

tyco

Electronics

Energy Division

Raychem

FCSM
Heat-shrinkable flame-retarded
heavy-wall tubing



Raychem FCSM heat-shrinkable tubing is a tough electrical insulating material which combines flame-retarded properties with flexibility, abrasion resistance and a rapid installation technique.

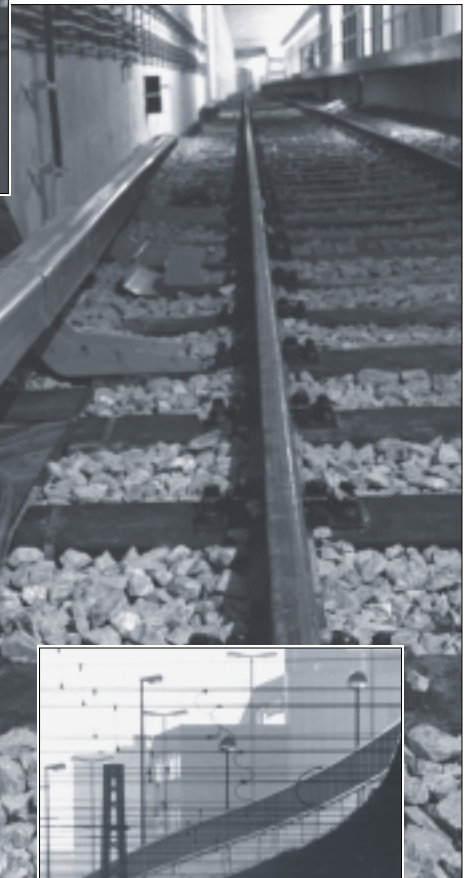
This combination of features has led FCSM tubing to be used in a wide range of demanding applications, in particular to insulate, to protect and to seal flexible cable joints, accessories and connections. Installation is effected by heating above 125°C, which causes the tubing to shrink in diameter while retaining its form. For sealing and corrosion protection purposes, FCSM tubing can be supplied internally pre-coated with an adhesive liner which melts, flows and bonds as the tubing shrinks.

The heat-shrinkable feature ensures a close-fitting seal over regularly or irregularly shaped objects of various sizes, making FCSM tubing a versatile and easy method for insulating electrical components or repairing and terminating flexible cables and cords. FCSM tubing's remarkable properties also provide electrical engineers with efficient, economical solutions to difficult and unusual problems in the power supply, transport, mining and manufacturing industries.

FCSM tubing is yet another result of Raychem expertise in the technology of heat-shrinkable materials, gained through long experience in their application to power engineering. As the leading producer of heat-shrinkable materials and one of the largest cable accessory manufacturers, Raychem supplies a wide range of jointing, repair and sealing systems to meet the demands of the growing world of energy.



Photos: Electrical failures frequently result when birds perched on catenary wires make contact with the bridge as they fly away to avoid oncoming trains. This problem is overcome by insulating the catenary wires with Raychem FCSM tubing as shown here.



In public transport systems Raychem FCSM meets requirements for vibration-resistant flame-retarded insulating and sealing materials, in this case for a underground network in Germany.



Properties

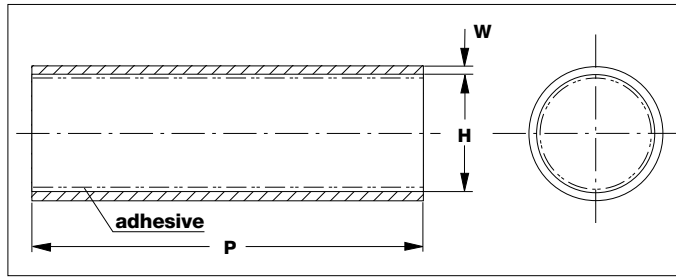
Properties		Test method	Material requirements
Tensile strength		ISO 37	12 MPa min.
Ultimate elongation		ISO 37	350% min.
Density		ISO/R 1138 Method A	1.1-1.3 g/cm ³
Hardness		ISO 868	30-50 shore D
Accelerated ageing	168 hrs at 150°C ± 2°C	ISO 188	
	Tensile strength	ISO 37	11 MPa min.
	Ultimate elongation	ISO 37	200% min.
Thermal endurance*		IEC 216	130°C
Low temperature flexibility	4 hrs at -40°C ± 3°C	ASTM D 2671	No cracking
Dielectric strength		IEC 243	130 kV/cm min.
Volume resistivity		IEC 93	1×10 ¹³ Ω cm min.
Comparative tracking index		VDE 030/1	KA 1
Corrosion		ASTM D 2671 Proc. A	No corrosion after 16 hrs at 150°C
Flammability		ICEA-S-19-81	Self-extinguishing 60 sec. max
Flame propagation		IEC 332-1	Pass
Water absorption		ISO 62 Proc. A	0,5% after 14 days at 23°C max.
Resistance to liquids	168 hrs at 23°C ± 2°C	ISO 1817	Transformer oil to VDE 0370
	Tensile Strength	ISO 37	11 MPa min.
	Ultimate Elongation	ISO 37	300% min.
Resistance to fungi		ASTM G 21	Pass rating 1
Weathering	The material from which FCSM is manufactured contains carbon black to protect it from ultra-violet light.		
Additional properties	More detailed product specification data available on request.		

* based on ultimate elongation



FCSM tubing covering the cores of low voltage power cable terminations for the electric drive of a bucket wheel excavator at one of the world's largest open pit mines.

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 -15%

Product/ size	Application range (diameter)		H		W		P Cut length
	a min	b max	a min	b min	a* min	b min	
FCSM 9/3	3.5	8.0	9	3	0.6	2.0	See standard lengths
FCSM 19/6	6.5	17.0	19	6	0.7	2.4	
FCSM 28/9	10.0	25.0	28	9	0.8	3.2	
FCSM 38/12	13.0	34.0	38	12	1.0	4.1	
FCSM 51/16	17.5	46.0	51	16	1.0	4.1	
FCSM 68/22	24.0	61.0	68	22	1.0	4.1	
FCSM 90/30	33.0	81.0	90	30	1.0	4.1	
FCSM 120/40	44.0	108.0	120	40	1.0	4.1	
FCSM 177/63	96.0	159.0	177	63	1.0	4.1	

Standard lengths and adhesive

Lengths	Adhesive
All sizes are available in the standard lengths: 1000 mm and 1500 mm.	FCSM tubing is available with or without an inner adhesive wall. The adhesive exhibits excellent bonding and sealing characteristics to all materials commonly used in the various cable insulation and sheath constructions, such as plastic, rubber, lead and aluminium.
On request: other lengths and on spools.	
All lengths subject to standard cutting tolerances.	

Ordering example

Part number
FCSM 68/22-1000/U

Product type _____	}
Size _____	
Length/Spool (A) _____	
/172 = adhesive _____	
/U = without adhesive _____	}

All of the above information, including drawings, illustrations and graphic designs, reflects our present understanding and is to the best of our knowledge and belief correct and reliable. Users, however, should independently evaluate the suitability of each product for the desired application. Under no circumstances does this constitute an assurance of any particular quality or performance. Such an assurance is only provided in the context of our product specifications or explicit contractual arrangements. Our liability for these products is set forth in our standard terms and conditions of sale. AMP, Dulmison, Hellstern, Raychem, and SIMEL are trademarks of Tyco International Ltd.



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