



Halogen-free, radiation cross-linkable, flame retardant insulation and sheathing compound









<p>■ Compound class Insulation / sheathing</p>	<p>■ Compound category </p>	<p>■ Flame retardant MDH</p>
<p>■ Standards EN 50306-1 S2, HL 4-M</p>	<p>EN 50306-2</p>	<p>EN 50306-4</p>
<p>■ Operating temperature [°C] -40 to 125</p>	<p>■ Oil resistance level ★★★</p>	

■ **Typical applications**
This compound with extra low temperature resistance and extra oil resistance is classified as hazard level 4, identification code M. It is an excellent choice for compact wiring systems, where a reduced wall thickness results in space and weight savings.



Rolling Stock, Rapid Transit, Railways

■ **Features**

 Flame retardant	 Halogen-free	 Low smoke
 Oil resistant	 Abrasion resistant	 High temperature resistant
 Flexible	 Flexible at low temperatures	

PHYSICAL PROPERTIES

■ Physical properties	Unit	Typical value	Test method
Density*	g/cm ³	1.40	DIN EN ISO 1183-1A
Hardness*	Shore D	50	DIN ISO 48-4
Melt Flow Index (190°C; 10kg)	g/10 min	4.0	DIN EN ISO 1133
■ Water absorption ***	Unit	Typical value	Test method
Water absorption after 168h at 70°C	mg/cm ²	< 15	EN 50306-1

MECHANICAL PROPERTIES

■ Before cross-linking **	Unit	Typical value	Test method
Tensile strength	N/mm ²	≥ 15	IEC 60811-501
Elongation at break	%	180	IEC 60811-501

■ After cross-linking ***	Unit	Typical value	Test method
Tensile strength (150kGy)	N/mm ²	> 16	IEC 60811-501
Elongation at break (150kGy)	%	> 150	IEC 60811-501
■ After ageing in air oven 240h at 120°C ***	Unit	Typical value	Test method
Variation in tensile strength	%	< 25	IEC 60811-401
Variation in elongation at break	%	< 25	IEC 60811-401

THERMAL PROPERTIES ***

■ Low temperature tests	Unit	Typical value	Test method
Cold bend test at -40°C	-	No cracks	EN 60811-504
Elongation at break at -40°C	%	> 30	IEC 60811-505
■ Heat tests	Unit	Typical value	Test method
Penetration 4h at 140°C	%	< 50	IEC 60811-508
Heat shock 4h at 175°C	%	Pass	IEC 60811-509
Shrinkage test 1h at 120°C	%	< 2	IEC 60811-502
■ Hot set test at 200°C / 15min / 0,2MPa	Unit	Typical value	Test method
Elongation under load	%	< 60	IEC 60811-507
Residual elongation	%	< 10	IEC 60811-507

ELECTRICAL PROPERTIES*

■ Major electrical properties	Unit	Typical value	Test method
Volume resistivity (at 23°C)	Ω cm	≥ 10 ¹⁵	EN 60093
Volume resistivity (at 90°C)	Ω cm	≥ 10 ¹²	EN 60093

RESISTANCE ***

■ Fluid IRM 902 24h at 100°C	Unit	Typical value	Test method
Variation in tensile strength	%	< 30	IEC 60811-404
Variation in elongation at break	%	< 30	IEC 60811-404
■ Ozone resistance	Unit	Typical value	Test method
Method A 250ppm – 24h at 25°C	-	No cracks	EN 50305
Method B 200ppm – 72h at 40°C	-	No cracks	EN 50305

BURNING PROPERTIES*

■ Main burning properties	Unit	Typical value	Test method
LOI	%	32	ASTM D 2863 A
Halogen content	%	0	IEC 754-1
Temperature index	°C	250	ASTM D 2863 D
Toxicity index	ITC	< 3.0	EN 50305
Caloric Value Hu	kJ/kg	18700	DIN 51900-2
■ Acid gas emission	Unit	Typical value	Test method
Corrosivity: pH (min.)	-	> 4.5	IEC 60754-2
Conductivity (max.)	μS/mm	<4	IEC 60754-2

* pressed plaques
 ** extruded tapes
 *** cross-linked plaques / tapes

PROCESSING GUIDE

■ **Extruder type**

Standard extruders for elastomeric or thermoplastic materials.

■ **Screw configuration**

Good results have been achieved with ‘halogen-free’ screws, PE-screws and barrier type screws (BM) having high flights and a L/D-ratio > 25:1. Screws having low shear are recommended.

■ **Extrusion dies**

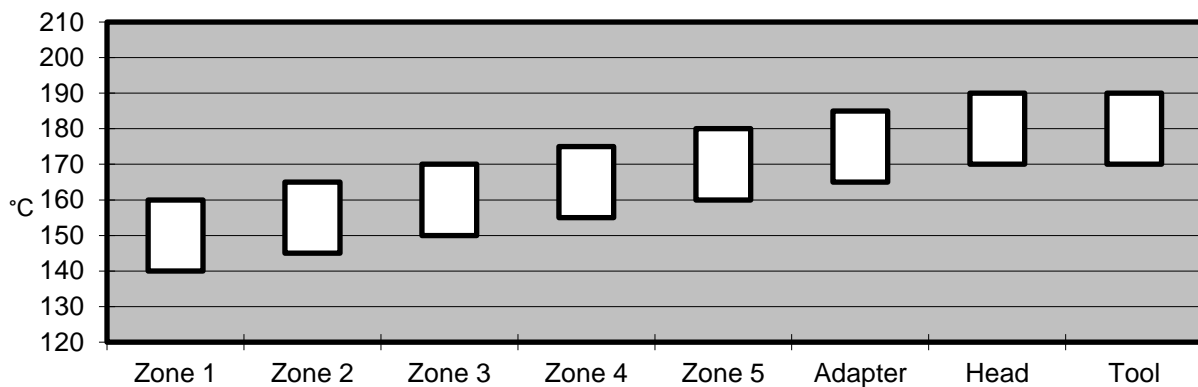
For isolation pressure tools, for jacketing tubing tools are recommended. Pressure extrusion may have effect on low temp. flexibility.

■ **Die opening**

Recommended die opening 5-10% 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**

190°C

■ **Conductor pre-heating**

Usually required to improve elongation at break. Typically in the range of 100°C–140°C (to be optimized).

■ **Wire/conductor**

To achieve a good abrasion resistance, dynamic cut through and low temperature flexibility properties, concentric conductors are required.

■ **Quenching**

Quenching in a hot water bath (80°C) is recommended to improve elongation at break, although good results have also been achieved without hot water cooling.

■ **Drying**

Pre-drying to below 200 ppm humidity is recommended to avoid porosity.

■ **Recommended colour master batches**

Well dispersed PE 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.

CROSS-LINKING INFORMATION

■ **Recommended radiation dose** 125 - 175kGy

STORAGE INFORMATION

■ **Form & packaging** Pellets in sizes 2.8mm
Moisture-resistant bags (25kg) & octabins (alu-innerliner, max. 1250kg)

■ **Shelf life** 1 year after production

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IS 1251 F TDS ENG rev07 *14.04.2022*JT