Riteflex® thermoplastic polyester elastomer Short Term Properties Brochure

Thermoplastic polyester elastomer

RF-4

Riteflex® *Thermoplastic polyester elastomer*

Celanese
Ticona
A business of Celanese AG

Riteflex® *Thermoplastic polyester elastomer*

Introduction

Riteflex® thermoplastic polyester elastomers (TPE) are well-suited for applications which require toughness, and where thermosets and lower performance thermoplastic elastomers cannot perform. Riteflex® TPE combines excellent fatigue resistance with outstanding chemical resistance, good low temperature impact and a wide temperature use range (-40˚F to 250˚F). Consult the appropriate Material Safety Data Sheet (MSDS) before attempting to process Riteflex thermoplastic polyester elastomer.

Application Areas

- Hose and tubing
- Seals and gaskets
- Belts
- Pump diaphragms
- Energy absorbing devices
- Coil (wire) coating
- Hooks and fasteners
- Film and sheet
- Electrical/Electronic connectors
- Nonwoven fabric
- Footwear hardware
- Polymer modification
- Monofilament

635 Extrusion/Injection Grade, 35 Shore D Hardness.

640 Extrusion/Injection Grade, 40 Shore D Hardness.

647 Extrusion/Injection Grade, 47 Shore D Hardness.

655 Extrusion/Injection Grade, 55 Shore D Hardness.

663 Extrusion/Injection Grade, 63 Shore D Hardness.

672 Extrusion/Injection Grade, 72 Shore D Hardness.

677 Extrusion/Injection Grade, 77 Shore D Hardness.

Riteflex® Thermoplastic Polyester Elastomer – Typical ASTM Properties

Properties		ASTM Test Method	Units	635	640	647	655	663	672	677
Physical										
Specific Gravity		D792	—	1.14	1.15	1.17	1.19	1.24	1.25	1.29
Water Absorption, 24 Hr. Immersion		D570	%	0.6	0.5	0.5	0.4	0.3	0.2	0.2
Mold Shrinkage, Flow Direction		D955	in/in	0.009	0.010	0.013	0.015	0.019	0.020	0.020
Mechanical										
Tensile Strength, (Type I bar)	@ 5% Yield	D638	psi	380	561	875	1,291	1,844	2,760	3,260
	@ 10% Yield	D638	psi	607	912	1,341	1,884	2,596	3,628	4,130
Tensile Strength, (Type IV bar),	@ Break	D638	psi	1,920	3,000	3,260	3,650	3,800	4,240	5,000
Elongation	@ Break	D638	%	470	480	470	430	320	300	310
Tensile Modulus		D638	psi	8,400	13,400	21,900	34,900	52,900	42,100	100,000
Flexural Modulus	@ -40°C	D790	psi	12,300	22,400	53,800	98,200	226,800	343,700	—
	@ 23°C	D790	psi	8,800	12,300	21,300	30,500	47,200	74,200	100,000
	@ 100°C	D790	psi	4,650	7,500	11,900	16,100	23,500	32,200	—
Izod Impact, Notched	@ -40°C	D256	ft lb/in	NB	NB	5.1	2.7	0.5	0.7	0.7
	@ 23°C	D256	ft lb/in	NB	NB	NB	NB	NB	4.1	4.1
Tear Strength		D1004	lb/in	575	630	720	840	1,100	1,240	2,065
Tear Strength		D624	lb/in	490	720	930	930	1,050	1,220	2,040
Resilience, Bashore		D2632	%	60	59	53	48	40	40	40
Ross Flex		D1052	cycles to failure	>1MM	>1MM	>1MM	>1MM	>1MM	>1MM	>1MM
Taber Abrasion†		D1044	mg/1000 cycles	121	90	67	85	62	30	30
Durometer Hardness		D2240	(Shore D)	35	40	47	55	63	72	77
Thermal										
Melt Index	@ 220°C	D1238	gms/10 min.	10 –15	8 –12	8 –12	7–11	8 –12*	10–15**	10 –20**
Melt Point		D3418	°C	164	180	191	200	208	214	217
Softening Point, Vicat		D1525	°C	107	136	162	181	195	—	204
Coefficient of Linear Thermal Expansion		E831	$x10^{-5}$ cm/cm/°C	22.5	22.1	20.5	19.8	18.0	17.3	17.3

* Melt index run @ 230°C

** Melt index run @ 240°C

† H-18 Wheel, 1000 g weight

Riteflex® Thermoplastic Polyester Elastomer – Typical ISO Properties

Properties	Units	ISO Test Method	635	640	647	655	663	672	677
Mechanical									
Tensile Strength at Break	MPa		19.8	22	28.2	34.2	42.2		44.5
Tensile Modulus[3]	MPa	ISO 527	60	66	125	190	360		690
Flex Modulus	MPa	ISO 178	65	85	125	205	360	470	750
Flex Stress @3.5% Deflection	MPa	ISO 178	2.3	2.9	4.3	6.8	11		23
Electrical									
Relative Permittivity at 1MHz		DIN VDE 0303	4.7	4.7	4.6	4.4	4		3.3
Dissipation Factor at 1MHz		IEC250	0.03	0.03	0.04	0.04	0.04		0.02
Dielectric Strength P25/P75	kV/mm	IEC 243 Teil 1	13	13	13	14	14		16
Comparative Tracking Index (CTI)	V	DIN VDE 0303 Part 2, IEC 122	>600	>600	>600	>600	>600		>600
Volume Resistivity	ohm-cm	IEC 93	5×10^{12}	5×10^{12}	5×10^{12}	4×10^{12}	2×10^{13}		4×10^{14}

1) 50 mm/min
2) 5 mm/mimn
3) 1mm/min, secant at 0.05 to 0.25% elongation

Eng. Units	x	Conversion Factor	=	S.I. Units
ft-lb/in		53.40		J/m
ft-lb/in²		2.11		kJ/m²

Temperature conversion

°C to °F, use formula: °F = (1.8 x °C) + 32

Riteflex® 655 vs. 655HS, *Thermal Property Comparison

Property	ASTM Test Method	655	655HS
% Retention after 1 week, (oven aged @ 145°C)			
Tensile Strength	D638	82	98
Tensile Elongation	D638	10	95
% Retention after 3 weeks, (oven aged @ 145°C)			
Tensile Strength	D638	19	88
Tensile Elongation	D638	1	31
% Retention after 5 weeks, (oven aged @ 145°C)			
Tensile Strength	D638	††	80
Tensile Elongation	D638	††	31

†† Specimen too brittle to test.
* Unaged 655HS properties similar to 655, data sheets available upon request.

Typical Molding Conditions

Machine Parameters	635	640	647	655, 663, 672, 677
Barrel Temps.				
Rear	310 – 340˚F	325 – 360˚F	370 – 390˚F	390 – 420˚F
Center	340 – 360˚F	360 – 390˚F	390 – 410˚F	420 – 450˚F
Front	340 – 360˚F	360 – 400˚F	390 – 420˚F	420 – 460˚F
Nozzle	340 – 370˚F	360 – 400˚F	390 – 420˚F	420 – 460˚F
Melt Temp.*	340 – 370˚F	360 – 400˚F	390 – 420˚F	430 – 460˚F
Mold Temp.	75 – 125˚F	75 – 125˚F	75 – 125˚F	75 – 125˚F
Injection Pressure	low – med	low – med	low – med	low – med
Injection Speed	fast	fast	fast	fast
Screw Speed	60 – 125 rpm	60 – 125 rpm	60 – 125 rpm	60 – 125 rpm
Back Pressure	0 – 50 psi	0 – 50 psi	0 – 50 psi	0 – 50 psi
Cushion/Pad	0.2 – 0.4 in.	0.2 – 0.4 in.	0.2 – 0.4 in.	0.2 – 0.4 in.

* Determine melt temperature using a hand held pyrometer under actual processing conditions.

Injection Pressure: Keep the injection pressure low when starting the molding cycle; this will produce short shots. Gradually increase pressure by 50 – 100 psi until the cavity fills completely. When complete parts are ejected from the mold, raise the injection pressure approximately 100 psi, making sure the material does not flash.

Drying: Material must be dried for 4 hours @ 225˚F. Pellet moisture content must be ≤ 0.05%.

Regrind: Regrind should not exceed 25% when mixed with virgin material. Regrind must also be dried following the suggested conditions.

Extrusion: Melt temperatures should be 10˚F above the low end of the typical melt range. Set the barrel temperatures to produce the suitable melt temperature.

Ticona

NOTICE TO USERS: To the best of our knowledge, the information contained in this publication is accurate, however we do not assume any liability whatsoever for the accuracy and completeness of such information. Further, the analysis techniques included in this publication are often simplifications and, therefore, approximate in nature. More vigorous analysis techniques and/or prototype testing are strongly recommended to verify satisfactory part performance. Anyone intending to rely on such recommendation or to use any equipment, processing technique or material mentioned in this publication should satisfy themselves that they can meet all applicable safety and health standards.

It is the sole responsibility of the users to investigate whether any existing patents are infringed by the use of the materials mentioned in this publication.

Any determination of the suitability of a particular material for any use contemplated by the user is the sole responsibility of the user. The user must verify that the material, as subsequently processed, meets the requirements of the particular product or use. The user is encouraged to test prototypes or samples of the product under the harshest conditions likely to be encountered to determine the suitability of the materials.

Material data and values included in this publication are either based on testing of laboratory test specimens and represent data that fall within the normal range of properties for natural material or were extracted from various published sources. All are believed to be representative. Colorants or other additives may cause significant variations in data values. These values are not intended for use in establishing maximum, minimum, or ranges of values for specification purposes.

We strongly recommend that users seek and adhere to the manufacturer's or supplier's current instructions for handling each material they use. Please call 1-800-833-4882 for additional technical information. Call Customer Services at the number listed below for the appropriate Material Safety Data Sheets (MSDS) before attempting to process these products. Moreover, there is a need to reduce human exposure to many materials to the lowest practical limits in view of possible adverse effects. To the extent that any hazards may have been mentioned in this publication, we neither suggest nor guarantee that such hazards are the only ones that exist.

Riteflex® Thermoplastic Polyester Elastomers are not intended for use in medical or dental implants.

Products offered by Ticona

Celcon® and Hostaform® *acetal copolymer (POM)*

GUR® *ultra-high molecular weight polyethylene (UHMW-PE)*

Celanex® *thermoplastic polyester*

Impet® *thermoplastic polyester*

Vandar® *thermoplastic polyester alloy*

Riteflex® *thermoplastic polyester elastomer*

Vectra® *liquid crystal polymer (LCP)*

Vectran™ *liquid crystal polymer (LCP)*

Celstran® *long fiber reinforced thermoplastic (LFRT)*

Fortron® *polyphenylene sulfide (PPS)*

Celanese® *nylon 6/6 (PA 6/6)*

Topas® *cyclic olefin copolymer (COC)*

North America
Ticona
90 Morris Avenue
Summit, NJ 07901

Technical Information
1-800-833-4882
prodinfo@ticona.com

Customer Service
1-800-526-4960

Visit our Internet Site at http://www.ticona.com for further information.

Celanese
Ticona
A business of Celanese AG

Riteflex® *Thermoplastic polyester elastomer*