DuPont™ Viton® F-605C

Technical Information — Rev. 3, July 2010

Introduction

DuPont™ Viton® F-605C is a new generation incorporated cure "F-family" terpolymer designed for compression and transfer molding of seals, gaskets, and O-rings that require excellent fluids resistance to today's automotive fuels. In addition to the heat and chemical resistance characteristics typical of Viton® fluoroelastomers, Viton® F-605C offers significant improvements in processing, rheology, and physical properties.

Compared to Viton® F-601C, Viton® F-605C features:

- Improved processing
  - – increased mold flow
  - – improved mold release
  - – less mold fouling
- Improved extrusion performance
- Excellent compression set resistance
- Similar fluids and permeation resistance to automotive fuels (including oxygenated and "sour" fuels).

Product Description

Chemical Composition	Terpolymer of hexafluoropropylene, vinylidene fluoride and tetrafluoroethylene, plus cure chemicals
Physical Form	Slab
Color	Off White
Odor	None
Specific Gravity	1.90
Solubility	Low molecular weight esters and ketones
Storage Stability	Excellent
Mooney Viscosity (ML 1+10 at 121 °C [250 °F])	60

Applications

Viton® F-605C is recommended for sealing applications such as fuel systems that require improved fluids and permeation resistance to fuels (especially oxygenated and "sour" fuels). Also for compression/transfer molding of O-rings, gaskets, and diaphragms requiring excellent chemical resistance.

Use of Viton® F-605C

Table 1 compares compounds of Viton® F-605C to Viton® F-601C, A-401C, and B-601C. Table 2 lists the performance of Viton® F-605C relative to Ford Specification M2D401-A8.

Safety and Handling

Before handling or processing Viton® F-605C, read and follow the recommendations in DuPont bulletin "Handling Precautions for Viton® and Related Chemicals."

Viton® F-605C should be handled like other types of Viton®. Keep off skin and wash well after handling. For safe handling of other compounding ingredients, please refer to the respective manufacturers' information.

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*Viton® F-605C was formerly VTR-7244.

Table 1. The Performance of DuPont™ Viton® F-605C in Typical Compounds

	A Viton® F-605C	B Viton® F-601C	C Viton® A-401C	D Viton® B-601C
Viton® F-605C	100	—	—	—
Viton® F-601C	—	100	—	—
Viton® A-401C	—	—	100	—
Viton® B-601C	—	—	—	100
High Activity Magnesium Oxide	3	3	3	3
Calcium Hydroxide	6	6	6	6
Carnauba Wax	1	1	1	1
MT Black (N990)	30	30	30	30
Stock Properties				
Mooney Scorch, MS at 121 °C (250 °F)				
Minimum, in⊕lb	61	55	69	55
5 pt rise, min.	17.8	>30	>15.7	>30
10 pt rise, min.	24.0	—	>30	—
ODR at 177 °C (350 °F), Microdie, 3° Arc, 12 Min				
ML, in⊕lb	21	16	16	22
Ts2, min.	1.5	2.6	2.1	2.7
Tc90, min.	4.3	6.1	3.7	6.1
Mc90, in⊕lb	93	85	122	106
MH, in⊕lb	101	93	133	115
MDR 2000 at 177 °C (350 °F), Microdie, 0.5 Arc, 6 Min				
ML, in⊕lb	2	2	—	—
Ts2, min.	1:11	2:04	—	—
T□50, min.	1:54	2:46	—	—
T□90, min.	3:02	3:40	—	—
MH, in⊕lb	28	25	—	—
Vulcanizate Properties				
slabs cured: 10□/177 °C (350 °F)				
post cured: 24 hr/232 °C (450 °F)				
Stress/Strain at 23 °C (73 °F)—Original, Post Cured				
100% Modulus, MPA (psi)	6.1 (885)	6.9 (995)	7.0 (1010)	6.7 (975)
Tensile Strength, MPa (% change)	14.9 (2160)	15.2 (2200)	13.8 (1925)	14.0 (2030)
Elongation at Break, %	250	255	175	200
Hardness, Durometer A, pts	77	79	78	76
Stress/Strain at 23 °C (73 °F)—After aging 70 hr at 250 °C (482 °F)				
100% Modulus, MPA (psi)	5.8 (–5)	7.6 (+10)	6.8 (–2)	5.0 (–25)
Tensile Strength, MPa (% change)	14.6 (–2)	14.9 (–2)	12.8 (–7)	11.7 (–16)
Elongation at Break, %	205 (–18)	175 (–31)	172 (–2)	210 (+3)
Hardness, Durometer A, pts	76	79	78	75

*Note: 1 MPa is equal to 145 psi.

(continued)

Table 1. The Performance of DuPont™ Viton® F-605C in Typical Compounds *(continued)*

	A Viton® F-605C	B Viton® F-601C	C Viton® A-401C	D Viton® B-601C
Stress/Strain at 23 °C (73 °F)—After aging 168 hr at 23 °C (73 °F)/Fuel C-Methanol (85-15)				
100% Modulus, MPA (% change)	4.1 (–33)	4.0 (–42)	—	—
Tensile Strength, MPa (% change)	10.8 (–28)	9.4 (–38)	—	—
Elongation at Break, %	280 (+12)	245 (–4)	—	—
Hardness, Durometer A, pts	67	68	—	—
Volume Swell, %	9	10	—	—
Compression Set, Method B, O-Rings, %				
70 hr at 150 °C (302 °F)	14	24	—	—
22 hr at 200 °C (392 °F)	18	32	14	14
70 hr at 200 °C (392 °F)	30	47	20	24
Low Temperature Properties				
DSC (glass transition temperature)				
Inflection, °C (°F)	–8.1 (17.4)	–7.8 (18.0)	–15.2 (4.6)	–13.2 (8.2)

Table 2. The Performance of DuPont™ Viton® F-605C in Ford Specification M2D401-A8

	E Viton® F-605C	F Viton® F-605C	
Viton® F-605C	100	100	
High Activity Magnesium Oxide	3	3	
Calcium Hydroxide	6	6	
Nyad® 400	28	—	
Ti-Pure® R960	1	—	
AkronChem 414 Green	1	—	
MT Black (N990)	—	25	
Vulcanizate Properties slabs cured: 10□/177 °C (350 °F) post cured: 24 hr/232 °C (450 °F)			**M2D401-A8** (green)
Stress/Strain at 23 °C (73 °F)—Original, Post Cured			
Tensile Strength, MPa (psi)	11.4 (1650)	12.8 (1850)	10.0 min (1450 min)
Elongation at Break, %	270	265	175 min
Hardness, duromater A, pt	71	74	75±5
TR 10 (maximum, °C (°F)	–6 (21)	–7 (19)	–5 (23)
Tear Strength, Die C	142	168	80 min
Stress/Strain at 23 °C (73 °F)—After aging 1000 hr at 200 °C (392 °F)			
Tensile Strength, % change (max.)	0	+11	±20
Elongation at Break,% change (max.)	–18	–9	±20
Hardness, pts change	–1	+1	±5
Stress/Strain at 23 °C (73 °F)—After aging 336 hr at 60 °C (140 °F)/ASTM Reference Fuel C			
Tensile Strength, % change (max.)	–37	–20	–60
Elongation at Break,% change (max.)	–11	+6	–40
Hardness, pts change	–12	–11	–15
Volume Swell, %	+12	+12	+15
Stress/Strain at 23 °C (73 °F)—After aging 336 hr at 60 °C (140 °F)/Oxidized Fuel (PN 180)			
Tensile Strength, % change (max.)	–58	–49	–60
Elongation at Break,% change (max.)	+35	+49	–25
Hardness, pts change	–22	–23	–25
Volume Swell, %	+23	+20	+30
Stress/Strain at 23 °C (73 °F)—After aging 2000 hr at 60 °C (140 °F)/ASTM Reference Fuel C-Methanol (50-50)			
Tensile Strength, % change (max.)	—	–44	–60
Elongation at Break,% change (max.)	—	+22	–40
Hardness, pts change	—	–15	–15
Volume Swell, %	—	+19	+25
Stress/Strain at 23 °C (73 °F)—After aging 2000 hr at 60 °C (140 °F)/ASTM Reference Fuel C-Methanol-MTBE (65-20-15)			
Tensile Strength, % change (max.)	—	–54	–70
Elongation at Break,% change (max.)	—	+2	–45
Hardness, pts change	—	–20	–25
Volume Swell, %	—	+30	+40
Compression Set, Method B, % Plied Discs			
70 hr at 200 °C (392 °F)	25	25	35

Test Procedures
(Test temperature is 24 °C [75 °F] except where specified otherwise.)

Property Measured	Test Procedure
Compression Set	ASTM D395-89, Method B (25% deflection)
Compression Set, O-Rings	ASTM D1414-94 ASTM D1229-79 (low temperature)
Hardness	ASTM D2240-91, durometer A
Mooney Scorch	ASTM D1646-95, using small rotor. Minimum viscosity and time to a 1-, 2-, 5- and 10-unit rise are reported.
Mooney Viscosity	ASTM D1646-95, ten pass 121 °C
ODR (vulcanization characteristics measured with an oscillating disk cure meter)	ASTM D2084-93
Property Change After Oven Heat-Aging	ASTM D573-88
Stress/Strain Properties 100% Modulus Tensile Strength Elongation at Break	ASTM D412-92, pulled at 8.5 mm/s (20 in/min)
Volume Change in Fluids	ASTM D471-95
Temperature Retraction	ASTM D1329-88
Low Temperature Brittleness	ASTM D2137-94

Proprietary Materials

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

Material	Composition	Supplier
AkroChem 414 Green	Pigment Green 7 (phthalocyanine)	AkroChem Company 255 Fountain Street Akron, Ohio 44304
Nyad® 400[1]	Calcium Metasilicate	Interpace Corporation 260 Cherry Hill Road Parsippany, NJ 07054
Ti-Pure® R960[2]	Rutile Titanium Oxide	DuPont Company Specialty Chemicals Wilmington, DE 19898

[1]Trademark of Interpace Corporation

[2]Trademark of DuPont Company

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