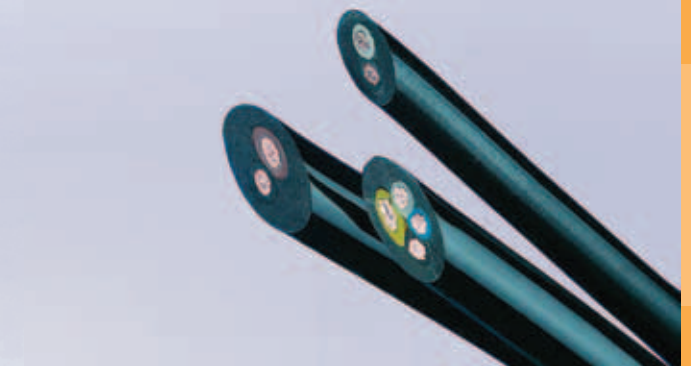
About BASF Elastollan TPU

Elastollan, a thermoplastic polyurethane elastomer made by BASF Corporation, is a material with outstanding potential for innovation.

Elastollan's career as a problem-solver began over 30 years ago in Lemfrode, Germany and has consistently developed and adapted to the requirements of the market. Through customized Elastollan formulations, it is able to meet complex specifications for the most demanding applications. Elastollan has established itself successfully as a multi-talented material in virtually every branch of industry and is now manufactured at several locations throughout the globe.

When the success of your application is critical to your business, choose the most reliable TPU in the industry-Elastollan.



Elastollan

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for wire and cable applications

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Elastollan® for Wire and Cable

Thermoplastic polyurethane (TPU) for wire and cable applications is generally supplied with a surface hardness of 70 Shore A to 75 Shore D. However, the Elastollan TPU product line has grades down to a 35A shore hardness. More flexible TPU's up to 95 Shore A are generally used for cable sheathing on account of their greater elasticity. Harder products are given preference for the insulation of stranded wires. These are sufficiently flexible with low wall thicknesses and have a lower coefficient of friction. All the different degrees of hardness are used for cable connectors, depending on the flexibility required.

Outstanding TPU Properties

The following properties make TPU the ideal material for cable jacketing and insulation:

- Temperature range: - 40 °C to 125 °C
- Excellent low temperature flexibility
- Ageing resistant
- Environmental resistance (humidity, ozone, UV-radiation, microbes)
- Cut and tear propagation resistant
- Wear resistant
- Chemical resistant
- Oil resistant
- High flexural fatigue strength
- Sufficient electrical insulation
- Possible gating of watertight plug, for example of Elastollan

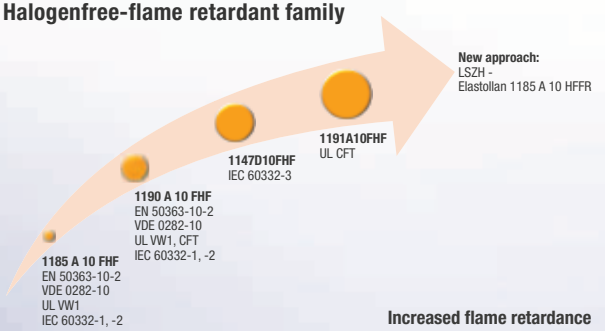
Elastollan 1185 A 10 HFFR vs. FHF mechanical performance

			Elastollan 1185 A 10 HFFR	Elastollan 1185 A 10 FHF
Tensile strength	DIN 53504-S2	MPa	25	35
Elongation at break	DIN 53504-S2	%	580	600
Density	DIN EN ISO 1183-1-A	g/cm³	1.42	1.23
Tear strength	DIN ISO 34-1Bb	N/mm	50	60
Hardness	DIN 53505	Shore A	86	89

Flame Retardant Properties

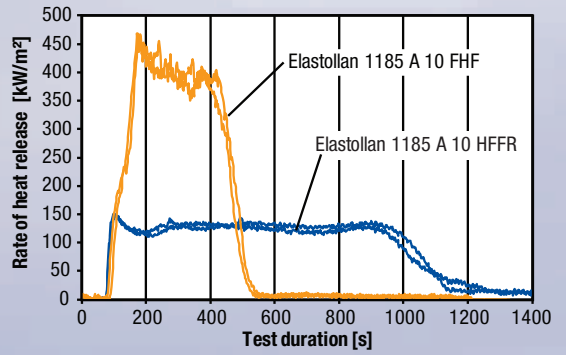
- Halogen-free flame retardant
- Increased flame resistance (i.e. UL 1581 Cable flame test)
- Increased LOI
- Excellent processability, easy to color (can be colored black)
- REACH, RoHS, IMDS
- Good mechanical performance
- Excellent resistance against hydrolysis and microbes
- Good cold temperature flexibility
- Improved rating concerning smoke density and toxicity index

Halogenfree-flame retardant family



Heat Release Properties

Cone calorimeter. ISO 5660 Part 1 (2002-12), heat flux level: 35 kW/m², orientation: horizontal; double measurement, sample thickness 5 mm. Rate of Heat Release of "HFFR" compared with "FHF" is reduced by 68%. Total Heat Release of "HFFR" (143 MJ/m²) to "FHF" (124 MJ/m²) is reduced by 10%



Toxicity of Combustion Gases and Smoke Density

To estimate the hazards of a possible fire, test procedures for toxicity of combustion gases and smoke density need to be considered. The procedures developed to date are however limited because:

- large amounts of strongly toxic carbon monoxide are released in any fire;
- the generation of smoke depends mainly on the fire condition and air supply.

Standards to assess the toxicity of combustion gases and smoke density exist but are not internationally uniform.

The French standard NF 16-101 considers the composition of combustion gases, smoke density and smoke development. This standard has been adopted for railway vehicles in Spain, Portugal and Belgium.

The whole cable construction has to be considered when applying the material specific values to a complete cable. By the use of the form stable TPU instead of another material the thickness of the sheathing often can be reduced – the easiest and most effective way for reducing combustion gases and smoke density.

Toxicity of combustion gases and smoke density

	NF X - 10-702		NF 16-101		
	D_m	VOF 4	ITC (600 °C)	IF	Class
1185 A	97	190	10.8	12.7	F1
1185 A FHF	253	512	32.2	35.7	F2
1885 A HFFR	195	271	6.0	14.0	F1
CR-EM 2	297	578	53.5	49.0	F3
EPDM-EM 3	136	198	4.2	9.5	F1
PV C-YM 2	693	1458	125.5	118.3	F4

Legend

D_m	Maximum optical density
VOF 4	Speed of smoke development during the first 4 minutes
ITC	Conventional toxicity index
IF	Smoke indes, $F=D_m/100 + VOF4/20 + ITC/2$
FO ... F5	Classification by smoke index