered in maximum manufacturing cable drums length, continuous lengths on non-returnable cable drums. VENDOR shall specify their standard production length for the selected cable types.

Cable ends shall be sealed and fixed to the drum. Cable drums shall be fitted with battens, fixed around the entire periphery of the drum.

All cable drums shall have their identification number or reference clearly stenciled on the outside of both flanges.

Each cable drum shall be fixed with clear weatherproof identification labels. Labels shall be robust and non-fading. All cable drums labels shall provide the following information as a minimum:

(a) Manufacturer’s name and year of manufacture

(b) Drum identification number (COMPANY and VENDOR's numbers)

(c) Purchase order number and project name

(d) Purchase order item number (or Stock code Number as stated in Material Requisition)

(e) Voltage rating

(f) Number of cores (or pairs or fibres) and conductor size (CSA)

(g) Cable quantity (length)

(h) Cable type and Designation (construction) or Fibre quantity, size and type

(i) Length of cable on the drum (in metres)

(j) Total weight of cable and drum (kg)

(k) Site location

VENDOR shall produce a drum schedule for the scope of supply on each project and shall identify each cable length. All drum lengths shall be continuous. Cable or conductor jointing in any form is unacceptable.

VENDOR shall also identify where multiple cable designations have been applied to a single cable length on the drum and identify each designated cable length to allow for unreel & cable cutting after delivery, where appropriate.

11 SPECIAL CABLES

11.1 Fibre Optic Cables

Selection of Fibre Optic (FO) cables and its design shall comply with all parts of IEC 60793, IEC 60794, IEC 61281-1, IEC 61282 and ITU-T G.652.

Fibre optic cable properties and construction shall be as follows:

Sr.No.	Description	Multimode step Index/Multimode Graded Index	Single Mode Fibre
1	Core Glass Diameter	6.25/125 or 50/125 micrometer	9 / 125 micrometer
2	Maximum Attenuation	3.0 dB/Km@850 nm 0.8 dB/Km@1300 nm	0.4 dB/Km@1310 nm 0.25 dB/Km@1550 nm
3	Minimum Bandwidth	400 MHz/Km@850 nm 600 MHz/Km@1300 nm	20 GHz
4	Optical Characteristics	IEC 60793-210 Type A1b (62.5 micrometer)	G.652.D
		G.651.1 (50 micrometer)	G.655 NZ-DSF (DWDM System)
5	Minimum Fibre Count	24	
6	Fibre Identification	Colour Coded Fibre Tubes	
7	Fibre Tube	Extruded Tubes, Jelly filled with longitudinal tightness	
8	Minimum Core in a tube	6	
9	Inner Jacket	Black Flame Retardant Polyvinyl Chloride	
10	Fibre Sheath	Non-leaded Hydrocarbon Resistant, Moisture Barrier with Metallic Tape	
11	Bedding	Polyvinyl Chloride, Black Colour	
12	Armour	Galvanized Steel Wire Armour or Equivalent strength Steel Tape Armour	
13	Rip Cord	Yes	
14	Outer Jacket	Black Flame Retardant Polyvinyl Chloride, Black Colour	

A minimum of 2 x 24 core Single Mode FO Cable shall be provided for each system, unless otherwise specified by the project requirement.

All FO cables construction shall be based on the ‘Loose Tube’ type. Loose tube cables are characterized by loose fitting, buffer or gel-filled tubes into which the fibres are placed.

Each individual fibre shall be protected by a loosely fitting, colour coded, buffer tube. The tubes shall be extruded from PolyButylene Terephthalate (PBT) or Allied ‘HALAR’ fluoroplastic or an acceptable equivalent. The outside diameter of the buffer tubes shall not exceed 3.0 mm (0.118 inches). The buffer tubes shall be twisted around the central member with a lay which will result in each buffer tube being

approximately two percent longer than the central member. Each buffer tube, as well as the core interstices, shall be flooded with a filling compound to minimize water entry and migration. The compound shall be stable, moisture resistant, non-toxic, electrically non-conducting and compatible with all other cable components.

No fibre splices are allowed in a length of completed cable.

FO Cables shall be given buckle resistance by a glass reinforced plastic (GRP) rod or equivalent, through the center of the cable. An Aramid wrap and/or E-glass yarn and polyester tape around the buffer tubes provides tensile strength.

The inner and outer sheath material shall be LSZH Flame Retardant compound. Wherever required, the FO cable design shall also be fire resistant to IEC 60331.

All outdoor FO cables shall have a twisted steel wire armour in addition to the dual jacketing structure.

The cable shall be designed so that the fibers will not be stressed when the cable is installed with a minimum bending radius of 25 cm.

Fibre Optic Cable shall have fibre colours and buffer tube colours in accordance with EIA/TIA-598.

11.2 Direct Burial Fibre-Optic Cables

In addition to the requirements above, fibre-optic cables intended for direct burial shall have a secondary lead sheath, or equivalent multi-layer sheath.

11.2.1 Lead Sheath / Multi-layer Sheath

The lead sheath or multilayer sheath shall provide a barrier against moisture, chemicals, water, solvents, environment and hydrocarbon oil attacks.

All onshore underground buried cables shall be provided with Lead Sheath as a moisture and chemical barrier in accordance with BS EN 50288 and shall comply to EEMUA 133 for lead quality. Alternatively, Aluminum/high density polyethylene/polyamide (AL/HDPE/PA) multi-layer inner sheath can be acceptable subject to COMPANY prior approval. VENDOR shall provide ‘Type Test’ certificates, from a test house acceptable to COMPANY, for AL/HDPE/PA multi-layer inner sheath cables to validate degree of ingress protection against water, organic and non-organic chemicals.

11.2.2 Bedding Layer

The bedding layer shall be provided between lead sheath and armour for underground cables.

The material of construction for the bedding layer shall be same as that of the inner sheath material.

11.2.3 Steel Wire Armour

Armored cable shall have Galvanized Steel Wire Armour under outer sheath.

The galvanized steel wire armour shall comply to requirements of EN 10257-1 and, EN 10218-1.

The coating of steel wire shall comply with the requirements of EN 10244-2.

11.2.4 Outer Sheath

Outer sheath material shall be minimum PVC or better and comply with this specification requirements. Outer sheath shall be Low Smoke Zero Halogen Flame Retardant Compound. Outer sheath shall be

suitable for specified service, operating temperature, site conditions and cable design standard indicated in cable data sheets. Outer sheath shall be extrusion type.

Outer sheath shall be anti-vermin impregnated and UV-resistant. Outer sheath shall be heat, oil and flame retardant (HOFR).

Outer sheath material shall be minimum PVC or better and comply with this specification requirements.

SECTION C

12 SCOPE OF SUPPLY

The VENDOR shall supply Instrument and Control cables in accordance with technical requirements in this specification and project specific Purchase Order documentation.

The VENDOR scope of supply shall include but not be limited to:

1. Supply of cables as per types and quantities listed in project purchase order
2. Design, fabrication, assembly and testing of cables
3. Submission of VENDOR's Design Specification for cable design, fabrication and testing for CONTRACTOR/COMPANY approval
4. Inspection and Testing at VENDOR's work
5. Packing & Shipping to site
6. Documentation
7. Warranty and Guarantee

13 QUALITY CONTROL AND ASSURANCE

Equipment and materials shall only be purchased from Vendors approved by ADNOC Category Management. This approval indicates that the VENDOR has an approved Quality management system and a proven track record in supply of this equipment and material type.

COMPANY/CONTRACTOR reserves the right to inspect materials and workmanship at all stages of manufacture and to witness any or all tests.

VENDOR shall comply to Criticality Rating for Equipment outlined in respective ADNOC Group Company's Quality System Specifications for requirements of production checks, shop inspection, testing and material certification.

The VENDOR shall provide equipment and material inspection and test reports as per approved Inspection and Test Plan by CONTRACTOR.

14 MATERIAL CERTIFICATION

VENDOR shall provide all material Test Certificates as per Supplier Document Register and Schedule (SDRS) provided in Purchase Order.

15 INSPECTION & TESTING REQUIREMENTS

The VENDOR shall be responsible for workmanship, testing and quality assurance of the material supplied.

All formal testing will be conducted in accordance with written Inspection and Test Plan (ITP) test procedure. The test procedures shall be furnished by the VENDOR to the CONTRACTORS at least two months prior to the associated test for approval.

15.1 Instrument and Control Cables

All the cables shall be subjected to routine tests and the test records/reports shall be submitted for CONTRACTOR/COMPANY review.

The test requirements, types of tests and test procedures shall be specified in the Inspection and Test Plan (ITP), submitted and agreed with the COMPANY.

COMPANY, CONTRACTOR and/or assigned Third Party Inspector for the specific project shall witness the inspection and tests as per approved project specific Inspection and Test Plan (ITP) and QA/QC procedure. The COMPANY shall be informed of testing schedule with an advance notice as per project specific contract requirements.

The inspection and acceptance of reports and certificates shall in no way release VENDOR from final guarantee with regard to materials, workmanship and performance of the material inspected.

The VENDOR shall be responsible for inspection and quality assurance of the materials and standard of workmanship furnished. Testing and inspection will be carried out and witnessed by the CONTRACTOR and COMPANY representatives at various stages as the equipment is manufactured and assembled, at locations as detailed below:

(1) Shop Inspection: Conducted at the manufacturing facility of VENDOR

(2) Factory Acceptance Test: Conducted at the manufacturing facility of VENDOR

(3) Site Delivery Acceptance Test and Inspection: Conducted at the job site.

Each formal acceptance test shall be signed by VENDOR, CONTRACTOR and COMPANY representatives at the successful completion of the test(s).

Inspection and Testing shall be performed only when all the technical documents from the VENDOR are reviewed and approved by COMPANY. Before commencement of any test, copies of all relevant drawings, certificates and specifications shall be made available to the COMPANY.

Provision of suitable test gear and accessories, if any, for the test shall be the responsibility of the VENDOR.

All the punch points highlighted during Factory Acceptance Test (FAT) shall be cleared in agreement with COMPANY.

Material shall be dispatched only after obtaining dispatch clearance from the CONTRACTOR/COMPANY. All the necessary documents including FAT punch points clearance report and material test certificates shall be submitted to CONTRACTOR/COMPANY, while requesting the dispatch clearance.

During the FAT, the following tests are to be carried out at VENDOR works for witness by representatives of COMPANY, CONTRACTOR and Third-Party Inspector.

Below (S) means 'Sample Test during FAT (samples taken from drum)' and (D) means 'Drum Test for the complete length of cable in the drum'.

(a) Dimensions and Tolerances Check (S & D)

(b) Voltage test (S)

(c) Continuity test (D)

(d) Insulation resistance test (S & D)

(e) Flame Retardant test (S)

(f) Fire with mechanical shock resistant test (S)

(g) Fire tests including pH & Conductivity, Fluorine content, Acid gas emission test (S)

(h) Oxygen index test (S)

(i) Bending test (S)

(j) Conductor resistance test. including drain wire (S & D)

(k) Electrical Characteristics L/R ratio & Capacitance (S)

(l) Resistant to Fire with water spray test (S)

(m) Thermal Ageing test (S)

(n) Smoke Density test (S)

(o) Ozone Resistance Test (S)

(p) Oil Resistant Test (S)

(q) UV resistant Test S)

(r) Drilling Fluid Resistance test (S)

(s) High Temperature Test (for siliconee insulated cables) (S)

(t) Watering Treeing Test (S)

(u) Galvanizing Test (Dipping Test) (S)

(v) Mechanical Tests including impact resistance test (S)

Where there are no standard test procedures available in the referenced IEC / BS standards for some specific tests, test procedures and methods shall be developed by VENDOR and agreed with COMPANY.

Details such as cable diameter shall be submitted to the COMPANY during the course of manufacture to enable designing and/or selection of the cable gland.

After testing, the ends of the cable shall be sealed with approved caps to prevent the ingress of moisture.

The test reports shall contain as a minimum:

(a) The anticipated (theoretical) values.

(b) The tolerances permitted.

(c) The results of the measurements, including any intermediate value, which has caused a temporary rejection.

(d) Explanation of any calculations.

15.2 Fibre Optic Cables

Tests shall be carried out on all fibre optic cables according to EIA TIA-455 to verify attenuation and bandwidth specifications at the manufacturer's premises.

Routine tests and sample tests shall be carried out on all cables produced and shall be in accordance with IEC 60793, IEC 60794 and IEC 61280.

The routine type tests shall include the following:

(a) OTDR measurements

(b) End to end attenuation

(c) Macrobending loss

(d) Chromatic dispersion

(e) Stress corrosion susceptibility

(f) Bandwidth

(g) Tensile strength

(h) Fibre proof tests

(i) Fibre geometry

Additional tests shall be carried out to verify the FO cable properties including the following:

(a) Fire resistance test to IEC 60331 and EN 50200 for fire resistant cables.

(b) Flame retardant test IEC 60332 for flame retardant cables.

(c) Bending test for all cables.

(d) Cable Bending Radius (IEC 60794-1-2-E11 and -E6).

(e) Tensile Force (IEC 60794-1-2-E1).

(f) Torsion Strength (IEC 60794-1-2-E7).

(g) Crush Resistance (IEC 60794-1-2-E3).

(h) Impact Resistance (IEC 60794-1-2-E4).

(i) Kink Resistance (IEC 60794-1-2-E10).

(j) Water Penetration (IEC 60794-1-2-F5).

The FAT will include the inspection, testing and acceptance of Fibre Optic Cables as per EIA/TIA and ITU standards. In particular, the attenuation test shall be done on 100% fibres.

At the satisfactory conclusion of the FAT, a factory Certificate of Acceptance shall be provided by the VENDOR for signature by COMPANY and CONTRACTOR.

At the satisfactory conclusion of the Site Acceptance Test (SAT), a Provisional Acceptance Certificate shall be prepared by CONTRACTOR. Along with all test reports and certificates, a Certificate of Provisional Site Acceptance, which COMPANY shall review and approve.

16 SUBCONTRACTORS/SUBVENDORS

The VENDOR shall assume unit responsibility and overall guarantee for the equipment package and associated materials.

The VENDOR shall transmit all relevant purchase order documents including specifications to his SUBCONTRACTORS.

It is the VENDOR'S responsibility to enforce all Purchase Order and Specification requirements on his SUBCONTRACTORS.

The VENDOR shall submit all relevant SUBCONTRACTOR drawings and engineering data to the CONTRACTOR.

The VENDOR shall obtain and transmit all SUBCONTRACTORS warranties to the CONTRACTOR/COMPANY, in addition to the system warranty.

17 SPARE PARTS

Not Applicable.

18 PACKING, PRESERVATION & SHIPMENT

18.1 Packing and Shipping

Preparation for shipment shall be in accordance with purchase order Preservation and Export Packing requirements. VENDOR shall be solely responsible for the adequacy of the preparation for shipment provisions with respect to materials and application, and to provide equipment at the destination in ex-works condition when handled by commercial carriers. Adequate protection shall be provided to prevent mechanical damage and atmospheric corrosion in transit and at the jobsite. Preparation for shipment and packing will be subject to inspection and rejection by COMPANY'S/CONTRACTOR'S inspectors. All costs occasioned by such rejection shall be to the account of the VENDOR. Cables shall be export quality packed to prevent damage during transit, lifting, or unloading. Pieces of equipment and spare parts shall be identified by item number and service and marked with CONTRACTOR'S order number, tag number, and weight, both inside and outside of each individual package or container. A bill of material shall be enclosed in each package or container of parts. One complete set of the installation, operation, and maintenance instructions shall be packed in the boxes or crates with equipment. This is in addition to the number called for in the Purchase Order.

All kinds of regulatory / non-regulatory approvals and procedures required for shipping shall be in the scope of CONTRACTOR / VENDOR.

18.2 Preservation and Storage

Cables shall be protected to withstand ocean transit and extended period of storage at the jobsite for a minimum period of 18 months. Cables shall be protected to safeguard against all adverse environments, such as humidity, moisture, rain, dust, dirt, sand, mud, salt air, salt spray, and seawater. All cables shall be preserved, and export packed in accordance with project specifications.

Adequate protection shall be provided to prevent mechanical damage and atmospheric corrosion in transit and at the worksite. The cable drums shall be lagged or covered with suitable material, to provide physical protection during transit, ordinary storage and handling operations.

The ends of Control and Instrument cables shall be properly sealed for transport by sea and for storage under desert conditions. Cable ends shall be fitted with heat shrink end cap to prevent entry to moisture inside the cable.

The VENDOR shall provide preservation plan to protect and ensure the integrity of equipment and materials during the period that starts when the equipment and materials is prepared for the first shipment from the point of origin and ends at the completion of project commissioning and start-up. The plan shall identify protective measures to be implemented during each phase of the project, inclusive of ambient conditions. The completion plan shall be submitted to COMPANY for review and comment no later than 90 days prior to the first shipment of equipment and materials from the factory.

Preparation for shipment and packing will be subject to inspection and rejection by COMPANY inspectors.

19 COMMISSIONING

Not Applicable.

20 TRAINING

Not Applicable.

21 DOCUMENTATION/MANUFACTURER DATA RECORDS

21.1 GENERAL

VENDOR shall submit the type and quantity of drawings and documentation for COMPANY/CONTRACTOR authorization or information as per Supplier Document Register and Schedule (SDRS) provided in Purchase Order.

The VENDOR shall provide all standard and project-specific documentation and material data sheets. This information shall provide complete documentation for the cables in sufficient detail to permit supply, installation, proof testing, maintenance and replacement of the control and instrumentation cables.

Mutual Agreement on document list and documents issue dates shall be an integral part of Purchase Order.

Comments made by COMPANY/CONTRACTOR on drawing submittal shall not relieve VENDOR of any responsibility in meeting the requirements of this specification. Such comments shall not be construed as permission to deviate from requirements of the Purchase Order unless specific and mutual agreement is reached and confirmed in writing.

All drawings, documents, information, correspondence, test reports, operating and maintenance instructions and like items shall be in the English language.

All documents and drawings issued by the VENDOR shall be produced in an electronic format compatible with Microsoft Office computer software. Documentation shall also be provided in Native format, in order to allow company to update during operational upgrade and future projects. VENDOR shall provide final documentation on DVD-ROM with search and retrieval capabilities.

All drawings and datasheets shall be prepared and submitted in accordance with recognized standards. Every effort shall be made to minimize the total number of drawings and datasheets prepared by use of common drawings or datasheets, where practicable without loss of clarity.

Each drawing or datasheet shall be provided with a block in the bottom right-hand corner incorporating the following information:

(a) Official trade name of the VENDOR.

(b) VENDOR'S drawing or material reference number.

(c) Drawing title giving the description of contents whereby the drawing can be identified.

(d) A symbol or letter indicating the latest issue or revision.

(e) PO number and item tag numbers.

Revisions to drawing or datasheet shall be identified with symbols adjacent to the alterations, a brief description in tabular form of each revision shall be given, and if applicable, the authority and date of the revision shall be listed. The term "Latest Revision" shall not be used.

21.2 DELIVERABLES

The VENDOR and CONTRACTOR shall supply complete final cable documentation, which shall include but not limited to the following:

(a) Technical Data Sheets & Specifications

(b) Material Test Certificates

(c) Dimensional Details

(d) Installation Test Certificates

22 GUARANTEES & WARRANTY

VENDOR shall provide warranty support for a period of two years following cable installation and plant commissioning at site. Warranty shall apply to defective material workmanship and cable failures. The cost of diagnostics and/or correction of any warranty items shall be borne by the VENDOR.

The VENDOR shall guarantee that supplied cables last till design life for 30 years.

SECTION D

23 DATA SHEETS

Refer following Appendices in Section E for cable data sheet, numbering method and construction requirements:

Appendix 1: CABLE DATASHEET

Appendix 2: CABLE DESIGNATION

Appendix 3: TYPICAL CONSTRUCTION DETAILS FOR CABLES

24 STANDARD DRAWINGS

Not applicable.

APPENDICES

APPENDIX 1 CABLE DATA SHEETS

A1.1 CONTROL/INSTRUMENTATION CABLE

The cable details listed below, items 1 to 71 including the tick-boxes & the data values, shall be provided/submitted by the VENDOR on a datasheet for each cable.

1. Cable Type (Code and Designation):

_____

2. Cable Quantity required (metres): ……**3. Manufacturer:** …….....

4. Purchase Order Number and Date: …… dd/mm/yyyy

5. Installation: ☐ Aboveground Underground ☐ Indoor ☐ Marine

6. Manufacturing Standard ☐ IEC 60092 ☐ EN 50288 ☐ BS 6883 ☐ BS 7917

7. Cable characteristic: ☐ Flame Retardant ☐ Fire Resistant ☐ High Temperature

8. Intrinsic Safety requirement: ☐ IS ☐ NIS

9. Application Requirement: ……

(Analog, RTD, Thermocouple, Vibration, Speed, Digital Input, Digital Output, SOV, F&G, ESD, Comms, Other – please specify)

10. Rated Voltage (Uo/U): ☐ 300V/500V ☐ Other(…….)

11. CSA of Conductor: ☐ 1.0mm^2 ☐ 1.5mm^2 ☐ 2.5mm^2 ☐ Other ( )

12. Conductor Class: ☐ Class 1 (solid) ☐ Class 2 (stranded)

13. Conductor Insulation Material Halogen Free Flame Retardant as per IEC 60092, BS EN 50290:

☐ EPR ☐ XLPE ☐ MGT EPR ☐ MGT XLPE ☐ Other _____

☐ XL SILICONE RUBBER (S95) ☐ MGT XL SILICONE RUBBER (S95)

14. Conductor Insulation Material Halogen Free Flame Retardant BS 6883 & BS 7917:

☐ GP4 ☐ GP 5 ☐ GP6 ☐ GP7 ☐ Other _____

15. Conductor Formation: ☐ Cores (…….) ☐ Pair ☐ Triad ☐ Quad

16. Core Colours / Identification:

☐ Black, White ☐ Black, White, Red ☐ Black, White, Red, Blue ☐ Other……..

17. Thickness of insulation: _____ mm

18. Lay length (Number of twists per Metre): _____

19. Screen/Foil: ☐ Individual ☐ Overall ☐ Individual & Overall ☐ N/A

20. Screen material: ☐ Aluminium bonded to polyester (Mylar) tape ☐ Braid ☐ Other…….

21. Drain wire and size: …….

22. Inner Sheath material as per IEC 60092, BS EN 50290:

☐ Halogen Free Flame Retardant Compound ☐ Other…….

23. Inner Sheath material Halogen Free Flame Retardant Compound (BS 6883-5.3 or BS 7917-5.3):

☐ SW2 ☐ Other……

24. Thickness of inner sheath: ……. **25. Inner Sheath colour:** ……

26. Mechanical Protection:

☐ Unarmoured ☐ GSWB ☐ GSWA ☐ Foil ☐ GSW Diameter……..……

27. Bedding material: ☐ Rubber, Type SHF2 ☐ HFFR Compound ☐ Other…….

28. Moisture and Chemical barrier: ☐ Lead sheath ☐ AL/HDPE/PA Multi-layer Sheath ☐ N/A

29. Thickness of lead sheath……. **30. Thickness of multi-layer sheath**……

31. Outer Sheath material as per IEC 60092, BS EN 50290:

☐ **Halogen Free Flame Retardant Compound** ☐ Other……

32. Outer Sheath material Halogen Free Flame Retardant Compound (BS 6883-4.2 or BS 7917-4.2):

☐ SW2 ☐ Other……

33. Thickness of outer sheath: ……. **34. Outer Sheath colour:** ……

35. Halogen Emission (EN 50267-1&2): ☐ 0.5% ☐ 5%

36. Special Requirements: ……...
(Excessive Sunlight, Resistance to Chemicals, Corrosive Environment, High Temperature)

37. Thermocouple Tolerance Class: ☐ Class 1 ☐ Class 2 ☐ N/A

38. Total Cable Length (metres): ……..

39. Drum Length (metres): …….

40. Cable Weight (Kg/Km): …… **41. Cable and Drum combined Weight (Kg):** ……

42. Conductor Max Temperature: Normal operation……°C Fault Condition……..°C.

43. Cable Min. Installation Temperature: ……...°C

44. Bending Radius (mm) at minimum install temperature: ……..……mm at ……..…°C.

45. Cable Diameter (mm) and Tolerances:
- Under Armour……..
- Over Armour…….
- Overall……

46. Material & Thickness:
- Insulation ……
- Bedding……..
- Sheath……..……
- Armour…….
- Others……..

47. Recommended Gland type and size: …….

48. Resistance Max. at 90°C (Ohm/Km): …….. **49. Reactance (Ohm/Km):** ……

50. Inductance Max. up to 1 KHz (mH/Km): ……

51. Impedance Max. @ 90°C & 60 Hz (Ohm/Km): …….

52. Conductor Loop Resistance per Km @ 35°C: …… **@ 60°C:** …….

53. Max. Loop Self Inductance per Km up to 1 Khz (mH): ……

54. Max. L/R ratio (µH/Ω): ……

55. Max. Mutual Capacitance (µF/Km): ……

56. Max. Capacitance Core to Earth (µF/Km): …… **Core to Core (µF/m):** ……..

57. Voltage Drop (per amp per Km): ……

58. Short Circuit Rating (kA) at 250°C / sec. duration: ……

59. Smoke Emission level: …… ……

60. Corrosive and Acid Gas Emission level: ……

61. pH and Conductivity levels: ……

62. Fluorine content level: ……

63. Oxygen Index value: ……

64. Oil resistance characteristics:	☐	Yes	☐	No
65. Ozone resistance characteristics:	☐	Yes	☐	No
66. Resistance to high temperature:	☐	Yes	☐	No
67. Resistant to chemicals & solvents:	☐	Yes	☐	No
68. Resistant to rodent & fauna attack:	☐	Yes	☐	No
69. Resistant to mechanical damage:	☐	Yes	☐	No
70. Resistant to water treeing:	☐	Yes	☐	No
71. Resistant to drilling fluids:	☐	Yes	☐	No
72. Resistant to soil salinity:	☐	Yes	☐	No
72. Resistant to saline water ingress:	☐	Yes	☐	No

A1.2 FIBRE-OPTIC CABLES

The Fibre Optic cable details listed below, items 1 to 48 including the tick-boxes & the data values, shall be provided/submitted by the VENDOR on a datasheet for each Fibre Optic cable.

1. Cable Type (Code and Designation):
……...

2. Cable Quantity required (metres): ……**3. Manufacturer:** …….....

4. Purchase Order Number and Date: …… dd/mm/yyyy

5. Installation: ☐ Aboveground ☐ Underground ☐ Indoor ☐ Marine

6. Standard References: ☐ IEC60793 ☐ IEC60794 ☐ IEC62181 ☐ IEC61282

☐ ITU-T G.651.1 ☐ ITU-T G.652 ☐ ITU-T G.655

7. Cable characteristic: ☐ Flame Retardant ☐ Fire Resistant

8. Cable Temperature Range: Storage -…..…°C to +…..…°C, Operating -……°C to +.....…°C

9. Application Requirement: ……

(Comms Backbone, Data trunk, Direct Burial, Cable tray or Duct installation, Automation, Subsystem, Other)

10. Mode/Fibre Type: ☐ OM1 ☐ OM2 ☐ OM3 ☐ OM4 ☐ OS2

11. Optical Performance: Bandwidth……..…MHz@ 850 nm Attenuation……dB/km

Optical Performance: Bandwidth……..…MHz@ 1300 nm Attenuation……dB/km

Optical Performance: Bandwidth……..…MHz@ ……. nm Attenuation……dB/km

Optical Performance: Bandwidth……..…GHz Attenuation……dB/km@.....nm

12. Core (Fibre) diameter: ……..…/…… micrometer

13. Strength Member Material: Central……. Overall……..

(GRP rod, Fibreglass, E-glass, E-glass and Aramid Yarn, Aramid Yarn)

14. Buffer Tube Material: ……..

15. Fibre bundle Formation: No. of Fibre Cores ……..…… No. of Buffer Tubes……

16. Fibre bundle Wrap / Binder material: …….

(Water blocking tape, Water swellable tape, Water blocking E-glass yarn, Aramid yarn and polyester tape)

17. Inner Jacket Material:

☐ Halogen Free Flame Retardant Compound ☐ Other……

18. Thickness of inner jacket: ……. **19. Inner jacket colour:** ……

20. Mechanical Protection:

☐ Unarmoured ☐ Corrugated Steel Tape ☐ Aluminium Tape ☐ Polyester Tape

☐ GSWA ☐ E-glass & Aramid Yarn ☐ Aramid Yarn ☐ Other…….

21. Outer Jacket Material:

☐ Halogen Free Flame Retardant Compound ☐ Other……

22. Thickness of outer jacket: …….

23. Outer Jacket colour: ……

(Orange, Aqua, Yellow, Black)

24. Halogen Emission (EN 50267-1&2): ☐ 0.5% ☐ 5%

25. Special Requirements: ……..
(Excessive Sunlight, Resistance to Chemicals, Corrosive Environment, High Temperature)

26. Total FO Cable Length (metres): ……..

27. Drum Length (metres): …….

28. Cable Weight (Kg/Km): …… **29. Cable and Drum combined Weight (Kg):** ……

29. Cable Min and Max. Installation Temperature: ……°C Min …..……...°C Max

30. Minimum Bending Radius at minimum install temperature: …… x O.D.
at ……..…….°C.

31. FO Cable Outside Diameter (O.D.): …… mm

32. Max Installation Load: …… N (or equivalent …….. Lbs)

33. Crush Resistance (EIA-455-41): …… N/cm

34. Impact Resistance (EIA-455-25): …… impacts at …….N-m

35. Cyclic Flexing (EIA-455-104): …… cycles

36. Smoke Emission level: …… ……

37. Corrosive and Acid Gas Emission level: …….

38. pH and Conductivity levels: …….

39. Fluorine content level: ……

40. Oxygen Index value: ……

41. Oil resistance characteristics:	☐	Yes	☐	No
42. Ozone resistance characteristics:	☐	Yes	☐	No
43. Resistance to high temperature:	☐	Yes	☐	No
44. Resistant to chemicals & solvents:	☐	Yes	☐	No
45. Resistant to rodent & fauna attack:	☐	Yes	☐	No
46. Resistant to mechanical damage:	☐	Yes	☐	No
47. Resistant to water treeing:	☐	Yes	☐	No
48. Resistant to drilling fluids:	☐	Yes	☐	No
49. Resistant to soil salinity:	☐	Yes	☐	No
50. Resistant to saline water ingress:	☐	Yes	☐	No

APPENDIX 2 CABLE DESIGNATION

A2.1 CABLE FOR OUTDOOR ABOVE GROUND INSTALLATION

Instrument and Control cables (Analogue and Digital Signals) - Low Smoke Zero Halogen Flame Retardant or Fire Resistant cable types, used for above ground outdoor installation shall be identified with the following designation:

LSZH	1	2	3	4	5	6	7	Colour

For example LSZH/MGT XLPE/IS & OS/LZSH/GSWA/LZSH/5P/1.5 mm²/Black

1) <u>Core Insulation</u>

XLPE	-	Flame retardant Cross (X) Linked Polyethylene
MGT XLPE	-	Mica impregnated glass tape beneath extruded layer of XLPE
EPR	-	Ethylene Propylene Rubber
MGT EPR	-	Mica impregnated glass tape beneath extruded layer of EPR
S95	-	Cross linked Silicone Rubber with treated glass fibre braid
MGT S95	-	Mica impregnated glass tape beneath extruded layer of S95

2) <u>Screen</u>

OS	-	Overall Screen
IS & OS	-	Individual and Overall Screen

3) <u>Inner Jacket</u>

LZSH	-	Flame Retardant Low Smoke Zero Halogen Compound

4) <u>Armour</u>

GSWA	-	Galvanised Steel Wire Armour

5) <u>Outer Jacket</u>

LZSH	-	Flame Retardant Low Smoke Zero Halogen Compound

6) <u>Number of Cores or Pairs or Triads or Quads</u>

2C, 4C, 7C, 11C, 19C, 27C, 37C,
1P, 1T, 1Q
2P, 2T, 2Q
10P, 10T, 10Q
20P, 20T

7) <u>Cross Sectional Area of each Conductor</u>

1.0 mm2, 1.5mm² or 2.5mm² or state the alternative size

Outer jacket colour shall be as per application.

Use the "–" (dash symbol) to indicate when the designation parameter is not applicable, as necessary for cables types without inner jacket and/or without armour.

A2.2 CABLE SUITABLE FOR DIRECT BURIAL OR OUTDOOR USE

Instrument and Control cables (Analogue and Digital Signals) - Low Smoke Zero Halogen Flame Retardant or Fire Resistant cable types, used for underground or outdoor installation shall be identified with the following designation:

LSZH	1	2	3	4	5	6	7	8	9	Colour

For example LSZH/MGT XLPE/IS & OS/LZSH/MLS/LSZH/GSWA/LZSH/2T/2.5 mm²/Black

1) Core Insulation

XLPE - Flame retardant Cross (X) Linked Polyethylene
MGT XLPE - Mica impregnated glass tape beneath extruded layer of XLPE
EPR - Ethylene Propylene Rubber
MGT EPR - Mica impregnated glass tape beneath extruded layer of EPR
S95 - Cross linked Silicone Rubber with treated glass fibre braid
MGT S95 - Mica impregnated glass tape beneath extruded layer of S95

2) Screen

OS - Overall Screen
IS & OS - Individual and Overall Screen

3) Inner Jacket

LZSH - Flame Retardant Low Smoke Zero Halogen Compound
EPR - equivalent EPR, LSZH.
SHF2 - equivalent Siliconee Rubber, LSZH.

4) Inner Sheath (Moisture & Chemical Barrier)

LS - Lead Sheath
MLS - Multi-Layer Sheath (AL/HDPE/PE)

5) Bedding

LZSH - Flame Retardant Low Smoke Zero Halogen Compound

6) Armour

GSWA - Galvanised Steel Wire Armour

7) Outer Jacket

LZSH - Flame Retardant Low Smoke Zero Halogen Compound
EPR - equivalent EPR, LSZH.
SHF2 - equivalent Siliconee Rubber, LSZH.

8) Number of Cores or Pairs or Triads or Quads

2C, 3C, 4C, 7C, 11C, 19C, 27C, 37C,
1P, 1T, 1Q
2P, 2T, 2Q
10P, 10T, 10Q
20P, 20T

9) <u>CSA of each Conductor</u>

1.0 mm2, 1.5mm² or 2.5mm² or state the alternative size

Outer jacket colour shall be as per application.

Use the " – " (dash symbol) to indicate when the designation parameter is not applicable, as necessary for cables types without inner sheath and without bedding material.

A2.3 THERMOCOUPLE EXTENSION CABLE FOR OUTDOOR ABOVE GROUND INSTALLATION

Thermocouple Extension cables - Low Smoke Zero Halogen Flame Retardant or Fire Resistant cable types, used for above ground outdoor installation shall be identified with the following designation:

LSZH	1	2	3	4	5	6	7	Type

For example LSZH/MGT XLPE/IS & OS/LZSH/GSWA/LZSH/5P/1.5 mm²/Type K

1) <u>Core Insulation</u>

XLPE - Flame retardant Cross (X) Linked Polyethylene
MGT XLPE - Mica impregnated glass tape beneath extruded layer of XLPE
EPR - Ethylene Propylene Rubber
MGT EPR - Mica impregnated glass tape beneath extruded layer of EPR
S95 - Cross linked Silicone Rubber with treated glass fibre braid
MGT S95 - Mica impregnated glass tape beneath extruded layer of S95

2) <u>Screen</u>

OS - Overall Screen
IS & OS - Individual and Overall Screen

3) <u>Inner Jacket</u>

LZSH - Flame Retardant Low Smoke Zero Halogen Compound

4) <u>Armour</u>

GSWA - Galvanised Steel Wire Armour

5) <u>Outer Jacket</u>

LZSH - Flame Retardant Low Smoke Zero Halogen Compound

6) <u>Number of Pairs</u>

1P, 2P, 10P, 20P

7) <u>CSA of each Conductor</u>

1.0 mm2, 1.5mm² or state the alternative size

State the Thermocouple Type; Type B, E, J, K, N, R, S or Type T.

Use the " – " (dash symbol) to indicate when the designation parameter is not applicable, as necessary for cables types without inner jacket and/or without armour.

A2.4 THERMOCOUPLE EXTENSION CABLE SUITABLE FOR DIRECT BURIAL

Thermocouple Extension cables - Low Smoke Zero Halogen Flame Retardant or Fire Resistant cable types, used for underground or outdoor installation shall be identified with the following designation;

LSZH	1	2	3	4	5	6	7	8	9	Type

For example LSZH/MGT XLPE/IS & OS/LZSH/MLS/LSZH/GSWA/LZSH/2P/1.5 mm²/Type K

1) <u>Core Insulation</u>

XLPE	-	Flame retardant Cross (X) Linked Polyethylene
MGT XLPE	-	Mica impregnated glass tape beneath extruded layer of XLPE
EPR	-	Ethylene Propylene Rubber
MGT EPR	-	Mica impregnated glass tape beneath extruded layer of EPR
S95	-	Cross linked Siliconee Rubber with treated glass fibre braid
MGT S95	-	Mica impregnated glass tape beneath extruded layer of S95

2) <u>Screen</u>

OS	-	Overall Screen
IS & OS	-	Individual and Overall Screen

3) <u>Inner Jacket</u>

LZSH	-	Flame Retardant Low Smoke Zero Halogen Compound
EPR	-	equivalent EPR, LSZH.
SHF2	-	equivalent Siliconee Rubber, LSZH.

4) <u>Inner Sheath (Moisture & Chemical Barrier)</u>

LS	-	Lead Sheath
MLS	-	Multi-Layer Sheath (AL/HDPE/PE)

5) <u>Bedding</u>

LZSH	-	Flame Retardant Low Smoke Zero Halogen Compound

6) <u>Armour</u>

GSWA	-	Galvanised Steel Wire Armour

7) <u>Outer Jacket</u>

LZSH	-	Flame Retardant Low Smoke Zero Halogen Compound
EPR	-	equivalent EPR, LSZH.
SHF2	-	equivalent Silicone Rubber, LSZH.

8) <u>Number of Pairs</u>

1P, 2P, 10P, 20P

9) <u>CSA of each Conductor</u>

1.0 mm2, 1.5mm² or 2.5mm² or state the alternative size

State the Thermocouple Type; Type B, E, J, K, N, R, S or Type T.
Use the " – " (dash symbol) to indicate when the designation parameter is not applicable, as necessary for cables types without inner sheath and without bedding material.

A2.5 FIELDBUS CABLE FOR OUTDOOR ABOVE GROUND INSTALLATION

Foundation Fieldbus cables - Low Smoke Zero Halogen Flame Retardant or Fire Resistant cable types, used for above ground outdoor installation shall be identified with the following designation:

LSZH	1	2	3	4	5	6	7	Colour

For example LSZH/XLPE/IS & OS/LZSH/GSWA/LZSH/2P/1.5 mm²/Orange

1) <u>Core Insulation</u>

XLPE	-	Flame retardant Cross (X) Linked Polyethylene
MGT XLPE	-	Mica impregnated glass tape beneath extruded layer of XLPE
EPR	-	Ethylene Propylene Rubber
MGT EPR	-	Mica impregnated glass tape beneath extruded layer of EPR
S95	-	Cross linked Silicone Rubber with treated glass fibre braid
MGT S95	-	Mica impregnated glass tape beneath extruded layer of S95

2) <u>Foil Screen</u>

OS	-	Overall Foil Screen
IS & OS	-	Individual Foil and Overall Foil Screen

Each foil screen is an aluminium tape plastic coated on one surface, with the metal surface in contact with a drain wire.

3) <u>Inner Jacket</u>

LZSH	-	Flame Retardant Low Smoke Zero Halogen Compound
BRAID	-	Tinned copper braid in continuous contact with a drain wire.

4) <u>Armour</u>

GSWA	-	Galvanised Steel Wire Armour

5) <u>Outer Jacket</u>

LZSH	-	Flame Retardant Low Smoke Zero Halogen Compound

6) <u>Number of Cores or Pairs</u>

1P, 2P, 5P, 10P, 20P

7) <u>CSA of each Conductor</u>

1.0mm², 1.5 mm2 or state the alternative size.

Outer jacket colour shall be as per application.

Use the " – " (dash symbol) to indicate when the designation parameter is not applicable, as necessary for cables types without inner jacket and/or without armour.

A2.6 FIELDBUS CABLE SUITABLE FOR DIRECT BURIAL

Foundation Fieldbus cables - Low Smoke Zero Halogen Flame Retardant or Fire Resistant cable types, used for underground or outdoor installation shall be identified with the following designation:

LSZH	1	2	3	4	5	6	7	8	9	Colour

For example LSZH/MGT XLPE/IS & OS/LZSH/MLS/LSZH/GSWA/LZSH/2P/1.5 mm²/Orange

1) <u>Core Insulation</u>

XLPE - Flame retardant Cross (X) Linked Polyethylene
MGT XLPE - Mica impregnated glass tape beneath extruded layer of XLPE
EPR - Ethylene Propylene Rubber
MGT EPR - Mica impregnated glass tape beneath extruded layer of EPR
S95 - Cross linked Silicone Rubber with treated glass fibre braid
MGT S95 - Mica impregnated glass tape beneath extruded layer of S95

2) <u>Screen</u>

OS - Overall Foil Screen
IS & OS - Individual Foil and Overall Foil Screen

Each foil screen is an aluminium tape plastic coated on one surface, with the metal surface in contact with a drain wire.

3) <u>Inner Jacket</u>

LZSH - Flame Retardant Low Smoke Zero Halogen Compound
BRAID - Tinned copper braid in continuous contact with a drain wire.

4) <u>Inner Sheath (Moisture & Chemical Barrier)</u>

LS - Lead Sheath
MLS - Multi-Layer Sheath (AL/HDPE/PE)

5) <u>Bedding</u>

LZSH - Flame Retardant Low Smoke Zero Halogen Compound

6) <u>Armour</u>

GSWA - Galvanised Steel Wire Armour.

7) <u>Outer Jacket</u>

LZSH - Flame Retardant Low Smoke Zero Halogen Compound
EPR - equivalent EPR, LSZH.
SHF2 - equivalent Silicone Rubber, LSZH.

8) <u>Number of Cores or Pairs</u>

1P, 2P, 10P, 20P

9) <u>CSA of each Conductor</u>

1.0mm² , 1.5 mm2 or state the alternative size.

Outer jacket colour shall be as per application.
Use the " – " (dash symbol) to indicate when the designation parameter is not applicable, as necessary for cables types without inner sheath and without bedding material.

A2.7 FIRE RESISTANT CABLE FOR OUTDOOR ABOVE GROUND INSTALLATION

Control cables - Low Smoke Zero Halogen Flame Retardant or Fire Resistant cable types, used for above ground outdoor installation shall be identified with the following designation:

LSZH	1	2	3	4	5	6	7	Colour

For example LSZH/XLPE/OS/LZSH/GSWA/LZSH/12C/2.5 mm²/Black

1) <u>Core Insulation</u>

XLPE - Flame retardant Cross (X) Linked Polyethylene
MGT XLPE - Mica impregnated glass tape beneath extruded layer of XLPE
EPR - Ethylene Propylene Rubber
MGT EPR - Mica impregnated glass tape beneath extruded layer of EPR
S95 - Cross linked Silicone Rubber with treated glass fibre braid
MGT S95 - Mica impregnated glass tape beneath extruded layer of S95

Cores should be laid up with extruded Flame Retardant LSZH Compound filler for up to 5 cores. For 6 cores or more a wrapping of polyester tape is required.

2) <u>Screen</u>

OS - Overall Screen
IS & OS - Individual and Overall Screen

3) <u>Inner Jacket</u>

LZSH - Flame Retardant Low Smoke Zero Halogen Compound

4) <u>Armour</u>

GSWA - Galvanised Steel Wire Armour

5) <u>Outer Jacket</u>

LZSH - Flame Retardant Low Smoke Zero Halogen Compound

6) <u>Number of Cores</u>

2C, 3C, 4C, 7C, 11C, 19C, 27C, 37C

7) <u>CSA of each Conductor</u>

2.5mm² minimum or state the alternative size.

Outer jacket colour shall be as per application.

Use the " – " (dash symbol) to indicate when the designation parameter is not applicable, as necessary for cables types without inner jacket and/or without armour.

A2.8 FIRE RESISTANT CABLE SUITABLE FOR DIRECT BURIAL

Control cables - Low Smoke Zero Halogen Flame Retardant or Fire Resistant cable types, used for underground outdoor installation shall be identified with the following designation:

LSZH	1	2	3	4	5	6	7	8	9	Colour

for example LSZH/MGT XLPE/IS & OS/LZSH/MLS/LSZH/GSWA/LZSH/7C/2.5 mm²/Black

1) <u>Core Insulation</u>

XLPE - Flame retardant Cross (X) Linked Polyethylene
MGT XLPE - Mica impregnated glass tape beneath extruded layer of XLPE
EPR - Ethylene Propylene Rubber
MGT EPR - Mica impregnated glass tape beneath extruded layer of EPR
S95 - Cross linked Silicone Rubber with treated glass fibre braid
MGT S95 - Mica impregnated glass tape beneath extruded layer of S95

Cores should be laid up with extruded Flame Retardant LSZH Compound filler for up to 5 cores. For 6 cores or more a wrapping of polyester tape is required.

2) <u>Screen</u>

OS - Overall Screen
IS & OS - Individual and Overall Screen

3) <u>Inner Jacket</u>

LZSH - Flame Retardant Low Smoke Zero Halogen Compound

4) <u>Inner Sheath (Moisture & Chemical Barrier)</u>

LS - Lead Sheath
MLS - Multi-Layer Sheath (AL/HDPE/PE)

5) <u>Bedding</u>

LZSH - Flame Retardant Low Smoke Zero Halogen Compound

6) <u>Armour</u>

GSWA - Galvanised Steel Wire Armour.

7) <u>Outer Jacket</u>

LZSH - Flame Retardant Low Smoke Zero Halogen Compound
EPR - equivalent EPR, LSZH.
SHF2 - equivalent Silicone Rubber, LSZH.

8) <u>Number of Cores</u>

2C, 3C, 4C, 7C, 11C, 19C, 27C, 37C

9) <u>CSA of each Conductor</u>

2.5mm² minimum or state the alternative size.

Outer jacket colour shall be as per application.
Use the " – " (dash symbol) to indicate when the designation parameter is not applicable, as necessary for cables types without inner jacket and/or without armour.

A2.9 FIBRE OPTIC CABLE FOR OUTDOOR ABOVE GROUND INSTALLATION

Fibre Optic cables:

LSZH	1	2	3	4	5	6	7	8	Colour

for example LSZH/SMF OS2/PBT 6/Tape/AT/LSZH1/GSWA/LZSH/24//Black

1) <u>Fibre Type and Glass Fibre Grade Code</u>

SMF-	Single mode glass fibres	OM3-	Grade 3, 50/125µm mutli-mode
MMF-	Multi-mode glass fibres	OM4-	Grade 4, 50/125µm mutli-mode
OM1-	Grade 1, 62.5/125µm mutli-mode	OS2-	Grade S, single-mode
OM2-	Grade 2, 50/125µm mutli-mode		

2) <u>Buffer Tubes and quantity of fibres per tube</u>

PBT	-	PolyButylene Terephthalate
HF	-	Halar Fluoroplastic
Other	-	equivalent to PBT or HF materials

Minimum 6 fibres per buffer tube. Each extruded buffer tube with a moisture resistant gel filling compound.

Multiple buffer tubes are to be twisted around a dielectric material rod provided for central strength together with a filler core where required, flame retardant, LSZH.

3) <u>Separator / Inner Sheath</u>

Foil	-	Aramid yarn for strength and aluminium foil core wrapping or separator
Tape	-	Water blocking E-glass yarn and polyester tape together with Aramid strength members and a Rip cord.
LSZH	-	Flame Retardant Low Smoke Zero Halogen Compound sheath.

4) <u>Armour Tape</u>

AT	-	Aluminium Tape armour and a Rip cord
PT	-	Polyester Tape armour and a Rip cord
CST	-	Corrugated Steel Tape armour and a Rip cord

5) <u>Inner Jacket</u>

LZSH1	-	Flame Retardant Low Smoke Zero Halogen Compound
LSZH2	-	Flame Retardant LSZH Compound together with Aramid strength members and a Rip cord.

6) <u>Armour</u>

GSWA	-	Galvanised Steel Wire Armour.
CST	-	Corrugated Steel Tape armour and a Rip cord.

7) <u>Outer Jacket</u>

LZSH	-	Flame Retardant Low Smoke Zero Halogen Compound
EPR	-	equivalent EPR, LSZH.
SHF2	-	equivalent Silicone Rubber, LSZH.

8) <u>Number of Fibres (total)</u>

6, 12, 24, 36, 48, 72, 96, 144

Outer jacket colour shall be as per application.

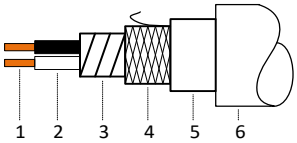
Fibres and Buffer Tubes shall be colour coded in accordance with EIA/TIA-598.

A printed legend shall be provided on the outer jacket of the FO cable at equal distances to identify the quantity and types of glass fibres within the cable.

Use the " – " (dash symbol) to indicate when the designation parameter is not applicable, as necessary for cables types without inner jacket and/or without armour.

APPENDIX 3 CONSTRUCTION DETAILS FOR EACH CABLE TYPE

(A1) Single pair, collective screen, unarmoured, flame retardant.
(XLPE/Coll Scr/ LSHF)
Voltage Rating: 300/500V



CORE:

1.	Conductors	Standed annealed copper. Circular section, Class 2 according to IEC 60228. Temperature rating 90°C. Size: 1.5 mm^2 min for analogue & digital signals. 2.5 mm^2 for Solenoids, beacons, hooters
	Identification	Black and White.
2.	Insulation	Flame retardant material as per data sheet.

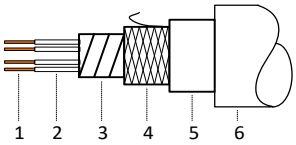
CABLE:

		Cores are twisted together and covered with:
3.	Fillers	Flame retardant moisture resistant material , LSZH.
4.	Cable screen	One tinned copper 0.50 mm^2 min solid drain wire and aluminium backed Mylar tape. Tape shall be helically wrapped with 25% overlap. Aluminium tape shall be in continuous contact with the drain wire.
5.	Inner jacket	Flame retardant Low Smoke Zero Halogen Compound. Colour: Black.
6.	Outer jacket	Flame retardant Low Smoke Zero Halogen compound.

Entire cable assembly shall be Flame Retardant to IEC 60332. Pt.3. Cat`A'.

Note: This cable type shall be only utilized for indoor application where the cable is installed and fully routed within the same building.

(A2) Multi-pair, Collective Screen, unarmoured, flame retardant.
(XLPE/Coll Scr /LSHF)
Voltage Rating: 300/500V



CORE:

1. Conductors	Standed annealed copper. Circular section, Class 2 according to IEC 60228. Temperature rating 90°C. Size: 1.0 mm2 min for analogue & digital signals. 2.5 mm^2 for Solenoids, beacons, hooters
Identification	Black and White. Each core printed with pair number throughout the cable at equal distances.
2. Insulation	Flame retardant material as per data sheet.

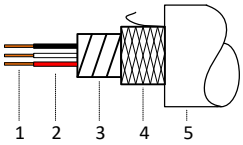
CABLE:

	Cores are twisted together and covered with:
3. Fillers	Flame retardant moisture resistant material , LSZH.
4. Cable screen	One tinned copper 0.50 mm^2 min solid drain wire and aluminium backed Mylar tape. Tape shall be helically wrapped with 25% overlap. Aluminium tape shall be in continuous contact with the drain wire.
5. Inner jacket	Flame retardant Low Smoke Zero Halogen Compound , LSZH. Colour: Black.
6. Outer jacket	Flame retardant Low Smoke Zero Halogen compound.

Entire cable assembly shall be Flame Retardant to IEC 60332. Pt.3. Cat`A'.

Note: This cable type shall be only utilized for indoor application where the cable is installed and fully routed within the same building.

(A3) Single-triad, collective screen, unarmoured, flame retardant.
(XLPE/Coll Scr/LSHF)
Voltage Rating: 300/500V



CORE:

1. Conductors	Stranded annealed copper. Circular section, Class 2 according to IEC 60228. Temperature rating 90°C. Size: 1.5 mm^2 min for RTD, Winding Temperature & Vibration signals.
Identification	Black, Red & White.
2. Insulation	Flame retardant material as per data sheet.

CABLE:

Cores are twisted together and covered with:

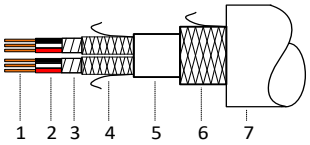
3. Fillers	Flame retardant moisture resistant material , LSZH.
4. Cable screen	One tinned copper 0.50 mm^2 min solid drain wire and aluminium backed Mylar tape. Tape shall be helically wrapped with 25% overlap. Aluminium tape shall be in continuous contact with the drain wire.
5. Outer jacket	Flame retardant Low Smoke Zero Halogen Compound.

Entire cable assembly shall be Flame Retardant to IEC 60332. Pt.3. Cat`A'.

Note: For the cables utilized for Vibration Signals Total capacitance of (core to core) + (core to screen) shall be less than 200nf/km.2.

Note: This cable type shall be only utilized for indoor application where the cable is installed and fully routed within the same building.

(A4) Multi- triad, individual & collective screen, unarmoured, flame retardant.
(XLPE/Ind & Coll Scr/LSHF)
Voltage Rating: 300/500V



CORE:

1. Conductors	Stranded annealed copper. Circular section, Class 2 according to IEC 60228. Temperature rating 90°C. Size: As per data sheet.
Identification	Black, Red & White. Each core printed with triad number through out the cable at equal distances.
2. Insulation	Flame retardant material as per data sheet.

CABLE:

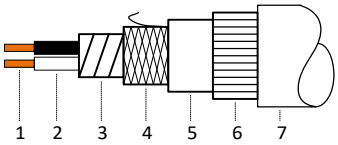
Cores are twisted into triads – each triad covered with:

3. Fillers	Flame retardant moisture resistant material , LSZH.
4. Ind screen	One tinned copper 0.50 mm² min solid drain wire and aluminium backed Mylar tape. Tape shall be helically wrapped with 25% overlap. Aluminium tape shall be in continuous contact with the drain wire.
5. Fillers	Flame retardant moisture resistant material , LSZH.
6. Coll screen	One tinned copper 0.50 mm² min solid drain wire and aluminium backed Mylar tape. Tape shall be helically wrapped with 25% overlap. Aluminium tape shall be in continuous contact with the drain wire.
7. Outer jacket	Flame retardant Low Smoke Zero Halogen Compound.

Entire cable assembly shall be Flame Retardant to IEC 60332. Pt.3. Cat`A'.

Note: For the cables utilized for Vibration Signals Total capacitance of (core to core) + (core to screen) shall be less than 200nf/km.2.
Note: This cable type shall be only utilized for indoor application where the cable is installed and fully routed within the same building.

(A5) Single-pair, collective screen, armoured, flame retardant.
(XLPE/Coll Scr/SWA/LSHF)
Voltage Rating: 300/500V



CORE:

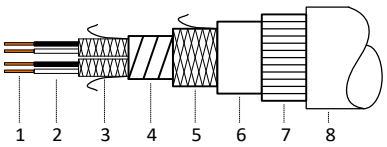
1.	Conductors	Stranded annealed copper. Circular section, Class 2 according to IEC 60228. Temperature rating 90°C. Size: 1.5 mm² min for analogue & digital signals. 2.5 mm^2 for Solenoids, beacons, hooters
	Identification	Black and White.
2.	Insulation	Flame retardant material as per data sheet.

CABLE:

		Cores are twisted together and covered with:
3.	Fillers	Flame retardant moisture resistant material , LSZH.
4.	Cable screen	One tinned copper 0.50 mm² min solid drain wire and aluminium backed Mylar tape. Tape shall be helically wrapped with 25% overlap. Aluminium tape shall be in continuous contact with the drain wire.
5.	Inner jacket	Flame retardant Low Smoke Zero Halogen Compound, LSZH. Colour: Black.
6.	Armour	Galvanized steel wire.
7.	Outer jacket	Flame retardant Low Smoke Zero Halogen Compound.

Entire cable assembly shall be Flame Retardant to IEC 60332. Pt.3. Cat`A'.

(A6) Multi-pair, individual & collective screen, armoured, flame retardant.
(XLPE/Ind & Coll Scr/SWA/LSHF)
Voltage Rating: 300/500V



CORE:

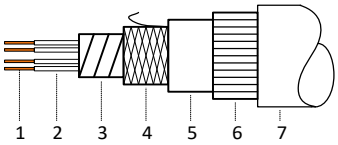
1.	Conductors	Stranded annealed copper. Circular section, Class 2 according to IEC 60228. Temperature rating 90°C. Size: 1.0 mm2 min for analogue & digital signals.
	Identification	Black and White. Each core printed with pair number throughout the cable at equal distances.
2.	Insulation	Flame retardant material as per data sheet.

CABLE:

		Cores are twisted together and covered with:
3.	Ind screen tape.	One tinned copper 0.50 mm² min solid drain wire and aluminium backed Mylar tape. Tape shall be helically wrapped with 25% overlap. Aluminium tape shall be in continuous contact with the drain wire.
4.	Binder Tape	PETP tape 50% overlap.
5.	Coll screen	One tinned copper 0.50 mm² min solid drain wire and aluminium backed Mylar tape. Tape shall be helically wrapped with 25% overlap. Aluminium tape shall be in continuous contact with the drain wire.
6.	Inner jacket	Flame retardant Low Smoke Zero Halogen Compound, LSZH. Colour: Black.
7.	Armour	Galvanized steel wire.
8.	Outer jacket	Flame retardant Low Smoke Zero Halogen Compound.

Entire cable assembly shall be Flame Retardant to IEC 60332. Pt.3. Cat`A'.

(A7) Multi-pair, collective screen, armoured, flame retardant.
(XLPE/ Coll Scr/ SWA/LSHF)
Voltage Rating: 300/500V



CORE:

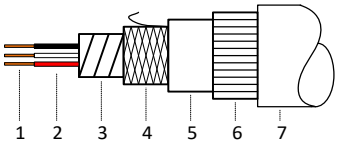
1.	Conductors	Stranded annealed copper. Circular section, Class 2 according to IEC 60228. Temperature rating 90°C. Size: As per data sheet for Digital (24VDC or Namur) signals. 2.5 mm^2 for Solenoids, beacons, hooters
	Identification	Black and White. Each core printed with pair number throughout the cable at equal distances.
2.	Insulation	Flame retardant material as per data sheet .

CABLE:

		Cores are twisted together and covered with:
3.	Binder Tape	PETP tape 50% overlap
4.	Coll screen	One tinned copper 0.50 mm^2 min solid drain wire and aluminium backed Mylar tape. Tape shall be helically wrapped with 25% overlap. Aluminium tape shall be in continuous contact with the drain wire.
5.	Inner jacket	Flame retardant Low Smoke Zero Halogen Compound , LSZH. Colour: Black.
6.	Armour	Galvanized steel wire
7.	Outer jacket	Flame retardant Low Smoke Zero Halogen Compound.

Entire cable assembly shall be Flame Retardant to IEC 60332. Pt.3. Cat`A'.

(A8) Single-triad, collective screen, armoured, flame retardant.
(XLPE/Coll Scr/ SWA/LSHF)
Voltage Rating: 300/500V



CORE:

1. Conductors	Stranded annealed copper. Circular section, Class 2 according to IEC 60228. Temperature rating 90°C. Size: 1.5 mm^2 min for RTD, Winding Temperature & Vibration signals.
Identification	Black, Red & White.
2. Insulation	Flame retardant material as per data sheet.

CABLE:

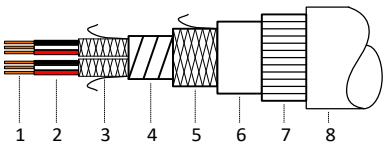
Cores are twisted together and covered with:

3. Fillers	Flame retardant moisture resistant material , LSZH.
4. Cable screen	One tinned copper 0.50 mm^2 min solid drain wire and aluminium backed Mylar tape. Tape shall be helically wrapped with 25% overlap. Aluminium tape shall be in continuous contact with the drain wire.
5. Inner jacket	Flame retardant Low Smoke Zero Halogen Compound. Colour: Black
6. Armour	Galvanized steel wire.
7. Outer jacket	Flame retardant Low Smoke Zero Halogen Compound.

Entire cable assembly shall be Flame Retardant to IEC 60332. Pt.3. Cat`A'.

Note: For the cables utilized for Vibration Signals Total capacitance of (core to core)2 + (core to screen) shall be less than 200nf/km.2.

(A9) Multi- triad, individual & collective screen, armoured, flame retardant.
(XLPE/Ind & Coll Scr/ SWA/LSHF)
Voltage Rating: 300/500V



CORE:

1. Conductors	Stranded annealed copper. Circular section, Class 2 according to IEC 60228. Temperature rating 90°C. Size: As per data sheet for Winding Temperature & Vibration Instrument signals.
Identification	Black, Red & White. Each core printed with triad number through out the cable at equal distances.
2. Insulation	Flame retardant material as per data sheet .

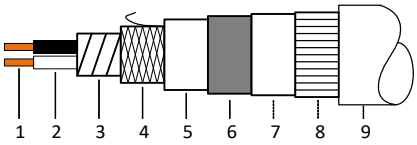
CABLE:

	Cores are twisted together and covered with:
3. Ind screen	One tinned copper 0.50 mm² min solid drain wire and aluminium backed Mylar tape. Tape shall be helically wrapped with 25% overlap. Aluminium tape shall be in continuous contact with the drain wire.
4. Binder Tape	PETP tape 50% overlap.
5. Coll screen	One tinned copper 0.50 mm² min solid drain wire and aluminium backed Mylar tape. Tape shall be helically wrapped with 25% overlap. Aluminium tape shall be in continuous contact with the drain wire.
6. Inner jacket	Flame retardant Low Smoke Zero Halogen Compound. Colour: Black.
7. Armour	Galvanized steel wire.
8. Outer jacket	Flame retardant Low Smoke Zero Halogen Compound.

Entire cable assembly shall be Flame Retardant to IEC 60332. Pt.3. Cat`A'.

Note: For the cables utilized for Vibration Signals Total capacitance of (core to core)2 + (core to screen) shall be less than 200nf/km.2.

(A10) Single-pair, collective screen, armoured, external buried, flame retardant.
(XLPE/Coll Scr/LS/SWA/LSHF)
Voltage Rating: 300/500V



CORE:

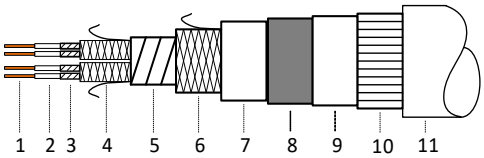
1.	Conductors	Stranded annealed copper. Circular section, Class 2 according to IEC 60228. Temperature rating 90°C. Size: 1.5 mm² min for analogue & digital signals. 2.5 mm^2 for Solenoids, beacons, hooters
	Identification	Black and White.
2.	Insulation	Flame retardant material as per data sheet.

CABLE:

		Cores are twisted together and covered with:
3.	Fillers	Flame retardant moisture resistant material , LSZH.
4.	Cable screen	One tinned copper 0.50 mm² min solid drain wire and aluminium backed Mylar tape. Tape shall be helically wrapped with 25% overlap. Aluminium tape shall be in continuous contact with the drain wire.
5.	Inner jacket	Flame retardant Low Smoke Zero Halogen Compound , LSZH. Colour: Black.
6.	Inner Sheath	Lead Sheath (or Lead pipe). A multi-layered Inner Sheath (AL/HDPE/PA instead of lead sheath) will be considered if the multi-layer sheath provides the same protection as a lead sheath for hydrocarbons, chemical and solvents, saline water ingress and vermin protection, as per BS 50288-7 section 4.18.2.
7.	Bedding	Flame retardant Low Smoke Zero Halogen Compound , LSZH. Colour: Black.
8.	Armour	Galvanized steel wire.
9.	Outer jacket	Flame retardant Low Smoke Zero Halogen Compound.

Entire cable assembly shall be Flame Retardant to IEC 60332. Pt.3. Cat`A'.

(A11) Multi-pair, individual & collective screen, armoured, external buried, flame retardant.
(XLPE/Ind & Coll Scr/LS/SWA/LSHF)
Voltage Rating: 300/500V



CORE:

1. Conductors — Stranded annealed copper. Circular section, Class 2 according to IEC 60228. Temperature rating 90°C. Size: 1.0 mm2 for analogue & digital signals.
   Identification — Black and White. Each core printed with pair number throughout the cable at equal distances.
2. Insulation — Flame retardant material as per data sheet.

Cores are twisted into pairs – each pair covered with:

3. Fillers — Flame retardant moisture resistant material , LSZH.
4. Ind screen — One tinned copper 0.50 mm² min solid drain wire and aluminium backed Mylar tape. Tape shall be helically wrapped with 25% overlap. Aluminium tape shall be in continuous contact with the drain wire.

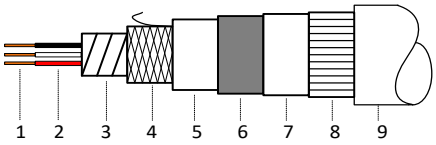
CABLE:

Pairs are twisted into multi-pairs - Pairs twisted (10 to 14 twists/m) together are covered with:

5. Fillers — Flame retardant moisture resistant material , LSZH.
6. Coll screen — One tinned copper 0.50 mm² min solid drain wire and aluminium backed Mylar tape. Tape shall be helically wrapped with 25% overlap. Aluminium tape shall be in continuous contact with the drain wire.
7. Inner jacket — Flame retardant Low Smoke Zero Halogen Compound ,LSZH. Colour: Black.
8. Inner Sheath — Lead Sheath (or Lead pipe). A multi-layered Inner Sheath (AL/HDPE/PA instead of lead sheath) will be considered if the multi-layer sheath provides the same protection as a lead sheath for hydrocarbons, chemical and solvents, saline water ingress and vermin protection, as per BS 50288-7 section 4.18.2.
9. Bedding — Flame retardant Low Smoke Zero Halogen Compound. Colour: Black.
10. Armour — Galvanized steel wire.
11. Outer jacket — Flame retardant Low Smoke Zero Halogen Compound.

Entire cable assembly shall be Flame Retardant to IEC 60332. Pt.3. Cat`A'.

(A12) Single-triad, collective screen, armoured, external buried, flame retardant.
(XLPE/Coll Scr/LS/SWA/LSHF)
Voltage Rating: 300/500V



CORE:

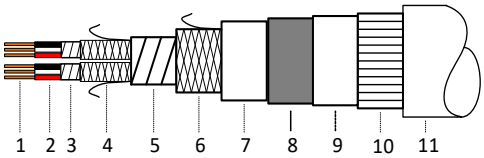
1.	Conductors	Stranded annealed copper. Circular section, Class 2 according to IEC 60228. Temperature rating 90°C. Size: 1.5 mm² min for analogue & digital signals.
	Identification	Black, Red and White.
2.	Insulation	Flame retardant material as per data sheet.

CABLE:

		Cores are twisted together and covered with:
3.	Fillers	Flame retardant moisture resistant material , LSZH.
4.	Cable screen	One tinned copper 0.50 mm² min solid drain wire and aluminium backed Mylar tape. Tape shall be helically wrapped with 25% overlap. Aluminium tape shall be in continuous contact with the drain wire.
5.	Inner jacket	Flame retardant Low Smoke Zero Halogen Compound , LSZH. Colour: Black.
6.	Inner Sheath	Lead Sheath (or Lead pipe). A multi-layered Inner Sheath (AL/HDPE/PA instead of lead sheath) will be considered if the multi-layer sheath provides the same protection as a lead sheath for hydrocarbons, chemical and solvents, saline water ingress and vermin protection, as per BS 50288-7 section 4.18.2.
7.	Bedding	Flame retardant Low Smoke Zero Halogen Compound. Colour: Black.
8.	Armour	Galvanized steel wire.
9.	Outer jacket	Flame retardant Low Smoke Zero Halogen Compound.

Entire cable assembly shall be Flame Retardant to IEC 60332. Pt.3. Cat`A' and Fire Resistant to IEC 60331.

(A13) Multi-triad, individual & collective screen, armoured, external buried, flame retardant.
(XLPE/Ind & Coll Scr/LS/SWA/LSHF)
Voltage Rating: 300/500V



CORE:

1. Conductors	Stranded annealed copper. Circular section, Class 2 according to IEC 60228. Temperature rating 90°C. Size: As per data sheet for Winding Temperature & Vibration Instrument signals.
Identification	Black, Red & White. Each core printed with triad number through out the cable at equal distances.
2. Insulation	Flame retardant material as per data sheet.

Cores are twisted into triads – each triad covered with:

3. Fillers	Flame retardant moisture resistant material , LSZH.
4. Ind screen	One tinned copper 0.50 mm² min solid drain wire and aluminium backed Mylar tape. Tape shall be helically wrapped with 25% overlap. Aluminium tape shall be in continuous contact with the drain wire.

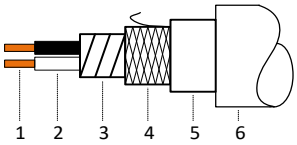
CABLE:

Triads twisted into multi-triads - Triads twisted (10 to 14 twists/m) together are covered with:

5. Fillers	Flame retardant moisture resistant material, LSZH.
6. Coll screen	One tinned copper 0.50 mm² min solid drain wire and aluminium backed Mylar tape. Tape shall be helically wrapped with 25% overlap. Aluminium tape shall be in continuous contact with the drain wire.
7. Inner jacket	Flame retardant Low Smoke Zero Halogen Compound. Colour: Black.
8. Inner Sheath	Lead Sheath (or Lead pipe). A multi-layered Inner Sheath (AL/HDPE/PA instead of lead sheath) will be considered if the multi-layer sheath provides the same protection as a lead sheath for hydrocarbons, chemical and solvents, saline water ingress and vermin protection, as per BS 50288-7 section 4.18.2.
9. Bedding	Flame retardant Low Smoke Zero Halogen Compound. Colour: Black.
10. Armour	Galvanized steel wire.
11. Outer jacket	Flame retardant Low Smoke Zero Halogen Compound.

Entire cable assembly shall be Flame Retardant to IEC 60332. Pt.3. Cat`A'.

(B1) Single pair, collective screen, unarmoured, fire resistant.
(Mica/XLPE/Coll Scr/ LSHF)
Voltage Rating: 300/500V



CORE:

1.	Conductors	Standed annealed copper. Circular section, Class 2 according to IEC 60228. Temperature rating 90°C. Size: 1.5 mm^2 min for Analogue or Digital signals (inside building) and ESD, F&G and PA applications. 2.5 mm^2 for Solenoids, beacons, hooters
	Identification	Black and White.
2.	Insulation linked	Mica impregnated glass tape beneath extruded layer of flame retardant cross Polyethylene (XLPE) or equivalent Ethylene Propylene Rubber (EPR) or equivalent Silicone Rubber (S95) or material as per data sheet.

CABLE:

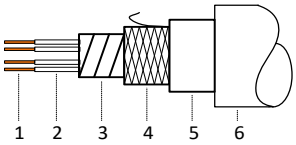
Cores are twisted together and covered with:

3.	Binder Tape	PETP tape 50% overlap.
4.	Cable screen	One tinned copper 0.50 mm min solid drain wire and aluminium backed (overall) Mylar tape. Tape shall be helically wrapped with 25% overlap. Aluminium tape shall be in continuous contact with the drain wire.
5.	Inner jacket	Flame retardant Low Smoke Zero Halogen Compound. Colour: Black.
6.	Outer jacket	Flame retardant Low Smoke Zero Halogen compound

Entire cable assembly shall be Flame Retardant to IEC 60332. Pt.3. Cat`A' and Fire Resistant to IEC 60331.

Note: This cable type shall be only utilized for indoor application where the cable is installed and fully routed within the same building.

(B2) Multi-pair, Collective Screen, unarmoured, fire resistant.
(Mica/XLPE/Coll Scr /LSHF)
Voltage Rating: 300/500V



CORE:

1. Conductors	Standed annealed copper. Circular section, Class 2 according to IEC 60228. Temperature rating 90°C. Size: 1.0 mm2 for Analogue or Digital signals (inside building) and ESD, F&G and PA applications. 2.5 mm^2 for Solenoids, beacons, hooters
Identification	Black and White. Each core printed with pair number throughout the cable at equal distances.
2. Insulation linked	Mica impregnated glass tape beneath extruded layer of flame retardant cross Polyethylene (XLPE) or equivalent Ethylene Propylene Rubber (EPR) or equivalent Silicone Rubber (S95) or material as per data sheet.

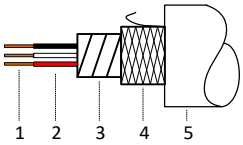
CABLE:

	Cores are twisted into pairs - Pairs twisted (10 to 14 twists/m) together are covered with:
3. Binder Tape	PETP tape 50% overlap.
4. Cable Screen	One tinned copper 0.50 mm^2 min solid drain wire and aluminium backed Mylar tape. Tape shall be helically wrapped with 25% overlap. Aluminium tape shall be in continuous contact with the drain wire.
5. Inner jacket	Flame retardant Low Smoke Zero Halogen Compound. Colour: Black.
6. Outer jacket	Flame retardant Low Smoke Zero Halogen Compound.

Entire cable assembly shall be Flame Retardant to IEC 60332. Pt.3. Cat`A' and Fire Resistant to IEC 60331.

Note: This cable type shall be only utilized for indoor application where the cable is installed and fully routed within the same building.

(B3) Single-triad, collective screen, non-armoured, fire resistant.
(XLPE/Coll Scr/LSHF)
Voltage Rating: 300/500V



CORE:

1. Conductors	Stranded annealed copper. Circular section, Class 2 according to IEC 60228. Temperature rating 90°C. Size: 1.5 mm^2 for RTD, Vibration signals etc for ESD and FGS applications.
Identification	Black, Red & White.
2. Insulation linked	Mica impregnated glass tape beneath extruded layer of flame retardant cross Polyethylene (XLPE) or equivalent Ethylene Propylene Rubber (EPR) or equivalent Silicone Rubber (S95) or material as per data sheet.

CABLE:

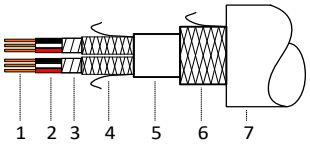
	Cores are twisted together and covered with:
3. Fillers	Flame retardant moisture resistant material.
4. Cable screen	One tinned copper 0.50 mm^2 min solid drain wire and aluminium backed Mylar tape. Tape shall be helically wrapped with 25% overlap. Aluminium tape shall be in continuous contact with the drain wire.
5. Outer jacket	Flame retardant Low Smoke Zero Halogen compound.

Entire cable assembly shall be Flame Retardant to IEC 60332. Pt.3. Cat`A' and Fire Resistant to IEC 60331.

Note: For the cables utilized for Vibration Signals Total capacitance of (core to core) + (core to screen) shall be less than 200nf/km.2.

Note: This cable type shall be only utilized for indoor application where the cable is installed and fully routed within the same building.

(B4) Multi- triad, individual & collective screen, unarmoured, fire resistant.
(Mica/XLPE/Ind & Coll Scr/LSHF)
Voltage Rating: 300/500V



CORE:

1. Conductors	Stranded annealed copper. Circular section, Class 2 according to IEC 60228. Temperature rating 90°C. Size: As per data sheet for RTD, F&G Detector & Vibration Signals etc for ESD, F&G and PA applications.
Identification	Black, Red & White. Each core printed with triad number through out the cable at equal distances.
2. Insulation linked	Mica impregnated glass tape beneath extruded layer of flame retardant cross Polyethylene (XLPE) or equivalent Ethylene Propylene Rubber (EPR) or equivalent Silicone Rubber (S95) or material as per data sheet.

Cores are twisted into triads – each triad covered with:

3. Fillers	Flame retardant moisture resistant material , LSZH.
4. Ind screen	One tinned copper 0.50 mm² min solid drain wire and aluminium backed Mylar tape. Tape shall be helically wrapped with 25% overlap. Aluminium tape shall be in continuous contact with the drain wire.

CABLE:

Cores are twisted into triads - Triads twisted (10 to 14 twists/m) together are covered with:

5. Fillers	Flame retardant moisture resistant material , LSZH.
6. Coll screen	One tinned copper 0.50 mm² min solid drain wire and aluminium backed Mylar tape. Tape shall be helically wrapped with 25% overlap. Aluminium tape shall be in continuous contact with the drain wire.
7. Outer jacket	Flame retardant Low Smoke Zero Halogen compound.

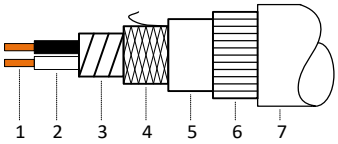
Entire cable assembly shall be Flame Retardant to IEC 60332. Pt.3. Cat`A' and Fire Resistant to IEC 60331.

Note: This cable type shall be only utilized for indoor application where the cable is installed and fully routed within the same building.

(B5) Single-pair, collective screen, armoured, fire resistant.

(Mica/XLPE/Coll Scr/SWA/LSHF)

Voltage Rating: 300/500V



CORE:

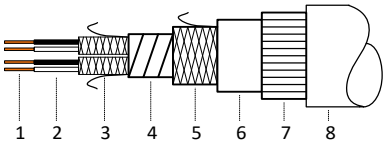
1. Conductors	Standed annealed copper. Circular section, Class 2 according to IEC 60228. Temperature rating 90°C Size 1.5 mm^2 min for Analogue and Digital signals and ESD, F&G and PA applications. 2.5 mm^2 for Solenoids, beacons, hooters
Identification	Black and White.
2. Insulation	Mica impregnated glass tape beneath extruded layer of flame retardant cross linked polyethylene (XLPE) or equivalent Ethylene Propylene Rubber (EPR) or equivalent Silicone Rubber (S95) or material as per data sheet.

CABLE:

	Cores are twisted together and covered with:
3. Binder tape :	PETP tape 50% overlap.
4. Cable screen	One tinned copper 0.50 mm^2 min solid drain wire and aluminium backed Mylar tape. Tape shall be helically wrapped with 25% overlap. Aluminium tape shall be in continuous contact with the drain wire.
5. Inner jacket	Flame retardant Low Smoke Zero Halogen compound , or equivalent EPR or equivalent S95 Rubber, LSZH. Colour: Black.
6. Armour	Galvanized steel wire.
7. Outer jacket	Flame retardant Low Smoke Zero Halogen compound

Entire cable assembly shall be Flame Retardant to IEC 60332. Pt.3. Cat`A' and Fire Resistant to IEC 60331.

(B6) Multi-pair, individual & collective screen, armoured, fire resistant.
(Mica/XLPE/Ind & Coll Scr/SWA/LSHF)
Voltage Rating: 300/500V



CORE:

1. Conductors	Stranded annealed copper. Circular section, Class 2 according to IEC 60228. Temperature rating 90°C. Size: As per data sheet for Analogue signals for ESD, F&G and PA applications.
Identification	Black and White. Each core printed with pair number throughout the cable at equal distances.
2. Insulation	Mica impregnated glass tape beneath extruded layer of flame retardant cross linked polyethylene (XLPE) or equivalent Ethylene Propylene Rubber (EPR) or equivalent Silicone Rubber (S95) or material as per data sheet.

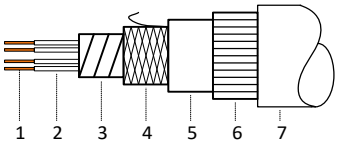
CABLE:

Cores are twisted together and covered with:

3. Ind screen	One tinned copper 0.50 mm² min drain wire and aluminium backed Mylar tape. Tape shall be helically wrapped with 25% overlap. Aluminium tape shall be in continuous contact with the drain wire.
4. Insulating Tapes	Glass - Silk and polyester.
5. Coll screen	One tinned copper 0.50 mm² min solid drain wire and aluminium backed Mylar tape. Tape shall be helically wrapped with 25% overlap. Aluminium tape shall be in continuous contact with the drain wire.
6. Inner jacket	Flame retardant Low Smoke Zero Halogen compound. Colour: Black
7. Armour	Galvanized steel wire.
8. Outer jacket	Flame retardant Low Smoke Zero Halogen compound

Entire cable assembly shall be Flame Retardant to IEC 60332. Pt.3. Cat`A' and Fire Resistant to IEC 60331.

(B7) Multi-pair, collective screen, armoured, fire resistant.
(Mica/XLPE/Coll Scr/SWA/LSHF)
Voltage Rating: 300/500V



CORE:

1. Conductors	Stranded annealed copper. Circular section, Class 2 according to IEC 60228. Temperature rating 90°C. Size: 1.0 mm2 for Analogue and Digital I/O of ESD, F&G and PA applications. 2.5 mm^2 for Solenoids, beacons, hooters
Identification	Black and White. Each core printed with pair number throughout the cable at equal distances.
2. Insulation linked	Mica impregnated glass tape beneath extruded layer of flame retardant cross Polyethylene (XLPE) or equivalent Ethylene Propylene Rubber (EPR) or equivalent Silicone Rubber (S95) or material as per data sheet.

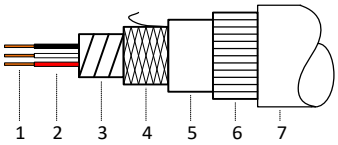
CABLE:

Cores are twisted into pairs - Pairs twisted (10 to 14 twists/m) together are covered with:

3. Binder tape	PETP tape 50% overlap.backed
4. Cable screen	One tinned copper 0.50 mm^2 min solid drain wire and aluminium backed (overall) Mylar tape. Tape shall be helically wrapped with 25% overlap. Aluminium tape shall be in continuous contact with the drain wire.
5. Inner jacket	Flame retardant Low Smoke Zero Halogen compound. Colour: Black
6. Armour	Galvanized steel wire.
7. Outer jacket	Flame retardant Low Smoke Zero Halogen compound.

Entire cable assembly shall be Flame Retardant to IEC 60332. Pt.3. Cat`A' and Fire Resistant to IEC 60331

(B8) Single-triad, collective screen, armoured, fire resistant.
(Mica/XLPE/Coll Scr/SWA/LSHF)
Voltage Rating: 300/500V



CORE:

1. Conductors	Stranded annealed copper. Circular section, Class 2 according to IEC 60228. Temperature rating 90°C Size: 1.5 mm^2 min for RTD, F&G Detector & Vibration signals to ESD, F&G and PA applications.
Identification	Black, Red and White.
2. Insulation linked	Mica impregnated glass tape beneath extruded layer of flame retardant cross Polyethylene (XLPE) or equivalent Ethylene Propylene Rubber (EPR) or equivalent Silicone Rubber (S95) or material as per data sheet.

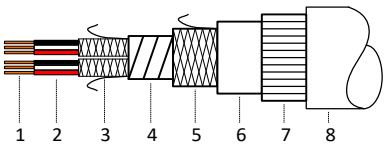
CABLE:

Cores are twisted together and covered with:

3. Binder tape :	PETP tape 50% overlap.backed
4. Cable screen	One tinned copper 0.50 mm^2 min solid drain wire and aluminium backed Mylar tape. Tape shall be helically wrapped with 25% overlap. Aluminium tape shall be in continuous contact with the drain wire.
5. Inner jacket	Flame retardant Low Smoke Zero Halogen compound. Colour: Black
6. Armour	Galvanized steel wire.
7. Outer jacket	Flame Retardant Low Smoke Zero Halogen compound.

Entire cable assembly shall be Flame Retardant to IEC 60332. Pt.3. Cat`A' and Fire Resistant to IEC 60331.

(B9) Multi- triad, individual & collective screen, armoured, fire resistant.
(Mica/XLPE/Ind & Coll Scr/ SWA/LSHF)
Voltage Rating: 300/500V



CORE:

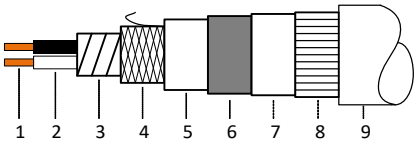
1. Conductors	Stranded annealed copper. Circular section, Class 2 according to IEC 60228. Temperature rating 90°C. Size: As per data sheet for RTD, Winding Temperature, F&G Detector & Vibration signals and ESD, F&G and PA applications.
Identification	Black, Red & White. Each core printed with triad number through out the cable at equal distances.
2. Insulation linked	Mica impregnated glass tape beneath extruded layer of flame retardant cross Polyethylene (XLPE) or equivalent Ethylene Propylene Rubber (EPR) or equivalent Silicone Rubber (S95) or material as per data sheet.

CABLE:

	Cores are twisted into triads - Triads twisted (10 to 14 twists/m) together are covered with:
3. Ind screen	One tinned copper 0.50 mm² min drain wire and aluminium backed Mylar tape. Tape shall be helically wrapped with 25% overlap. Aluminium tape shall be in continuous contact with the drain wire.
4. Insulating Tape	Glass - Silk and polyester.
5. Coll screen	One tinned copper 0.50 mm² min solid drain wire and aluminium backed Mylar tape. Tape shall be helically wrapped with 25% overlap. Aluminium tape shall be in continuous contact with the drain wire.
6. Inner jacket	Flame retardant Low Smoke Zero Halogen Compound. Colour: Black.
7. Armour	Galvanized steel wire.
8. Outer jacket	Flame Retardant Low Smoke Zero Halogen compound

Entire cable assembly shall be Flame Retardant to IEC 60332. Pt.3. Cat`A' and Fire Resistant to IEC 60331.

(B10) Single-pair, collective screen, armoured, external buried, fire resistant.
(XLPE/Coll Scr/IS/SWA/LSHF)
Voltage Rating: 300/500V



CORE:

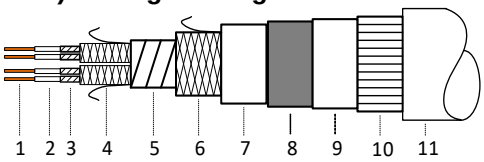
1.	Conductors	Stranded annealed copper. Circular section, Class 2 according to IEC 60228. Temperature rating 90°C. Size: 1.5 mm² min for analogue & digital signals and ESD, F&G and PA applications. 2.5 mm^2 for Solenoids, beacons, hooters
	Identification	Black and White.
2.	Insulation linked	Mica impregnated glass tape beneath extruded layer of flame retardant cross Polyethylene (XLPE) or equivalent Ethylene Propylene Rubber (EPR) or equivalent Silicone Rubber (S95) or material as per data sheet.

CABLE:

		Cores are twisted together and covered with:
3.	Fillers	Flame retardant moisture resistant material , LSZH.
4.	Cable screen	One tinned copper 0.50 mm² min solid drain wire and aluminium backed Mylar tape. Tape shall be helically wrapped with 25% overlap. Aluminium tape shall be in continuous contact with the drain wire.
5.	Inner jacket	Flame retardant Low Smoke Zero Halogen Compound Colour: Black.
6.	Inner Sheath	Lead Sheath (or Lead pipe). A multi-layered Inner Sheath (AL/HDPE/PA instead of lead sheath) will be considered if the multi-layer sheath provides the same protection as a lead sheath for hydrocarbons, chemical and solvents, saline water ingress and vermin protection, as per BS 50288-7 section 4.18.2.
7.	Bedding	Flame retardant Low Smoke Zero Halogen Compound ,LSZH. Colour: Black.
8.	Armour	Galvanized steel wire.
9.	Outer jacket	Flame Retardant Low Smoke Zero Halogen Compound.

Entire cable assembly shall be Flame Retardant to IEC 60332. Pt.3. Cat`A' and Fire Resistant to IEC 60331.

(B11) Multi-pair, individual & collective screen, armoured, external buried, fire resistant. (XLPE/Ind & Coll Scr/IS/SWA/LSHF). Voltage Rating: 300/500V.



CORE:

1.	Conductors	Stranded annealed copper. Circular section, Class 2 according to IEC 60228. Temperature rating 90°C. Size: As per data sheet for analogue & digital signals and ESD, F&G and PA applications.
	Identification	Black and White. Each core printed with pair number throughout the cable at equal distances.
2.	Insulation linked	Mica impregnated glass tape beneath extruded layer of flame retardant cross Polyethylene (XLPE) or equivalent Ethylene Propylene Rubber (EPR) or equivalent Silicone Rubber (S95) or material as per data sheet.

Cores are twisted into pairs – each pair covered with:

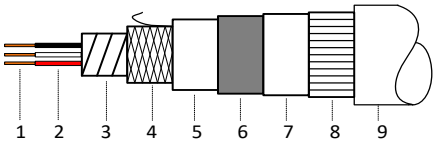
3.	Fillers	Flame retardant moisture resistant material , LSZH.
4.	Ind screen	One tinned copper 0.50 mm² min solid drain wire and aluminium backed Mylar tape. Tape shall be helically wrapped with 25% overlap. Aluminium tape shall be in continuous contact with the drain wire.

CABLE:

		Pairs are twisted into multi-pairs - Pairs twisted (10 to 14 twists/m) together are covered with:
5.	Fillers	Flame retardant moisture resistant material , LSZH.
6.	Coll screen	One tinned copper 0.50 mm² min solid drain wire and aluminium backed Mylar tape. Tape shall be helically wrapped with 25% overlap. Aluminium tape shall be in continuous contact with the drain wire.
7.	Inner jacket	Flame retardant Low Smoke Zero Halogen Compound. Colour: Black.
8.	Inner Sheath	Lead Sheath (or Lead pipe). A multi-layered Inner Sheath (AL/HDPE/PA instead of lead sheath) will be considered if the multi-layer sheath provides the same protection as a lead sheath for hydrocarbons, chemical and solvents, saline water ingress and vermin protection, as per BS 50288-7 section 4.18.2.
9.	Bedding	Flame retardant Low Smoke Zero Halogen Compound. Colour: Black.
10.	Armour	Galvanized steel wire.
11.	Outer jacket	Flame Retardant Low Smoke Zero Halogen Compound

Entire cable assembly shall be Flame Retardant to IEC 60332. Pt.3. Cat`A' and Fire Resistant to IEC 60331.

(B12) Single-triad, collective screen, armoured, external buried, fire resistant.
(XLPE/Coll Scr/LS/SWA/LSHF)
Voltage Rating: 300/500V



CORE:

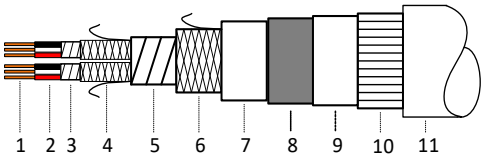
1.	Conductors	Stranded annealed copper. Circular section, Class 2 according to IEC 60228. Temperature rating 90°C. Size: 1.5 mm² min for RTD, F&G Detectors wired to ESD, FGS.
	Identification	Black, Red and White.
2.	Insulation linked	Mica impregnated glass tape beneath extruded layer of flame retardant cross Polyethylene (XLPE) or equivalent Ethylene Propylene Rubber (EPR) or equivalent Silicone Rubber (S95) or material as per data sheet.

CABLE:

		Cores are twisted together and covered with:
3.	Fillers	Flame retardant moisture resistant material , LSZH.
4.	Cable screen	One tinned copper 0.50 mm² min solid drain wire and aluminium backed Mylar tape. Tape shall be helically wrapped with 25% overlap. Aluminium tape shall be in continuous contact with the drain wire.
5.	Inner jacket	Flame retardant Low Smoke Zero Halogen Compound Colour: Black.
6.	Inner Sheath	Lead Sheath (or Lead pipe). A multi-layered Inner Sheath (AL/HDPE/PA instead of lead sheath) will be considered if the multi-layer sheath provides the same protection as a lead sheath for hydrocarbons, chemical and solvents, saline water ingress and vermin protection, as per BS 50288-7 section 4.18.2.
7.	Bedding	Flame retardant Low Smoke Zero Halogen Compound. Colour: Black.
8.	Armour	Galvanized steel wire.
9.	Outer jacket	Flame Retardant Low Smoke Zero Halogen Compound

Entire cable assembly shall be Flame Retardant to IEC 60332. Pt.3. Cat`A' and Fire Resistant to IEC 60331.

(B13) Multi-triad, individual & collective screen, armoured, external buried, fire resistant.
(XLPE/Ind & Coll Scr/LS/SWA/LSHF)
Voltage Rating: 300/500V



CORE:

1. Conductors	Stranded annealed copper. Circular section, Class 2 according to IEC 60228. Temperature rating 90°C. Size: As per data sheet for RTD, Vibration Instrument signals to ESD, FGS.
Identification	Black, Red & White. Each core printed with triad number through out the cable at equal distances.
2. Insulation	Mica impregnated glass tape beneath extruded layer of flame retardant cross linked Polyethylene (XLPE) or equivalent Ethylene Propylene Rubber (EPR) or equivalent Silicone Rubber (S95) or material as per data sheet.

Cores are twisted into triads – each triad covered with:

3. Fillers	Flame retardant moisture resistant material , LSZH.
4. Ind screen	One tinned copper 0.50 mm² min solid drain wire and aluminium backed Mylar tape. Tape shall be helically wrapped with 25% overlap. Aluminium tape shall be in continuous contact with the drain wire.

CABLE:

	Triads twisted into multi-triads - Triads twisted (10 to 14 twists/m) together are covered with:
5. Fillers	Flame retardant moisture resistant material , LSZH.
6. Coll screen	One tinned copper 0.50 mm² min solid drain wire and aluminium backed Mylar tape. Tape shall be helically wrapped with 25% overlap. Aluminium tape shall be in continuous contact with the drain wire.
7. Inner jacket	Flame retardant Low Smoke Zero Halogen Compound Colour: Black.
8. Inner Sheath	Lead Sheath (or Lead pipe). A multi-layered Inner Sheath (AL/HDPE/PA instead of lead sheath) will be considered if the multi-layer sheath provides the same protection as a lead sheath for hydrocarbons, chemical and solvents, saline water ingress and vermin protection, as per BS 50288-7 section 4.18.2.
9. Bedding	Flame retardant Low Smoke Zero Halogen Compound ,LSZH. Colour: Black.
10. Armour	Galvanized steel wire.
11. Outer jacket	Flame Retardant Low Smoke Zero Halogen Compound.

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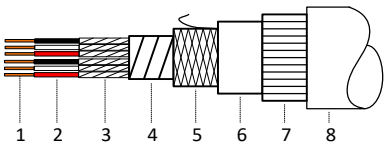
Entire cable assembly shall be Flame Retardant to IEC 60332. Pt.3. Cat`A' and Fire Resistant to IEC 60331.

(B14) Multi-triad, collective screen, armoured, fire resistant.
(XLPE/Coll Scr/SWA/LSHF)
Voltage Rating: 300/500V



CORE:

1. Conductors	Stranded annealed copper. Circular section, Class 2 according to IEC 60228. Temperature rating 90°C. Size: As per data sheet for 3 wire Fire and Gas Detectors.
Identification	Black, Red & White. Each core printed with triad number through out the cable at equal distances.
2. Insulation	Mica impregnated glass tape beneath extruded layer of flame retardant cross linked Polyethylene (XLPE) or equivalent Ethylene Propylene Rubber (EPR) or equivalent Silicone Rubber (S95) or material as per data sheet.

Cores are twisted into triads – each triad covered with:

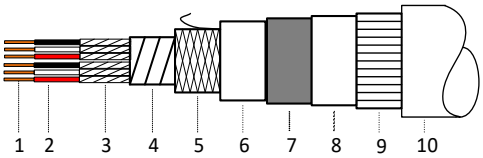
3. Fillers/Tape	Flame retardant moisture resistant material , LSZH.

CABLE:

	Triads twisted into multi-triads - Triads twisted (10 to 14 twists/m) together are covered with:
4. Fillers/Tape	Flame retardant moisture resistant material , LSZH.
5. Coll screen	One tinned copper 0.50 mm² min solid drain wire and aluminium backed Mylar tape. Tape shall be helically wrapped with 25% overlap. Aluminium tape shall be in continuous contact with the drain wire.
6. Inner jacket	Flame retardant Low Smoke Zero Halogen Compound Colour: Black.
7. Armour	Galvanized steel wire.
8. Outer jacket	Flame Retardant Low Smoke Zero Halogen Compound.

Entire cable assembly shall be Flame Retardant to IEC 60332. Pt.3. Cat`A' and Fire Resistant to IEC 60331.

(B15) Multi-triad, collective screen, armoured, external buried, fire resistant.
(XLPE/Coll Scr/LS/SWA/LSHF)
Voltage Rating: 300/500V



CORE:

1. Conductors	Stranded annealed copper. Circular section, Class 2 according to IEC 60228. Temperature rating 90°C. Size: As per data sheet for 3 wire Fire and Gas Detectors.
Identification	Black, Red & White. Each core printed with triad number through out the cable at equal distances.
2. Insulation	Mica impregnated glass tape beneath extruded layer of flame retardant cross linked Polyethylene (XLPE) or equivalent Ethylene Propylene Rubber (EPR) or equivalent Silicone Rubber (S95) or material as per data sheet.

Cores are twisted into triads – each triad covered with:

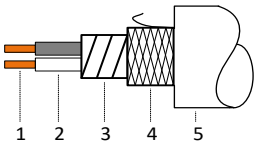
3. Fillers/Tape	Flame retardant moisture resistant material , LSZH.

CABLE:

	Triads twisted into multi-triads - Triads twisted (10 to 14 twists/m) together are covered with:
4. Fillers/Tape	Flame retardant moisture resistant material , LSZH.
5. Coll screen	One tinned copper 0.50 mm² min solid drain wire and aluminium backed Mylar tape. Tape shall be helically wrapped with 25% overlap. Aluminium tape shall be in continuous contact with the drain wire.
6. Inner jacket	Flame retardant Low Smoke Zero Halogen Compound LSZH. Colour: Black.
7. Inner Sheath	Lead Sheath (or Lead pipe). A multi-layered Inner Sheath (AL/HDPE/PA instead of lead sheath) will be considered if the multi-layer sheath provides the same protection as a lead sheath for hydrocarbons, chemical and solvents, saline water ingress and vermin protection, as per BS 50288-7 section 4.18.2.
8. Bedding	Flame retardant Low Smoke Zero Halogen Compound. Colour: Black.
9. Armour	Galvanized steel wire.
10. Outer jacket	Flame Retardant Low Smoke Zero Halogen Compound.

Entire cable assembly shall be Flame Retardant to IEC 60332. Pt.3. Cat`A' and Fire Resistant to IEC 60331.

(C1) Single pair Thermocouple Extension, Type B, collective screen, unarmoured, flame retardant (Mica/XLPE/Coll Scr/LSHF)
Voltage Rating: 300/500V



CORE:

1.	Conductor Type B	Positive: Chromel Wire, Solid, Size: 1.5 mm² min Negative: Alumel Wire, Solid, Size: 1.5 mm² min Temperature rating 105°C.
	Identification	Positive Core: Grey Negative Core: White
2.	Insulation	Flame retardant material as per data sheet .

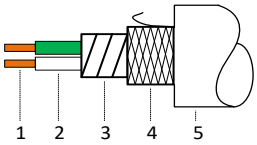
CABLE:

		Cores are twisted together and covered with:
3.	Fillers	Flame retardant moisture resistant material , LSZH.
4.	Cable screen	One tinned copper 0.50 mm² min drain wire and aluminium backed Mylar tape. Tape shall be helically wrapped with 25% overlap. Aluminium tape shall be in continuous contact with the drain wire.
5.	Outer jacket	Flame retardant Low Smoke Zero Halogen compound.

Entire cable assembly shall be Flame Retardant to IEC 60332. Pt.3. Cat`A'.

Note: This cable type shall be only utilized for indoor application where the cable is installed and fully routed within the same building.

(C2) Single pair Thermocouple Extension, Type K, collective screen, unarmoured, flame retardant (Mica/XLPE/Coll Scr/LSHF)
Voltage Rating: 300/500V



CORE:

1.	Conductor Type K	Positive: Chromel Wire, Solid, Size: 1.5 mm² min Negative: Alumel Wire, Solid, Size: 1.5 mm² min Temperature rating 105°C.
	Identification	Positive Core: Green Negative Core: White
2.	Insulation	Flame retardant material as per data sheet.

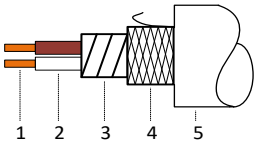
CABLE:

		Cores are twisted together and covered with:
3.	Fillers	Flame retardant moisture resistant material.
4.	Cable screen	One tinned copper 0.50 mm² min drain wire and aluminium backed Mylar tape. Tape shall be helically wrapped with 25% overlap. Aluminium tape shall be in continuous contact with the drain wire.
5.	Outer jacket	Flame retardant Low Smoke Zero Halogen compound.

Entire cable assembly shall be Flame Retardant to IEC 60332. Pt.3. Cat`A'.

Note: This cable type shall be only utilized for indoor application where the cable is installed and fully routed within the same building.

(C3) Single pair Thermocouple Extension, Type T, collective screen, unarmoured, flame retardant (Mica/XLPE/Coll Scr/LSHF)
Voltage Rating: 300/500V



CORE:

1.	Conductor Type T	Positive: Chromel Wire, Solid, Size: 1.5 mm² min Negative: Alumel Wire, Solid, Size: 1.5 mm² min Temperature rating 105°C.
	Identification	Positive Core: Brown Negative Core: White
2.	Insulation	Flame retardant material as per data sheet .

CABLE:

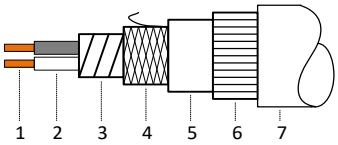
Cores are twisted together and covered with:

3.	Fillers	Flame retardant moisture resistant material , LSZH.
4.	Cable screen	One tinned copper 0.50 mm² min drain wire and aluminium backed Mylar tape. Tape shall be helically wrapped with 25% overlap. Aluminium tape shall be in continuous contact with the drain wire.
5.	Outer jacket	Flame retardant Low Smoke Zero Halogen compound.

Entire cable assembly shall be Flame Retardant to IEC 60332. Pt.3. Cat`A'.

Note: This cable type shall be only utilized for indoor application where the cable is installed and fully routed within the same building.

(C4) Single pair Thermocouple Extension, Type B, collective screen, armoured, flame retardant. (XLPE/Coll Scr/SWA/LSHF)
Voltage Rating: 300/500V



CORE:

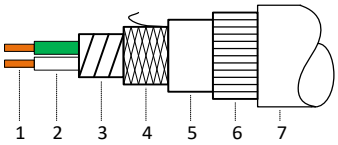
1.	Conductor Type B	Positive: Chromel Wire, Solid, Size: 1.5 mm² min Negative: Alumel Wire, Solid, Size: 1.5 mm² min Temperature rating 105°C.
	Identification	Positive Core: Grey Negative Core: White
2.	Insulation	Flame retardant material as per data sheet.

CABLE:

3.	Fillers	Flame retardant moisture resistant material , LSZH.
4.	Cable screen	One tinned copper 0.50 mm² min solid drain wire and aluminium backed Mylar tape. Tape shall be helically wrapped with 25% overlap. Aluminium tape shall be in continuous contact with the drain wire.
5.	Inner jacket	Flame retardant Low Smoke Zero Halogen Compound. Colour: Black.
6.	Armour	Galvanized steel wire.
7.	Outer jacket	Flame retardant Low Smoke Zero Halogen Compound.

Entire cable assembly shall be Flame Retardant to IEC 60332. Pt.3. Cat`A'.

(C5) Single pair Thermocouple Extension, Type K, collective screen, armoured, flame retardant. (XLPE/Coll Scr/SWA/LSHF)
Voltage Rating: 300/500V



CORE:

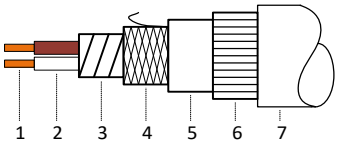
1.	Conductor Type K	Positive: Chromel Wire, Solid, Size: 1.5 mm² min Negative: Alumel Wire, Solid, Size: 1.5 mm² min Temperature rating 105°C.
	Identification	Positive Core: Green Negative Core: White
2.	Insulation	Flame retardant material as per data sheet.

CABLE:

3.	Fillers	Flame retardant moisture resistant material , LSZH.
4.	Cable screen	One tinned copper 0.50 mm² min solid drain wire and aluminium backed Mylar tape. Tape shall be helically wrapped with 25% overlap. Aluminium tape shall be in continuous contact with the drain wire.
5.	Inner jacket	Flame retardant Low Smoke Zero Halogen Compound. Colour: Black.
6.	Armour	Galvanized steel wire.
7.	Outer jacket	Flame retardant Low Smoke Zero Halogen Compound.

Entire cable assembly shall be Flame Retardant to IEC 60332. Pt.3. Cat`A'.

(C6) Single pair Thermocouple Extension, Type T, collective screen, armoured, flame retardant. (XLPE/Coll Scr/SWA/LSHF)
Voltage Rating: 300/500V



CORE:

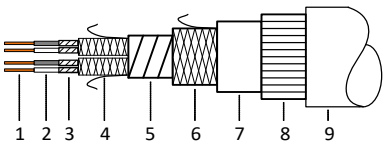
1.	Conductor Type T	Positive: Chromel Wire, Solid, Size: 1.5 mm² min Negative: Alumel Wire, Solid, Size: 1.5 mm² min Temperature rating 105°C.
	Identification	Positive Core: Brown Negative Core: White
2.	Insulation	Flame retardant material as per data sheet.

CABLE:

3.	Fillers	Flame retardant moisture resistant material , LSZH.
4.	Cable screen	One tinned copper 0.50 mm² min solid drain wire and aluminium backed Mylar tape. Tape shall be helically wrapped with 25% overlap. Aluminium tape shall be in continuous contact with the drain wire.
5.	Inner jacket	Flame retardant Low Smoke Zero Halogen Compound. Colour: Black.
6.	Armour	Galvanized steel wire.
7.	Outer jacket	Flame retardant Low Smoke Zero Halogen Compound.

Entire cable assembly shall be Flame Retardant to IEC 60332. Pt.3. Cat`A'.

(C7) Multi-pair Thermocouple Extension, Type B, individual & collective screen, armoured, flame retardant. (XLPE/Ind & Coll Scr/SWA/LSHF)
Voltage Rating: 300/500V



CORE:

1.	Conductor Type B	Positive: Chromel Wire, Solid, Size: 1.0 mm² min Negative: Alumel Wire, Solid, Size: 1.0 mm² min Temperature rating 105°C.
	Identification	Positive Core: Grey Negative Core: White.
2.	Insulation	Flame retardant material as per data sheet.

Cores are twisted into pairs – each pair covered with:

3.	Fillers	Flame retardant moisture resistant material , LSZH.
4.	Ind screen	One tinned copper 0.50 mm² min solid drain wire and aluminium backed Mylar tape. Tape shall be helically wrapped with 25% overlap. Aluminium tape shall be in continuous contact with the drain wire.

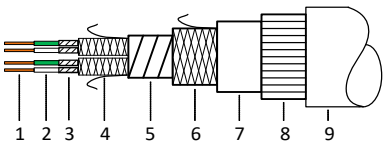
CABLE:

Pairs are twisted into multi-pairs - Pairs twisted (10 to 14 twists/m) together are covered with:

5.	Fillers	Flame retardant moisture resistant material , LSZH.
6.	Coll screen	One tinned copper 0.50 mm² min solid drain wire and aluminium backed Mylar tape. Tape shall be helically wrapped with 25% overlap. Aluminium tape shall be in continuous contact with the drain wire.
7.	Inner jacket	Flame retardant Low Smoke Zero Halogen Compound. Colour: Black.
8.	Armour	Galvanized steel wire.
9.	Outer jacket	Flame retardant Low Smoke Zero Halogen Compound.

Entire cable assembly shall be Flame Retardant to IEC 60332. Pt.3. Cat`A'.

(C8) Multi-pair Thermocouple Extension, Type K, individual & collective screen, armoured, flame retardant. (XLPE/Ind & Coll Scr/SWA/LSHF)
Voltage Rating: 300/500V



CORE:

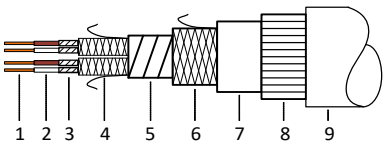
1.	Conductor Type K	Positive: Chromel Wire, Solid, Size: 1.0 mm² min Negative: Alumel Wire, Solid, Size: 1.0 mm² min Temperature rating 105°C.
	Identification	Positive Core: Green Negative Core: White.
2.	Insulation	Flame retardant material as per data sheet.
		Cores are twisted into pairs – each pair covered with:
3.	Fillers	Flame retardant moisture resistant material
4.	Ind screen	One tinned copper 0.50 mm² min solid drain wire and aluminium backed Mylar tape. Tape shall be helically wrapped with 25% overlap. Aluminium tape shall be in continuous contact with the drain wire.

CABLE:

		Pairs are twisted into multi-pairs - Pairs twisted (10 to 14 twists/m) together are covered with:
5.	Fillers	Flame retardant moisture resistant material .
6.	Coll screen	One tinned copper 0.50 mm² min solid drain wire and aluminium backed Mylar tape. Tape shall be helically wrapped with 25% overlap. Aluminium tape shall be in continuous contact with the drain wire.
7.	Inner jacket	Flame retardant Low Smoke Zero Halogen Compound. Colour: Black.
8.	Armour	Galvanized steel wire.
9.	Outer jacket	Flame retardant Low Smoke Zero Halogen Compound.

Entire cable assembly shall be Flame Retardant to IEC 60332. Pt.3. Cat`A'.

(C9) Multi-pair Thermocouple Extension, Type T, individual & collective screen, armoured, flame retardant. (XLPE/Ind & Coll Scr/SWA/LSHF)
Voltage Rating: 300/500V



CORE:

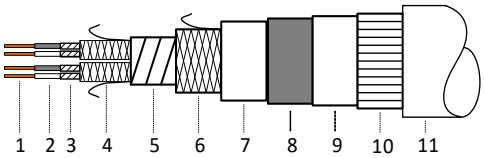
1.	Conductor Type T	Positive: Chromel Wire, Solid, Size: 1.0 mm² min Negative: Alumel Wire, Solid, Size: 1.0 mm² min Temperature rating 105°C.
	Identification	Positive Core: Brown Negative Core: White.
2.	Insulation	Flame retardant material as per data sheet.
		Cores are twisted into pairs – each pair covered with:
3.	Fillers	Flame retardant moisture resistant material , LSZH.
4.	Ind screen	One tinned copper 0.50 mm² min solid drain wire and aluminium backed Mylar tape. Tape shall be helically wrapped with 25% overlap. Aluminium tape shall be in continuous contact with the drain wire.

CABLE:

		Pairs are twisted into multi-pairs - Pairs twisted (10 to 14 twists/m) together are covered with:
5.	Fillers	Flame retardant moisture resistant material , LSZH.
6.	Coll screen	One tinned copper 0.50 mm² min solid drain wire and aluminium backed Mylar tape. Tape shall be helically wrapped with 25% overlap. Aluminium tape shall be in continuous contact with the drain wire.
7.	Inner jacket	Flame retardant Low Smoke Zero Halogen Compound. Colour: Black.
8.	Armour	Galvanized steel wire.
9.	Outer jacket	Flame retardant Low Smoke Zero Halogen Compound.

Entire cable assembly shall be Flame Retardant to IEC 60332. Pt.3. Cat`A'.

(C10) Multi-pair Thermocouple Extension, Type B, individual & collective screen, armoured, external buried, flame retardant. (XLPE/Ind & Coll Scr/IS/SWA/LSHF)
Voltage Rating: 300/500V



CORE:

1. Conductor Type B — Positive: Chromel Wire, Solid, Size: 1.0 mm² min
   Negative: Alumel Wire, Solid, Size: 1.0 mm² min
   Temperature rating 105°C.
   Identification — Positive Core: Grey
   Negative Core: White.

2. Insulation — Flame retardant material as per data sheet.

Cores are twisted into pairs – each pair covered with:

3. Fillers — Flame retardant moisture resistant material , LSZH.
4. Ind screen — One tinned copper 0.50 mm² min solid drain wire and aluminium backed Mylar tape. Tape shall be helically wrapped with 25% overlap. Aluminium tape shall be in continuous contact with the drain wire.

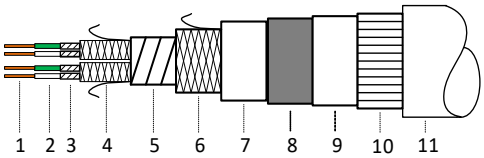
CABLE:

Pairs are twisted into multi-pairs - Pairs twisted (10 to 14 twists/m) together are covered with:

5. Fillers — Flame retardant moisture resistant material , LSZH.
6. Coll screen — One tinned copper 0.50 mm² min solid drain wire and aluminium backed Mylar tape. Tape shall be helically wrapped with 25% overlap. Aluminium tape shall be in continuous contact with the drain wire.
7. Inner jacket — Flame retardant Low Smoke Zero Halogen Compound.
   Colour: Black.
8. Inner Sheath — Lead Sheath (or Lead pipe).
   A multi-layered Inner Sheath (AL/HDPE/PA instead of lead sheath) will be considered if the multi-layer sheath provides the same protection as a lead sheath for hydrocarbons, chemical and solvents, saline water ingress and vermin protection, as per BS 50288-7 section 4.18.2.
9. Bedding — Flame retardant Low Smoke Zero Halogen Compound.
   Colour: Black.
10. Armour — Galvanized steel wire.
11. Outer jacket — Flame retardant Low Smoke Zero Halogen Compound

Entire cable assembly shall be Flame Retardant to IEC 60332. Pt.3. Cat`A'.

(C11) Multi-pair Thermocouple Extension, Type K, individual & collective screen, armoured, external buried, flame retardant. (XLPE/Ind & Coll Scr/IS/SWA/LSHF)
Voltage Rating: 300/500V



CORE:

1. Conductor Type K — Positive: Chromel Wire, Solid, Size: 1.0 mm² min
   Negative: Alumel Wire, Solid, Size: 1.0 mm² min
   Temperature rating 105°C.
   Identification — Positive Core: Green
   Negative Core: White.

2. Insulation — Flame retardant material as per data sheet.

Cores are twisted into pairs – each pair covered with:

3. Fillers — Flame retardant moisture resistant material , LSZH.
4. Ind screen — One tinned copper 0.50 mm² min solid drain wire and aluminium backed Mylar tape. Tape shall be helically wrapped with 25% overlap. Aluminium tape shall be in continuous contact with the drain wire.

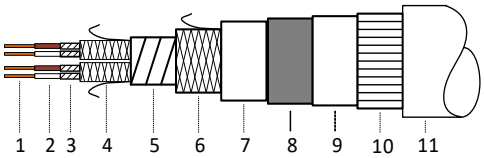
CABLE:

Pairs are twisted into multi-pairs - Pairs twisted (10 to 14 twists/m) together are covered with:

5. Fillers — Flame retardant moisture resistant material , LSZH.
6. Coll screen — One tinned copper 0.50 mm² min solid drain wire and aluminium backed Mylar tape. Tape shall be helically wrapped with 25% overlap. Aluminium tape shall be in continuous contact with the drain wire.
7. Inner jacket — Flame retardant Low Smoke Zero Halogen Compound.
   Colour: Black.
8. Inner Sheath — Lead Sheath (or Lead pipe).
   A multi-layered Inner Sheath (AL/HDPE/PA instead of lead sheath) will be considered if the multi-layer sheath provides the same protection as a lead sheath for hydrocarbons, chemical and solvents, saline water ingress and vermin protection, as per BS 50288-7 section 4.18.2.
9. Bedding — Flame retardant Low Smoke Zero Halogen Compound.
   Colour: Black.
10. Armour — Galvanized steel wire.
11. Outer jacket — Flame retardant Low Smoke Zero Halogen Compound

Entire cable assembly shall be Flame Retardant to IEC 60332. Pt.3. Cat`A'.

(C12) Multi-pair Thermocouple Extension, Type T, individual & collective screen, armoured, external buried, flame retardant. (XLPE/Ind & Coll Scr/IS/SWA/LSHF)
Voltage Rating: 300/500V



CORE:

1. Conductor Type T — Positive: Chromel Wire, Solid, Size: 1.0 mm² min
   Negative: Alumel Wire, Solid, Size: 1.0 mm² min
   Temperature rating 105°C.

   Identification — Positive Core: Brown
   Negative Core: White.

2. Insulation — Flame retardant material as per data sheet.

Cores are twisted into pairs – each pair covered with:

3. Fillers — Flame retardant moisture resistant material , LSZH.
4. Ind screen — One tinned copper 0.50 mm² min solid drain wire and aluminium backed Mylar tape. Tape shall be helically wrapped with 25% overlap. Aluminium tape shall be in continuous contact with the drain wire.

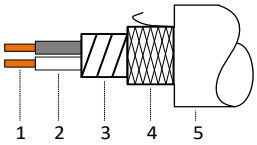
CABLE:

Pairs are twisted into multi-pairs - Pairs twisted (10 to 14 twists/m) together are covered with:

5. Fillers — Flame retardant moisture resistant material , LSZH.
6. Coll screen — One tinned copper 0.50 mm² min solid drain wire and aluminium backed Mylar tape. Tape shall be helically wrapped with 25% overlap. Aluminium tape shall be in continuous contact with the drain wire.
7. Inner jacket — Flame retardant Low Smoke Zero Halogen Compound.
   Colour: Black.
8. Inner Sheath — Lead Sheath (or Lead pipe).
   A multi-layered Inner Sheath (AL/HDPE/PA instead of lead sheath) will be considered if the multi-layer sheath provides the same protection as a lead sheath for hydrocarbons, chemical and solvents, saline water ingress and vermin protection, as per BS 50288-7 section 4.18.2.
9. Bedding — Flame retardant Low Smoke Zero Halogen Compound.
   Colour: Black.
10. Armour — Galvanized steel wire.
11. Outer jacket — Flame retardant Low Smoke Zero Halogen Compound.

Entire cable assembly shall be Flame Retardant to IEC 60332. Pt.3. Cat`A'.

(D1) Single pair Thermocouple Extension, Type B, collective screen, unarmoured, fire resistant. (Mica/XLPE/Coll Scr/LSHF)
Voltage Rating: 300/500V



CORE:

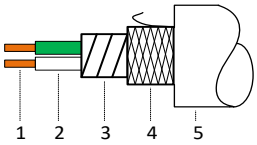
1.	Conductor Type B	Positive: Chromel Wire, Solid, Size: 1.5 mm² min Negative: Alumel Wire, Solid, Size: 1.5 mm² min Temperature rating 105°C.
	Identification	Positive Core: Grey Negative Core: White
2.	Insulation linked	Mica impregnated glass tape beneath extruded layer of flame retardant cross Polyethylene (XLPE) or equivalent Ethylene Propylene Rubber (EPR) or equivalent Silicone Rubber (S95) or material as per data sheet.

CABLE:

3.	Fillers	Flame retardant moisture resistant material , LSZH.
4.	Cable screen	One tinned copper 0.50 mm² min solid drain wire and aluminium backed Mylar tape. Tape shall be helically wrapped with 25% overlap. Aluminium tape shall be in continuous contact with the drain wire.
5.	Outer jacket	Flame Retardant Low Smoke Zero Halogen Compound.

Entire cable assembly shall be Flame Retardant to IEC 60332. Pt.3. Cat`A' and Fire Resistant to IEC 60331.

(D2) Single pair Thermocouple Extension, Type K, collective screen, unarmoured, fire resistant. (Mica/XLPE/Coll Scr/LSHF)
Voltage Rating: 300/500V



CORE:

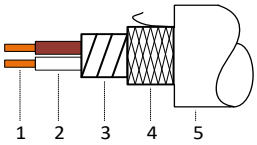
1.	Conductor Type K	Positive: Chromel Wire, Solid, Size: 1.5 mm² min Negative: Alumel Wire, Solid, Size: 1.5 mm² min Temperature rating 105°C.
	Identification	Positive Core: Green Negative Core: White
2.	Insulation linked	Mica impregnated glass tape beneath extruded layer of flame retardant cross Polyethylene (XLPE) or equivalent Ethylene Propylene Rubber (EPR) or equivalent Silicone Rubber (S95) or material as per data sheet.

CABLE:

3.	Fillers	Flame retardant moisture resistant material , LSZH.
4.	Cable screen	One tinned copper 0.50 mm² min solid drain wire and aluminium backed Mylar tape. Tape shall be helically wrapped with 25% overlap. Aluminium tape shall be in continuous contact with the drain wire.
5.	Outer jacket	Flame Retardant Low Smoke Zero Halogen Compound.

Entire cable assembly shall be Flame Retardant to IEC 60332. Pt.3. Cat`A' and Fire Resistant to IEC 60331.

(D3) Single pair Thermocouple Extension, Type T, collective screen, unarmoured, fire resistant. (Mica/XLPE/Coll Scr/LSHF)
Voltage Rating: 300/500V



CORE:

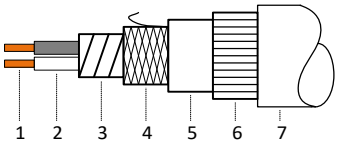
1.	Conductor Type T	Positive: Chromel Wire, Solid, Size: 1.5 mm² min Negative: Alumel Wire, Solid, Size: 1.5 mm² min Temperature rating 105°C.
	Identification	Positive Core: Brown Negative Core: White
2.	Insulation linked	Mica impregnated glass tape beneath extruded layer of flame retardant cross Polyethylene (XLPE) or equivalent Ethylene Propylene Rubber (EPR) or equivalent Silicone Rubber (S95) or material as per data sheet.

CABLE:

3.	Fillers	Flame retardant moisture resistant material .
4.	Cable screen	One tinned copper 0.50 mm² min solid drain wire and aluminium backed Mylar tape. Tape shall be helically wrapped with 25% overlap. Aluminium tape shall be in continuous contact with the drain wire.
5.	Outer jacket	Flame Retardant Low Smoke Zero Halogen Compound.

Entire cable assembly shall be Flame Retardant to IEC 60332. Pt.3. Cat`A' and Fire Resistant to IEC 60331.

(D4) Single pair Thermocouple Extension, Type B, collective screen, armoured, fire resistant. (XLPE/Coll Scr/SWA/LSHF)
Voltage Rating: 300/500V



CORE:

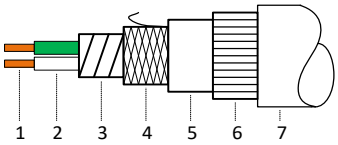
1.	Conductor Type B	Positive: Chromel Wire, Solid, Size: 1.5 mm² min Negative: Alumel Wire, Solid, Size: 1.5 mm² min Temperature rating 105°C.
	Identification	Positive Core: Grey Negative Core: White
2.	Insulation linked	Mica impregnated glass tape beneath extruded layer of flame retardant cross Polyethylene (XLPE) or equivalent Ethylene Propylene Rubber (EPR) or equivalent Silicone Rubber (S95) or material as per data sheet.

CABLE:

3.	Fillers	Flame retardant moisture resistant material , LSZH.
4.	Cable screen	One tinned copper 0.50 mm² min solid drain wire and aluminium backed Mylar tape. Tape shall be helically wrapped with 25% overlap. Aluminium tape shall be in continuous contact with the drain wire.
5.	Inner jacket	Flame retardant Low Smoke Zero Halogen Compound. Colour: Black.
6.	Armour	Galvanized steel wire.
7.	Outer jacket	Flame Retardant Low Smoke Zero Halogen Compound.

Entire cable assembly shall be Flame Retardant to IEC 60332. Pt.3. Cat`A' and Fire Resistant to IEC 60331.

(D5) Single pair Thermocouple Extension, Type K, collective screen, armoured, fire resistant. (XLPE/Coll Scr/SWA/LSHF)
Voltage Rating: 300/500V



CORE:

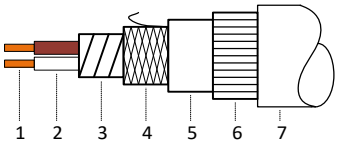
1.	Conductor Type K	Positive: Chromel Wire, Solid, Size: 1.5 mm² min Negative: Alumel Wire, Solid, Size: 1.5 mm² min Temperature rating 105°C.
	Identification	Positive Core: Green Negative Core: White
2.	Insulation linked	Mica impregnated glass tape beneath extruded layer of flame retardant cross Polyethylene (XLPE) or equivalent Ethylene Propylene Rubber (EPR) or equivalent Silicone Rubber (S95) or material as per data sheet.

CABLE:

3.	Fillers	Flame retardant moisture resistant material , LSZH.
4.	Cable screen	One tinned copper 0.50 mm² min solid drain wire and aluminium backed Mylar tape. Tape shall be helically wrapped with 25% overlap. Aluminium tape shall be in continuous contact with the drain wire.
5.	Inner jacket	Flame retardant Low Smoke Zero Halogen Compound Colour: Black.
6.	Armour	Galvanized steel wire.
7.	Outer jacket	Flame Retardant Low Smoke Zero Halogen Compound.

Entire cable assembly shall be Flame Retardant to IEC 60332. Pt.3. Cat`A' and Fire Resistant to IEC 60331.

(D6) Single pair Thermocouple Extension, Type T, collective screen, armoured, fire resistant. (XLPE/Coll Scr/SWA/LSHF)
Voltage Rating: 300/500V



CORE:

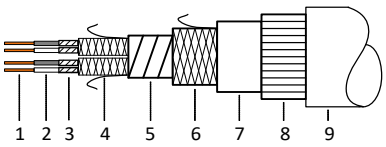
1.	Conductor Type T	Positive: Chromel Wire, Solid, Size: 1.5 mm² min Negative: Alumel Wire, Solid, Size: 1.5 mm² min Temperature rating 105°C.
	Identification	Positive Core: Brown Negative Core: White
2.	Insulation linked	Mica impregnated glass tape beneath extruded layer of flame retardant cross Polyethylene (XLPE) or equivalent Ethylene Propylene Rubber (EPR) or equivalent Silicone Rubber (S95) or material as per data sheet.

CABLE:

3.	Fillers	Flame retardant moisture resistant material , LSZH.
4.	Cable screen	One tinned copper 0.50 mm² min solid drain wire and aluminium backed Mylar tape. Tape shall be helically wrapped with 25% overlap. Aluminium tape shall be in continuous contact with the drain wire.
5.	Inner jacket	Flame retardant Low Smoke Zero Halogen Compound. Colour: Black.
6.	Armour	Galvanized steel wire.
7.	Outer jacket	Flame Retardant Low Smoke Zero Halogen Compound.

Entire cable assembly shall be Flame Retardant to IEC 60332. Pt.3. Cat`A' and Fire Resistant to IEC 60331.

(D7) Multi-pair Thermocouple Extension, Type B, individual & collective screen, armoured, fire resistant. (XLPE/Ind & Coll Scr/SWA/LSHF)
Voltage Rating: 300/500V



CORE:

1.	Conductor Type B	Positive: Chromel Wire, Solid, Size: 1.0 mm² min Negative: Alumel Wire, Solid, Size: 1.0 mm² min Temperature rating 105°C.
	Identification	Positive Core: Grey Negative Core: White.
2.	Insulation linked	Mica impregnated glass tape beneath extruded layer of flame retardant cross Polyethylene (XLPE) or equivalent Ethylene Propylene Rubber (EPR) or equivalent Silicone Rubber (S95) or material as per data sheet.

Cores are twisted into pairs – each pair covered with:

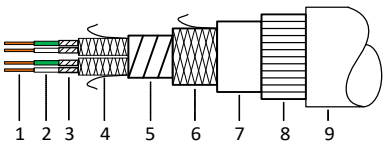
3.	Fillers	Flame retardant moisture resistant material , LSZH.
4.	Ind screen	One tinned copper 0.50 mm² min solid drain wire and aluminium backed Mylar tape. Tape shall be helically wrapped with 25% overlap. Aluminium tape shall be in continuous contact with the drain wire.

CABLE:

		Pairs are twisted into multi-pairs - Pairs twisted (10 to 14 twists/m) together are covered with:
5.	Fillers	Flame retardant moisture resistant material , LSZH.
6.	Coll screen	One tinned copper 0.50 mm² min solid drain wire and aluminium backed Mylar tape. Tape shall be helically wrapped with 25% overlap. Aluminium tape shall be in continuous contact with the drain wire.
7.	Inner jacket	Flame retardant Low Smoke Zero Halogen Compound. Colour: Black.
8.	Armour	Galvanized steel wire.
9.	Outer jacket	Flame Retardant Low Smoke Zero Halogen Compound.

Entire cable assembly shall be Flame Retardant to IEC 60332. Pt.3. Cat`A' and Fire Resistant to IEC 60331.

(D8) Multi-pair Thermocouple Extension, Type K, individual & collective screen, armoured, fire resistant. (XLPE/Ind & Coll Scr/SWA/LSHF)
Voltage Rating: 300/500V



CORE:

1.	Conductor Type K	Positive: Chromel Wire, Solid, Size: 1.0 mm² min Negative: Alumel Wire, Solid, Size: 1.0 mm² min Temperature rating 105°C.
	Identification	Positive Core: Green. Negative Core: White.
2.	Insulation linked	Mica impregnated glass tape beneath extruded layer of flame retardant cross Polyethylene (XLPE) or equivalent Ethylene Propylene Rubber (EPR) or equivalent Silicone Rubber (S95) or material as per data sheet.

Cores are twisted into pairs – each pair covered with:

3.	Fillers	Flame retardant moisture resistant material , LSZH.
4.	Ind screen	One tinned copper 0.50 mm² min solid drain wire and aluminium backed Mylar tape. Tape shall be helically wrapped with 25% overlap. Aluminium tape shall be in continuous contact with the drain wire.

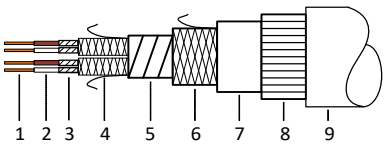
CABLE:

Pairs are twisted into multi-pairs - Pairs twisted (10 to 14 twists/m) together are covered with:

5.	Fillers	Flame retardant moisture resistant material , LSZH.
6.	Coll screen	One tinned copper 0.50 mm² min solid drain wire and aluminium backed Mylar tape. Tape shall be helically wrapped with 25% overlap. Aluminium tape shall be in continuous contact with the drain wire.
7.	Inner jacket	Flame retardant Low Smoke Zero Halogen Compound. Colour: Black.
8.	Armour	Galvanized steel wire.
9.	Outer jacket	Flame Retardant Low Smoke Zero Halogen Compound.

Entire cable assembly shall be Flame Retardant to IEC 60332. Pt.3. Cat`A' and Fire Resistant to IEC 60331.

(D9) Multi-pair Thermocouple Extension, Type T, individual & collective screen, armoured, fire resistant. (XLPE/Ind & Coll Scr/SWA/LSHF)
Voltage Rating: 300/500V



CORE:

1.	Conductor Type T	Positive: Chromel Wire, Solid, Size: 1.0 mm² min Negative: Alumel Wire, Solid, Size: 1.0 mm² min Temperature rating 105°C.
	Identification	Positive Core: Brown. Negative Core: White.
2.	Insulation linked	Mica impregnated glass tape beneath extruded layer of flame retardant cross Polyethylene (XLPE) or equivalent Ethylene Propylene Rubber (EPR) or equivalent Silicone Rubber (S95) or material as per data sheet.

Cores are twisted into pairs – each pair covered with:

3.	Fillers	Flame retardant moisture resistant material , LSZH.
4.	Ind screen	One tinned copper 0.50 mm² min solid drain wire and aluminium backed Mylar tape. Tape shall be helically wrapped with 25% overlap. Aluminium tape shall be in continuous contact with the drain wire.

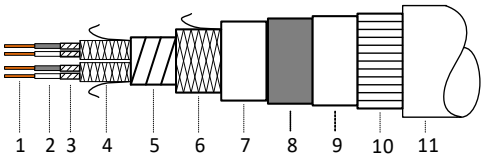
CABLE:

Pairs are twisted into multi-pairs - Pairs twisted (10 to 14 twists/m) together are covered with:

5.	Fillers	Flame retardant moisture resistant material , LSZH.
6.	Coll screen	One tinned copper 0.50 mm² min solid drain wire and aluminium backed Mylar tape. Tape shall be helically wrapped with 25% overlap. Aluminium tape shall be in continuous contact with the drain wire.
7.	Inner jacket	Flame retardant Low Smoke Zero Halogen Compound. Colour: Black.
8.	Armour	Galvanized steel wire.
9.	Outer jacket	Flame Retardant Low Smoke Zero Halogen Compound.

Entire cable assembly shall be Flame Retardant to IEC 60332. Pt.3. Cat`A' and Fire Resistant to IEC 60331.

(D10) Multi-pair Thermocouple Extension, Type B, individual & collective screen, armoured, external buried, fire resistant. (XLPE/Ind & Coll Scr/IS/SWA/LSHF)
Voltage Rating: 300/500V



CORE:

1.	Conductor Type B	Positive: Chromel Wire, Solid, Size: 1.0 mm² min Negative: Alumel Wire, Solid, Size: 1.0 mm² min Temperature rating 105°C.
	Identification	Positive Core: Grey Negative Core: White.
2.	Insulation linked	Mica impregnated glass tape beneath extruded layer of flame retardant cross Polyethylene (XLPE) or equivalent Ethylene Propylene Rubber (EPR) or equivalent Silicone Rubber (S95) or material as per data sheet.

Cores are twisted into pairs – each pair covered with:

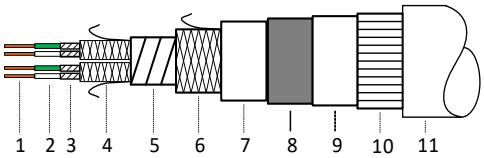
3.	Fillers	Flame retardant moisture resistant material , LSZH.
4.	Ind screen	One tinned copper 0.50 mm² min solid drain wire and aluminium backed Mylar tape. Tape shall be helically wrapped with 25% overlap. Aluminium tape shall be in continuous contact with the drain wire.

CABLE:

		Pairs are twisted into multi-pairs - Pairs twisted (10 to 14 twists/m) together are covered with:
5.	Fillers	Flame retardant moisture resistant material , LSZH.
6.	Coll screen	One tinned copper 0.50 mm² min solid drain wire and aluminium backed Mylar tape. Tape shall be helically wrapped with 25% overlap. Aluminium tape shall be in continuous contact with the drain wire.
7.	Inner jacket	Flame retardant Low Smoke Zero Halogen Compound. Colour: Black.
8.	Inner Sheath	Lead Sheath (or Lead pipe). A multi-layered Inner Sheath (AL/HDPE/PA instead of lead sheath) will be considered if the multi-layer sheath provides the same protection as a lead sheath for hydrocarbons, chemical and solvents, saline water ingress and vermin protection, as per BS 50288-7 section 4.18.2.
9.	Bedding	Flame retardant Low Smoke Zero Halogen Compound. Colour: Black.
10.	Armour	Galvanized steel wire.
11.	Outer jacket	Flame Retardant Low Smoke Zero Halogen Compound.

Entire cable assembly shall be Flame Retardant to IEC 60332. Pt.3. Cat`A' and Fire Resistant to IEC 60331.

(D11) Multi-pair Thermocouple Extension, Type K, individual & collective screen, armoured, external buried, fire resistant. (XLPE/Ind & Coll Scr/IS/SWA/LSHF)
Voltage Rating: 300/500V



CORE:

1.	Conductor Type K	Positive: Chromel Wire, Solid, Size: 1.0 mm² min Negative: Alumel Wire, Solid, Size: 1.0 mm² min Temperature rating 105°C.
	Identification	Positive Core: Green Negative Core: White.
2.	Insulation linked	Mica impregnated glass tape beneath extruded layer of flame retardant cross Polyethylene (XLPE) or equivalent Ethylene Propylene Rubber (EPR) or equivalent Silicone Rubber (S95) or material as per data sheet.

Cores are twisted into pairs – each pair covered with:

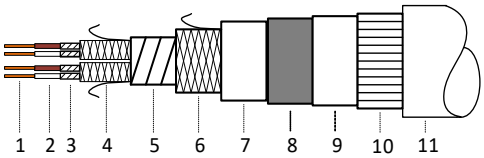
3.	Fillers	Flame retardant moisture resistant material , LSZH.
4.	Ind screen	One tinned copper 0.50 mm² min solid drain wire and aluminium backed Mylar tape. Tape shall be helically wrapped with 25% overlap. Aluminium tape shall be in continuous contact with the drain wire.

CABLE:

		Pairs are twisted into multi-pairs - Pairs twisted (10 to 14 twists/m) together are c overed with:
5.	Fillers	Flame retardant moisture resistant material , LSZH.
6.	Coll screen	One tinned copper 0.50 mm² min solid drain wire and aluminium backed Mylar tape. Tape shall be helically wrapped with 25% overlap. Aluminium tape shall be in continuous contact with the drain wire.
7.	Inner jacket	Flame retardant Low Smoke Zero Halogen Compound. Colour: Black.
8.	Inner Sheath	Lead Sheath (or Lead pipe). A multi-layered Inner Sheath (AL/HDPE/PA instead of lead sheath) will be considered if the multi-layer sheath provides the same protection as a lead sheath for hydrocarbons, chemical and solvents, saline water ingress and vermin protection, as per BS 50288-7 section 4.18.2.
9.	Bedding	Flame retardant Low Smoke Zero Halogen Compound Colour: Black.
10.	Armour	Galvanized steel wire.
11.	Outer jacket	Flame retardant Low Smoke Zero Halogen Compound.

Entire cable assembly shall be Flame Retardant to IEC 60332. Pt.3. Cat`A' and Fire Resistant to IEC 60331.

(D12) Multi-pair Thermocouple Extension, Type T, individual & collective screen, armoured, external buried, fire resistant. (XLPE/Ind & Coll Scr/IS/SWA/LSHF)
Voltage Rating: 300/500V



CORE:

1.	Conductor Type T	Positive: Chromel Wire, Solid, Size: 1.0 mm² min Negative: Alumel Wire, Solid, Size: 1.0 mm² min Temperature rating 105°C.
	Identification	Positive Core: Brown Negative Core: White.
2.	Insulation linked	Mica impregnated glass tape beneath extruded layer of flame retardant cross Polyethylene (XLPE) or equivalent Ethylene Propylene Rubber (EPR) or equivalent Silicone Rubber (S95) or material as per data sheet.

Cores are twisted into pairs – each pair covered with:

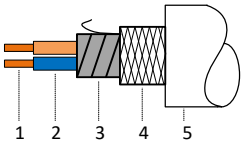
3.	Fillers	Flame retardant moisture resistant material , LSZH.
4.	Ind screen	One tinned copper 0.50 mm² min solid drain wire and aluminium backed Mylar tape. Tape shall be helically wrapped with 25% overlap. Aluminium tape shall be in continuous contact with the drain wire.

CABLE:

		Pairs are twisted into multi-pairs - Pairs twisted (10 to 14 twists/m) together are covered with:
5.	Fillers	Flame retardant moisture resistant material , LSZH.
6.	Coll screen	One tinned copper 0.50 mm² min solid drain wire and aluminium backed Mylar tape. Tape shall be helically wrapped with 25% overlap. Aluminium tape shall be in continuous contact with the drain wire.
7.	Inner jacket	Flame retardant Low Smoke Zero Halogen Compound. Colour: Black.
8.	Inner Sheath	Lead Sheath (or Lead pipe). A multi-layered Inner Sheath (AL/HDPE/PA instead of lead sheath) will be considered if the multi-layer sheath provides the same protection as a lead sheath for hydrocarbons, chemical and solvents, saline water ingress and vermin protection, as per BS 50288-7 section 4.18.2.
9.	Bedding	Flame retardant Low Smoke Zero Halogen Compound. Colour: Black.
10.	Armour	Galvanized steel wire.
11.	Outer jacket	Flame retardant Low Smoke Zero Halogen Compound.

Entire cable assembly shall be Flame Retardant to IEC 60332. Pt.3. Cat`A' and Fire Resistant to IEC 60331.

(E1) Communication, 2 wire applications, Single-pair, foil shield and braid, unarmoured, flame retardant. (XLPE/Coll Scr/LSHF)
Voltage Rating: 300/500V



CORE:

1.	Conductors	Stranded annealed copper. Circular section, Type A according to IEC 61158-2. Temperature rating 90°C Size 1.5 mm^2 min for `Foundation Fieldbus' and RS-485 signals.
	Identification	Orange (+) and Blue (-).
2.	Insulation	Flame retardant material as per data sheet.

CABLE:

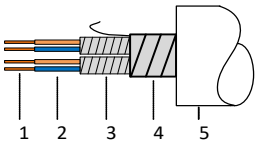
		Cores are twisted together and covered with:
3.	Foil	Overall foil (aluminium foil, polyester tape coated on one surface) shield with metal surface in contact with one tinned copper drain wire . Together with Flame retardant moisture resistant material fillers.
4.	Braid	Tinned copper wire braid in continuous contact with the tinned copper drain wire.
5.	Outer jacket	Flame retardant Low Smoke Zero Halogen Compound.

Entire cable assembly shall be Flame Retardant to IEC 60332. Pt.3. Cat`A.

Note: This cable type shall be only utilized for indoor application where the cable is installed and fully routed within the same building.

(E2) Communication, 2wire applications, Multi-pair, foil shield, unarmoured, flame retardant. (XLPE/Ind & Coll Scr/LSHF)

Voltage Rating: 300/500V



CORE:

1.	Conductors	Stranded annealed copper. Circular section, Type A according to IEC 61158-2 and Foundation Fieldbus Cable Specification FF-844 H1. Temperature rating 90°C. Size: 1.0 mm² min for `Foundation Fieldbus' and RS-485 signals.
	Identification	Orange (+) and Blue (-). Each core printed with pair number throughout the cable at equal distances.
2.	Insulation	Flame retardant material as per data sheet.

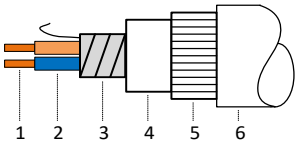
CABLE:

		Cores are twisted together and covered with:
3.	Ind Foil	Individual foil (aluminium foil, polyester tape coated on one surface) shield with metal surface in contact with one tinned copper drain wire . Together with Flame retardant moisture resistant material fillers.
4.	Coll Foil	Collective foil (aluminium foil, polyester tape coated on one surface) shield with metal surface in contact with one tinned copper drain wire .
5.	Outer jacket	Flame Retardant Low Smoke Zero Halogen compound.

Entire cable assembly shall be Flame Retardant to IEC 60332. Pt.3. Cat`A'.

Note: This cable type shall be only utilized for indoor application where the cable is installed and fully routed within the same building.

(E3) Communication, 2wire applications, Single-pair, foil shield, armoured, flame retardant. (XLPE/Coll Scr/SWA/LSHF)
Voltage Rating: 300/500V



CORE:

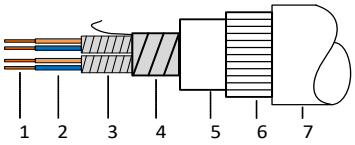
1. Conductors	Standed annealed copper. Circular section, Type A according to IEC 61158-2. Temperature rating 90°C Size 1.5 mm^2 min for `Foundation Fieldbus' and RS-485 signals.
Identification	Orange (+) and Blue (-).
2. Insulation	Flame retardant material as per data sheet.

CABLE:

	Cores are twisted together and covered with:
3. Coll Foil	Collective foil (aluminium foil, polyester tape coated on one surface) shield with metal surface in contact with one tinned copper drain wire . Together with Flame retardant moisture resistant material fillers.
4. Inner jacket	Flame retardant Low Smoke Zero Halogen Compound.
5. Armour	Galvanized steel wire.
6. Outer jacket	Flame retardant Low Smoke Zero Halogen compound.

Entire cable assembly shall be Flame Retardant to IEC 60332. Pt.3. Cat`A'.

(E4) Communication, 2wire applications, Multi-pair, foil shield, armoured, flame retardant.
(XLPE/Ind & Coll Scr/SWA/LSHF)
Voltage Rating: 300/500V



CORE:

1.	Conductors	Stranded annealed copper. Circular section, Type A according to IEC 61158-22 and Foundation Fieldbus Cable Specification FF-844 H1. Temperature rating 90°C. Size: 1.0 mm² min for `Foundation Fieldbus' and RS-485 signals.
	Identification	Orange (+) and Blue (-). Each core printed with pair number throughout the cable at equal distances.
2.	Insulation	Flame retardant material as per data sheet.

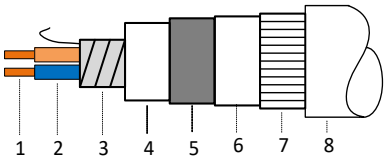
CABLE:

Cores are twisted together and covered with:

3.	Ind Foil	Individual foil (aluminium foil, polyester tape coated on one surface) shield with metal surface in contact with one tinned copper drain wire . Together with Flame retardant moisture resistant material fillers.
4.	Coll Foil	Collective foil (aluminium foil, polyester tape coated on one surface) shield with metal surface in contact with one tinned copper drain wire.
5.	Inner jacket	Flame retardant Low Smoke Zero Halogen Compound.
6.	Armour	Galvanized steel wire.
7.	Outer jacket	Flame Retardant Low Smoke Zero Halogen compound.

Entire cable assembly shall be Flame Retardant to IEC 60332. Pt.3. Cat`A'.

(E5) Communication, 2wire applications, Single-pair, foil shield, armoured, external buried, flame retardant. (XLPE/Coll Scr/LS/SWA/LSHF)
Voltage Rating: 300/500V



CORE:

1.	Conductors	Stranded annealed copper. Circular section, Class 2 according to IEC 60228. Temperature rating 90°C. Size: 1.5 mm² min for `Foundation Fieldbus' and RS-485 signals.
	Identification	Orange (+) and Blue (-).
2.	Insulation	Flame retardant material as per data sheet.

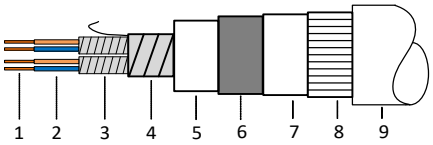
CABLE:

Cores are twisted together and covered with:

3.	Coll Foil	Collective foil (aluminium foil, polyester tape coated on one surface) shield with metal surface in contact with one tinned copper drain wire . Together with Flame retardant moisture resistant material fillers and PETP binder tape.
4.	Inner jacket	Flame retardant Low Smoke Zero Halogen Compound ,LSZH. Colour: Black.
5.	Inner Sheath	Lead Sheath (or Lead pipe). A multi-layered Inner Sheath (AL/HDPE/PA instead of lead sheath) will be considered if the multi-layer sheath provides the same protection as a lead sheath for hydrocarbons, chemical and solvents, saline water ingress and vermin protection, as per BS 50288-7 section 4.18.2.
6.	Bedding	Flame retardant Low Smoke Zero Halogen Compound. Colour: Black.
7.	Armour	Galvanized steel wire.
8.	Outer jacket	Flame Retardant Low Smoke Zero Halogen compound.

Entire cable assembly shall be Flame Retardant to IEC 60332. Pt.3. Cat`A'.

(E6) Communication, 2-wire applications, Multi-pair, foil shield, armoured, external buried, flame retardant. (XLPE/Ind & Coll Scr/LS/SWA/LSHF)
Voltage Rating: 300/500V



CORE:

1.	Conductors	Stranded annealed copper. Circular section, Class 2 according to IEC 60228 and Foundation Fieldbus Cable Specification FF-844 H1. Temperature rating 90°C. Size: 1.0 mm² min for `Foundation Fieldbus' and RS-485 signals.
	Identification	Orange (+) and Blue (-). Each core printed with pair number throughout the cable at equal distances.
2.	Insulation	Flame retardant material as per data sheet.

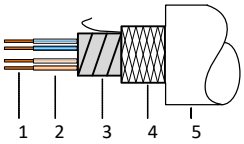
CABLE:

Cores are twisted into pairs – each pair covered with:

3.	Ind Foil	Individual foil (aluminium foil, polyester tape coated on one surface) shield with metal surface in contact with one tinned copper drain wire . Together with Flame retardant moisture resistant material fillers.
4.	Coll Foil	Collective foil (aluminium foil, polyester tape coated on one surface) shield with metal surface in contact with one tinned copper drain wire.
5.	Inner jacket	Flame retardant Low Smoke Zero Halogen Compound ,LSZH. Colour: Black.
6.	Inner Sheath	Lead Sheath (or Lead pipe). A multi-layered Inner Sheath (AL/HDPE/PA instead of lead sheath) will be considered if the multi-layer sheath provides the same protection as a lead sheath for hydrocarbons, chemical and solvents, saline water ingress and vermin protection, as per BS 50288-7 section 4.18.2.
7.	Bedding	Flame retardant Low Smoke Zero Halogen Compound. Colour: Black.
8.	Armour	Galvanized steel wire.
9.	Outer jacket	Flame Retardant Low Smoke Zero Halogen Compound.

Entire cable assembly shall be Flame Retardant to IEC 60332. Pt.3. Cat`A'.

(E7) RS232/422/485 Communication, 4wire applications, overall screen, unarmoured, flame retardant.
(XLPE/OS/LSHF)
Voltage Rating: 300/500V



CORE:

1.	Conductors 2	2Pair, Stranded annealed copper. Circular section, TypeA according to IEC 61158- Temperature rating 90°C. Size: 1.5 mm² min for 4-wire serial communications.
	Identification	Pair1 - White/Blue stripe and Blue/White stripe Pair2 - White/Orange stripe and Orange/White stripe.
2.	Insulation	Flame retardant material as per data sheet .

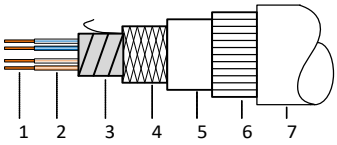
CABLE:

		Cores are twisted together and covered with:
3.	Coll Foil	Overall foil shield with one tinned copper drain wire .
4.	Braid	Tinned copper braid in continuous contact with the tinned copper drain wire.
5.	Outer jacket	Flame Retardant Low Smoke Zero Halogen Compound.

Entire cable assembly shall be Flame Retardant to IEC 60332. Pt.3. Cat`A'.

Note: This cable type shall be only utilized for indoor application where the cable is installed and fully routed within the same building.

(E8) RS232/422/485 Communication, 4wire applications, overall screen, armoured, flame retardant.
(XLPE/OS/SWA/LSHF)
Voltage Rating: 300/500V



CORE:

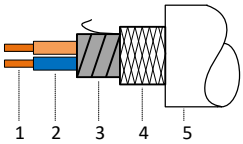
1.	Conductors	2Pair, Stranded annealed copper, Circular section, Type A as per IEC 61158-2. Temperature rating 90°C. Size: 1.5 mm² min for 4-wire serial communications.
	Identification	Pair1 - White/Blue stripe and Blue/White stripe Pair2 - White/Orange stripe and Orange/White stripe.
2.	Insulation	Flame retardant material as per data sheet.

CABLE:

		Cores are twisted together and covered with:
3.	Coll Foil	Overall foil shield with one tinned copper drain wire .
4.	Braid	Tinned copper braid in continuous contact with the tinned copper drain wire.
5.	Inner jacket	Flame retardant Low Smoke Zero Halogen Compound , LSZH. Colour: Black.
6.	Armour	Galvanized steel wire (see note).
7.	Outer jacket	Flame Retardant Low Smoke Zero Halogen Compound.

Entire cable assembly shall be Flame Retardant to IEC 60332. Pt.3. Cat`A'.

(F1) Communication, 2wire applications, Single-pair, foil shield and braid, unarmoured, fire resistant.
(XLPE/Coll Scr/LSHF)
Voltage Rating: 300/500V



CORE:

1.	Conductors	Stranded annealed copper. Circular section, Type A according to IEC 61158-2. Temperature rating 90°C Size 1.5 mm^2 min for `Foundation Fieldbus' and RS-485 signals.
	Identification	Orange (+) and Blue (-).
2.	Insulation linked	Mica impregnated glass tape beneath extruded layer of flame retardant cross Polyethylene (XLPE) or equivalent Ethylene Propylene Rubber (EPR) or equivalent Silicone Rubber (S95) or material as per data sheet.

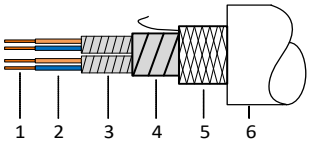
CABLE:

		Cores are twisted together and covered with:
3.	Coll Foil	Overall foil (aluminium tape plastic coated on one surface) shield with metal surface in contact with one tinned copper drain wire .
4.	Braid	Tinned copper wire braid in continuous contact with the tinned copper drain wire.
5.	Outer jacket	Flame retardant Low Smoke Zero Halogen Compound.

Entire cable assembly shall be Flame Retardant to IEC 60332. Pt.3. Cat`A' and Fire Resistant to IEC 60331.

Note: This cable type shall be only utilized for indoor application where the cable is installed and fully routed within the same building.

(F2) Communication, 2wire applications, Multi-pair, foil shield and braid, unarmoured, fire resistant. (XLPE/Ind & Coll Scr/LSHF)
Voltage Rating: 300/500V



CORE:

1.	Conductors	Stranded annealed copper. Circular section, Type A according to IEC 61158-2 and Foundation Fieldbus Cable Specification FF-844 H1. Temperature rating 90°C. Size: 1.0 mm² min for `Foundation Fieldbus' and RS-485 signals.
	Identification	Orange (+) and Blue (-). Each core printed with pair number throughout the cable at equal distances.
2.	Insulation	Mica impregnated glass tape beneath extruded layer of flame retardant cross linked Polyethylene (XLPE) or equivalent Ethylene Propylene Rubber (EPR) or equivalent Silicone Rubber (S95) or material as per data sheet.

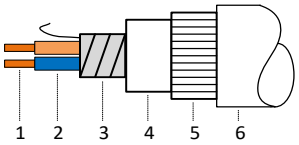
CABLE:

		Cores are twisted together and covered with:
3.	Ind Foil	Individual foil (aluminium foil, polyester tape coated on one surface) shield with metal surface in contact with one tinned copper drain wire . Together with Flame retardant moisture resistant material fillers.
4.	Coll Foil	Collective foil (aluminium foil, polyester tape coated on one surface) shield with metal surface in contact with one tinned copper drain wire .
5.	Braid	Tinned copper wire braid in continuous contact with the tinned copper drain wire.
6.	Outer jacket	Flame Retardant Low Smoke Zero Halogen Compound.

Entire cable assembly shall be Flame Retardant to IEC 60332. Pt.3. Cat`A' and Fire Resistant to IEC 60331.

Note: This cable type shall be only utilized for indoor application where the cable is installed and fully routed within the same building.

(F3) Communication, 2wire applications, Single-pair, foil shield, armoured, fire resistant.
(XLPE/Coll Scr/SWA/LSHF)
Voltage Rating: 300/500V



CORE:

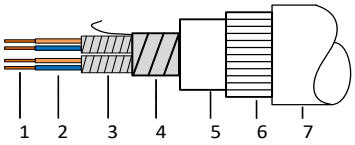
1.	Conductors	Stranded annealed copper. Circular section, Type A according to IEC 61158-2. Temperature rating 90°C Size 1.5 mm^2 min for `Foundation Fieldbus' and RS-485 signals.
	Identification	Orange (+) and Blue (-).
2.	Insulation linked	Mica impregnated glass tape beneath extruded layer of flame retardant cross Polyethylene (XLPE) or equivalent Ethylene Propylene Rubber (EPR) or equivalent Silicone Rubber (S95) or material as per data sheet.

CABLE:

		Cores are twisted together and covered with:
3.	Coll Foil	Overall foil (aluminium tape plastic coated on one surface) shield with metal surface in contact with one tinned copper drain wire .
4.	Inner jacket	Flame retardant Low Smoke Zero Halogen Compound , LSZH Colour: Black.
5. Armour		Galvanized steel wire.
6. Outer jacket		Flame Retardant Low Smoke Zero Halogen Compound.

Entire cable assembly shall be Flame Retardant to IEC 60332. Pt.3. Cat`A' and Fire Resistant to IEC 60331.

(F4) Communication, 2wire applications, Multi-pair, foil shield, armoured, fire resistant.
(XLPE/Ind & Coll Scr/SWA/LSHF)
Voltage Rating: 300/500V



CORE:

1.	Conductors	Stranded annealed copper. Circular section, Type A according to IEC 61158-2 and Foundation Fieldbus Cable Specification FF-844 H1. Temperature rating 90°C Size 1.0 mm^2 min for `Foundation Fieldbus' and RS-485 signals.
	Identification	Orange (+) and Blue (-).
2.	Insulation linked	Mica impregnated glass tape beneath extruded layer of flame retardant cross Polyethylene (XLPE) or equivalent Ethylene Propylene Rubber (EPR) or equivalent Silicone Rubber (S95) or material as per data sheet.

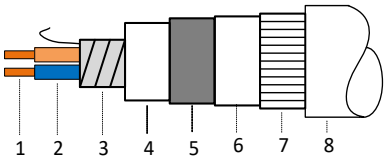
CABLE:

Cores are twisted together and covered with:

3.	Ind Foil	Individual foil (aluminium foil, polyester tape coated on one surface) shield with metal surface in contact with one tinned copper drain wire . Together with Flame retardant moisture resistant material fillers.
4.	Coll Foil	Collective foil (aluminium foil, polyester tape coated on one surface) shield with metal surface in contact with one tinned copper drain wire .
5.	Inner jacket	Flame retardant Low Smoke Zero Halogen Compound ,LSZH. Colour: Black.
6.	Armour	Galvanized steel wire.
7.	Outer jacket	Flame Retardant Low Smoke Zero Halogen Compound.

Entire cable assembly shall be Flame Retardant to IEC 60332. Pt.3. Cat`A' and Fire Resistant to IEC 60331.

(F5) Communication, 2wire applications, Single-pair, foil shield, armoured, external buried, fire resistant. (XLPE/Coll Scr/LS/SWA/LSHF)
Voltage Rating: 300/500V



CORE:

1.	Conductors	Stranded annealed copper. Circular section, Type A according to IEC 61158-2. Temperature rating 90°C Size 1.5 mm^2 min for `Foundation Fieldbus' and RS-485 signals.
	Identification	Orange (+) and Blue (-).
2.	Insulation linked	Mica impregnated glass tape beneath extruded layer of flame retardant cross Polyethylene (XLPE) or equivalent Ethylene Propylene Rubber (EPR) or equivalent Silicone Rubber (S95) or material as per data sheet.

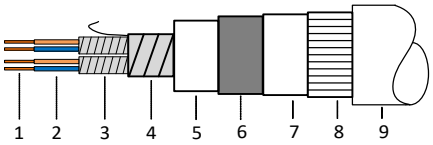
CABLE:

Cores are twisted together and covered with:

3.	Coll Foil	Collective foil (aluminium foil, polyester tape coated on one surface) shield with metal surface in contact with one tinned copper drain wire . Together with Flame retardant moisture resistant material fillers and PETP binder tape.
4.	Inner jacket	Flame retardant Low Smoke Zero Halogen Compound. Colour: Black.
5.	Inner Sheath	Lead Sheath (or Lead pipe). A multi-layered Inner Sheath (AL/HDPE/PA instead of lead sheath) will be considered if the multi-layer sheath provides the same protection as a lead sheath for hydrocarbons, chemical and solvents, saline water ingress and vermin protection, as per BS 50288-7 section 4.18.2.
6.	Bedding	Flame retardant Low Smoke Zero Halogen Compound ,LSZH. Colour: Black.
7.	Armour	Galvanized steel wire.
8.	Outer jacket	Flame Retardant Low Smoke Zero Halogen Compound.

Entire cable assembly shall be Flame Retardant to IEC 60332. Pt.3. Cat`A' and Fire Resistant to IEC 60331.

(F6) Communication, 2wire applications, Multi-pair, foil shield, armoured, external buried, fire resistant. (XLPE/Ind & Coll Scr/LS/SWA/LSHF)
Voltage Rating: 300/500V



CORE:

1.	Conductors	Stranded annealed copper. Circular section, Type A according to IEC 61158-2 and Foundation Fieldbus Cable Specification FF-844 H1. Temperature rating 90°C Size 1.0 mm^2 min for `Foundation Fieldbus' and RS-485 signals.
	Identification	Orange (+) and Blue (-).
2.	Insulation linked	Mica impregnated glass tape beneath extruded layer of flame retardant cross Polyethylene (XLPE) or equivalent Ethylene Propylene Rubber (EPR) or equivalent Silicone Rubber (S95) or material as per data sheet.

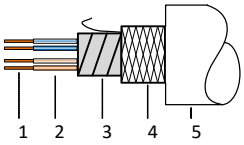
CABLE:

Cores are twisted together and covered with:

3.	Ind Foil	Individual foil (aluminium foil, polyester tape coated on one surface) shield with metal surface in contact with one tinned copper drain wire . Together with Flame retardant moisture resistant material fillers.
4.	Coll Foil	Collective foil (aluminium foil, polyester tape coated on one surface) shield with metal surface in contact with one tinned copper drain wire .
5.	Inner jacket	Flame retardant Low Smoke Zero Halogen Compound ,LSZH. Colour: Black.
6.	Inner Sheath	Lead Sheath (or Lead pipe). A multi-layered Inner Sheath (AL/HDPE/PA instead of lead sheath) will be considered if the multi-layer sheath provides the same protection as a lead sheath for hydrocarbons, chemical and solvents, saline water ingress and vermin protection, as per BS 50288-7 section 4.18.2.
7.	Bedding	Flame retardant Low Smoke Zero Halogen Compound ,LSZH. Colour: Black.
8.	Armour	Galvanized steel wire.
9.	Outer jacket	Flame Retardant Low Smoke Zero Halogen Compound.

Entire cable assembly shall be Flame Retardant to IEC 60332. Pt.3. Cat`A' and Fire Resistant to IEC 60331.

(F7) RS232/422/485 Communication, 4wire applications, overall screen, unarmoured, fire resistant. (XLPE/OS/LSHF)
Voltage Rating: 300/500V



CORE:

1.	Conductors 2.	2Pair, Stranded annealed copper. Circular section, TypeA according to IEC 61158-2. Temperature rating 90°C. Size: 1.5 mm² min for 4-wire serial communications.
	Identification	Pair1 - White/Blue stripe and Blue/White stripe Pair2 - White/Orange stripe and Orange/White stripe.
2.	Insulation linked	Mica impregnated glass tape beneath extruded layer of flame retardant cross Polyethylene (XLPE) or equivalent Ethylene Propylene Rubber (EPR) or equivalent Silicone Rubber (S95) or material as per data sheet.

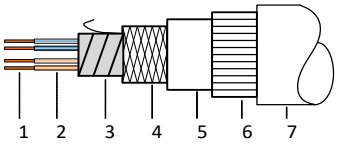
CABLE:

		Cores are twisted together and covered with:
3.	Coll Foil	Overall foil shield with one tinned copper drain wire.
4.	Braid	Tinned copper braid in continuous contact with the tinned copper drain wire.
5.	Outer jacket	Flame Retardant Low Smoke Zero Halogen Compound.

Entire cable assembly shall be Flame Retardant to IEC 60332. Pt.3. Cat`A' and Fire Resistant to IEC 60331.

Note: This cable type shall be only utilized for indoor application where the cable is installed and fully routed within the same building.

(F8) RS232/422/485 Communication, 4wire applications, overall screen, armoured, fire resistant. (XLPE/OS/SWA/LSHF)
Voltage Rating: 300/500V



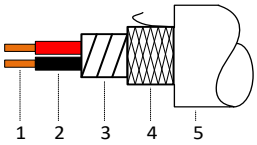
CORE:

1.	Conductors 2.	2Pair, Stranded annealed copper. Circular section, TypeA according to IEC 61158-2. Temperature rating 90°C. Size: 1.5 mm² min for 4-wire serial communications.
	Identification	Pair1 - White/Blue stripe and Blue/White stripe Pair2 - White/Orange stripe and Orange/White stripe.
2.	Insulation linked	Mica impregnated glass tape beneath extruded layer of flame retardant cross Polyethylene (XLPE) or equivalent Ethylene Propylene Rubber (EPR) or equivalent Silicone Rubber (S95) or material as per data sheet.

CABLE:

		Cores are twisted together and covered with:
3.	Coll Foil	Overall foil shield with one tinned copper drain wire.
4.	Braid	Tinned copper braid in continuous contact with the tinned copper drain wire.
5.	Inner jacket	Flame retardant Low Smoke Zero Halogen Compound. Colour: Black.
6.	Armour	Galvanized steel wire (see note).
7.	Outer jacket	Flame Retardant Low Smoke Zero Halogen Compound. Entire cable assembly shall be Flame Retardant to IEC 60332. Pt.3. Cat`A' and Fire Resistant to IEC 60331.

(G1) Two core, Collective Screen, unarmoured, flame retardant (Control Cable).
(XLPE/Coll Scr/LSHF)
Voltage Rating: 300/500V



CORE:

1. Conductors	Standed annealed copper. Circular section, Class 2 according to IEC 60228. Temperature rating 90°C. Size: 2.5 mm^2 min for control signals, Digital Output & Solenoid signals.
Identification	Red and Black.
2. Insulation	Flame retardant material as per data sheet.

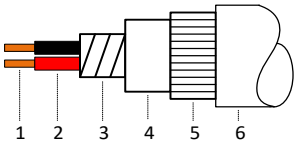
CABLE:

	Cores are covered with:
3. Fillers	Flame retardant moisture resistant material , LSZH.
4. Cable screen	One tinned copper 0.50 mm^2 min solid drain wire and aluminium backed Mylar tape. Tape shall be helically wrapped with 25% overlap. Aluminium tape shall be in continuous contact with the drain wire.
5. Outer jacket	Flame retardant Low Smoke Zero Halogen compound.

Entire cable assembly shall be Flame retardant to IEC 60332.Pt.3.Cat`A'.

Note: This cable type shall be only utilized for indoor application where the cable is installed and fully routed within the same building.

(G2) Two core, armoured, flame retardant (Control Cable).
(XLPE/SWA/ LSHF)
Voltage Rating: 300/500V



CORE:

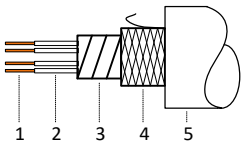
1. Conductors	Standed annealed copper. Circular section, Class 2 according to IEC 60228. Temperature rating 90°C. Size: 2.5 mm^2 min for control signals, Digital Output & Solenoid signals.
Identification	Red and Black.
2. Insulation	Flame retardant material as per data sheet.

CABLE:

	Cores are covered with:
3. Fillers	Flame retardant Low Smoke Zero Halogen Compound.
4. Inner jacket	Flame retardant Low Smoke Zero Halogen Compound. Colour: Black.
5. Armour	Galvanized steel wire.
6. Outer jacket	Flame retardant Low Smoke Zero Halogen compound.

Entire cable assembly shall be Flame retardant to IEC 60332.Pt.3.Cat`A'.

(G3) Multi-core, Collective Screen, unarmoured, flame retardant (Control Cable).
(XLPE/Coll Scr/LSHF)
Voltage Rating: 300/500V



CORE:

1. Conductors	Standed annealed copper. Circular section, Class 2 according to IEC 60228. Temperature rating 90°C. Size: 2.5 mm^2 min for control signals, Digital Output & Solenoid signals.
Identification	Red, Black, Brown, Blue for 4 cores. White with Black core numbers for 7, 12, 19, 25 and 37 cores. Each core printed with a number throughout the cable at equal (150mm) distances.
2. Insulation	Flame retardant material as per data sheet.

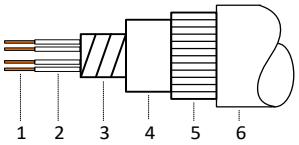
CABLE:

	Cores are twisted together and covered with:
3. Fillers	Flame retardant moisture resistant material , LSZH.
4. Cable screen	One tinned copper 0.50 mm^2 min solid drain wire and aluminium backed Mylar tape. Tape shall be helically wrapped with 25% overlap. Aluminium tape shall be in continuous contact with the drain wire.
5. Outer jacket	Flame retardant Low Smoke Zero Halogen compound.

Entire cable assembly shall be Flame retardant to IEC 60332.Pt.3.Cat`A'.

Note: This cable type shall be only utilized for indoor application where the cable is installed and fully routed within the same building.

(G4) Multi - core, armoured, flame retardant (Control Cable).
(XLPE/SWA/ LSHF)
Voltage Rating: 300/500V



CORE:

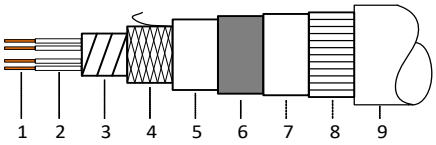
1. Conductors	Standed annealed copper. Circular section, Class 2 according to IEC 60228. Temperature rating 90°C. Size: 2.5 mm^2 min for control signals, Digital Output & Solenoid signals.
Identification	Red, Black, Brown, Blue for 4 cores. White with Black core numbers for 7, 12, 19, 25 and 37 cores. Each core printed with a number throughout the cable at equal (150mm) distances.
2. Insulation	Flame retardant material as per data sheet.

CABLE:

	Cores are covered with:
3. Fillers	Cores laid up with extruded PVC filler for 5 cores. For 6 cores or more wrapping of polyester tape.
4. Inner jacket	Flame retardant Low Smoke Zero Halogen Compound. Colour: Black.
5. Armour	Galvanized steel wire.
6. Outer jacket	Flame retardant Low Smoke Zero Halogen compound.

Entire cable assembly shall be Flame retardant to IEC 60332.Pt.3.Cat`A'.

(G5) Multi-core, collective screen, armoured, external buried, flame retardant (Control Cable).
(XLPE/Coll Scr/LS/SWA/LSHF)
Voltage Rating: 300/500V



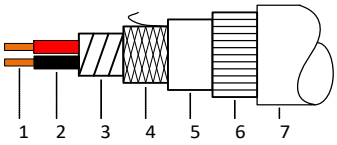
CORE:

1.	Conductors	Stranded annealed copper. Circular section, Class 2 according to IEC 60228. Temperature rating 90°C. Size: 2.5 mm^2 min for control signals, Digital Output & Solenoid signals.
	Identification	Red, Black, Brown, Blue for 4 cores. White with Black core numbers for 7, 12, 19, 25 and 37 cores. Each core printed with a number throughout the cable at equal (150mm) distances.
2.	Insulation	Flame retardant material as per data sheet.

CABLE:

		Cores are twisted together and covered with:
3.	Fillers	Flame retardant moisture resistant material , LSZH.
4.	Cable screen	One tinned copper 0.50 mm^2 min solid drain wire and aluminium backed Mylar tape. Tape shall be helically wrapped with 25% overlap. Aluminium tape shall be in continuous contact with the drain wire.
5.	Inner jacket	Flame retardant Low Smoke Zero Halogen Compound ,LSZH. Colour: Black.
6.	Inner Sheath	Lead Sheath (or Lead pipe). A multi-layered Inner Sheath (AL/HDPE/PA instead of lead sheath) will be considered if the multi-layer sheath provides the same protection as a lead sheath for hydrocarbons, chemical and solvents, saline water ingress and vermin protection, as per BS 50288-7 section 4.18.2.
7.	Bedding	Flame retardant Low Smoke Zero Halogen Compound ,LSZH. Colour: Black.
8.	Armour	Galvanized steel wire.
9.	Outer jacket	Flame retardant Low Smoke Zero Halogen Compound.
		Entire cable assembly shall be Flame retardant to IEC 60332.Pt.3.Cat`A'

(G6) Two core, Collective Screen, armoured, flame retardant (Control Cable).
(XLPE/Coll Scr/SWA/ LSHF)
Voltage Rating: 300/500V



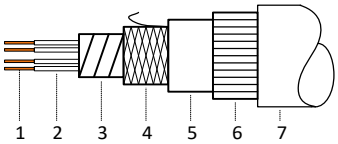
CORE:

1. Conductors	Standed annealed copper. Circular section, Class 2 according to IEC 60228. Temperature rating 90°C. Size: 2.5 mm^2 min for control signals, Digital Output & Solenoid signals.
Identification	Red and Black.
2. Insulation	Flame retardant material as per data sheet.

CABLE:

	Cores are covered with:
3. Fillers	Cores laid up with extruded PVC filler or Flame retardant Low Smoke Zero Halogen Compound ,LSZH.
4. Cable Screen	One tinned copper 0.50 mm^2 min solid drain wire and aluminium backed Mylar tape. Tape shall be helically wrapped with 25% overlap. Aluminium tape shall be in continuous contact with the drain wire.
5. Inner jacket	Flame retardant Low Smoke Zero Halogen Compound. Colour: Black.
6. Armour	Galvanized steel wire.
7. Outer jacket	Flame retardant Low Smoke Zero Halogen compound.
	Entire cable assembly shall be Flame retardant to IEC 60332.Pt.3.Cat`A'.

(G7) Multi-core, Collective Screen, armoured, flame retardant (Control Cable).
(XLPE/Coll Scr/SWA/ LSHF)
Voltage Rating: 300/500V



CORE:

1. Conductors	Standed annealed copper. Circular section, Class 2 according to IEC 60228. Temperature rating 90°C. Size: 2.5 mm^2 min for control signals, Digital Output & Solenoid signals.
Identification	Red, Black, Brown, Blue for 4 cores. White with Black core numbers for 7, 12, 19, 25 and 37 cores. Each core printed with a number throughout the cable at equal (150mm) distances.
2. Insulation	Flame retardant material as per data sheet.

CABLE:

	Cores are twisted together and covered with:
3. Fillers	Cores laid up with extruded PVC filler or Flame retardant Low Smoke Zero Halogen Compound ,LSZH.
4. Cable Screen	One tinned copper 0.50 mm^2 min solid drain wire and aluminium backed Mylar tape. Tape shall be helically wrapped with 25% overlap. Aluminium tape shall be in continuous contact with the drain wire.
5. Inner jacket	Flame retardant Low Smoke Zero Halogen Compound. Colour: Black.
6. Armour	Galvanized steel wire.
7. Outer jacket	Flame retardant Low Smoke Zero Halogen compound.
	Entire cable assembly shall be Flame retardant to IEC 60332.Pt.3.Cat`A'.

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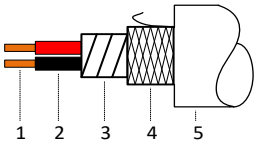
(H1) Two core, Collective Screen, unarmoured, fire resistant (Control Cable).
(XLPE/Coll Scr/LSHF)
Voltage Rating: 300/500V



CORE:

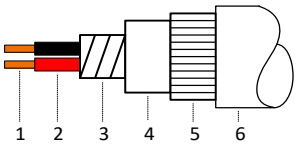
1. Conductors	Standed annealed copper. Circular section, Class 2 according to IEC 60228. Temperature rating 90°C. Size: 2.5 mm^2 min for control signals, Digital Output & Solenoid signals.
Identification	Red and Black.
2. Insulation linked	Mica impregnated glass tape beneath extruded layer of flame retardant cross Polyethylene (XLPE) or equivalent Ethylene Propylene Rubber (EPR) or equivalent Silicone Rubber (S95) or material as per data sheet.

CABLE:

	Cores are covered with:
3. Fillers	Flame retardant moisture resistant material , LSZH.
4. Cable screen	One tinned copper 0.50 mm^2 min solid drain wire and aluminium backed Mylar tape. Tape shall be helically wrapped with 25% overlap. Aluminium tape shall be in continuous contact with the drain wire.
5. Outer jacket	Flame Retardant Low Smoke Zero Halogen Compound.
	Entire cable assembly shall be Flame Retardant to IEC 60332. Pt.3. Cat`A' and Fire Resistant to IEC 60331.

Note: This cable type shall be only utilized for indoor application where the cable is installed and fully routed within the same building.

(H2) Two core, armoured, fire resistant (Control Cable).
(Mica/XLPE/SWA/ LSHF)
Voltage Rating: 300/500V



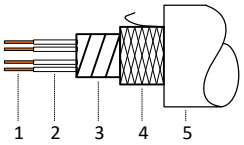
CORE:

1. Conductors	Standed annealed copper. Circular section, Class 2 according to IEC 60228. Temperature rating 90°C. Size: 2.5 mm^2 min for Fire and Gas (Sounder/Beacon), Digital Output & Solenoid signals and ESD, F&G and PA applications.
Identification	Red and Black.
2. Insulation linked	Mica impregnated glass tape beneath extruded layer of flame retardant cross Polyethylene (XLPE) or equivalent Ethylene Propylene Rubber (EPR) or equivalent Silicone Rubber (S95) or material as per data sheet.

CABLE:

	Cores are covered with:
3. Fillers	Flame retardant moisture resistant material , LSZH.
4. Inner jacket	Flame retardant Low Smoke Zero Halogen Compound or equivalent EPR or equivalent S95 Rubber, LSZH. Colour: Black.
5. Armour	Galvanized steel wire.
6. Outer jacket	Flame retardant Low Smoke Zero Halogen Compound.
	Entire cable assembly shall be Flame Retardant to IEC 60332. Pt.3. Cat`A' and Fire Resistant to IEC 60331.

(H3) Multi-core, Collective Screen, unarmoured, fire resistant (Control Cable).
(XLPE/Coll Scr/LSHF)
Voltage Rating: 300/500V



CORE:

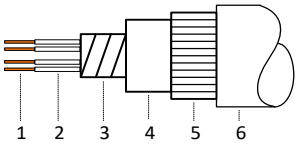
1. Conductors	Standed annealed copper. Circular section, Class 2 according to IEC 60228. Temperature rating 90°C. Size: 2.5 mm^2 min for control signals, Digital Output & Solenoid signals.
Identification	Red, Black, Brown, Blue for 4 cores. White with Black core numbers for 7, 12, 19, 25 and 37 cores. Each core printed with a number throughout the cable at equal (150mm) distances.
2. Insulation linked	Mica impregnated glass tape beneath extruded layer of flame retardant cross Polyethylene (XLPE) or equivalent Ethylene Propylene Rubber (EPR) or equivalent Silicone Rubber (S95) or material as per data sheet.

CABLE:

	Cores are twisted together and covered with:
3. Fillers	Flame retardant moisture resistant material , LSZH.
4. Cable screen	One tinned copper 0.50 mm^2 min solid drain wire and aluminium backed Mylar tape. Tape shall be helically wrapped with 25% overlap. Aluminium tape shall be in continuous contact with the drain wire.
5. Outer jacket	Flame retardant Low Smoke Zero Halogen Compound.
	Entire cable assembly shall be Flame Retardant to IEC 60332. Pt.3. Cat`A' and Fire Resistant to IEC 60331.

Note: This cable type shall be only utilized for indoor application where the cable is installed and fully routed within the same building.

(H4) Multi-core, armoured, fire resistant (Control Cable).
(Mica/XLPE/SWA/ LSHF)
Voltage Rating: 300/500V



CORE:

1. Conductors	Standed annealed copper. Circular section, Class 2 according to IEC 60228. Temperature rating 90°C. Size: 2.5 mm^2 min for Fire and Gas (Sounder/Beacon), Digital Output & Solenoid signals and ESD, F&G and PA applications.
Identification	Red, Black, Brown, Blue for 4 cores. White with Black core numbers for 7, 12, 19, 25 and 37 cores. Each core printed with a number throughout the cable at equal (150mm) distances.
2. Insulation linked	Mica impregnated glass tape beneath extruded layer of flame retardant cross Polyethylene (XLPE) or equivalent Ethylene Propylene Rubber (EPR) or equivalent Silicone Rubber (S95) or material as per data sheet.

CABLE:

	Cores are twisted together and covered with:
3. Fillers	Flame retardant moisture resistant material , LSZH.
4. Inner jacket	Flame retardant Low Smoke Zero Halogen Compound or equivalent EPR or equivalent S95 Rubber, LSZH. Colour: Black.
5. Armour	Galvanized steel wire.
6. Outer jacket	Flame retardant Low Smoke Zero Halogen Compound.
	Entire cable assembly shall be Flame Retardant to IEC 60332. Pt.3. Cat`A' and Fire Resistant to IEC 60331.

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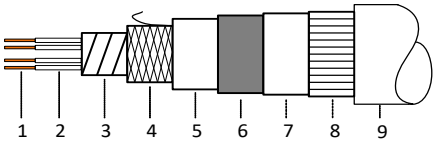
(H5) Multi-core, collective screen, armoured, external buried, fire resistant (Control Cable).

(XLPE/Coll Scr/LS/SWA/LSHF)
Voltage Rating: 300/500V



CORE:

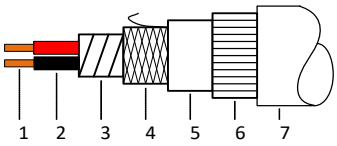
1.	Conductors	Stranded annealed copper. Circular section, Class 2 according to IEC 60228. Temperature rating 90°C. Size: 2.5 mm² min for control signals, Fire and Gas (Sounder/Beacon), Digital Output & Solenoid signals and ESD, F&G and PA applications.
	Identification	Red, Black, Brown, Blue for 4 cores. White with Black core numbers for 7, 12, 19, 25 and 37 cores. Each core printed with a number throughout the cable at equal (150mm) distances.
2.	Insulation linked	Mica impregnated glass tape beneath extruded layer of flame retardant cross Polyethylene (XLPE) or equivalent Ethylene Propylene Rubber (EPR) or equivalent Silicone Rubber (S95) or material as per data sheet.

CABLE:

		Cores are twisted together and covered with:
3.	Fillers	Flame retardant moisture resistant material , LSZH.
4.	Cable screen	One tinned copper 0.50 mm² min solid drain wire and aluminium backed Mylar tape. Tape shall be helically wrapped with 25% overlap. Aluminium tape shall be in continuous contact with the drain wire.
5.	Inner jacket	Flame retardant Low Smoke Zero Halogen Compound or equivalent EPR or equivalent S95 Rubber, LSZH. Colour: Black.
6.	Inner Sheath	Lead Sheath (or Lead pipe). A multi-layered Inner Sheath (AL/HDPE/PA instead of lead sheath) will be considered if the multi-layer sheath provides the same protection as a lead sheath for hydrocarbons, chemical and solvents, saline water ingress and vermin protection, as per BS 50288-7 section 4.18.2.
7.	Bedding	Flame retardant Low Smoke Zero Halogen Compound ,LSZH. Colour: Black.
8.	Armour	Galvanized steel wire.
9.	Outer jacket	Flame retardant Low Smoke Zero Halogen Compound

Entire cable assembly shall be Flame Retardant to IEC 60332. Pt.3. Cat`A' and Fire Resistant to IEC 60331.

(H6) Two core, Collective Screen, armoured, fire resistant (Control Cable).
(Mica/XLPE/Coll Scr/SWA/ LSHF)
Voltage Rating: 300/500V



CORE:

1. Conductors	Standed annealed copper. Circular section, Class 2 according to IEC 60228. Temperature rating 90°C. Size: 2.5 mm^2 min for Fire and Gas (Sounder/Beacon), Digital Output & Solenoid signals and ESD, F&G and PA applications.
Identification	Red and Black.
2. Insulation linked	Mica impregnated glass tape beneath extruded layer of flame retardant cross Polyethylene (XLPE) or equivalent Ethylene Propylene Rubber (EPR) or equivalent Silicone Rubber (S95) or material as per data sheet.

CABLE:

Cores are covered with:

3. Fillers	Flame retardant moisture resistant material , LSZH.
4. Cable shield	One tinned copper 0.50 mm^2 min solid drain wire and aluminium backed Mylar tape. Tape shall be helically wrapped with 25% overlap. Aluminium tape shall be in continuous contact with the drain wire
5. Inner jacket	Flame retardant Low Smoke Zero Halogen Compound or equivalent EPR or equivalent S95 Rubber, LSZH. Colour: Black.
6. Armour	Galvanized steel wire.
7. Outer jacket	Flame retardant Low Smoke Zero Halogen Compound.

Entire cable assembly shall be Flame Retardant to IEC 60332. Pt.3. Cat`A' and Fire Resistant to IEC 60331.

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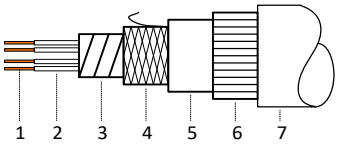
(H7) Multi-core, Collective Screen, armoured, fire resistant (Control Cable).
(XLPE/Coll Scr/SWA/ LSHF)
Voltage Rating: 300/500V



CORE:

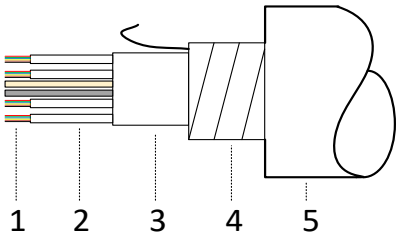
1. Conductors	Standed annealed copper. Circular section, Class 2 according to IEC 60228. Temperature rating 90°C. Size: 2.5 mm^2 min for control signals, Digital Output & Solenoid signals and ESD, F&G and PA applications.
Identification	Red, Black, Brown, Blue for 4 cores. White with Black core numbers for 7, 12, 19, 25 and 37 cores. Each core printed with a number throughout the cable at equal (150mm) distances.
2. Insulation linked	Mica impregnated glass tape beneath extruded layer of flame retardant cross Polyethylene (XLPE) or equivalent Ethylene Propylene Rubber (EPR) or equivalent Silicone Rubber (S95) or material as per data sheet.

CABLE:

Cores are twisted together and covered with:

3. Fillers	Flame retardant Low Smoke Zero Halogen Compound ,LSZH.
4. Cable Screen	One tinned copper 0.50 mm^2 min solid drain wire and aluminium backed Mylar tape. Tape shall be helically wrapped with 25% overlap. Aluminium tape shall be in continuous contact with the drain wire.
5. Inner jacket	Flame retardant Low Smoke Zero Halogen Compound ,LSZH. Colour: Black.
6. Armour	Galvanized steel wire.
7. Outer jacket	Flame retardant Low Smoke Zero Halogen compound. Entire cable assembly shall be Flame retardant to IEC 60332.Pt.3.Cat`A'.

(I1) Fibre Optic cable (24Fibres), flame retardant, indoor.



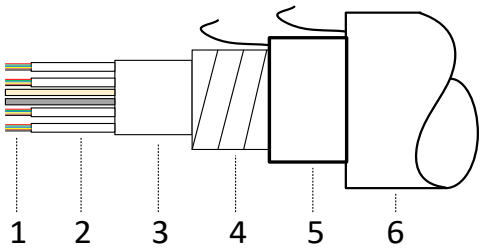
CORE:

1. Fibres	Single mode fibre or Multimode fibres, to suit the glass type needed for the application. Minimum 6 fibres per buffer tube.
Fibre Identification	Colour Coded in accordance with EIA/TIA-598. Fibre colours shall not be repeated. 1st group of 12 fibres are solid colours. 2nd group of 12 fibres are solid colours with a stripe.
2. Buffer tubes	Flame retardant PolyButylene Terephthalate (PBT) or Halar Fluoroplastic or equivalent extruded tube with a moisture resistant gel filling compound. Multiple buffer tubes are twisted around a GRP (or equivalent dielectric material) rod provided for central strength and a filler core, flame retardant LSZH.
Tube Identification	Colour Coded in accordance with EIA/TIA-598. Tube colours shall not be repeated. Each tube shall be a solid colour and be marked with a number.

CABLE:

3. Separator	Water blocking E-glass yarn and polyester tape, together with Aramid strength members and a Rip cord.
4. Armour Tape	Aluminium or Polyester or Corrugated steel tape armour and a Rip cord.
5. Outer jacket	Flame retardant Low Smoke Zero Halogen compound
	Entire cable assembly shall be Flame Retardant to IEC 60332. Pt.3. Cat`A'.
	Colour Coded in accordance with EIA/TIA-598 with a printed legend on the outer jacket of the cable at equal distances to identify the quantity and types of glass fibres within the cable.

(I2) Fibre Optic cable (24Fibres), flame retardant, outdoor.



CORE:

1. Fibres	Single mode fibre or Multimode fibres, to suit the glass type needed for the application. Minimum 6 fibres per buffer tube.
Fibre Identification	Colour Coded in accordance with EIA/TIA-598. Fibre colours shall not be repeated. 1st group of 12 fibres are solid colours. 2nd group of 12 fibres are solid colours with a stripe.
2. Buffer tubes	Flame retardant PolyButylene Terephthalate (PBT) or Halar Fluoroplastic or equivalent extruded tube with a moisture resistant gel filling compound. Multiple buffer tubes are twisted around a GRP (or equivalent dielectric material) rod provided for central strength and a filler core, flame retardant LSZH.
Tube Identification	Colour Coded in accordance with EIA/TIA-598. Tube colours shall not be repeated. Each tube shall be a solid colour and be marked with a number.

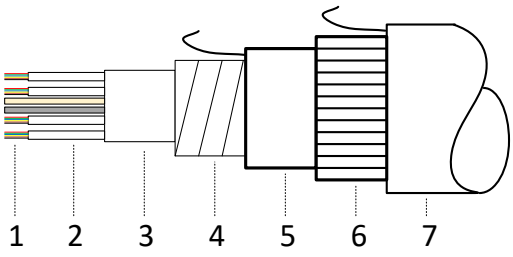
CABLE:

3. Separator	Water blocking E-glass yarn or Aramid yarn and polyester tape.
4. Armour Tape	Aluminium or Polyester or Corrugated steel tape armour and a Rip cord.
5. Inner jacket	Flame retardant Low Smoke Zero Halogen Compound) Together with Aramid strength members and a Rip cord. Colour: Black.
6. Outer jacket	Flame retardant Low Smoke Zero Halogen compound.

Entire cable assembly shall be Flame Retardant to IEC 60332. Pt.3. Cat`A'.

Colour Coded in accordance with EIA/TIA-598 with a printed legend on the outer jacket of the cable at equal distances to identify the quantity and types of glass fibres within the cable.

(I3) Fibre Optic cable (24Fibres), flame retardant, outdoor, armoured.



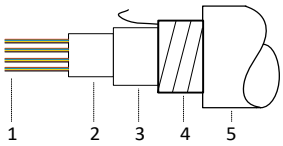
CORE:

1. Fibres	Single mode fibre or Multimode fibres, to suit the glass type needed for the application. Minimum 6 fibres per buffer tube.
Fibre Identification	Colour Coded in accordance with EIA/TIA-598. Fibre colours shall not be repeated. 1st group of 12 fibres are solid colours. 2nd group of 12 fibres are solid colours with a stripe.
2. Buffer tubes	Flame retardant PolyButylene Terephthalate (PBT) or Halar Fluoroplastic or equivalent extruded tube with a moisture resistant gel filling compound. Multiple buffer tubes are twisted around a GRP (or equivalent dielectric material) rod provided for central strength and a filler core, flame retardant LSZH.
Tube Identification	Colour Coded in accordance with EIA/TIA-598. Tube colours shall not be repeated. Each tube shall be a solid colour and be marked with a number.

CABLE:

3. Separator	Water blocking E-glass yarn or Aramid yarn and polyester tape.
4. Armour Tape	Aluminium or Polyester or Corrugated steel tape armour and a Rip cord.
5. Inner jacket	Flame retardant Low Smoke Zero Halogen Compound , LSZH Colour: Black.
6. Armour	Galvanised Steel Wire Armour or equivalent steel tape armour and a Rip cord.
7. Outer jacket	Flame retardant Low Smoke Zero Halogen compound
	Entire cable assembly shall be Flame Retardant to IEC 60332. Pt.3. Cat`A'.
	Colour Coded in accordance with EIA/TIA-598 with a printed legend on the outer jacket of the cable at equal distances to identify the quantity and types of glass fibres within the cable.

(I4) Fibre Optic cable (2 up to 24Fibres), flame retardant, indoor or outdoor, armoured.



CORE:

1. Fibres	Single mode fibre or Multimode fibres, to suit the glass type needed for the application. Maximum of 24 individual fibres. Temperature rating 70°C.
Fibre Identification	Colour Coded in accordance with EIA/TIA-598. Fibre colours shall not be repeated. 1st group of 12 fibres are solid colours. 2nd group of 12 fibres are solid colours with a stripe.
2. Uni-Tube	Flame retardant PolyButylene Terephthalate (PBT) or Halar Fluoroplastic or equivalent extruded loose tube with a moisture resistant gel filling compound. Flame retardant LSZH.

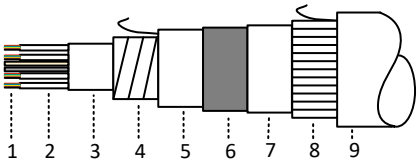
CABLE:

3. Separator	Water blocking E-glass yarn or Aramid yarn and polyester tape.
4. Armour Tape	Aluminium or Corrugated steel tape armour and a Rip cord.
5. Outer jacket	Flame retardant Low Smoke Zero Halogen compound

Entire cable assembly shall be Flame Retardant to IEC 60332. Pt.3. Cat`A'.

Colour Coded in accordance with EIA/TIA-598 with a printed legend on the outer jacket of the cable at equal distances to identify the quantity and types of glass fibres within the cable.

(I5) Fibre Optic cable (2 up to 24Fibres), armoured, external buried, flame retardant.



CORE:

1. Fibres	Single mode fibre or Multimode fibres, to suit the glass type needed for the application. Minimum 6 fibres per buffer tube.
Fibre Identification	Colour Coded in accordance with EIA/TIA-598. Fibre colours shall not be repeated. 1st group of 12 fibres are solid colours. 2nd group of 12 fibres are solid colours with a stripe.
2. Buffer tubes	Flame retardant PolyButylene Terephthalate (PBT) or Halar Fluoroplastic or equivalent extruded tube with a moisture resistant gel filling compound. Multiple buffer tubes are twisted around a GRP (or equivalent dielectric material) rod provided for central strength and a filler core, flame retardant LSZH.
Tube Identification	Colour Coded in accordance with EIA/TIA-598. Tube colours shall not be repeated. Each tube shall be a solid colour and be marked with a number.

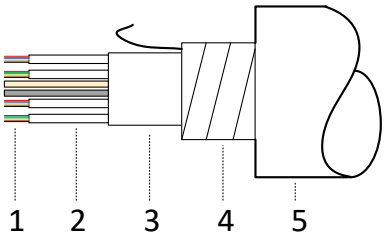
CABLE:

3. Separator	Water blocking E-glass yarn or Aramid yarn and polyester tape.
4. Armour Tape	Aluminium or Polyester or Corrugated steel tape armour and a Rip cord.
5. Inner jacket	Flame retardant Low Smoke Zero Halogen Compound , LSZH Colour: Black.
6. Inner Sheath	Lead Sheath (or Lead pipe). A multi-layered Inner Sheath (AL/HDPE/PA instead of lead sheath) will be considered if the multi-layer sheath provides the same protection as a lead sheath for hydrocarbons, chemical and solvents, saline water ingress and vermin protection, as per BS 50288-7 section 4.18.2.
7. Bedding	Flame retardant Low Smoke Zero Halogen Compound. Colour: Black
8. Armour	Galvanised Steel Wire Armour or equivalent steel tape armour and a Rip cord.
9. Outer jacket	Flame retardant Low Smoke Zero Halogen compound

Entire cable assembly shall be Flame Retardant to IEC 60332. Pt.3. Cat`A'.

Colour Coded in accordance with EIA/TIA-598 with a printed legend on the outer jacket of the cable at equal distances to identify the quantity and types of glass fibres within the cable.

(J1) Fibre Optic cable (24Fibres), fire resistant, indoor.



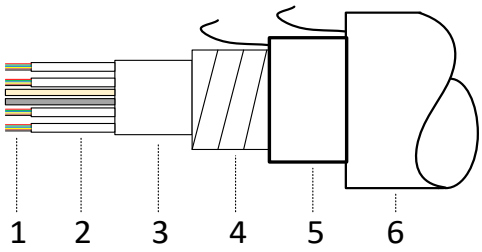
CORE:

1. Fibres	Single mode fibre or Multimode fibres, to suit the glass type needed for the application. Minimum 6 fibres per buffer tube.
Fibre Identification	Colour Coded in accordance with EIA/TIA-598. Fibre colours shall not be repeated. 1st group of 12 fibres are solid colours. 2nd group of 12 fibres are solid colours with a stripe.
2. Buffer tubes	Flame retardant PolyButylene Terephthalate (PBT) or Halar Fluoroplastic or equivalent extruded tube with a moisture resistant gel filling compound. Multiple buffer tubes are twisted around a GRP (or equivalent dielectric material) rod provided for central strength and a filler core, flame retardant LSZH.
Tube Identification	Colour Coded in accordance with EIA/TIA-598. Tube colours shall not be repeated. Each tube shall be a solid colour and be marked with a number.

CABLE:

3. Separator	Water blocking E-glass yarn and polyester tape, together with Aramid strength members and a Rip cord.
4. Armour Tape	Aluminium or Polyester or Corrugated steel tape armour and a Rip cord.
5. Outer jacket	Flame retardant Low Smoke Zero Halogen Compound.
	Entire cable assembly shall be Flame Retardant to IEC 60332. Pt.3. Cat`A'.
	Colour Coded in accordance with EIA/TIA-598 with a printed legend on the outer jacket of the cable at equal distances to identify the quantity and types of glass fibres within the cable.

(J2) Fibre Optic cable (24Fibres), fire resistant, outdoor.



CORE:

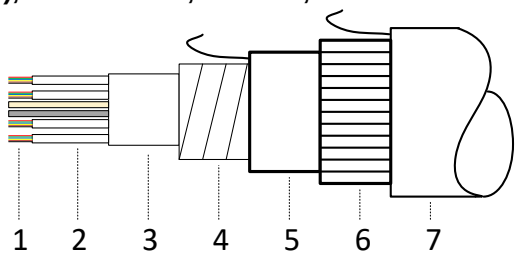
1. Fibres	Single mode fibre or Multimode fibres, to suit the glass type needed for the application. Minimum 6 fibres per buffer tube.
Fibre Identification	Colour Coded in accordance with EIA/TIA-598. Fibre colours shall not be repeated. 1st group of 12 fibres are solid colours. 2nd group of 12 fibres are solid colours with a stripe.
2. Buffer tubes	Flame retardant PolyButylene Terephthalate (PBT) or Halar Fluoroplastic or equivalent extruded tube with a moisture resistant gel filling compound. Multiple buffer tubes are twisted around a GRP (or equivalent dielectric material) rod provided for central strength and a filler core, flame retardant LSZH.
Tube Identification	Colour Coded in accordance with EIA/TIA-598. Tube colours shall not be repeated. Each tube shall be a solid colour and be marked with a number.

CABLE:

3. Separator	Water blocking E-glass yarn or Aramid yarn and polyester tape.
4. Armour Tape	Aluminium or Polyester or Corrugated steel tape armour and a Rip cord.
5. Inner jacket	Flame retardant Low Smoke Zero Halogen Compound) Together with Aramid strength members and a Rip cord. Colour: Black.
6. Outer jacket	Flame retardant Low Smoke Zero Halogen Compound.

Entire cable assembly shall be Flame Retardant to IEC 60332. Pt.3. Cat`A' and Fire resistant to IEC 60331 .
Colour Coded in accordance with EIA/TIA-598 with a printed legend on the outer jacket of the cable at equal distances to identify the quantity and types of glass fibres within the cable.

(J3) Fibre Optic cable (24Fibres), fire resistant, outdoor, armoured.



CORE:

1. Fibres	Single mode fibre or Multimode fibres, to suit the glass type needed for the application. Minimum 6 fibres per buffer tube.
Fibre Identification	Colour Coded in accordance with EIA/TIA-598. Fibre colours shall not be repeated. 1st group of 12 fibres are solid colours. 2nd group of 12 fibres are solid colours with a stripe.
2. Buffer tubes	Flame retardant PolyButylene Terephthalate (PBT) or Halar Fluoroplastic or equivalent extruded tube with a moisture resistant gel filling compound. Multiple buffer tubes are twisted around a GRP (or equivalent dielectric material) rod provided for central strength and a filler core, flame retardant LSZH.
Tube Identification	Colour Coded in accordance with EIA/TIA-598. Tube colours shall not be repeated. Each tube shall be a solid colour and be marked with a number.

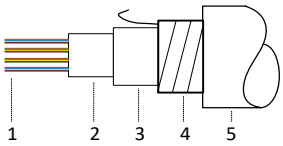
CABLE:

3. Separator	Water blocking E-glass yarn or Aramid yarn and polyester tape.
4. Armour Tape	Aluminium or Polyester or Corrugated steel tape armour and a Rip cord.
5. Inner jacket	Flame retardant Low Smoke Zero Halogen Compound or equivalent EPR or equivalent S95 Rubber, LSZH to IEC 60332. Pt.3. Cat`A'. Fire resistant to IEC 60331. Together with Aramid strength members and a Rip cord. Colour: Black.
6. Armour	Galvanised Steel Wire Armour or equivalent steel tape armour and a Rip cord.
7. Outer jacket	Flame retardant Low Smoke Zero Halogen Compound.

Entire cable assembly shall be Flame Retardant to IEC 60332. Pt.3. Cat`A' and Fire resistant to IEC 60331.

Colour Coded in accordance with EIA/TIA-598 with a printed legend on the outer jacket of the cable at equal distances to identify the quantity and types of glass fibres within the cable.

(J4) Fibre Optic cable (2 up to 24Fibres), fire resistant, indoor or outdoor, armoured.



CORE:

1. Fibres	Single mode fibre or Multimode fibres, to suit the glass type needed for the application. Maximum of 24 individual fibres. Temperature rating 70°C.
Fibre Identification	Colour Coded in accordance with EIA/TIA-598. Fibre colours shall not be repeated. 1st group of 12 fibres are solid colours. 2nd group of 12 fibres are solid colours with a stripe.
2. Uni-Tube	Flame retardant PolyButylene Terephthalate (PBT) or Halar Fluoroplastic or equivalent extruded loose tube with a moisture resistant gel filling compound. Flame retardant LSZH.

CABLE:

3. Separator	Water blocking E-glass yarn or Aramid yarn and polyester tape.
4. Armour Tape	Aluminium or Corrugated steel tape armour and a Rip cord.
5. Outer jacket	Flame retardant Low Smoke Zero Halogen Compound.

Entire cable assembly shall be Flame Retardant to IEC 60332. Pt.3. Cat`A' and Fire resistant to IEC 60331.

Colour Coded in accordance with EIA/TIA-598 with a printed legend on the outer jacket of the cable at equal distances to identify the quantity and types of glass fibres within the cable.