


## Halogen-free, radiation cross-linkable, flame retardant compound

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









### ■ 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 <sup>3</sup>	<b>1.40</b>	DIN EN ISO 1183-1A
Hardness *	Shore D	<b>51</b>	DIN ISO 48-4
Melt Flow Index (165°C; 21,6kg)	g/10 min	<b>10</b>	DIN EN ISO 1133
■ Water absorption	Unit	Typical value	Test method
Water absorption after 168h at 70°C*	mg/cm <sup>2</sup>	<b>&lt; 15</b>	EN 50306-1

## MECHANICAL PROPERTIES

■ Before crosslinking **	Unit	Typical value	Test method
Tensile strength	N/mm <sup>2</sup>	<b>&gt;15</b>	IEC 60811-501
Elongation at break	%	<b>&gt;200</b>	IEC 60811-501

■ After crosslinking ***	Unit	Typical value	Test method
Tensile strength (150kGy)	N/mm <sup>2</sup>	>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	IEC 60811-504
Elongation at break at -40°C	%	>30	IEC 60811-505
Brittleness temperature (150kGy)	°C	-53,8	ASTM D 746-14
■ 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
Variation in tensile strength	%	< 25	IEC 60811-508
Variation in elongation at break	%	< 25	IEC 60811-508
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
Electrical breakdown	-	No breakdown	EN 50264
Volume resistivity (at 23°C)	Ω cm	10 <sup>15</sup>	IEC 60093
Volume resistivity (at 90°C)	Ω cm	>10 <sup>12</sup>	IEC 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	%	<b>32</b>	ASTM D 2863 A
Halogen content	%	<b>0</b>	IEC 754-1
Temperature index	°C	<b>250</b>	ASTM D 2863 D
Toxicity index	-	<b>2.6</b>	EN 50305

■ Acid gas emission	Unit	Typical value	Test method
Corrosivity: pH (min.)	-	<b>&gt;4.5</b>	IEC 60754-2
Conductivity (max.)	μS/mm	<b>&lt;4</b>	IEC 60754-2

\* pressed plaques  
 \*\* extruded tapes  
 \*\*\* cross-linked plaques or 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**

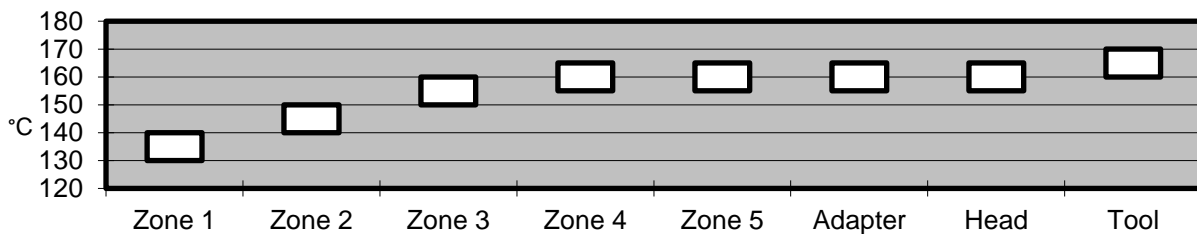
For isolation pressure tools, for jacketing tubing tools are recommended. Pressure extrusion may have effect on low temp. flexibility.

■ **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**

230°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.

## CROSSLINKING INFORMATION

■ **Recommended radiation dose**

125-175 kGy

## 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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