



Viton[®] fluoroelastomer

From DuPont Performance Elastomers

Viton[®] A-361C

Introduction

Viton[®] A-361C* is an incorporated cure A-family dipolymer designed for the injection and transfer molding of parts requiring better metal adhesion along with the fluid and heat resistance characteristics typical of fluoroelastomers. The moderate viscosity level of Viton[®] A-361C also allows for satisfactory compression molding of parts.

Features of Viton[®] A-361C are:

- Intermediate viscosity level (when compared with Viton[®] A-201C/Viton[®] A-401C)
- Fully precompounded
 - reduced curative level
 - incorporated metal adhesion promoter
- Improved processing
 - increased mold flow
 - easier mold release with less mold fouling
 - improved demolding “hot tear”
- Good metal bonding with standard industrial primers

Applications

Compression, transfer, and injection molding of:

- O-rings and gaskets
- Valve stem and crankshaft seals (and other bonded parts requiring fluid and heat resistance of the A-family of Viton[®])

*Viton[®] A-361C was formerly VT-R-7152.

Use of Viton[®] A-361C

Table 1 compares compounds of Viton[®] A-361C, Viton[®] A-201C, and Viton[®] A-401C; *Table 2* compares the effects of carbon black levels in Viton[®] A-361C; and *Table 3* compares the use of mineral fillers in Viton[®] A-361C.

Product Description

Chemical Composition	Dipolymer of hexafluoropropylene and vinylidene fluoride, plus cure chemicals and metal adhesion promoter
Physical Form	Slab
Color	Off-white
Odor	None
Specific Gravity	1.82
Solubility	Low molecular weight esters and ketones
Storage Stability	Excellent
Mooney Viscosity (ML 1 + 10 at 121°C [250°F])	31

Safety and Handling

Before handling or processing Viton[®] A-361C, read and follow the recommendations in the DuPont Performance Elastomers technical bulletin “Handling Precautions for Viton[®] and Related Chemicals.”

Viton[®] A-361C should be handled like other types of Viton[®]. Keep off skin and wash well after handling. For the safe handling of other compounding ingredients, please refer to the respective manufacturers’ literature.

Table 1
Performance of Viton® A-361C in Typical Compounds

	A Viton® A-361C	B Viton® A-201C	C Viton® A-401C	D Viton® A-361C Shaft Seal Compounds	E Viton® A-361C
Viton® A-361C	100	—	—	100	100
Viton® A-201C	—	100	—	—	—
Viton® A-401C	—	—	100	—	—
High Activity MgO	3	3	3	6	6
Calcium Hydroxide	6	6	6	3	3
MT Black (N990)	30	30	30	30	—
Nyad® 400	—	—	—	—	20
Blanc Fixe	—	—	—	—	20
Carnauba Wax	—	—	—	0.5	0.5

Stock Properties

Viscosity, ML 1 + 10, 121°C [250°F]					
Units	63	42	79	60	62
Mooney Scorch, MS at 121°C [250°F]					
Minimum, in-lb	33	22	42	32	33
5-unit rise, min	>30	>30	>30	>30	>30
ODR at 177°C [350°F], Microdie, 3° Arc, 15 min					
M _L , in-lb	14	10	19	14	16
t _{s2} , min	1.9	2.1	2.1	1.9	1.8
t _{c90} , min	3.7	3.6	3.7	3.9	3.4
M _{c90} , in-lb	92	97	122	99	94
M _H , in-lb	100	107	134	108	102
Rosand Capillary Rheometer at 100°C [212°F], 1.5 mm Die, L/D = 0/1					
Piston Speeds	Shear Rate	Pressure, MPa			
12.7 mm/min	113 s ⁻¹	6.8	5.1	7.8	6.8
50.8 mm/min	452 s ⁻¹	10.2	8.1	11.7	9.7
127 mm/min	1130 s ⁻¹	16.1	11.3	17.8	13.2

Vulcanizate Properties

Slabs Cure: 10 min at 177°C [350°F]					
Post Cure: 24 hr at 232°C [450°F]					
Stress/Strain at 23°C [73°F]—Original, no post cure					
100% Modulus, MPa [psi]	3.8[545]	4.2[610]	4.7[675]	3.5[505]	3.0[440]
Tensile Strength, MPa [psi]	9.5[1,380]	9.3[1,355]	8.8[1,270]	8.1[1,180]	7.2[1,045]
Elongation at Break, %	297	240	211	296	319
Hardness, Durometer A, points	78	78	79	77	69
Stress/Strain at 23°C [73°F]—Original, post cure					
100% Modulus, MPa [psi]	5.5[800]	6.0[870]	6.6[955]	5.9[855]	6.7[970]
Tensile Strength, MPa [psi]	14.3[2,075]	11.6[1,685]	13.5[1,960]	13.1[1,905]	12.3[1,780]
Elongation at Break, %	213	177	198	182	196
Hardness, Durometer A, points	77	80	80	77	68
Stress/Strain at 23°C [73°F]—After aging 70 hr at 200°C [392°F]					
100% Modulus, MPa [psi]	5.0[730]	6.3[920]	6.8[985]	5.6[810]	5.6[815]
Tensile Strength, MPa [psi]	12.5[1,810]	12.7[1,835]	13.4[1,940]	12.7[1,835]	10.7[1,555]
Elongation at Break, %	208	177	183	201	211
Hardness, Durometer A, points	76	78	81	77	69
Stress/Strain at 23°C [73°F]—After aging 168 hr at 200°C [392°F]					
100% Modulus, MPa [psi]	5.6[815]	6.5[940]	6.7[975]	5.8[840]	6.1[890]
Tensile Strength, MPa [psi]	12.8[1,850]	14.2[2,060]	13.6[1,970]	12.9[1,875]	10.9[1,580]
Elongation at Break, %	205	193	187	200	218
Hardness, Durometer A, points	79	82	79	76	72
Stress/Strain at 23°C [73°F]—After aging 70 hr at 232°C [450°F]					
100% Modulus, MPa [psi]	5.2[760]	6.9[1,000]	7.1[1,035]	6.0[865]	6.2[900]
Tensile Strength, MPa [psi]	13.1[1,905]	13.2[1,920]	12.9[1,875]	12.7[1,840]	11.0[1,590]
Elongation at Break, %	208	168	158	186	203
Hardness, Durometer A, points	76	82	79	77	70
Compression Set, Method B, O-rings, %					
70 hr at 23°C [73°F]	7	10	7	7	6
70 hr at 200°C [392°F]	17	18	13	19	21
70 hr at 232°C [450°F]	37	41	30	41	44
Adhesion to Metal (Steel), 90° Peel (primed with 50%/50% Chemlok™ 607*/methanol)					
No post-cure, N/mm [pli]	—	—	—	13.6[76]	12.0[67]**

*Trademark of Lord Corporation **Stock Tear

Table 2
Effect of Carbon Black Level in Viton® A-361C

	F 60 phr	G 45 phr	H 30 phr	I 15 phr	J 5 phr	K 2 phr
Viton® A-361C	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, 121°C [250°F]						
Units	97	78	63	52	47	42
Mooney Scorch, MS at 121°C [250°F]						
Minimum, in·lb	51	41	33	27	23	20
5-unit rise, min	>30	>30	>30	>30	>30	>30
ODR at 177°C [350°F], Microdie, 3° Arc, 15 min						
M _L , in·lb	18	16	14	13	11	10
t _{s2} , min	1.7	1.8	1.9	2.2	2.3	3.0
t _{c90} , min	4.2	3.6	3.7	3.7	3.7	5.1
M _{c90} , in·lb	109	102	92	82	72	67
M _H , in·lb	119	111	100	90	78	74
Vulcanizate Properties						
Slabs Cure: 10 min at 177°C [350°F]						
Post Cure: 24 hr at 232°C [450°F]						
Stress/Strain at 23°C [73°F]—Original, no post cure						
100% Modulus, MPa [psi]	6.4 [930]	5.1 [745]	3.8 [545]	2.1 [310]	1.5 [220]	1.2 [170]
Tensile Strength, MPa [psi]	9.6 [1,385]	9.8 [1,415]	9.5 [1,380]	8.6 [1,250]	5.3 [775]	5.0 [720]
Elongation at Break, %	226	274	297	313	253	292
Hardness, Durometer A, points	90	85	78	66	59	55
Stress/Strain at 23°C [73°F]—Original, post cure						
100% Modulus, MPa [psi]	10.3 [1,495]	7.4 [1,080]	5.5 [800]	2.7 [385]	1.7 (240)	1.2 (175)
Tensile Strength, MPa [psi]	14.4 [2,085]	13.1 [1,900]	14.3 [2,075]	10.4 [1,515]	8.6 [1,245]	4.8 [690]
Elongation at Break, %	152	176	213	244	273	248
Hardness, Durometer A, points	90	85	77	65	58	53
Stress/Strain at 23°C [73°F]—After aging 70 hr at 200°C [392°F]						
100% Modulus, MPa [psi]	10.2 [1,485]	7.7 [1,115]	5.0 [730]	2.7 [390]	1.6 [230]	1.2 [180]
Tensile Strength, MPa [psi]	14.2 [2,065]	14.6 [2,120]	12.5 [1,810]	11.9 [1,730]	9.3 [1,350]	6.2 [905]
Elongation at Break, %	149	187	208	261	282	276
Hardness, Durometer A, points	91	85	76	63	57	54
Stress/Strain at 23°C [73°F]—After aging 168 hr at 200°C [392°F]						
100% Modulus, MPa [psi]	10.4 [1,515]	8.0 [1,160]	5.6 [815]	2.7 [395]	1.6 [230]	1.3 [185]
Tensile Strength, MPa [psi]	14.6 [2,110]	13.9 [2,015]	12.8 [1,850]	12.3 [1,790]	9.6 [1,385]	5.6 [815]
Elongation at Break, %	147	171	205	264	289	254
Hardness, Durometer A, points	91	82	79	56	55	54
Stress/Strain at 23°C [73°F]—After aging 70 hr at 232°C [450°F]						
100% Modulus, MPa [psi]	10.8 [1,565]	8.7 [1,265]	5.2 [760]	2.7 [395]	1.6 [230]	1.2 [170]
Tensile Strength, MPa [psi]	13.7 [1,980]	14.5 [2,105]	13.1 [1,905]	12.2 [1,770]	8.8 [1,275]	6.5 [940]
Elongation at Break, %	132	168	208	254	269	288
Hardness, Durometer A, points	86	84	76	61	56	50
Compression Set, Method B, O-rings, %						
70 hr at 23°C [73°F]	16	14	7	9	9	6
70 hr at 200°C [392°F]	24	20	17	15	13	12
70 hr at 232°C [450°F]	47	40	37	35	32	29

Table 3
Effect of Mineral Fillers in Viton® A-361C

	L MT Black	M Albaglos®	N Nyad® 400	O Celite® 350	P Blanc Fixe	Q Ti-Pure® R-960
Viton® A-361C	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, 121°C [250°F]						
Units	63	66	61	84	56	58
Mooney Scorch, MS at 121°C [250°F]						
Minimum, in-lb	33	34	32	44	29	31
5-unit rise, min	>30	>30	>30	>30	>30	>30
ODR at 177°C [350°F], Microdie, 3° Arc, 15 min						
M _L , in-lb	14	17	15	18	15	14
t _{s2} , min	1.9	1.8	2.1	1.9	2.1	2.3
t _{c90} , min	3.7	3.5	3.3	3.3	3.6	4.5
M _{c90} , in-lb	92	92	89	91	82	71
M _H , in-lb	100	100	97	99	89	78

Vulcanizate Properties

Slabs Cure: 10 min at 177°C [350°F]
Post Cure: 24 hr at 232°C [450°F]

Stress/Strain at 23°C [73°F]—Original, no post cure						
100% Modulus, MPa [psi]	3.8[545]	3.0[435]	3.3[480]	4.7[685]	2.0[285]	2.1[300]
Tensile Strength, MPa [psi]	9.5[1,380]	9.6[1,395]	7.1[1,025]	9.4[1,360]	7.0[1,010]	9.1[1,325]
Elongation at Break, %	297	287	312	331	320	392
Hardness, Durometer A, points	78	63	66	77	63	64
Stress/Strain at 23°C [73°F]—Original, post cure						
100% Modulus, MPa [psi]	5.5[800]	4.1[590]	5.4[785]	9.6[1,390]	2.5[365]	2.7[390]
Tensile Strength, MPa [psi]	14.3[2,075]	12.7[1,835]	10.3[1,490]	15.0[2,170]	9.4[1,365]	12.5[1,815]
Elongation at Break, %	213	225	235	166	271	288
Hardness, Durometer A, points	77	69	70	82	66	67
Stress/Strain at 23°C [73°F]—After aging 70 hr at 200°C [392°F]						
100% Modulus, MPa [psi]	5.0[730]	4.4[645]	6.7[975]	10.9[1,575]	2.5[365]	2.7[390]
Tensile Strength, MPa [psi]	12.5[1,810]	13.4[1,950]	11.4[1,655]	15.5[2,250]	11.1[1,610]	12.9[1,870]
Elongation at Break, %	208	210	198	147	305	267
Hardness, Durometer A, points	76	72	68	79	64	68
Stress/Strain at 23°C [73°F]—After aging 168 hr at 200°C [392°F]						
100% Modulus, MPa [psi]	5.6[815]	4.9[710]	6.2[895]	11.2[1,630]	2.8[400]	2.9[425]
Tensile Strength, MPa [psi]	12.8[1,850]	12.7[1,840]	10.9[1,575]	15.3[2,220]	11.2[1,620]	14.0[2,025]
Elongation at Break, %	205	187	194	139	278	265
Hardness, Durometer A, points	79	70	67	75	60	62
Stress/Strain at 23°C [73°F]—After aging 70 hr at 232°C [450°F]						
100% Modulus, MPa [psi]	5.2[760]	4.8[695]	6.5[940]	10.7[1,545]	2.4[355]	2.9[420]
Tensile Strength, MPa [psi]	13.1[1,905]	13.2[1,920]	10.9[1,575]	15.4[2,235]	10.9[1,580]	12.8[1,855]
Elongation at Break, %	208	200	197	149	298	256
Hardness, Durometer A, points	76	71	68	81	61	66
Compression Set, Method B, O-rings, %						
70 hr at 23°C [73°F]	7	6	7	10	9	12
70 hr at 200°C [392°F]	17	19	16	19	16	18
70 hr at 232°C [450°F]	37	44	35	44	40	41

Test Procedures

Property Measured	Test Procedure
Compression Set	ASTM D395, Method B (25% deflection)
Compression Set, O-Rings	ASTM D1414
Hardness	ASTM D2240, Durometer A
Mooney Scorch	ASTM D1646, using small rotor. Minimum viscosity and time to a 1-, 2-, 5-, and 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/s (20 in/min)
Volume Change in Fluids	ASTM D471

Note: Test temperature is 24°C [75°F] except where specified otherwise.

Proprietary Materials

Sources of compounding ingredients used in developing the information in this technical information are listed below. This is not to imply that comparable ingredients from other sources might not be equally usable.

Material	Composition	Supplier
Albaglos®	Calcium Carbonate (precipitated)	Pfizer, Inc. M.P.M. Division New York, NY 10017
Blanc Fixe	Barium Sulfate (precipitated)	Whittaker, Clark & Daniels (Distributor) South Plainfield, NJ 07080
Celite® 350	Diatomaceous Silica	Manville Corp. & Subsidiaries Ken-Caryl Ranch Denver, CO 80217
Nyad® 400	Calcium Metasilicate	Interpace Corporation Parsippany, NJ 07054
Ti-Pure® R-960	Rutile Titanium Oxide	DuPont Company Wilmington, DE 19898

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