

Halogen-free, radiation cross-linkable, highly flame-retardant insulation and sheathing compound for low & medium voltage cables

■ Compound class Insulation / sheathing	■ Compound category 	■ Flame retardant MDH
■ Standards DIN EN 50264-1 EI 109	EN 50306-1 S2	
■ Operating temperature [C°] -40 to 125	■ Oil resistance level ★★★★	
■ Typical applications <i>Halogen-free, low smoke, radiation cross-linkable, highly flame-retardant compound for isolation of low and medium voltage cables in railway applications.</i>		
		
Rolling Stock, Rapid Transit, Railways		
■ Features		
 Flame retardant	 Halogen-free	 Low smoke

PHYSICAL PROPERTIES

■ Physical properties	Unit	Typical value	Test method
Density*	g/cm ³	1.44	DIN EN ISO 1183-1A
Hardness*	Shore D	59	DIN ISO 7619-1
Melt Flow Index (150°C; 21.6kg)	g/10 min	2.6	DIN EN ISO 1133
■ Water absorption ***	Unit	Typical value	Test method
Water absorption after 168h at 70°C	mg/cm ²	0.3	IEC 60811-402

MECHANICAL PROPERTIES

■ Thermoplastic **	Unit	Typical value	Test method
Tensile strength	N/mm ²	16.0	IEC 60811-501
Elongation at break	%	230	IEC 60811-501
■ After crosslinking ***	Unit	Typical value	Test method
Tensile strength (125 kGy)	%	17.7	IEC 60811-501
Elongation at break (125 kGy)	%	173	IEC 60811-501

■ After ageing in air oven 168h at 135°C ***	Unit	Typical value	Test method
Variation in tensile strength	%	+15	IEC 60811-401
Variation in elongation at break	%	-6.9	IEC 60811-401

THERMAL PROPERTIES ***

■ Hot set test at 200°C / 15min / 0.2MPa	Unit	Typical value	Test method
Elongation under load	%	28	IEC 60811-507
Residual elongation	%	4	IEC 60811-507
■ Low temperature tests	Unit	Typical value	Test method
Elongation at break at -40°C	%	73	IEC 60811-505

Resistance ***

■ Fluid IRM 903 168h at 70°C	Unit	Typical value	Test method
Variation in tensile strength	%	-14.7	IEC 60811-404
Variation in elongation at break	%	-15.6	IEC 60811-404
■ Fluid IRM 902 72h at 100°C	Unit	Typical value	Test method
Variation in tensile strength	%	-18.1	IEC 60811-404
Variation in elongation at break	%	-8.1	IEC 60811-404
■ 1 N Oxalic acid 168h at 23°C	Unit	Typical value	Test method
Variation in tensile strength	%	-11.3	IEC 60811-404
Variation in elongation at break	%	+12.7	IEC 60811-404
■ 1 N NaOH 168h at 23°C	Unit	Typical value	Test method
Variation in tensile strength	%	-8.5	IEC 60811-404
Variation in elongation at break	%	-11.6	IEC 60811-404

Arrhenius Ageing ***

■ After ageing in air oven 360h at 180°C ***	Unit	Typical value	Test method
Residual tensile strength	N/mm ²	15.9	IEC 60811-404
Residual elongation at break	%	57	IEC 60811-404
■ After ageing in air oven 982h at 165°C ***	Unit	Typical value	Test method
Residual tensile strength	N/mm ²	15.8	IEC 60811-404
Residual elongation at break	%	52	IEC 60811-404
■ After ageing in air oven 4415h at 145°C ***	Unit	Typical value	Test method
Residual tensile strength	N/mm ²	17.0	IEC 60811-404
Residual elongation at break	%	54	IEC 60811-404
■ Arrhenius 20,000h ***	Unit	Typical value	Test method
Temperature	°C	126	IEC 60216-1

ELECTRICAL PROPERTIES*

■ Major electrical properties	Unit	Typical value	Test method
Volume resistivity (at 23°C)	Ω cm	1.8 · 10¹⁵	IEC 62631-3-1
Volume resistivity (at 90°C)	Ω cm	1.3 · 10¹⁵	IEC 62631-3-1

BURNING PROPERTIES *

■ Main burning properties	Unit	Typical value	Test method
LOI	%	33	ASTM D 2863 A
Toxicity index	-	3.22	DIN EN 50305
Halogen content	%	TBD	IEC 754-1
Temperature index	°C	TBD	ASTM D 2863 D

* pressed plaques, 165°C / 4 min.

** extruded tapes

*** crosslinked extruded tapes

PROCESSING GUIDE

■ Extruder type

Standard extruders for elastomeric or thermoplastic materials.
L/D-ratios between 20 – 24 are recommended.

■ Screw configuration

Good results have been achieved with low shear and low compression screws (compression ratio of 1.2 – 1.4) and having deep flow channels.

■ Extrusion dies

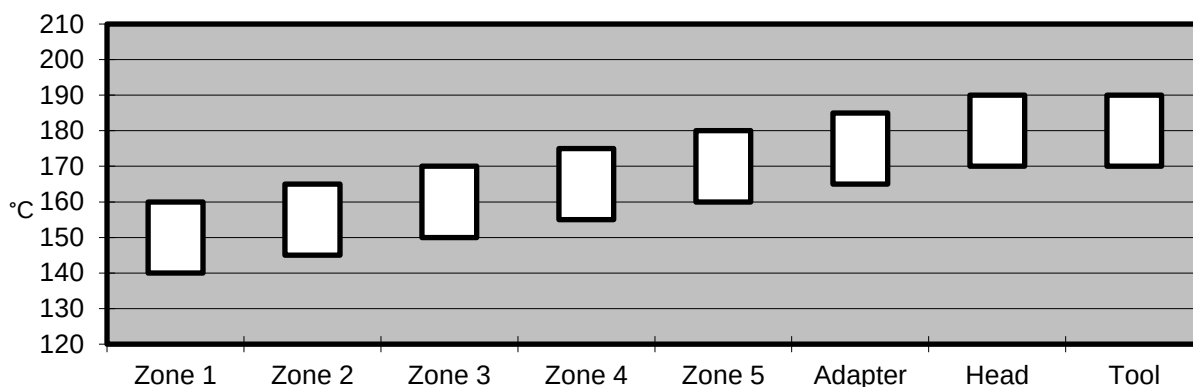
For isolation pressure tools, for jacketing tubing tools are recommended.
Pressure extrusion may have effect on low temp. flexibility.

■ Die opening

Recommended die opening up to 10% below the required OD of the wire.

■ Temperature profile extruder

The profile shown below may vary slightly depending on extruder type, head design & output.



■ Maximum mass temperature

200°C

■ Conductor pre-heating

Can be required to improve elongation at break (80-130°C).

■ Quenching

Quenching in a hot water bath (80°C) can improve elongation at break.

■ Drying

Pre-dry the compound 4 hrs at 60°C. Dry air, which has been dried by a desiccant air-dryer, should be used.

■ Recommended colour master batches

Well dispersed EVA master batch 0,5-1,0%. For black jacket applications, UV resistance can be obtained by adding a higher level of master batch depending on requirements and type of carbon black master batch used.

CROSSLINKING INFORMATION

■ Recommended radiation dose

125 kGy

■ Radiation information

125 kGy is a good starting point. This can be optimized by customer for maximum result.

STORAGE INFORMATION

■ Form & packaging

Pellets in sizes 2.8mm, PE-bags (25 kg)

Moisture-resistant bags (25kg) & octabins (alu-inliner, max. 1250kg)

■ Shelf life

1 year after production

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