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ZCSM
Heat-shrinkable halogen-free, heavy-wall tubing for low fire hazard areas

We have developed a range of halogen-free, thick-wall tubings for use in cable accessories and as insulating tubing in hazardous areas where very high material specifications are required.

This low fire hazard material has been developed using the latest polymer technology to provide low smoke, low toxicity and low acid gas generation while being highly flame retarded and having low calorific value.

The value of low fire hazard materials is increasingly recognized not only because of the potential fire hazards to personnel from toxic smoke and poor visibility, but also the corrosion damage by halogenated materials to equipment. The cost of corrosion damage to the equipment often exceeds the cost of direct fire damage. As a result, low fire hazard cables are now specified in an increasing range of environments such as mass transport, oil and gas production, petrochemical plants, power stations, airports, ships, hospitals and public buildings.

ZCSM can also be made with a nuclear grade adhesive for use in nuclear power applications.

Raychem

ZCSM
Heat-shrinkable halogen-free, heavy-wall tubing for low fire hazard areas

The choice of suitable materials for electrical systems is an important factor in preventive fire safety measures. In recent years, considerable attention has been paid to the fire risks associated with cable insulation polymers.

Flame retardancy
As primary insulation and oversheath replacement, we have developed a heat-shrinkable material, ZCSM tubing, that is halogen-free and flame-retardant. A range of established tests, such as flammability tests, limiting oxygen index and temperature index, have been carried out to assess the flame retardancy of this material. The results show that the performance of the ZCSM tubing compares favourably with that of modern flame retardant cable materials.

Absence of halogens
Corrosion damage depends on the amount of acid gases generated when a material is burned, and therefore on the level of halogens and other acidic components in the insulation material. Pyrolytic analyses show only trace quantities of these substances in the ZCSM tubing. The low toxicity index rating derived from measurements of these and further combustion products provides additional evidence of the material's suitability for meeting special requirements of this kind.

Low smoke generation
The reduction in visibility caused by rapid smoke evolution in fire conditions represents a serious hazard to both escaping personnel and fire-fighting teams. The optical smoke density produced by ZCSM tubing in fire conditions has been measured in accordance with typical methods such as the 3 m^3 Cube Test (IEC 60134) and has proven its applicability.

Use in cable accessories
The range of thick-wall ZCSM tubing can be used as the jackets to MV and LV cable accessories, providing protection to the same fire standards as modern low fire hazard cable specifications.
In combination with glass fiber tapes, the ZCSM tubing is used for fire-resistant cable joints which ensure that electrical insulation is maintained during a fire test such as IEC 60331 or even DIN 4102 part 12 (E90).

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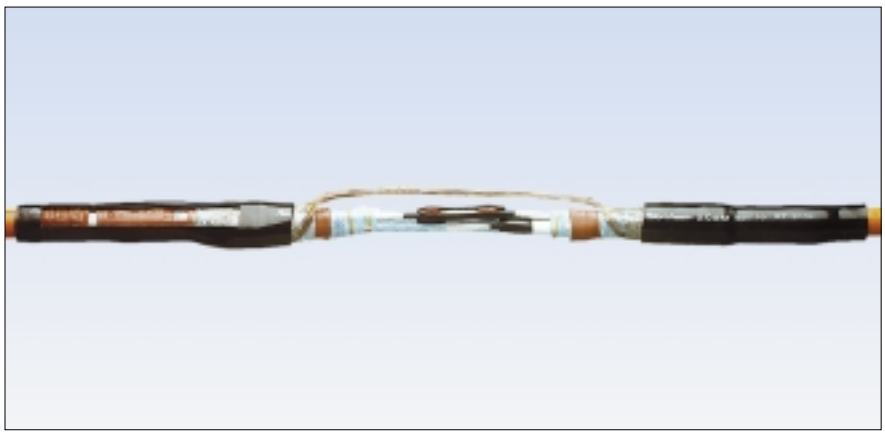

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Photo 1: Public transport systems now make increasing use of halogen-free, flame-retardant and fire-resistant cables and accessories.

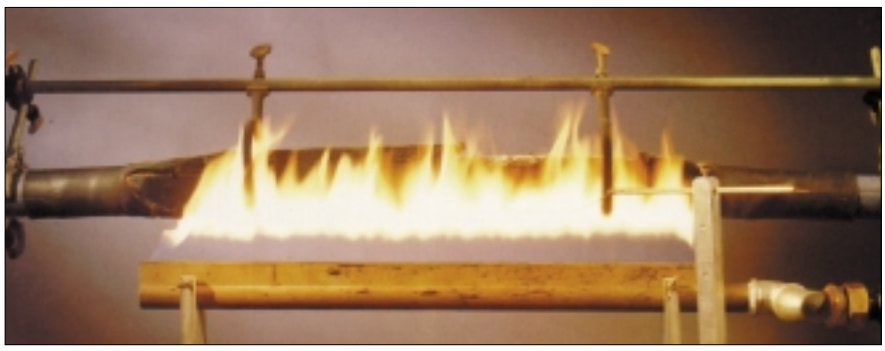
Photo 2: Raychem joints for fire-resistant cables were developed in the course of the company's experience in supplying jointing systems for special cables.

Photo 3: Halogen-free and fire-resistant cables and a cable joint after successful completion of a fire test according to DIN 4102 part 12 (E90).

Photo 4: Design of a halogen-free and fire-resistant joint with ZCSM tubing providing the insulation over the connectors and the whole joint area.

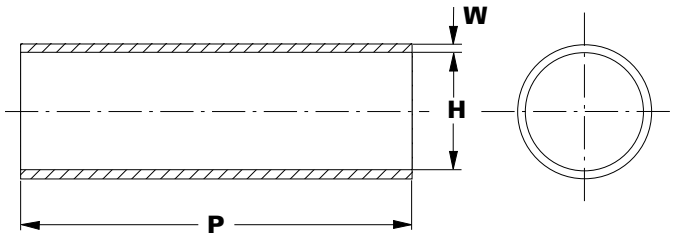
	Properties	Test method	Material requirements
Fire Safety	Flammability	UL 94 HB, IEC 60332-1	Pass
	Flame propagation	IEC 60332-1	on request
	Limited oxygen index	ISO 4589	29 min.
	Temperature index	NES 715 Type B	250 °C min.
	Smoke density (3 m^3)	IEC 60134	on request
	Smoke index	NES 711	20 max.
	Acid gas generation	BR TDE 76-P-16	1.5% max.
	Toxicity index	NES 713	3 max.
Electrical	Dielectric strength	IEC 60243	120 kV/cm min. (2 mm wall)
	Volume resistivity	IEC 60093	$1x10^{12}$ Ω cm min.
	Comparitive tracking index	VDE 0303/1	on request
Chemical	Water absorption	ISO 62 Proc. A	max. 0.3% after 24 hours at 23 °C ±2 °C max. 0.7% after 14 days at 23 °C ±2 °C
	Corrosion	ASTM D 2671 Proc. A	No corrosion after 16 hrs at 150 °C ±3 °C
	Resistance to liquids -Tensile strength -Ultimate elongation	ISO 1817 ISO 37 ISO 37	on request
Physical	Tensile strength	ISO 37	8 MPa min.
	Ultimate elongation	ISO 37	200 % min.
	Density	ISO/R 1183 Method A	1.5 g/cm^3 max.
	Hardness	ISO 868	40-60 shore D
	Accelerated Ageing -Tensile Strength -Ultimate Elongation	ISO 188 ISO 37 ISO 37	168 hrs at (150 ±3) °C 8 MPa min. 100% min.
	Low temperature flexibility	ASTM D 2671	No cracking after 4 hrs at -40 °C ±3 °C
	Weathering	The material from which ZCSM is manufactured contains carbon black to protect it from ultraviolet light.	
Additional properties	More detailed product specification data available on request.		

Photo 5: A fire-resistant Raychem joint maintaining its electrical integrity for more than 180 min. during a fire test according to IEC 60331.



Ordering information

Dimensions



Notes:

1. Dimensions in millimeters
a= as supplied
b= after free recovery
*= at minimum supplied diameter
2. Max. longitudinal change after free recovery:
+5% to -10% up to size 70/25,
+5% to -15% for size 85/36 and 120/50,
+5% to -20% for size 180/75

Product/ size	Application range (diameter)		H a max	H b min	W a* min	W b min	P Cut length
ZCSM 8/3	3.5	7.0	8	3	0.6	2.0	See standard lengths
ZCSM 16/5	5.5	14.5	16	5	0.7	2.4	
ZCSM 24/8	9.0	21.5	24	8	0.9	2.9	
ZCSM 32/12	13.0	29.0	32	12	1.0	4.0	
ZCSM 45/16	17.5	40.5	45	16	1.0	4.0	
ZCSM 60/22	24.0	54.0	60	22	1.0	4.0	
ZCSM 70/25	27.5	63.0	70	25	1.0	4.0	
ZCSM 85/36	39.5	76.5	85	36	1.0	4.0	
ZCSM 120/50	55.0	108.0	120	50	1.0	4.2	
ZCSM 180/75	82.5	162.0	180	75	1.0	4.2	

Standard lengths

Lengths

All sizes are availabe in the standard lengths:
1000 mm and 1500 mm.

On request: other lengths and on spools.

All lengths subject to standard cutting tolerances.

Ordering example

Part number
ZCSM 70/25-1000/U

Product Type
Size
Length/Spool (A)
/U = without adhesive