M.E.M. INDUSTRIES

...CABLES ARE IN OUR CONTROL

M.E.M. INDUSTRIES

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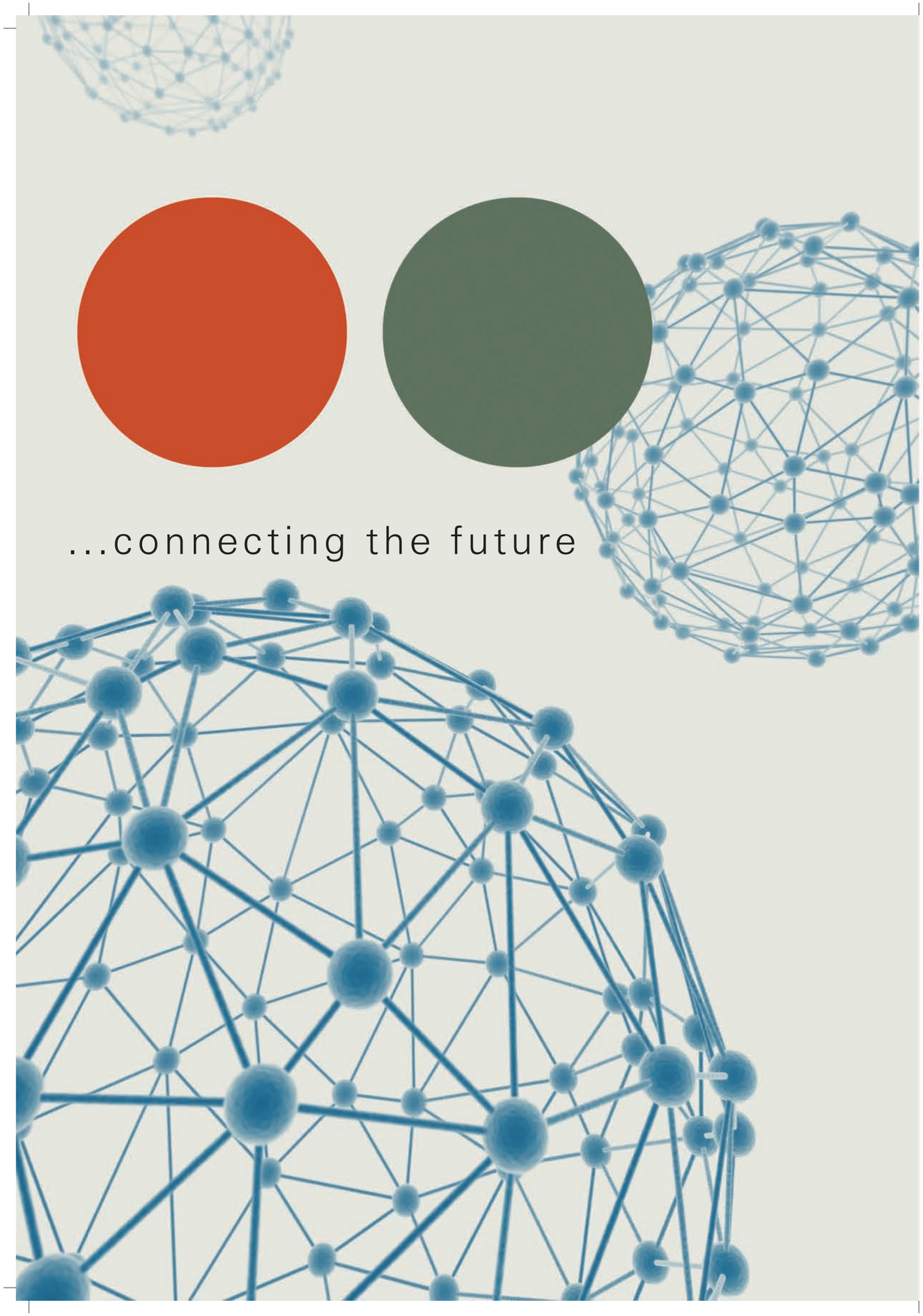


Company profile

M.E.M. Industries have been manufacturing Speciality Cables and Wires since 1995, meeting stringent manufacturing and quality standards to satisfy demanding users in Steel Plants, Power Plants, Defence and other hitech industries. We have excellent inhouse manufacturing facilities with the latest state of the art machineries. Our test facilities are the most comprehensive in India. At all times, providing highest quality not only in materials, but in services too, remains our principle aim and we continuously strive towards achieving this aim.

We at 'M.E.M.' believe in Innovation, keeping pace with the latest technology and in course, developing products that would best meet the needs of our customers. M.E.M.'s thrust for giving latest & better products makes it the leader in the field of special application cables. The reason behind our success is strong emphasis on customer satisfaction in all respect. Our constant interaction with the buyer, consultants & the end users of the cables has provided us in-depth information of customer's problems. The constant effort to solve the same have made us one of the most preferred brand in the field of Special Application Cables.

M.E.M. with its meticulous efforts in maintaining best quality with its well experienced team having the knowledge of cable designing, are proud and capable of supplying special cables meeting any Indian / International standards or customised requirements as desired by Project Authorities.

Product range

- **Thermocouple Extension & Compensating Cables**
- **Instrumentation Screened Cables**
- **High Temperature Cables**
- **Power & Control Cables**
- **Rubber Insulated Cables**
- **Water Cooled Cables**
- **Thermocouples & RTD**

MEM ...CABLES ARE IN OUR CONTROL

Compensating Cables / Thermocouple Extension Cables

Compensating Cables / Thermocouple Extension Cables

In process plants and other industries it is impractical and many times impossible to have a cold junction at the end of thermocouple. It is therefore desirable to extend the couple to a reference point some considerable distance away. This can be achieved by the use of thermocouple extension or compensating cables.

Extension Cables are used in temperature measurement connecting the Thermocouple to the measuring instrument. Thermocouple Extension cables uses the same alloy of the thermocouple while the Compensating cable uses different alloy to provide positive & negative cores to match the components of those in the thermocouple elements, which have a matched thermal e. m. f. output over the appropriate temperature range

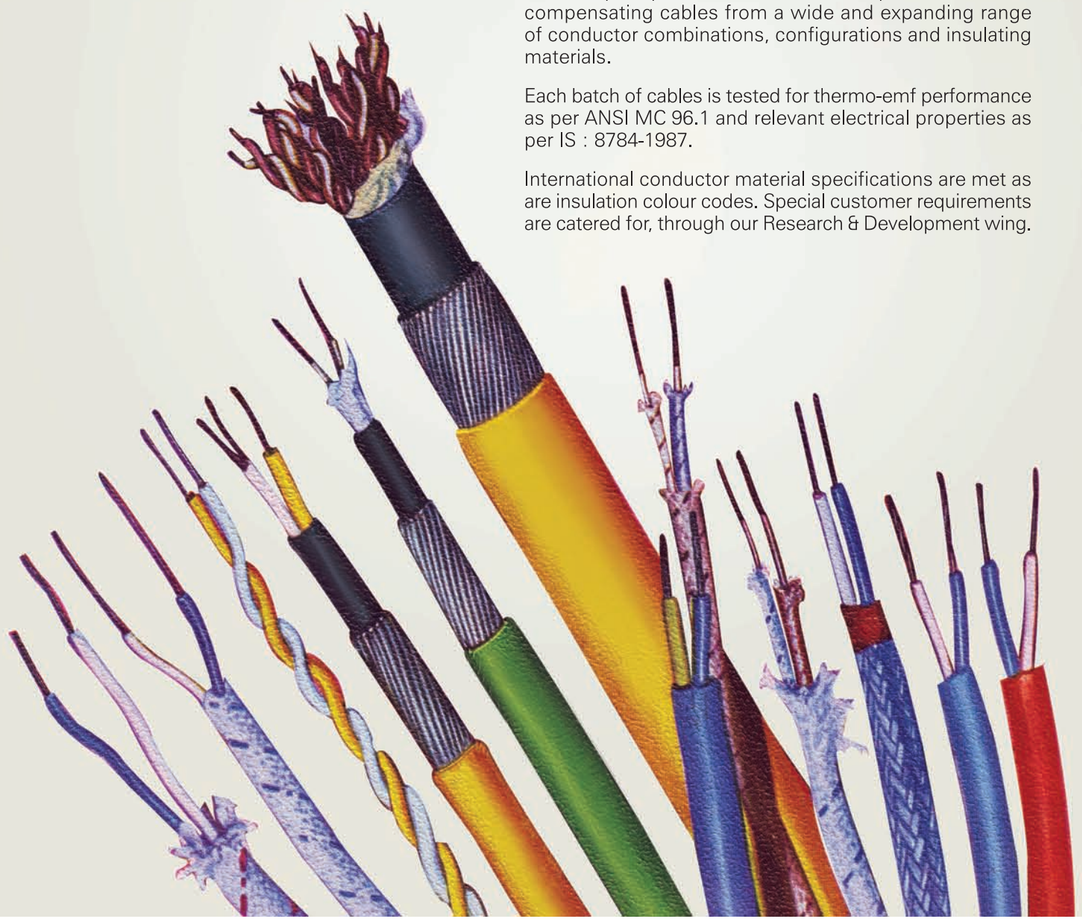
Thermocouple extension wires and compensating cables have identical characteristics to their basic thermocouples in the restricted temperature span as is recommended in ANSI MC 96. 1.

With this range of cables the element conductors can be extended to a position where a stable temperature is maintained, transferring the effective cold junction to the remote end of the extension or compensating cable.

We offer prompt deliveries of thermocouple extension and compensating cables from a wide and expanding range of conductor combinations, configurations and insulating materials.

Each batch of cables is tested for thermo-emf performance as per ANSI MC 96.1 and relevant electrical properties as per IS : 8784-1987.

International conductor material specifications are met as are insulation colour codes. Special customer requirements are catered for, through our Research & Development wing.



THERMOCOUPLE COMPENSATING CABLES

Type	:	KX, SX, RX, BX, JX, TX, NX, EX, KX (A)
Conductor	:	Solid / Stranded / Multistranded.
Conductor Size	:	Commonly used : for single pair cables - 1.5 sq.mm./16 AWG/3 x 22 SWG/40 x 36 SWG for multipair cables - 0.5 sq.mm./20 AWG/18 AWG
Conductor Materials	:	As per IS: 8784- 1987 / ANSI MC 96.1
Insulation	:	PVC / H.R. PVC / Sintered PTFE / EPR Rubber / Ceramic glass fibre / Silicon rubber
Pairs	:	Single -Pair & Multi - pair.
Twisting	:	Pairs Twisted.
Shielding / Screening	:	Individual Pair / Overall.
Shield / Screen Material	:	Aluminum Mylar Tape with ATC Drain Wire OR ATC braided / Silver Plated Copper Wire braided.
Inner and Outer Sheath Materials	:	PVC / FRLS PVC / H.R. PVC / Sintered PTFE / CSP / PCP Rubber / Silica micanite / Asbestos Yarn / Ceramic Glass sheaths to withstand temperatures upto 400^0 C.
Armouring	:	Galvanised steel round wire/flat strip OR flexible stainless steel wire braided.
Standard Applicable	:	ANSI MC96.1 / IS : 8784-1987/ ASTM-D & IEEE. IS: 5831-84,IS: 3975 & JSS : 51034.

INTERNATIONAL COLOUR CODE FOR EXTENSION AND COMPENSATING CABLES :

CABLE TYPE	INDIA IS-8784	USA ANSI-MC-96-1	GERMANY DIN 43710-4	BRITISH BS-1843	FRENCH NFE C-42-324	JAPAN JIS C-1610-1981
EXTENSION CABLES :						
K						
J						
T						
E						
N						
COMPENSATING CABLES :						
V						
R/S						
B						

MEM ...CABLES ARE IN OUR CONTROL

Instrumentation Screened Cables

Instrumentation Screened Cables

M.E.M. provides a wide range of cables suitable for process control and signal transmission.In the Industries, related to Iron & Steel Power Generation & Distribution, Petrochemical & Fertilizers, Oil Refineries, Aluminium Plants, Nuclear Power Plants and other Engineering industries, the process instrumentation plays a vital role in quality, productivity, economy and control of the entire plant. Hence selection of reliable cable manufacturer for such critical signal transmission forms the backbone of the entire process automation.

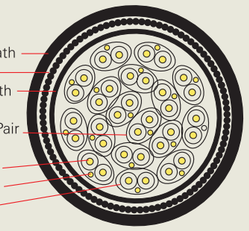
Shield is provided to prevent harmful electrostatic interference.There are three basic reasons for providing an electrostatic shield in a cable. The first and most common reason is the need to keep external electrical disturbances from affecting the signal in the cable. The second reason is to prevent the signal in the cable from being detectable at location other than at the cable ends. The third reason is the combination of the first two, i.e, the elimination of unwanted transfer of signals between circuit in the same cable, commonly called cross talk.

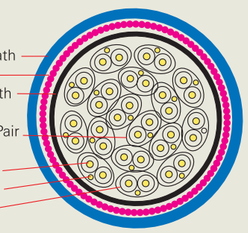
Shielding or Screening is the most important part of Instrumentation Cables which are provided by aluminium - mylar tape with tinned copper drain wire or tinned copper braided. Both the types have got their respective advantages. Shielding of either of the forms or even both the forms are provided in extreme situation depending upon the application. When signal speeds are comparitively low a braid screen is sufficient, but for higher speeds a foiled screen or composite foil and braid screen is more suitable.

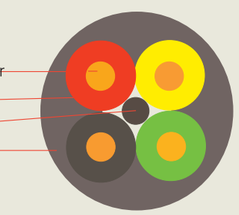
A further refinement is to use individually screened pairs to minimize the effect of cross talk, thus making possible the transmission of data over long distances. Armouring of Galvanised Steel Wire / Flat Strip / Flexible Braiding is provided to prevent the Cables from mechanical stresses.

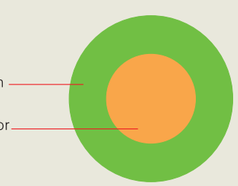
INSTRUMENTATION CABLES

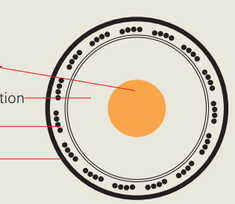
Conductor	:	Stranded / Multistranded.
Conductor Material	:	Electrolytic Grade Annealed Bare / Tinned / Silver Plated copper conductors as per IS : 8130-1984
Conductor Size	:	0.25mm^2, 0.5mm^2, 0.75mm^2, 1.0mm^2, 1.5mm^2 2.5mm^2
Insulation	:	PVC / H.R. PVC / Sintered PTFE / EPR Rubber.
Pairs	:	Single -Pair & Multi - pair / Single Triad & Multi-triad
Twisting	:	Pairs / Triads twisted with 12/14 twists per mtr.
Shielding / Screening	:	Individual Pair / Overall, Individual Triad / Overall
Shield / Screen Material	:	Aluminum Mylar Tape with ATC Drain Wire OR ATC braided / Silver Plated Copper Wire braided / Copper Tape Shielded
Inner and Outer Sheath Materials	:	PVC / FRLS PVC / H.R. PVC / Sintered PTFE / CSP PCP Rubber / Silica micanite / Asbestos Yarn / Ceramic Glass sheath to withstand temperature upto 400^0 C.
Armouring	:	Galvanised steel round wire/flat strip OR flexible stainless steel wire braided.
Standards Applicable	:	BS: 5308(Pt-2), IS: 8130-84 , IS: 5831-84 , IS:3975,ASTM-D , IEEE , IS:5608, IS : 10610, VDE











MEM ...CABLES ARE IN OUR CONTROL

Power & Control Cables

M.E.M. Industries offers a wide range of LT PVC insulated Power and Control Cables with Copper as well as Aluminium conductors. The insulation of normal PVC or HR PVC can be offered. Special purpose FRLS compound for inner as well as outer sheath can be offered on request. Following are the standard constructional features of PVC Insulated Heavy Duty Cables as per IS: 1554 (Part-I).

Conductor : The conductor is made of electrolytic grade high conductivity annealed copper or electrolytic grade aluminium. Generally, all power cables have aluminium as the conductor material, while control cables have copper. However power cables with copper conductor can be request.

Insulation : The insulation is suitably compounded PVC applied to the conductors by the extrusion process. For normal application PVC insulation type A (70°C) and for HR PVC insulation type C (85°C) as per IS : 5831 (1984) is provided.

Laying - up : All multi - core cables are laid - up with thermoplastic fillers in the interstics wherever applicable to make the cable circular.

Inner Sheath : The laid -up cores are surrounded by an inner sheath of any of the following types:

a) Extruded PVC.

b) Wrapping of plastic tapes.

Single-core cables usually do not have any inner sheath. However the same can be provided as on extra feature.

Armouring : Depending upon the application,these cables can be armoured or unarmoured. When armouring is desired for single-core cables for using for a.c system, the cable should be armoured with non-magnetic material. If the single-core cables are to be used in d.c. system, the cable can be armoured with steel wire / strip.

The armouring is applied over the core insulation in case of single-core cables and over the inner sheath in case of multi-core cables. Where the calculated nominal diameter over the insulation or inner sheath as the case may be. Is not more than 13mm, the armour consists of galvanized round steel wire.In other case, it can be of either galvanized round steel wire or steel strip. Wires and strips for armouring conform to IS: 3975.

The direction of lay of thearmour is always opposite to that of the outer layer of cores.

Outer Sheath : The outer sheath is of suitable grade of PVC compound applied by extrusion method. The colour of the outer sheath is generally Black. Outer in a colour other than black can be supplied for special applications.

Our Manufacturing Range :

a. Single - core : 1.5 sq. mm to 1000 sq. mm
b. Multi - core : 1.5 sq. mm to 630 sq. mm
c. Control Cables : Upto 61 core (1.5 & 2.5 sq. mm)

In addition to the above PVC insulated cables as per International Standards can also be manufactured.

Copper Conductor Control Cables (Unarmoured)

PVC insulated and PVC sheathed unarmoured multicore / 1100 Volts grade copper conductor control cables (1.5 sq. mm & 2.5 sq. mm) to IS : 1554 (Pt I)

No. of Cores & Cross Sectional area	Thickness of PVC Insulation (Nom)	Thickness of PVC Inner Sheath (min)		Thickness of PVC outer sheath (Nom)	Approx OD	Approx. net wt. of cable	Normal Length	Max. D.C resis-tance at 20°C	Approx AC resis-tance at operating temp 70°C	Approx reac-tance at 50Hz	Approx Capaci-tance for two adjacent cores	Current Rating	
		Extruded	Wrapped									In Ground	In air
No. x mm^2	mm.	mm.	mm.	mm.	mm.	Kg/Km	Mtr.	Kg/Km	ohm/km	oh/km	uf/km	Amps.	Amps.
2 X 1.5	0.8	0.3	-	1.8	11.5	163	500/1000	12.2	14.5	0.214	0.1	23	20
3X 1.5	0.8	0.3	-	1.8	12.0	185	do	12.2	14.5	0.214	0.1	21	17
4 X 1.5	0.8	0.3	-	1.8	13.0	218	do	12.2	14.5	0.214	0.1	21	17
5 X 1.5	0.8	0.3	-	1.8	13.5	253	do	12.2	14.5	0.214	0.1	16	14
6 X 1.5	0.8	0.3	-	1.8	14.5	292	do	12.2	14.5	0.214	0.1	15	13
7 x 1.5	0.8	0.3	-	1.8	14.5	305	do	12.2	14.5	0.214	0.1	14	13
10 X1.5	0.8	0.3	-	1.8	18.0	420	500	12.2	14.5	0.214	0.1	13	11
12 X1.5	0.8	0.3	-	1.8	18.5	461	do	12.2	14.5	0.214	0.1	12	10
14 X 1.5	0.8	0.3	0.3	1.8	18.5	485	do	12.2	14.5	0.214	.01	11	10
16 X 1.5	0.8	-	0.3	1.8	19.5	506	do	12.2	14.5	0.214	0.1	11	9
19 X 1.5	0.8	-	0.3	2.0	21.0	601	do	12.2	14.5	0.214	0.1	10	9
24 X 1.5	0.8	-	0.3	2.0	24.0	738	do	12.2	14.5	0.214	0.1	9	8
27 X 1.5	0.8	-	0.3	2.0	24.5	810	do	12.2	14.5	0.214	0.1	9	8
30 X 1.5	0.8	-	0.3	2.0	25.0	878	do	12.2	14.5	0.214	0.1	9	7
37 X 1.5	0.8	-	0.3	2.0	27.0	1040	do	12.2	14.5	0.214	0.1	8	7
2 X 2.5	0.9	0.3	-	1.8	13.0	213	do	7.4	8.71	0.204	0.1	32	27
3 X 2.5	0.9	0.3	-	1.8	13.0	248	do	7.4	8.71	0.204	0.1	27	24
4 X 2.5	0.9	0.3	-	1.8	14.5	289	do	7.4	8.71	0.204	0.1	27	24
5 X 2.5	0.9	0.3	-	1.8	15.5	595	do	7.4	8.71	0.204	0.1	18	15
6 X 2.5	0.9	0.3	-	1.8	16.5	605	do	7.4	8.71	0.204	0.1	18	15
7 X 2.5	0.9	0.3	-	1.8	16.5	610	do	7.4	8.71	0.204	0.1	18	15
10 X 2.5	0.9	0.3	-	1.8	21.0	615	do	7.4	8.71	0.204	0.1	18	15
12 X 2.5	0.9	0.3	-	1.8	21.5	623	do	7.4	8.71	0.204	0.1	17	14
14 X 2.5	0.9	-	0.3	2.0	21.5	673	do	7.4	8.71	0.204	0.1	16	13
16 X 2.5	0.9	-	0.3	2.0	23.0	744	do	7.4	8.71	0.204	0.1	15	13
19 X 2.5	0.9	-	0.3	2.0	24.0	857	do	7.4	8.71	0.204	0.1	14	12
24 X 2.5	0.9	-	0.3	2.0	27.5	890	do	7.4	8.71	0.204	0.1	13	11
27 X 2.5	0.9	-	0.3	2.0	28.3	1170	do	7.4	8.71	0.204	0.1	12	10
30 X 2.5	0.9	-	0.3	2.0	29.5	1279	do	7.4	8.71	0.204	0.1	12	10
37 X 2.5	0.9	-	0.3	2.0	32.0	1577	do	7.4	8.71	0.204	0.1	11	9

Copper Conductor Control Cables (Armoured)

TABLE-2
PVC insulated and PVC sheathed armoured multicore650/1100 Vgrade copper conducter control cables (1.5 sq. mm & 2.5 sq. mm)

Type	No.of Cores & Cross sectional area	Thickness of PVC Insulation (Nom)	Thickness of Inner Sheath (min)		Armouring		Thickness of PVC outer sheath (Nom)	Approx OD	Approx. net wt. of cable	Normal Delivery Length	Max.D.C. resistance at 20°C	Approx AC resis-tance at operating temp. 70°C	Approx reactance at 50 HZ	Approx Capaci-tance for adja-cent cores	Current Rating	
			Extruded	Wrapped	Flat strip	Round wire Dia									In ground	In air
	No.x mm²	mm.	mm.	mm.	mm.	mm.	mm.	mm.	Kg/Km	Mtrs.	ohms/Km	ohms/Km	ohms/Km	uf/Km	Amps.	Amps.
YWY	2 X 1.5	0.8	0.3			1.40	1.24	15.0	430	500/1000	12.1	14.5	0.126	0.14	22	18
	3 X 1.5	0.8	0.3	-	-	1.40	1.24	15.5	448	do	12.1	14.5	0.239	0.1	21	17
	5 X 1.5	0.8	0.3	-	-	1.40	1.24	17.0	560	do	12.1	14.5	0.239	0.1	16	14
	6 X 1.5	0.8	0.3	-	-	1.40	1.24	18.0	600	do	12.1	14.5	0.239	0.1	15	13
	7 X 1.5	0.8	0.3	-	-	1.40	1.24	18.0	625	do	12.1	14.5	0.239	0.1	14	13
	10 X 1.5	0.8	-	0.3	4.0 X 0.8	-	2.0	20.0	690	500	12.1	14.5	0.239	0.1	13	11
	12 X 1.5	0.8	-	0.3	4.0 X 0.8	-	2.0	20.0	716	do	12.1	14.5	0.239	0.1	12	10
	14 X 1.5	0.8	-	0.3	4.0 X 0.8	-	2.0	20.5	730	do	12.1	14.5	0239	0.1	11	10
YFY	16 X 1.5	0.8	-	0.3	4.0 X 0.8	-	2.0	21.5	780	do	12.1	14.5	0.239	0.1	11	9
	19 X 1.5	0.8	-	0.3	4.0 X 0.8	-	2.0	22.5	870	do	12.1	14.5	0.239	0.1	10	9
	24 x 1.5	0.8	-	0.3	4.0 X 0.8	-	2.0	25.5	1060	do	12.1	14.5	0.239	0.1	9	8
	27 X 1.5	0.8	-	0.3	4.0 X 0.8	-	2.0	26.0	1150	do	12.1	14.5	0.239	0.1	9	8
	30 X 1.5	0.8	-	0.3	4.0 X 0.8	-	2.0	27.0	1240	do	12.1	14.5	0.239	0.1	9	7
	37 X 1.5	0.8	-	0.3	4.0 X 0.8	-	2.0	29.0	1410	do	12.1	14.5	0.239	0.1	8	7
YWY	2 x 2.5	0.9	0.3`	-	-	1.40	1.8	16.0	486	do	7.41	8.71	0.204	0.15	32	27
	3 x 2.5	0.9	0.3`	-	-	1.40	1.8	17.0	539	do	7.41	8.71	0.204	0.15	37	24
	4 x 2.5	0.9	0.3`	-	-	1.40	1.8	17.5	608	do	7.41	8.71	0.204	0.15	37	24
	5 x 2.5	0.9	0.3`	-	-	1.40	1.8	19.0	677	do	7.41	8.71	0.204	0.15	23	19
	6 x 2.5	0.9	0.3`	-	-	1.40	2.0	20.5	780	do	7.41	8.71	0.204	0.15	21	18
	7 x 2.5	0.9	0.3`	-	-	1.40	2.0	20.5	608	do	7.41	8.71	0.204	0.15	20	17
	10 X 2.5	0.9	-	0.3	4.0 X 0.8	-	2.0	22.0	800	do	7.41	8.71	0.204	0.15	18	15
	12 X 2.5	0.9	-	0.3	4.0 X 0.8	-	2.0	22.0	860	do	7.41	8.71	0.204	0.15	17	14
	14 X 2.5	0.9	-	0.3	4.0 X 0.8	-	2.0	23.5	966	do	7.41	8.71	0.204	0.15	16	13
YFY	16 X 2.5	0.9	-	0.3	4.0 X 0.8	-	2.0	24.5	1048	do	7.41	8.71	0.204	0.15	15	13
	19 X 2.5	0.9	-	0.3	4.0 X 0.8	-	2.0	25.5	1176	do	7.41	8.71	0.204	0.15	14	12
	24 X 2.5	0.9	-	0.3	4.0 X 0.8	-	2.0	29.5	1456	do	7.41	8.71	0.204	0.15	13	11
	27 X 2.5	0.9	-	0.3	4.0 X 0.8	-	2.0	30.0	1554	do	7.41	8.71	0.204	0.15	12	10
	30 X 2.5	0.9	-	0.3	4.0 X 0.8	-	2.0	32.0	1718	do	7.41	8.71	0.204	0.15	12	10
	37 X 2.5	0.9	-	0.3	4.0 X 0.8	-	2.0	34.0	2004	do	7.41	8.71	0.204	0.15	11	9

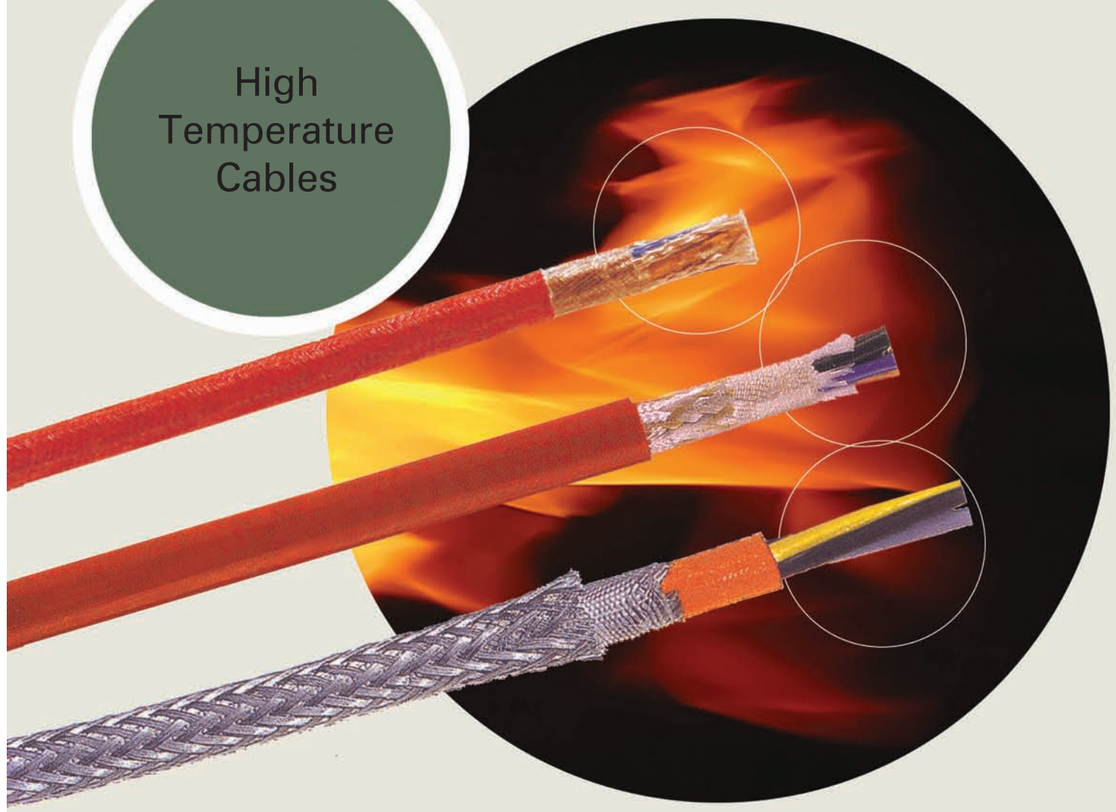
M.E.M. specialises in the field of High Temperature application cables giving the widest range of insulation and sheath materials, depending upon the temperature and other critical environment conditions. These high temperature cables are ideally suited for Blast Furnaces, Coke Ovens, Cement, Ceramic & Glass Factories, Hot Rolling Mills, Steel Melting Shops, Sponge Iron Plants, Aluminium Plants, etc.

These cables are suitable for use in Ship building & Aircraft construction, Oil refineries, Thermal power plants, Defence, Nuclear power plants, petrochemcial units, etc. The range includes from conventional fiber glass yarn & polished asbestos yarn insulated cables to the latest Silicamicanite, Ceramic glass yarn, Extruded FEP, Kapton, Sintered Teflon® (PTFE), Mineral Insulated (MI) & Fire survival cables.

COMPARISON CHART OF DIFFERENT INSULATING MATERIAL

Properties	Teflon® (PTFE)	Silicon Rubber	Asbestos/ Fibre Glass	PVC
Heat Resistance	300°C	180°C	300°C	85°C
Flame Retardency	Excellent	Good	Good	Fair
Weatherability	Excellent	Good	Fair	Fair
Water Resistance	Excellent	Excellent	Poor	Excellent
Acid Resistance	Excellent	Good	Poor	Poor
Chemical Resistance	Excellent	Good	Poor	Poor
Abrasion Resistance	Good	Fair	Fair	Good
Insulation Resistance	Excellent	Good	Fair	Good

High Temperature Cables



Special Sintered Teflon (PTFE) Cables

We are pleased to introduce a very special insulating material of "SINTERED TEFLON" (PTFE) which is provided for insulation as well as overall sheath. Sintered Teflon® Cables are available for Compensating Cables, Instrumentation Cables, Signal Cables, Control Cables, Power Cables and Co-axial Cables.
Even at temperatures beyond 300°C Teflon® does not melt / burn. This assures insulation integrity even at such high temperature range. There is no known chemical that will degrade Teflon®, making it ideal for harsh envirnoment. Teflon® also possesses excellent electrical properties. It is an ideal material for low loss transmission of high frequency signals.

Shielding of Al-mylar tape with copper drain wire or copper wire braided screen can also be provided with Teflon® insulated cables. We also provide G.I. wire and S.S. wire braided flexible armouring for protection of cables from mechanical stresses.

For high temperature cables, we also recommend "Asbestos" braided and "Fibre Glass" braided cables which can withstand continous temperature upto 300°C but cannot be used in extreme moist condition and water leakage areas, as by nature these materials are hygroscopic which absorbs water and moisture.

Hence, for such condition we have specially developed this special insulating and sheathing material of "SINTERED TEFLON®, which is not only heat resistant but also water - resistant. It is also non-flammable, i.e., it does not burn or propagate fire.

HIGH TEMPERATURE CABLES

Conductor	:	Stranded / Multistranded.
Conductor Size	:	0.5mm2 , 0.75mm2 , 1.0mm2 , 1.5mm2, 2.5mm2, 4 mm2, 6 mm2, 10 mm2, 16 mm2, 25 mm2, 35 mm2 Upto 4C X 150MM2,
Conductor Materials	:	Electrolytic grade Copper / Silver Plated / Nickel Plated Copper as per IS : 8130 - 84
Inuslation	:	Sintered PTFE with Kapton lining
Pairs	:	Single -Pair / Multi - pair & Single core / Multi core
Twisting	:	Pairs Twisted / laid up together
Shielding / Screening	:	Individual Pair / Overall.
Shield / Screen Material	:	Aluminium Mylar Tape with Drain Wire OR ATC braided / Silver Plated Cu.Wire braided.
Inner and Outer Sheath Material	:	Sintered PTFE/Silica micanite / Heat Barrier tape, Asbestos Yarn / Ceramic Glass sheaths to withstand 400 deg.c
Armouring	:	Flexible stainless steel wire braided.
Standards Applicable	:	BS: 5308(Pt-2), IS: 8784-87 , IS: 8130-84 , IS:1554,(Pt-1) & JSS: 51034

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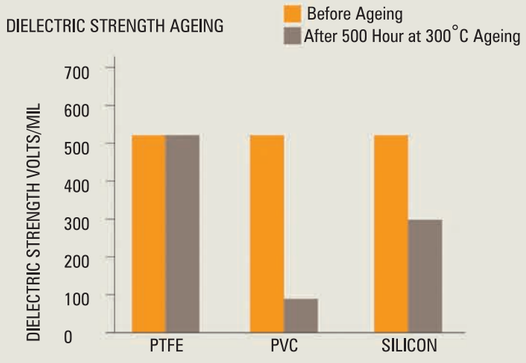
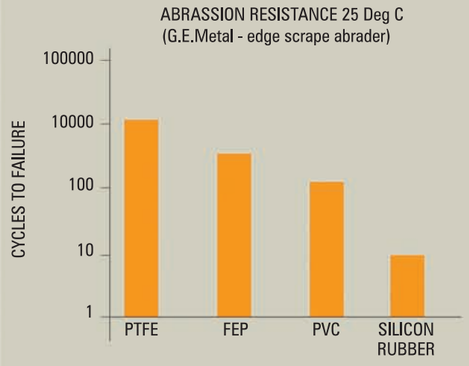
Major Advantages

- Continuous Heat Resistant Cables upto 300 deg.c & 400 deg.c
- Special Extra Heat Resistant Cables upto 500 deg.c
- Non-Flammable
- Water Resistant
- Chemical Resistant
- Oil / Lubricants / Hydraulic Fluids / Aircraft / Rocket fuel Resistant
- Immune to Ageing and Fungus & rodent resistant
- Best Die-electric properties resulting in space and weight saving
- Best suitable for high frequency operation
- Resistance to ultraviolet radiation and stress cracking
- Stainless Steel wire Braided Armouring provided for protection against mechanical stresses (Optional)
- Single length of upto 500 mtrs. can be provided

PTFE (Teflon) Safe Space Wiring System





Testing of cables

Before despatch,cables are tested according to Various national / international / customers' own specifications - as per the requirement of the customer / approved data sheets.

These tests have been classified as :

A. Routine tests

Carried out on each finished drum length to demonstrate integrity of the cable.

A typical routine test for cables as per Indian & International Standards :

- Conductor resistance test
- High voltage test

B. Acceptance test

Carried out on samples taken from a lot for the purpose of acceptance of the lot.

Involves generally electrical and physical tests and dimentional verification.

C. Type tests

Carried out on a type of cable on a general commercial basis in order to demonstrate satisfactory performance characteristics to meet the intended application.

Involves all possible tests - electrical, physical, thermal, including life cycle tests.

D. Optional tests

Any special tests by agreement between customer and the manufaturer.

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Rubber Insulated Cables

Rubber insulation holds its vital role in specific application where high flexibility and comparatively high temperature is required. Rubber insulation also permits simple splices and termination. Synthetic rubber such as Butyle rubber, Ethyelene Propylene rubber, Poly Chloroprene rubber, Chlorosulphunated Polythylene rubber have better heat resistance properties. Out of all the synthetic rubber, Silicon rubber has excellent die-electric characteristics. It is possible to operate silicon rubber insulated cables at ambient temperature of upto 180°C continously.The Polychloroprene rubber, Chlorosulphonated, Nitrile sheating are formulated against high abrasion, oil, weather and fire resistance properties.EPR insulation with CSP sheathing can withstand high ambient condition having long durable ageing properties. For selection of right type of Elastomeric cable, the comparative characteristics have been given in the chart below.

COMPARATIVE PERFORMANCE DATA FOR TYPICAL ELASTOMERIC INSULATING AND SHEATHING MATERIALS

Materials	Natural Rubber Including Blends With SBR	HOFR PCP/ Neoprene	NBR/CSP	BUTYLE	EPR	EPR/CSP	CSP	SILICONE RUBBER
Resistance to Ozone	Poor	Good	Good	Good	Very Good	Very Good	Very Good	Very Good
Corona	"	"	"	"	"	"	Good	Good
Weather	"	"	"	Fair	Good	"	Very Good	Very Good
Oil	"	"	Very Good	Poor	Poor	Good	Good	Fair
Water	Good	Fair	Good	Good	Good	Good to Fair	Good to Fair	Fair
Chemicals	Fair	"	Fair	"	Fair	Good	Good	Fair
Solvents	Poor	Good	Good	Poor	Poor	Fair	Fair	Poor
Abrasion	Good to Fair	Good	Good	Poor	Poor	Good	Good	Fair
Flame	Poor	Good	Good	Poor	Poor	Good	Good	Good
Insulation Resistance	Good	Poor	Poor	Good	Good	Good	Fair	Good
Voltage Breakdown	Good	Fair	Fair	Good	Good	Good	Good	Good
A.C. Losses	Good	Poor	Poor	Good	Good	Fair	Fair	Good

PROPERTIES OF COMMONLY USED ELASTOMERIC CABLE INSULATING AND SHEATHING MATERIAL

S.No.	Material	Type Code	Mx. Cond. Temp. for Continuous Operation (°C)	Max. cond. Temp. for Short circuit (°C)	Elongation at break (Min) (%)	Application / Usage
1.	Natural Rubber (VIR/TRS)	IE1/SE1/SE2	60	200	300	Insulation/Sheath general services
2.	Ethylene Propylene Rubber (EPR)	IE2/IE3	90	250	200	Insulation / Heat Resisting
3.	Polychloroprene (PCP)	SE3/SE4	90	250	250	Normal / Heavy duty sheath / heat resisting
4.	Nitrile Butadiene Rubber & PVC Blend (NBR-PVC)	SE3/SE4	80	200	250	Normal / Heavy duty sheath / heat resisting
5.	Chlorosulphonated Polyethylene (CSP)	SE3/SE4	90	250	250	Normal / Heavy duty sheath / heat resisting oil resisting & Flame retardant
6.	Silicon Rubber	IE5	150	350	150	Insulation for temp. upto 200°C
7.	Butyl Rubber		85	220	300	Insulation Heat Resisting

Water Cooled Cables

Water Cooled Cables are used for connecting arc furnace, melting furnace and ladle furnace.These cables are continously water cooled and hence named so.

Configuration:
Water cooled cables are normally designed according to the capacity of the furnace.The size of the main conductor is directly proportional to the tonnage capacity of the furnace. The main power core consist of pure Electrolytic grade (min 99.9% purity) of multilayer bunched stranded copper conductor. These bunched conductors are centrally sepertated to prevent restriction of water flow, Futher more copper / bronze seperators are placed at regular iIntervals.

The main central core is covered by neoprene rubber carbon free house, which is again asbestos/ceremic glass insulated to waithstand high temperature, as faced in these critical areas, The cable is end socketed by forged eletrolytic grade copper lugs as per site applicaiton.

L.T. Furnace Cables

L.T.Furnace cables are being used for connecting transformer busbars and melting electrodes. These are special cables being used in Iron and Steel Plants, Foundries, Hot Rolling Mills, Coking Plants, Cement, Glass and Ceramic factories to connect main transformer busbars and melting electrodes.

Configuration:
L.T. Furnace cables are normally manufactured having the core area of upto 400 sq. mm of pure electrolytic grade (min 99.9% purity) of multilayer bunched stranded copper conductor. Depending upon the site application, the conductor area can be increased or decreased too. The core is insulated with polyster/mylar tape and then varnish impregnated double ceramic glass yarn covered. The lacquer impregnation is polymerised suitable for operation at 500 volts. Overall braiding of heat proof asbestos is provided and is treated with heat proof and flame proof compound to suit high temperature conditions.

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Fire Survival Cables

FIRE! THE UNBEARABLE HAZARD

Fire is one of the most destructive acts, either of nature or mankind and destroys thousands of lives and crores of rupees worth of properties and data.

No Country however advanced, is free from the ravages of fire.

Data reveals that cables are the major causes of fire worldwide.

PROPERTIES OF DIFFERENT SHEATH MATERIALS

- **Normal PVC Sheaths (ST-1)**
  These Cables propagate flame and emits dense fumes & toxic acid gas and Chlorine on burning.
- **Flame Retardant Sheath (ST-2 FR)**
  These Cables do not propagate flame and are self extinguishing. However emits dense fumes, toxic acid gas and Chlorine on burning.
- **Flame Retardant Low Smoke Sheath (FRLS)**
  These Cables do not propagate flame and emit low amount of smoke and fumes. However, emits acid gas on burning.
- **Low Smoke Zero Halogen Sheath (LSZH)**
  These Cables do not propagate flame, emit low amount of smoke and very negligible amount of acid gas on burning.

WHAT CHARACTERISTICS OF CABLES ARE IMPORTANT IN A FIRE SITUATION?

Any cable used in public buildings or in hazardous areas in industries should not have any danger to public lives and properties. The danger is caused through acid gas emission during fire. The cable should be self-extinguishing i.e. should not continue to burn once the source of fire is removed and neither propagate fire any further. Even while burning, the smoke produced should not obstruct the escape and visibility by obscuring emergency lightings and exit signs.

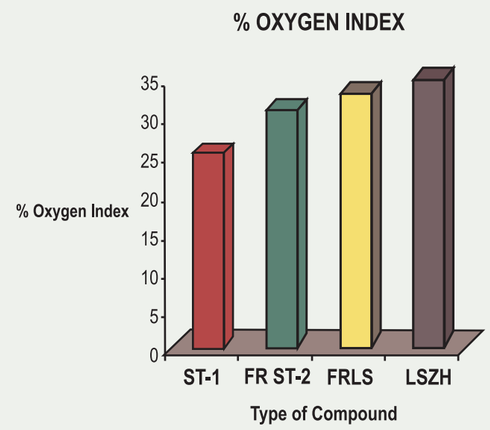
ADVANTAGES OF FIRE SURVIVAL CABLES

Traditionally fire resisting cables such as MICC (Mineral Insulated Copper Clad) Cables have been used as "Fire Survival Cables". These cables are very expensive to manufacture and install.

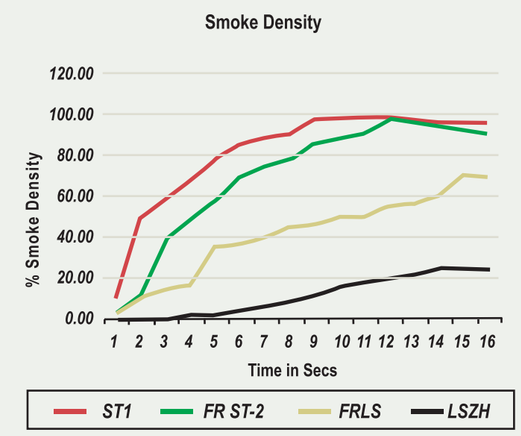
Of late a new concept in this field has been developed by MEM which has special Insulation of Glass mica tapes with Elastomeric / Thermoplastic compound and Sheath of "LSZH" which makes the cable "FIRE SURVIVAL".

The Advantages are:-

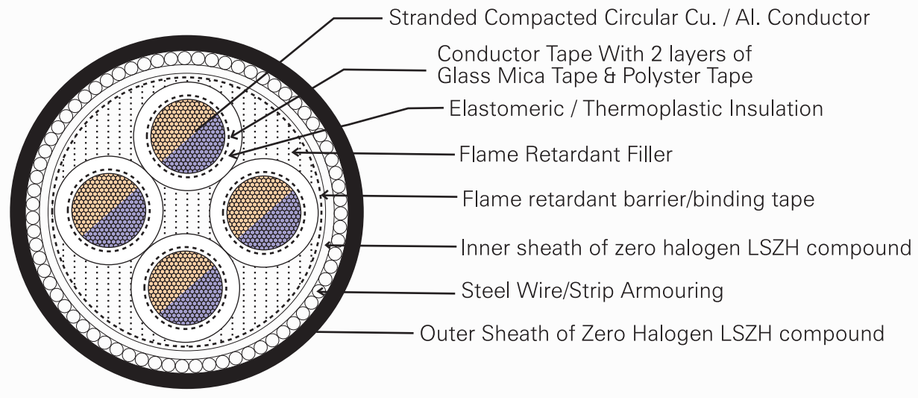
- >Zero Halogen, No Corrosive gases
- >Flame Retardance
- >Reduced Fire Propagation
- >Minimum Smoke Emission
- >Longer lengths production
- >Easier to install
- > Easier to join
- >Do not require high degree of skill to install them
- >More COST EFFECTIVE design

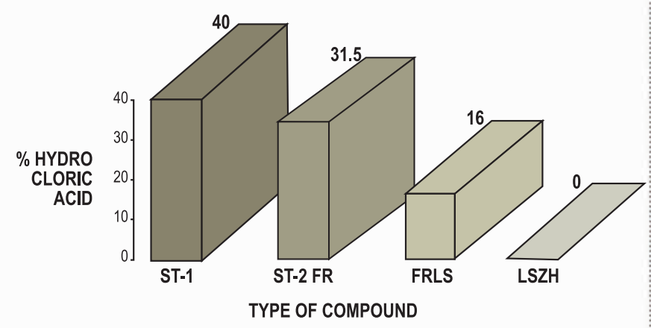


GRAPH OF OXYGEN INDEX OF VARIOUS COMPOUNDS



GRAPH OF SMOKE DENSITY OF VARIOUS COMPOUNDS





FIRE SURVIVAL CABLES TESTED AS PER IEC-331

Sample length of 1-2 metres of Cable is subjected to minimum of 3 hours of continuous flame whose temperature is set as per IEC-331 with distance of about 75mm between cable sample and burner. Cable is connected to Test Voltage / Rated Voltage and the cable sample is rechecked after 12 hours. No Voltage failure is observed.

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