

Technical Information

Introduction

Viton™ A-401C* fluoroelastomer is an incorporated cure “A-family” dipolymer designed for compression molding of sealing devices that must meet specific fluoroelastomer specifications. In addition to the heat and chemical resistance characteristics typical of Viton™ fluoroelastomers, Viton™ A-401C offers significant improvements in processing and rheology. Viton™ A-401C can be blended with similar Viton™ types to provide variations in processing, properties, and shrinkage.

Features

Compared with Viton™ E-60C, Viton™ A-401C features:

- Fully precompounded
 - O-ring curative level
- Improved compression molding
 - Increased mold flow
 - Easier mold release
 - Less mold fouling
- Improved extrusion
- Increased cure rate
- Improved compression set resistance
- Same mold shrinkage as Viton™ E-60C

Applications

Viton™ A-401C is highly recommended for O-rings, extruded cord, gaskets, seals, and profiles. Viton™ A-401C can be formulated to meet fluoroelastomer specifications Mil-R-83248B, AMS 7276D, and AMS 7259A.

*Viton™ A-401C was formerly named VTR-6600.

Product Description

Chemical Composition:	Dipolymer of hexafluoropropylene and vinylidene fluoride plus cure chemicals
Physical Form	Sheet
Appearance	Off-white
Odor	None
Mooney Viscosity, ML 1 + 10 at 121 °C (250 °F)	42
Specific Gravity	1.82
Storage Stability	Excellent
Solubility	Low molecular weight esters and ketones

Safety and Handling

Before handling or processing Viton™ A-401C, read and be guided by the recommendations in the Chemours technical bulletin, “Handling Precautions for Viton™ and Related Chemicals.”

Viton™ A-401C should be handled like other Viton™ fluoroelastomers. Keep off skin and wash well after handling. For the safe handling of other compounding ingredients, refer to the respective manufacturers’ literature.



Table 1. Performance of Viton™ A-401C in Typical Compounds

	Viton™ A-401C	Viton™ A	Viton™ E-60C	Viton™ A-201C
Viton™ A-401C	100	—	—	—
Viton™ A	—	94.35	—	—
Viton™ E-60C	—	—	100	—
Viton™ A-201C	—	—	—	100
High-Activity MgO	3	3	3	3
Calcium Hydroxide	6	6	6	6
MT Black (N990)	30	30	30	30
Viton™ Curative No. 20	—	1.65	—	—
Viton™ Curative No. 30	—	4	—	—
Stock Properties				
Viscosity, ML 1 + 10 at 121 °C (250 °F)				
Units	80	106	78	42
Mooney Scorch, MS at 121 °C (250 °F)				
Minimum, in-lb	43	57	41	23
2-pt rise, min	17.9	>30	>30	>30
5-pt rise, min	>30	—	—	—
ODR at 177 °C (350 °F), Microdie, 3° Arc, 15 min				
M _L , in-lb	15	18	11	9
t ₂ , min	1.7	2.8	2.2	1.9
t ₉₀ , min	3.2	7.0	4.5	3.3
M _{c90} , in-lb	112	127	111	103
M _H , in-lb	122	139	122	113
Rosand Capillary Rheometer at 100 °C (212 °F), 1.5 mm Die, L/D = 0/1				
<i>Piston Speeds</i>	<i>Shear Rate</i>		<i>Pressure, MPa</i>	
12.7 mm/min	113 sec ⁻¹	7.6	8.7	7.6
50.8 mm/min	452 sec ⁻¹	10.7	11.5	12.1
127 mm/min	1130 sec ⁻¹	18.7	16.1	28.0
Vulcanizate Properties				
Slabs Cured: 10 min at 177 °C (350 °F)—Post-Cured: 24 hr at 232 °C (450 °F)				
Stress/Strain at 23 °C (73 °F)—Original, no post-cure				
100% Modulus, MPa (psi)	4.6 (665)	5.2 (755)	4.2 (610)	4.0 (575)
Tensile Strength, MPa (psi)	9.9 (1,440)	9.6 (1,390)	9.0 (1,305)	8.8 (1,275)
Elongation at Break, %	257	202	266	261
Hardness, durometer A, pts	74	75	74	77
Stress/Strain at 23 °C (73 °F)—Original, post-cured				
100% Modulus, MPa (psi)	6.4 (925)	8.5 (1,235)	6.3 (920)	5.9 (855)
Tensile Strength, MPa (psi)	13.4 (1,950)	16.2 (2,345)	12.9 (1,870)	13.0 (1,890)
Elongation at Break, %	199	173	194	211
Hardness, durometer A, pts	75	79	76	79



Table 1. Performance of Viton™ A-401C in Typical Compounds (continued)

	Viton™ A-401C	Viton™ A	Viton™ E-60C	Viton™ A-201C
Stress/Strain at 23 °C (73 °F)—After aging 70 hr at 200 °C (392 °F)				
100% Modulus, MPa (psi)	6.9 (995)	9.2 (1,340)	6.8 (985)	5.9 (850)
Tensile Strength, MPa (psi)	14.0 (2,035)	16.4 (2,385)	13.5 (1,955)	11.9 (1,725)
Elongation at Break, %	198	168	198	195
Hardness, durometer A, pts	78	78	77	83
Stress/Strain at 23 °C (73 °F)—After aging 168 hr at 200 °C (392 °F)				
100% Modulus, MPa (psi)	7.0 (1,015)	9.2 (1,340)	7.1 (1,035)	6.2 (900)
Tensile Strength, MPa (psi)	13.9 (2,020)	16.9 (2,455)	13.4 (1,940)	13.0 (1,880)
Elongation at Break, %	187	176	187	200
Hardness, durometer A, pts	76	79	77	80
Stress/Strain at 23 °C (73 °F)—After aging 70 hr at 232 °C (450 °F)				
100% Modulus, MPa (psi)	7.2 (1,050)	9.4 (1,365)	7.1 (1,030)	6.2 (905)
Tensile Strength, MPa (psi)	14.0 (2,035)	15.9 (2,300)	13.9 (2,010)	12.4 (1,795)
Elongation at Break, %	177	152	183	184
Hardness, durometer A, pts	80	79	80	82
Compression Set, Method B, O-Rings, %				
70 hr at 23 °C (73 °F)	6	7	10	6
70 hr at 200 °C (392 °F)	15	19	21	16
168 hr at 200 °C (392 °F)	21	30	29	26
336 hr at 200 °C (392 °F)	29	—	38	47
70 hr at 232 °C (450 °F)	37	46	47	38

Table 2. Effect of Carbon Black Level in Viton™ A-401C

	60 phr	45 phr	30 phr	15 phr	5 phr	2 phr
Viton™ A-401C	100	100	100	100	100	100
High-Activity MgO	3	3	3	3	3	3
Calcium Hydroxide	6	6	6	6	6	3
MT Black (N990)	60	45	30	15	5	2
Stock Properties						
Viscosity, ML 1 + 10 at 121 °C (250 °F)						
Units	115	98	80	67	62	57
Mooney Scorch, MS at 121 °C (250 °F)						
Minimum, in-lb	62	51	43	37	33	29
2-pt rise, min	14.2	13.1	17.9	21.0	>30	>30
5-pt rise, min	29.1	28.7	>30	>30	—	—
10-pt rise, min	>30	>30	—	—	—	—
ODR at 177 °C (350 °F), Microdie, 3° Arc, 15 min						
M _t , in-lb	23	21	15	17	15	14
t ₂ , min	1.3	1.5	1.7	1.9	2.1	2.8
t _{c90} , min	2.6	2.8	3.2	3.4	3.6	4.6
M _{c90} , in-lb	150	138	112	108	93	84
M _t , in-lb	164	151	122	118	102	92

Table 2. Effect of Carbon Black Level in Viton™ A-401C (continued)

	60 phr	45 phr	30 phr	15 phr	5 phr	2 phr
Vulcanizate Properties						
Slabs Cured: 10 min at 177 °C (350 °F)—Post-Cured: 24 hr at 232 °C (450 °F)						
Stress/Strain at 23 °C (73 °F)—Original, no post-cure						
100% Modulus, MPa (psi)	7.1 (1,030)	6.1 (885)	4.6 (665)	2.9 (425)	1.8 (265)	1.4 (205)
Tensile Strength, MPa (psi)	9.2 (1,340)	9.8 (1,420)	9.9 (1,440)	8.6 (1,250)	7.4 (1,075)	5.6 (810)
Elongation at Break, %	180	223	257	254	269	252
Hardness, durometer A, pts	87	81	74	63	57	53
Stress/Strain at 23 °C (73 °F)—Original, post-cured						
100% Modulus, MPa (psi)	11.9 (1,730)	9.4 (1,360)	6.4 (925)	3.7 (535)	2.1 (310)	1.4 (210)
Tensile Strength, MPa (psi)	14.5 (2,105)	13.9 (2,020)	13.4 (1,950)	11.4 (1,660)	9.7 (1,405)	6.5 (945)
Elongation at Break, %	130	156	199	216	240	239
Hardness, durometer A, pts	90	84	75	63	57	53
Stress/Strain at 23 °C (73 °F)—After aging 70 hr at 200 °C (392 °F)						
100% Modulus, MPa (psi)	12.1 (1,760)	9.8 (1,415)	6.9 (995)	3.7 (530)	2.0 (295)	1.5 (215)
Tensile Strength, MPa (psi)	14.1 (2,050)	14.6 (2,115)	14.0 (2,035)	11.6 (1,675)	9.4 (1,360)	7.4 (1,080)
Elongation at Break, %	124	159	198	220	243	255
Hardness, durometer A, pts	93	86	78	67	60	57
Stress/Strain at 23 °C (73 °F)—After aging 168 hr at 200 °C (392 °F)						
100% Modulus, MPa (psi)	12.7 (1,840)	10.3 (1,495)	7.0 (1,015)	3.7 (540)	2.2 (315)	1.6 (225)
Tensile Strength, MPa (psi)	14.6 (2,115)	14.2 (2,055)	13.9 (2,020)	12.1 (1,750)	9.6 (1,390)	8.1 (1,170)
Elongation at Break, %	120	144	187	217	234	258
Hardness, durometer A, pts	93	87	76	68	61	58
Stress/Strain at 23 °C (73 °F)—After aging 70 hr at 232 °C (450 °F)						
100% Modulus, MPa (psi)	13.4 (1,945)	10.9 (1,580)	7.2 (1,050)	3.8 (550)	2.0 (290)	1.5 (220)
Tensile Strength, MPa (psi)	13.8 (2,005)	13.7 (1,980)	14.0 (2,035)	12.7 (1,840)	9.3 (1,345)	7.3 (1,060)
Elongation at Break, %	104	127	177	220	241	249
Hardness, durometer A, pts	92	86	80	69	62	57
Compression Set, Method B, O-Rings, %						
70 hr at 23 °C (73 °F)	15	9	6	6	3	3
70 hr at 200 °C (392 °F)	21	18	15	13	9	12
168 hr at 200 °C (392 °F)	29	26	21	19	18	18
336 hr at 200 °C (392 °F)	38	33	29	25	25	24
70 hr at 232 °C (450 °F)	46	41	37	35	35	31



Table 3. Effect of Mineral Fillers on Viton™ A-401C

	MT Black	Albaglos®	Nyad® 400	Celite® 350	Blanc Fixe	Ti-Pure™ R-960
Viton™ A-401C	100	100	100	100	100	100
High-Activity MgO	3	3	3	3	3	3
Calcium Hydroxide	6	6	6	6	6	3
MT Black (N990)	30	—	—	—	—	—
Albaglos®	—	30	—	—	—	—
Nyad® 400	—	—	30	—	—	—
Celite® 350	—	—	—	30	—	—
Blanc Fixe	—	—	—	—	30	—
Ti-Pure™ R-960	—	—	—	—	—	30
Stock Properties						
Viscosity, ML 1 + 10 at 121 °C (250 °F)						
Units	80	87	80	107	75	78
Mooney Scorch, MS at 121 °C (250 °F)						
Minimum, in-lb	43	46	42	56	39	40
2-pt rise, min	17.9	>30	>30	>30	>30	>30
5-pt rise, min	>30	—	—	—	—	—
ODR at 177 °C (350 °F), Microdie, 3° Arc, 15 min						
M _L , in-lb	15	22	20	24	19	19
t _{g2} , min	1.7	1.7	1.9	1.7	2.0	1.9
t _{c90} , min	3.2	3.6	3.0	2.9	3.5	4.1
M _{c90} , in-lb	112	114	112	122	104	98
M _H , in-lb	122	124	122	132	113	106
Vulcanizate Properties						
Slabs Cured: 10 min at 177 °C (350 °F)—Post-Cured: 24 hr at 232 °C (450 °F)						
Stress/Strain at 23 °C (73 °F)—Original, no post-cure						
100% Modulus, MPa (psi)	4.6 (665)	3.9 (565)	4.1 (600)	5.9 (850)	2.7 (395)	2.7 (395)
Tensile Strength, MPa (psi)	9.9 (1,440)	8.8 (1,270)	7.4 (1,075)	9.8 (1,420)	7.0 (1,010)	8.9 (1,295)
Elongation at Break, %	257	225	248	240	250	307
Hardness, durometer A, pts	74	67	67	76	61	64
Stress/Strain at 23 °C (73 °F)—Original, post-cured						
100% Modulus, MPa (psi)	6.4 (925)	6.5 (945)	8.4 (1,225)	14.4 (2,090)	3.4 (490)	4.1 (600)
Tensile Strength, MPa (psi)	13.4 (1,950)	12.8 (1,860)	11.4 (1,660)	15.8 (2,290)	9.9 (1,435)	11.0 (1,595)
Elongation at Break, %	199	153	154	110	211	176
Hardness, durometer A, pts	75	67	67	79	63	66
Stress/Strain at 23 °C (73 °F)—After aging 70 hr at 200 °C (392 °F)						
100% Modulus, MPa (psi)	6.9 (995)	6.7 (975)	8.4 (1,225)	14.9 (2,160)	3.7 (535)	4.2 (605)
Tensile Strength, MPa (psi)	14.0 (2,035)	13.7 (1,990)	11.1 (1,615)	16.4 (2,375)	10.6 (1,540)	12.0 (1,745)
Elongation at Break, %	198	159	146	111	215	188
Hardness, durometer A, pts	78	69	68	80	64	66



Table 3. Effect of Mineral Fillers on Viton™ A-401C (continued)

	MT Black	Albaglos®	Nyad® 400	Celite® 350	Blanc Fixe	Ti-Pure™ R-960
Stress/Strain at 23 °C (73 °F)—After aging 168 hr at 200 °C (392 °F)						
100% Modulus, MPa (psi)	7.0 (1,015)	6.1 (880)	7.2 (1,050)	12.2 (1,775)	3.2 (470)	3.8 (545)
Tensile Strength, MPa (psi)	13.9 (2,020)	13.1 (1,905)	10.7 (1,555)	14.9 (2,165)	9.6 (1,390)	12.0 (1,745)
Elongation at Break, %	187	187	203	129	242	214
Hardness, durometer A, pts	76	70	69	79	64	67
Stress/Strain at 23 °C (73 °F)—After aging 70 hr at 232 °C (450 °F)						
100% Modulus, MPa (psi)	7.2 (1,050)	6.3 (915)	7.5 (1,090)	12.7 (1,840)	3.2 (460)	3.8 (545)
Tensile Strength, MPa (psi)	14.0 (2,035)	13.2 (1,920)	10.8 (1,565)	15.1 (2,190)	9.7 (1,410)	12.8 (1,860)
Elongation at Break, %	177	179	189	125	245	220
Hardness, durometer A, pts	80	70	69	78	63	66
Compression Set, Method B, O-Rings, %						
70 hr at 23 °C (73 °F)	6	3	4	6	6	6
70 hr at 200 °C (392 °F)	15	18	13	18	12	12
168 hr at 200 °C (392 °F)	21	28	24	25	21	21
336 hr at 200 °C (392 °F)	29	41	29	32	29	26
70 hr at 232 °C (450 °F)	37	41	35	38	34	31



Table 4. Performance of Viton™ A-401C in Fluoroelastomer Specifications

Viton™ A-401C			
Viton™ A-401C	100		
High-Activity MgO	3		
Calcium Hydroxide	6		
MT Black (N990)	30		
Vulcanizate Properties		Mil-R-83248B (Amendment I)	AMS 7276D
Slabs Cured: 10 min at 177 °C (350 °F)—Post-Cured: 24 hr at 232 °C (450 °F)			
Stress/Strain at 23 °C (73 °F)—Original, post-cured			
Tensile Strength, MPa (psi)	13.7 (1,985)	9.65 (1,400)	9.65 (1,400)
Elongation at Break, %	191	125	125
Hardness, durometer A, pts	76	75 ± 5	75 ± 5
TR10 (max. °C [°F])	-15 (+5)	-15 (+5)	-15 (+5)
Specific Gravity	1.84	—	—
Stress/Strain at 23 °C (73 °F)—After aging 70 hr at 275 °C (527 °F)			
Tensile Strength, % change (max.)	-23	-35	-35
Elongation at Break, % change (max.)	+21	-15	-15
Hardness, pts change	0	-5 to +10	0 to +10
Weight Loss, %	4	10	10
Stress/Strain at 23 °C (73 °F)—After aging 70 hr at 23 °C (73 °F) in TT-S-735 Type III (ASTM Reference Fuel B)			
Tensile Strength, % change (max.)	-8	-20	-15
Elongation at Break, % change (max.)	-3	-20	-15
Hardness, pts change	-1	-5 to +5	-5 to +5
Volume Swell, %	+1	+1 to +10	+0 to +5
Stress/Strain at 23 °C (73 °F)—After aging 70 hr at 175 °C (347 °F) in AMS 3021 (Stauffer 7700 Blend)			
Tensile Strength, % change (max.)	-15	-30	-30
Elongation at Break, % change (max.)	-7	-20	-20
Hardness, pts change	-10	0 to -15	-15 to +5
Volume Swell, %	+15	+1 to +20	++0 to +20
Compression Set, Method B, %, O-Rings, 25 x 3.5 mm (0.984 x 0.139 in)			
70 hr at 23 °C (73 °F)	6	15	—
166 hr at 175 °C (347 °F)	16	20	—
22 hr at 200 °C (392 °F)	9	20	—
70 hr at 200 °C (392 °F)	16	—	20
336 hr at 200 °C (392 °F)	30	—	40



Test Procedures

Property Measured	Test Procedure
Compression Set	ASTM D3955, Method B (25% deflection)
Compression Set, O-Rings	ASTM D1414
Hardness	ASTM D2240, durometer A
Mooney Scorch	ASTM D1646, using the small rotor. Minimum viscosity and time to a 1-, 5-, or 10-unit rise are reported.
Mooney Viscosity	ASTM D1646, ten pass 121 °C (250 °F)
ODR (vulcanization characteristics measured with an oscillating disk cure meter)	ASTM D2084
Property Change After Oven Heat-Aging	ASTM D573
Stress/Strain Properties 100% Modulus Tensile Strength Elongation at Break	ASTM D412, pulled at 8.5 mm/sec (20 in/min)
Temperature Retraction	ASTM D1329
Volume Change in Fluids	ASTM D471

Note: Test temperature is 24 °C (75 °F), except where specified otherwise.

