



TPE 5187

Flexible Flame Retardant Thermoplastic Vulcanizate (TPV) Compound for FR Insulation and Jacketing Applications

Description

TPE 5187 is a flexible natural, olefin-based thermoplastic vulcanizate (TPV) intended for wire and cable insulation and jacketing applications where high temperature performance and excellent flame resistance are required. Common applications include jacketing for flexible power cords for PLC control units in factories and Paint Booth Cable. **TPE 5187** complies with “Restriction of Hazardous Substances” Directive, Citation 2002-95-EC, commonly known as RoHS. **TPE 5187** exhibits excellent wet and dry electrical properties and superior oil and chemical resistance. It provides good resistance to abrasion, impact and crush. **TPE 5187** exhibits superior low temperature properties as demonstrated by it passing cold bend and impact testing at -40°C.

TPE 5187 contains a halogen-based, flame retardant additive package designed to reduce normal flame spread characteristics. It also offers good extrusion processing characteristics on either conventional polyethylene or PVC extrusion lines.

TPE 5187 is readily pigmented to a variety of colors using standard wire and cable color concentrates designed for thermoplastic or crosslinked polyolefins.

UL Listings (QMTT2E341949)

- 720 hour sunlight resistance
- Dry Rating 105°C
- Wet Rating 75°C

Specifications

Cables manufactured using **TPE 5187** in accordance with standard industry practices should meet the following industry cable specifications:

- Underwriters Laboratories Standard 62 Insulation Class 14, 15 & 16
- Underwriters Laboratories Standard 62 Jacket Class 1.9, 1,10 & 1.11
- Corresponding classes for CSA C22.2 No. 49-14

Physical Properties	Typical Value ^{(2) (4)}	Unit	Test Method ⁽¹⁾
Density	1.23	g / cm ³	ASTM D 792
Tensile Strength	1800 (12.4)	psi (Mpa)	ASTM D 412
Ultimate Elongation	600	%	ASTM D 412
Flexural Modulus	42,000 (290)	psi (Mpa)	ASTM D 790
Heat Aging, 7 days at 136°C			UL 1581
Tensile Strength Retention	90	%	ASTM D 412
Ultimate Elongation Retention	75	%	ASTM D 412
Durometer Hardness, Shore A	90	-	ASTM D 2240
Brittleness Temperature	-40	°C	ASTM D 746
Limiting Oxygen Index	24	%	ASTM D 2863
Oil Resistance 96h @ 100°C			UL 2556
Retained Tensile	95	%	
Retained Elongation	91	%	
Oil Resistance 60 days @ 75°C			UL 2556
Retained Tensile	97	%	
Retained Elongation	89	%	

Electrical Properties	Typical Value ^{(2) (3)}	Unit	Test Method ⁽¹⁾
Dielectric Constant (60 Hz)	2.40	-	ASTM D 150
Dissipation Factor (60 Hz)	0.0027	-	ASTM D 150
Dielectric Strength	660	V / mil	ASTM D 149
Volume Resistivity	1.6 x 10 ¹⁶	Ω cm	ASTM D 257

Chemical Resistance Properties

Samples do not crack, split, dissolve or disintegrate

Not Notched Sample:		Acetone	2-butoxyethanol	de-ionized water	isopropyl alcohol	methy-ethyl ketone	toluene	xylene
Wet	Average Dimension Change	-0.6%	4.0%	0.6%	0.2%	-0.3%	23.0%	25.4%
Wet	Average Weight Change	-4.3%	2.5%	0.1%	-5.5%	-7.8%	10.5%	17.1%
Shore A								
Wet	Immediate Ave.	-2.2%	-1.3%	-0.4%	-0.1%	-2.2%	-14.8%	-15.2%
Wet	15 sec dwell Ave.	-2.3%	-1.0%	-0.4%	-0.8%	-3.0%	-15.6%	-17.1%
Notched Sample:		1	2	3	4	5	6	7
Wet	Average Dimension Change	-1.2%	4.2%	0.8%	0.6%	0.2%	23.6%	27.2%
Wet	Average Weight Change	-5.3%	2.6%	0.1%	-4.7%	-10.2%	9.6%	15.0%
Shore A								
Wet	Immediate Ave.	-2.1%	-1.7%	-0.3%	-0.3%	-2.0%	-15.1%	-14.5%
Wet	15 sec dwell Ave.	-2.2%	-1.5%	-0.4%	-1.0%	-2.4%	-15.6%	-16.6%

Not Notched Sample:		Acetone	2-butoxyethanol	de-ionized water	isopropyl alcohol	methy-ethyl ketone	toluene	xylene
Dry	Average Dimension Change	-3.1%	2.9%	0.9%	-3.6%	-6.0%	-26.6%	-25.9%
Dry	Average Weight Change	-11.9%	1.8%	0.0%	-16.0%	-21.1%	-22.5%	-22.0%
Shore A								
Dry	Immediate Ave.	-2.2%	-0.5%	0.2%	-0.4%	-0.2%	-0.3%	-0.6%
Dry	15 sec dwell Ave.	-1.3%	-0.3%	0.2%	-0.3%	0.3%	0.5%	0.3%
Notched Sample:		1	2	3	4	5	6	7
Dry	Average Dimension Change	-4.7%	3.6%	1.0%	-2.7%	-6.3%	-26.6%	-28.1%
Dry	Average Weight Change	-10.9%	1.8%	0.0%	-16.2%	-21.2%	-22.5%	-21.9%
Shore A								
Dry	Immediate Ave.	-0.5%	-0.6%	0.6%	-0.8%	-0.4%	-0.3%	-0.9%
Dry	15 sec dwell Ave.	-0.4%	-0.2%	1.0%	-0.1%	0.2%	0.7%	-0.4%

- (1) Tested in accordance with the latest issue of the designated Test Methods.
- (2) Data represents typical values and should not be used for specification work.
- (3) All electrical properties tested on a 0.075 inch thick molded plaque.
- (4) All physical properties tested on a 0.030 inch thick extruded tape
- (5) 12 AWG Wire Samples

General Processing Guidelines

The guideline below is meant as a reference to general specifications and process parameters. For more detailed processing information contact M. Holland technical services.

Machine Tool Specifications

Die Design	Pressure tooling is preferred for insulation applications, as well as low draw down or minimal over sizing of the insulation or jacket.
Screw design	3:1 Compression ratio with shear mixer (maddock, barrier, or both)
Screens	20/40/60 recommended. If the extrudate exhibits porosity, try higher mesh screen packs (up to 100 mesh) to increase the melt pressure

Processing Parameters

Temperature settings	Zone 1: 185°C (365°F) Zone 2: 195°C (380°F) Zone 3: 200°C (395°F) Zone 4: 210°C (415°F) Gate and Die: 215°C (420°F)
RPM	This compound is shear dependant to achieve a good melt. Depending on the extruder size, 35 would be a good target. Use shear heat from the extruder before adjusting the heat profile.
Wire preheat	Preheating wire to a minimum of 120°C (250°F) will increase initial elongation properties and retention after heat aging.
Melt temperature	210 to 220°C (415 to 425°F)

Cooling	Slower cooling rates improve the elongation retention (after heat aging) of the insulation and jacket. This can be achieved by lowering the line speed, increasing the preheating of the wire, using warm water cooling or sequential cooling baths with warm to cold water.
Drying	It is recommended to dry the material prior to processing. Use a desiccant dryer for 3 hours at 80°C (180°F)
Coloring	The addition of any carrier resin can affect material properties, including hardness and retention properties. Some pigments also affect these properties. Pre-coloring or standard color concentrates (master batches) that use PP, TPE, PE, SEBS as the carrier can be used. Carrier-less color concentrates may also be used. Color concentrate addition of up to 3% has been used without dramatically affecting properties.

Warning: This compound is subject to instability if left at processing temperatures static in the extruder. A slow purge is recommended for line down situations.

Liability

Information contained in this publication is accurate to the reasonable knowledge of the publisher. M. Holland does not accept any liability whatsoever arising out of the use of the information in this document or the use, application, adaptation or processing of the products described herein.

All information is given in good faith, without warranty, representation, inducement or license of any kind. No guarantee is given that M. Holland products will be suitable in purchasers' constructions or processes for any particular end use. No one is authorized to make representations or give warranties or assume any other liabilities on behalf of M. Holland except if in writing and signed by a duly authorized M. Holland employee.

The purpose of the information contained herein is to assist our present and potential customers in determining whether our products are suitable for their applications. Our products are intended for sale to industrial and commercial customers. It is the customer's responsibility to inspect and test our products and to consult the related Material Safety Data Sheet before use in order to satisfy itself as to the contents of the products and the suitability of the products for the customer's particular purpose. Although the information contained herein is to our knowledge accurate and reliable as of the date hereof, nothing herein shall constitute any warranty (express or implied, of merchantability, fitness or otherwise) and no statement herein shall be construed as an endorsement of any product or process. M. Holland shall not be liable for special, incidental, or consequential damages arising out of the use of the products based upon a breach of warranty, breach of contract, negligence, strict tort liability or any other legal theory.