DuPont™ Viton® GFLT-600S

Technical Information — Rev. 2, July 2010—Made with Advanced Polymer Architecture

Introduction

DuPont™ Viton® GFLT-600S* fluoroelastomer is a 67% fluorine, peroxide-cured, low temperature fluoroelastomer. GFLT-600S utilizes the latest technology from DuPont, Advanced Polymer Architecture (APA), which includes a novel peroxide cure site along with an optimized molecular weight distribution.

Features

- Cures exceptionally fast to a high state of cure
- Similar to improved low temperature properties compared to Viton® GFLT
- Improved mold release/mold fouling properties
- Improved mold flow and less shear sensitivity for a 65 Mooney peroxy cured FKM
- Excellent physical properties with high elongation, both original and aged
- Heat, fluids, and low temperature resistance comparable to Viton® GFLT
- Improved water resistance/lower volume swell in water
- Excellent compression set resistance with either low or no postcure

Product Description

Chemical Composition	Copolymer of perfluoromethvinyl ether, vinylidene fluoride and tetrafluoroethylene with a cure monomer
Physical Form	Sheet
Color	White to tan
Odor	None
Specific Gravity	1.86
Fluorine percent	~67%
Storage Stability	Excellent
Mooney Viscosity (ML 1+10 at 121 °C [250 °F])	65

Note: These are typical physical properties and not intended to serve as specifications.

Processing

A load factor of 72%+ for internal mixing of GFLT-600S is preferred. The suggested process aids for GFLT-600S are 0.75 phr of Struktol® HT290 either alone or in combination with 0.5 phr of PAT-777, or combinations of 0.5 phr Armeen® 18D with carnauba wax or Struktol® WS280. The use of Diak™ 8 is NOT suggested as it causes poor mold release and high compression set. Diak™ 7 (TAIC) is the suggested coagent for all GFLT-600S compounds, and is usually used at a 3 phr level or lower unless high modulus is needed. High levels of TAIC can bleed out and cause molding flaws. A peroxide level of 1.5 to 2 phr is suggested for this fast curing FKM polymer.

Safety and Handling

Before handling or processing Viton® GFLT-600S, read and follow the recommendations as described in DuPont bulletin, “Handling Precautions for Viton® and Related Chemicals”.

Contents

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*Viton® GFLT-600S was formerly known as VTR-8550.

Table 1. The Fundamental Properties of DuPont™ Viton® GFLT-600S

Compound[1]	GFLT A-50-01	GFLT-600S A50-03
Mooney (ML 1 + 10) at 121°C on gum polymers		
Reading (MU)	77	64
Viton® GFLT	100	—
Viton® GFLT-600S	—	100
Zinc Oxide	3	3
N990 (MT Black)	30	30
DIAK™ 7 (TAIC)	3	3
Luperox® 101XL45	3	2
Total phr lab	139	138
Mooney Scorch at 121 °C		
Minimum, MU	47	34
2 pt rise, min	>30	>30
5 pt rise, min	—	—
ODR at 162 °C, 3° Arc, 100 Range, 30 Minute Clock		
M_L, dNm	23	15
ts2, min	3.9	2.4
t'50, min	8.1	5.4
t'90, min	18.9	7.2
M_H, dNm	116	133
MDR 2000 at 177 °C, 0.5° Arc, 100 Range, 6 Minute Clock		
M_L, dNm	2.3	1.6
ts2, min	1.0	0.7
t'50, min	1.6	1.1
t'90, min	3.9	2.0
t'95, min	4.7	2.6
M_H, dNm	18.5	34.9
Rosand Capillary Rheometer at 100 °C, 1.5 mm die - L/D = 0/1 and 10/1		
Shear Rate, s^{-1}	**Pressure, MPa (L/D = 0/1 die)**	
44	6.4	4.3
113	7.5	5.4
452	10.0	7.1
1129	12.8	8.4
2222	16.5	10.0
Physical Properties at R.T. — Original (Cure 5' at 177 °C — no postcure)		
M-10, MPa	0.7	0.7
M-100, MPa	6.4	4.4
Tensile, MPa (T-B, psi)	14.4 (2088)	12.2 (1770)
Elongation, %	181	222
Hardness, A, pts	68	68
"Hot" Tear Die B at 150 °C — (Cure 5' at 177°C — no postcure)		
Tear Die B, (N/mm)	3.8	5.2
Physical Properties at R.T. — Original (Cure 5' at 177 °C — no postcure)		
	PC: 16 hr	PC: 2 hr
M-10, MPa	0.8	0.7
M-100, MPa	9.6	5.4
Tensile, MPa (T-B, psi)	20.1 (2920)	15.9 (2298)
Elongation, %	160	220
Hardness, A, pts	72	70

[1]Compound reference number: DD-1977A50

(continued)

Table 1. The Fundamental Properties of DuPont™ Viton® GFLT-600S *(continued)*

Compound[1]	GFLT A-50-01	GFLT-600S A50-03
Physical Properties at R.T. — Heat aged 70 hr at 250 °C in oven (slabs postcured)		
M-10, MPa (% change, M10)	0.8 (–4)	0.7 (–3)
M-100, MPa (% change, M100)	9.2 (–4)	4.3 (–20)
Tensile, MPa (T-B, % change)	18.8 (–7)	17.6 (11)
Elongation, % (E-B, % change)	153 (–4)	260 (18)
Hardness, A, pts (pts change)	72 (0)	70 (0)
Physical Properties at R.T. — Heat aged 70 hr at 275 °C in oven (slabs postcured)		
M-10, MPa (% change, M10)	0.7 (–12)	0.7 (–1)
M-100, MPa (% change, M100)	5.4 (–44)	3.4 (–38)
Tensile, MPa (T-B, % change)	15.6 (–22)	15.0 (–5)
Elongation, % (E-B, % change)	211 (32)	295 (34)
Hardness, A, pts (pts change)	69 (–3)	69 (–1)
Compression Set, Method B, O-Rings		
22 hr at 200°C		
- No Postcure	52	13
- Postcured 2 hr at 232 °C	26	12
70 hr at 200 °C		
- No Postcure	62	21
- Postcured 2 hr at 232 °C	37	18
Physical Properties at R.T. — Aged 168 hr at 150 °C In ASTM #105 Oil (5W/30) (slabs postcured)		
M-100, MPa (% change, M100)	5.9 (–38)	5.2 (–4)
Tensile, MPa (T-B, % change)	9.2 (–55)	8.0 (–50)
Elongation, % (E-B, % change)	103 (–36)	133 (–40)
Hardness, A, pts (pts change)	73 (72.18)	71 (70.26)
Volume Swell, %	2.0	1.5
Volume Swell After Immersion — time and temperature as noted		
Fuel C, 168 hr at 23 °C	4.9	5.9
CM15 Fuel, 168 hr at 23 °C	15.9	14.5
Methanol, 168 hr at 23 °C	8.8	8.5
Water, 168 hr at 23 °C	7.8	3.2
Low Temperature Testing		
TR-10, *C	–23.0	–24.5
Tg by DSC, °C	–23.7	–26.0

[1]Compound reference number: DD-1977A50

Table 2. DuPont™ Viton® GFLT-600S Filler Study

Table 2 shows the reinforcing effect of various levels of MT Black (N990) and some common mineral fillers in GFLT-600S. The mineral filled stocks all have a blue pigment present plus TiO_2 to stabilize the color. All the compounds contain 0.5 phr of process aid Armeen® 18D. Postcures were done both for 2 hours and 4 hours at 232°C. The data indicates that when a process aid like Armeen® 18D is present more than a 2 hour at 232 °C postcure is needed for optimal tensile strength depending on the amount of the process aid. For these types of compounds a 4 to 8 hour at 232 °C postcure would normally be suggested.

Compound[1]	A40-01 **5-MT**	A40-02 **30-MT**	A40-03 **60-MT**	A40-04 **Wollast**	A40-05 **Albaglos**	A40-06 **$BaSO_4$**	A40-07 **Albaglos/R972**
Viton® GFLT-600S	100	100	100	100	100	100	100
Zinc oxide	3	3	3	3	3	3	3
N990 (MT Black)	5	30	60	—	—	—	—
10 Wollastocoat® 10222	—	—	—	40	—	—	—
Albaglos® ($CaCO_3$)	—	—	—	—	40	—	35
Blanc Fixe ($BaSO_4$)	—	—	—	—	—	40	—
Aerosil® R972	—	—	—	—	—	—	5
TiPure® R960 (TiO_2)	—	—	—	1	1	1	1
Stan-Tone® D4005 blue	—	—	—	1	1	1	1
Armeen® 18D	0.5	0.5	0.5	0.5	0.5	0.5	0.5
Diak™ 7 (TAIC)	3	3	3	3	3	3	3
Varox® DBPH-50	2	2	2	2	2	2	2
Total phr	113.5	138.5	168.5	150.5	150.5	150.5	150.5
Mooney Scorch at 121 °C							
Minimum, MU	23	31	43	34	38	28	41
2 pt rise, min	24.3	13.2	9.4	21.4	16.5	23.6	16.8
5 pt rise, min	25.5	14.7	11.2	22.2	17.2	24.6	17.8
10 pt rise, min	27.0	16.0	12.8	22.9	17.9	26.1	18.8
ODR at 162 °C, 3° Arc, 100 Range, 30 Minute Clock							
M_L, dNm	14	17	20	19	19	16	21
ts2, min	1.4	1.3	1.1	1.3	1.0	1.5	1.1
t'50, min	2.7	3.0	3.0	2.8	2.5	3.0	2.5
t'90, min	4.5	6.3	6.5	4.3	5.0	6.5	3.9
M_H, dNm	94	134	176	146	143	129	161
MDR 2000 at 177 °C, 0.5° Arc, 100 Range, 6 Minute Clock							
M_L, dNm	1.3	1.8	3.1	2.0	2.4	1.7	2.5
ts2, min	0.5	0.4	0.3	0.4	0.4	0.4	0.4
t'50, min	0.7	0.6	0.6	0.6	0.6	0.7	0.6
t'90, min	1.1	1.1	1.4	1.0	0.9	1.0	0.9
t'95, min	1.3	1.5	1.9	1.2	1.1	1.3	1.1
M_H, dNm	18.5	30.0	49.6	30.8	34.5	25.8	40.4
Physical Properties at R.T. — Original — (Cure 5' at 177 °C — no postcure)							
M-10, MPa	0.4	0.8	1.3	1.0	0.7	0.7	0.8
M-100, MPa	1.4	3.7	7.5	4.5	2.6	1.8	3.0
Tensile, MPa (T-B, psi)	7.6 (1108)	9.1 (1314)	10.3 (1488)	8.0 (1166)	5.7 (819)	7.7 (1109)	10.4 (1511)
Elongation, %	286	248	199	259	280	297	298
Hardness, A, pts	55	69	81	68	68	61	71

[1]Compound reference number: DD-1964A40

(*continued*)

Table 2. DuPont™ Viton® GFLT-600S Filler Study *(continued)*

Compound[1]	A40-01 **5-MT**	A40-02 **30-MT**	A40-03 **60-MT**	A40-04 **Wollast**	A40-05 **Albaglos**	A40-06 **$BaSO_4$**	A40-07 **Albaglos/R972**
Physical Properties at R.T. — Original — (Cure 5' at 177 °C — Postcured 2 hr at 232 °C)							
M-10, MPa	0.4	0.9	1.6	1.0	0.7	0.6	0.9
M-100, MPa	1.4	4.7	10.5	6.3	3.3	2.1	4.0
Tensile, MPa (T-B, psi)	9.5 (1382)	13.2 (1910)	15.4 (2230)	9.1 (1318)	9.2 (1335)	9.3 (1346)	12.4 (1804)
Elongation, %	288	223	186	210	301	309	289
Hardness, A, pts	56	72	84	70	70	64	72
Physical Properties at R.T. — Original — (Cure 5' at 177 °C — Postcured 4 hr at 232 °C)							
M-10, MPa	0.4	1.0	1.9	1.1	0.7	0.7	0.9
M-100, MPa	1.5	5.4	12.6	7.3	4.2	2.5	4.5
Tensile, MPa (T-B, psi)	9.6 (1392)	16.3 (2361)	18.7 (2706)	11.1 (1602)	9.7 (1408)	10.8 (1570)	12.5 (1807)
Elongation, %	1392	2361	2706	1602	1408	1570	1807
Hardness, A, pts	265	215	176	223	279	316	284
Physical Properties at R.T. — Heat Aged 70 hr at 250 °C In Oven (4 hr postcure)							
M-100, MPa (% change, M100)	1.4 (–9)	4.6 (–15)	10.8 (–14)	6.6 (–10)	4.2 (1)	3.7 (49)	5.5 (6)
Tensile, MPa (% change, T-B)	16.4 (99)	17.2 (6)	18.7 (0)	12.9 (17)	11.4 (17)	13.0 (20)	12.9 (23)
Elongation, % (% change, E-B)	412 (63)	319 (22)	215 (0)	397 (78)	377 (35)	392 (24)	330 (41)
Hardness, A, pts (pts change)	57 (0)	74 (1)	86 (–1)	70 (–1)	71 (0)	66 (1)	76 (2)
Physical Properties at R.T. — ASTM #105 Oil (5W/30) Aged 168 hr at 150 °C (4 hr postcure)							
M-100, MPa (% change, M100)	1.5 (0)	6.0 (11)	11.7 (–7)	7.5 (4)	4.4 (4)	2.6 (6)	5.9 (13)
Tensile, MPa (% change, T-B)	3.7 (–55)	9.4 (–42)	11.9 (–36)	7.8 (–30)	5.9 (–39)	3.3 (–70)	6.8 (–36)
Elongation, % (% change, E-B)	183 (–28)	136 (–37)	101 (–43)	102 (–54)	149 (–47)	155 (–51)	122 (–48)
Hardness, A, pts (pts change)	57 (0)	73 (0)	86 (–1)	71 (0)	71 (0)	65 (0)	75 (1)
Volume Change, %	1.5	1.4	1.3	1.2	0.9	1.2	1.0
Compression Set, Method B, O-Rings							
22 hr at 200 °C							
No postcure	20	24	30	21	36	41	31
PC 2 hr at 232 °C	12	14	16	14	19	26	19
PC 4 hr at 232 °C	10	14	14	14	17	17	19
70 hr at 200 °C							
No postcure	21	37	43	31	54	53	49
PC 2 hr at 232 °C	22	30	34	26	33	40	37
PC 4 hr at 232 °C	24	26	31	31	37	33	34
Compression Set, Method B, Plied Discs							
22 hr at 200 °C (2 hr PC)	8	11	13	12	15	17	16
70 hr at 200 °C (2 hr PC)	14	15	18	16	22	21	25
Volume Swell After Immersion — time and temperature as noted (4 hr postcure)							
Fuel C, 168 hr at 23 °C	7.0	6.4	5.8	5.9	5.5	6.3	5.9
M-15 Fuel. 168 hr at 23 °C	19.2	16.1	13.4	16.1	16.1	17.3	15.5
Methanol, 168 hr at 23 °C	11.2	10.8	8.9	8.5	8.8	9.6	8.8
Water, 168 hr at 100 °C	4.3	3.4	2.5	6.9	9.8	10.2	8.8
Low Temperature Properties (4 hr postcure)							
Tg by DSC	–25.6	–26.4	–26.2	–26.3	–26.5	–26.3	–26.1
TR-10	–24.2	–24.1	–25.0	–24.0	–24.0	–24.1	–24.0

[1]Compound reference number: DD-1964A40

Table 3. DuPont™ Viton® GFLT-600S Metal Oxide Study

While zinc oxide is normally recommended with GFLT-600S, and all APA peroxide cured types, due to its good balance of hot tear and heat resistance, it is possible to use either no metal oxide or different metal oxides with this FKM if some tradeoffs can be accommodated. For example, magnesium oxide may help in bonding GFLT-600S to metal, and calcium hydroxide can be used in biodiesel applications that cannot tolerate zinc. The 100% modulus can be increased by using MgO in place of ZnO. The mixed MgO/ZnO metal oxide system is of interest as it has higher 100% modulus with good heat resistance.

Compound[1]	A44-01 **no MO**	A44-02 **ZnO**	A44-03 **MgO**	A44-04 **$Ca(OH)_2$**	A44-05 **CaO**	A44-06 **MgO/ZnO**
Viton® GFLT-600S	100	100	100	100	100	100
N990 (MT Black)	30	30	30	30	30	30
Zinc oxide (ZnO)	—	3	—	—	—	1.5
Elastomag® 170 (MgO)	—	—	3	—	—	1.5
Calcium Hydroxide	—	—	—	3	—	—
Calcium Oxide	—	—	—	—	3	—
Diak™ 7 (TAIC)	3	3	3	3	3	3
Varox® DBPH-50	2	2	2	2	2	2
Total phr:	135	138	138	138	138	138
Mooney Scorch at 121 °C						
Minimum, MU	32	33	35	36	34	35
2 pt rise, min	22.6	19.0	18.2	17.1	16.8	17.6
5 pt rise, min	24.3	20.3	19.1	18.2	17.8	18.7
10 pt rise, min	25.6	21.3	19.9	19.2	18.8	19.5
ODR at 162 °C, 3° Arc, 100 Range, 30 Minute Clock						
M_L, dNm	18	18	20	19	19	20
ts2, min	1.1	1.1	1.1	1.1	1.2	1.2
t'50, min	2.6	2.6	2.7	2.8	2.8	2.7
t'90, min	5.5	4.4	9.9	8.4	6.2	7.1
M_H, dNm	160	156	190	192	185	179
MDR 2000 at 177 °C, 0.5° Arc, 100 Range, 6 Minute Clock						
M_L, dNm	2.0	2.0	2.3	2.2	2.1	2.2
ts2, min	0.4	0.4	0.4	0.4	0.4	0.4
t'50, min	0.6	0.6	0.6	0.6	0.6	0.6
t'90, min	1.1	1.0	1.0	1.1	1.1	1.0
t'95, min	1.3	1.2	1.2	1.4	1.5	1.2
M_H, dNm	31.9	33.5	35.7	34.5	35.2	34.5
Spider Mold Flow Test — Sprue 0.031" (~0.8 mm) (cure 7' at 177 °C)						
Total shot weight, gms	32.0	31.8	31.9	31.9	32.0	31.8
Weight of spider, gms	12.5	15.6	15.2	14.0	13.5	12.6
Fill factor, %	39	49	47	44	42	40
Physical Properties at R.T. — Original (Cure 7' at 177 °C — no postcure)						
M-10, MPa	0.7	0.8	0.8	0.8	0.7	0.8
M-100, MPa	4.2	4.7	5.8	5.5	5.0	5.4
Tensile, MPa (T-B, psi)	12.2 (1775)	12.1 (1775)	14.5 (2104)	13.8 (2000)	13.3 (1926)	13.6 (1976)
Elongation, %	228	200	201	210	215	196
Hardness, A, pts	66	68	69	68	69	68

[1]Compound reference number: DD-1964A44

(*continued*)

Table 3. DuPont™ Viton® GFLT-600S Metal Oxide Study *(continued)*

Compound[1]	A44-01 **no MO**	A44-02 **ZnO**	A44-03 **MgO**	A44-04 **$Ca(OH)_2$**	A44-05 **CaO**	A44-06 **MgO/ZnO**
Physical Properties at R.T. — Original (Cure 7' at 177 °C — Postcured 2 hr at 232 °C)						
M-10, MPa	0.8	0.9	0.8	0.8	0.7	0.9
M-100, MPa	5.4	6.0	7.0	6.3	5.9	6.4
Tensile, MPa (T-B, psi)	16.9 (2443)	16.3 (2368)	18.3 (2648)	16.6 (2408)	16.8 (2436)	17.0 (2458)
Elongation, %	214	200	205	214	213	199
Hardness, A, pts	69	70	71	69	71	69
Physical Properties at R.T. — Original (Cure 7' at 177 °C — Postcured 4 hr at 232 °C)						
M-10, MPa	0.7	0.9	0.8	0.8	0.8	0.8
M-100, MPa	5.2	6.0	7.1	6.4	6.0	6.3
Tensile, MPa (T-B, psi)	16.8 (2433)	16.9 (2449)	18.0 (2613)	16.6 (2401)	16.6 (2401)	16.8 (2436)
Elongation, %	217	200	203	209	200	200
Hardness, A, pts	69	71	71	68	71	71
Physical Properties at R.T. — Heat Aged 70 hr at 250 °C In Oven (2 hr postcure)						
M-100, MPa (% change, M100)	2.6 (–52)	4.4 (–26)	4.2 (–41)	3.5 (–44)	3.6 (–39)	4.2 (–34)
Tensile, MPa (% change, T-B)	12.8 (–24)	17.2 (5)	16.5 (–10)	14.4 (–13)	13.9 (–17)	16.2 (–4)
Elongation, % (% change, E-B)	339 (58)	314 (57)	291 (42)	288 (35)	273 (28)	317 (59)
Hardness, A, pts (pts change)	70 (1)	72 (2)	73 (2)	71 (2)	71 (0)	72 (3)
Physical Properties at R.T. — Heat Aged 70 hr at 275 °C In Oven (2 hr postcure)						
M-100, MPa (% change, M100)	1.7 (–69)	2.8 (–53)	2.7 (–62)	2.2 (–64)	2.3 (–61)	2.9 (–54)
Tensile, MPa (% change, T-B)	6.9 (–59)	12.3 (–25)	9.7 (–47)	8.3 (–50)	7.9 (–53)	12.0 (–29)
Elongation, % (% change, E-B)	459 (115)	364 (82)	365 (78)	356 (67)	353 (66)	360 (81)
Hardness, A, pts (pts change)	67 (–2)	70 (0)	71 (–1)	68 (–1)	69 (–2)	70 (1)
Compression Set, Method B, O-Rings						
22 hr at 200 °C						
No Postcure	14	14	13	14	13	13
PC 2 hr at 232 °C	11	11	10	14	14	11
70 hr at 200 °C						
No Postcure	20	20	17	19	20	14
PC 2 hr at 232 °C	19	16	20	20	19	16
Volume Swell After Immersion — tested 168 hr at temperature noted (2 hr postcure)						
Fuel C, at 23 °C	5.3	5.3	5.0	5.2	6.2	5.7
CM-15 Fuel. at 23 °C	14.4	14.1	14.1	14.4	14.3	14.9
Methanol, at 23 °C	7.8	8.3	8.9	8.3	8.3	8.6
Water, at 100 °C	1.7	2.9	4.1	1.9	3.1	3.6
Low Temperature Properties (2 hr postcure)						
Tg by DSC, °C	–26.1	–26.2	–25.7	–25.3	–25.3	–25.5

[1]Compound reference number: DD-1964A44

Table 4. Fuel, Fluids, and Heat Resistance of DuPont™ Viton® GFLT-600S vs. DuPont™ Viton® GFLT

Compound[1]	GFLT A-36-03	GFLT-600S A36-034	Typical ASTM D2000/SAE J200 spec and values
Viton® GFLT	100	—	
Viton® GFLT-600S	—	100	
Zinc Oxide	3	3	
N990 (MT Black)	30	30	
Armeen® 18D	0.5	0.5	
Diak™ 7 (TAIC)	3	3	
Varox® DBPH-50	3	2	
Total phr lab	139.5	138.5	
Mooney Scorch at 121 °C			
Minimum, MU	33	42	
2 pt rise, min	19.0	10.5	
5 pt rise, min	22.6	11.8	
MDR 2000 at 177 °C, 0.5° Arc, 100 Range, 6 Minute Clock			
M_L, dNm	1.8	2.5	
ts2, min	0.6	0.4	
t'50, min	1.0	0.6	
t'90, min	3.6	1.2	
t'95, min	4.6	1.6	
M_H, dNm	15.8	29.2	
Physical Properties at R.T. — Original (Cured 7' at 177 °C — no postcure)			
M-10, MPa	0.8	0.8	
M-25, MPa	1.3	1.3	
M-100, MPa	5.5	3.8	
Tensile, MPa (T-B, psi)	11.4 (1650)	9.3 (1346)	
Elongation, %	200	251	
Hardness, A, pts	66	66	
Physical Properties at R.T. — Original (Cured 7' at 177 °C —postcured at 232 °C as noted)			
	16 hr	**8 hr**	
M-10, MPa	0.8	0.9	
M-25, MPa	1.5	1.5	
M-100, MPa	8.4	5.4	
Tensile, MPa (T-B, psi)	18.9 (2745)	18.2 (2632)	
Elongation, %	173	234	
Hardness, A, pts	72	72	
Physical Properties at R.T. — Heat Aged 70 hr at 250 °C in Oven			**A1-10**
M-25, MPa (% change, M25)	1.5 (3)	1.5 (2)	
M-100, MPa (% change, M100)	8.0 (–5)	4.3 (–20)	
Tensile, MPa (% change, T-B)	18.2 (–4)	16.6 (–9)	–25% max
Elongation, % (% change, E-B)	179 (3)	312 (33)	–25% max
Hardness, A, pt (pt change)	73 (1)	73 (1)	+10 max
Physical Properties at R.T. — Heat Aged 168 hr at 60 °C in Diesel Fuel			
M-25, MPa (% change, M25)	1.4 (–6)	1.5 (4)	
M-100, MPa (% change, M100)	8.3 (–1)	6.1 (12)	
Tensile, MPa (% change, T-B)	17.1 (–10)	14.4 (–21)	
Elongation, % (% change, E-B)	161 (–7)	220 (–6)	
Hardness, A, pt (pt change)	72 (0)	71 (–1)	
Volume Swell, %	2.3	2.4	

[1]Compound reference number: DD-1972A36

(*continued*)

Table 4. Fuel, Fluids, and Heat Resistance of DuPont™ Viton® GFLT-600S vs. DuPont™ Viton® GFLT ***(continued)***

Compound[1]	GFLT A-36-03	GFLT-600S A36-034	Typical ASTM D2000/SAE J200 spec and values
Physical Properties at R.T. — Heat Aged 70 hr at 23 °C in Fuel C			**EF31**
M-25, MPa (% change, M25)	1.3 (–15)	1.3 (–14)	
M-100, MPa (% change, M100)	7.3 (–12)	4.8 (–11)	
Tensile, MPa (% change, T-B)	15.4 (–19)	14.6 (–19)	–25% max
Elongation, % (% change, E-B)	159 (–8)	219 (–7)	–20% max
Hardness, A, pt (pt change)	70 (–2)	70 (–2)	±5
Volume Swell, %	3.8	4.5	0 to +10
Physical Properties at R.T. — Heat Aged 168 hr at 23 °C in E10 (90% Fuel C/10% Ethanol)			
M-100, MPa (% change, M100)	5.8 (–31)	3.9 (–28)	
Tensile, MPa (% change, T-B)	13.2 (–30)	11.7 (–36)	
Elongation, % (% change, E-B)	155 (–10)	193 (–18)	
Hardness, A, pt (pt change)	65 (–7)	67 (–5)	
Volume Swell, %	9.6	11.7	
Physical Properties at R.T. — Heat Aged 168 hr at 23 °C in CM15 (85% Fuel C/15% Methanol)			
M-25, MPa (% change, M25)	0.8 (–46)	1.1 (–29)	
M-100, MPa (% change, M100)	5.6 (–34)	3.9 (–27)	
Tensile, MPa (% change, T-B)	10.9 (–43)	9.9 (–46)	
Elongation, % (% change, E-B)	142 (–18)	183 (–22)	
Hardness, A, pt (pt change)	61 (–11)	67 (–5)	
Volume Swell, %	15.7	16.3	
Physical Properties at R.T. — Aged 70 hr at 200°C In Service Fluid 101			**EO78**
M-25, MPa (% change, M25)	1.6 (7)	1.2 (–20)	
M-100, MPa (% change, M100)	8.3 (–1)	4.8 (–11)	
Tensile, MPa (% change, T-B)	16.3 (–14)	16.3 (–10)	–40% max.
Elongation, % (% change, E-B)	166 (–4)	242 (4)	–20% max.
Hardness, A, pt (pt change)	75 (3)	70 (–2)	–15 to +5
Volume Swell, %	12.1	8.9	0 to +15
Physical Properties at R.T. — Aged 336 hr at 60 °C in 180PN Sour Fuel (Ford Method)			
M-25, MPa (% change, M25)	0.8 (–48)	1.0 (–35)	
M-100, MPa (% change, M100)	5.6 (–33)	3.4 (–38)	
Tensile, MPa (% change, T-B)	9.7 (–49)	9.2 (–49)	
Elongation, % (% change, E-B)	138 (–20)	201 (–14)	
Hardness, A, pt (pt change)	57 (–15)	64 (–8)	
Volume Swell, %	22.9	22.4	
NOTE: Ford "Sour Fuel" is a 80% Fuel C/15% Methanol/5% T-Butyl Alcohol blend with copper ion and t-butyl hydroperoxide added to bring up the peroxide number to 180			
Physical Properties at R.T. — Aged 70 hr at 200 °C in 7700 Fluid/SAE Fluid #2			**EO88**
M-100, MPa (% change, M100)	6.4 (–23)	4.3 (–21)	
Tensile, MPa (% change, T-B)	14.6 (–23)	15.3 (–16)	–40% max.
Elongation, % (% change, E-B)	165 (–5)	230 (–2)	–20% max.
Hardness, A, pt (pt change)	67 (–5)	69 (–3)	–15 to +5
Volume Swell, %	10.3	9.5	+25% max.
Compression Set, Method B, O-Rings (postcured at 232 °C as noted)			
	16 hr	**8 hr**	
70 hr at 200°C	37	23	
Low Temperature Testing			
Tg by DSC (Modulated)	–22.6	–24.6	
TR-10	–21.8	–24.7	

[1]Compound reference number: DD-1972A36

Appendix

List of Proprietary Chemicals and Ingredients

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

Material	Supplier	Composition
Aerosil® R972[1]	Silica (hydrophobic)	Degussa Corp. Parsippany, NJ 07054-0677
Albaglos®[2]	precipitated calcium carbonate	Specialty Minerals Inc. Bethlehem, PA 18017
Armeen® 18D[3]	1-Octadecanamine,N-Octadecyl	Akzo Nobel Polymer Chemicals LLC Chicago, IL 60606
Blanc Fixe	precipitated barium sulfate	Whittaker, Clark & Daniels, Inc South Plainfield, NJ 07080-1000
Carnauba wax	carnauba wax	Frank B. Ross Co. Inc. Jersey City, NJ 07304
Diak™ 7	TAIC – triallyl isocyanurate	DuPont Wilmington, DE 19809
Elastomag® 170[4]	magnesium oxide (high activity)	Rohm and Haas Co. Philadelphia, PA 19106-2399
Luperox® 101XL[5]	45% active dispersion of 2,5 Dimethyl-2-5Di-(t-butyl-peroxy) hexane	Arkema (Atofina) Paris, France
PAT-777	Fatty acid derivatives	IDE Processes International Sales LLC (E und P Wurtz GmbH) Kew Gardens, NY 11415
Stan-Tone® D4005	Phthalocyanine Blue pigment	PolyOne Corp. Burton, OH 44021
Struktol® HT-290[6]	Blend of fatty acid derivatives	Struktol Co. of America Stow, OH 44224
Struktol® WS-280[6]	silicone-organic compounds	Struktol Co. of America Stow, OH 44224
TiPure® R960[7]	titanium dioxide	E.I. DuPont de Nemours & Co. Inc. Wilmington, DE 19805
Varox® DBPH-50[8]	45% active dispersion of 2,5 Dimethyl-2-5Di-(t-butyl-peroxy) hexane	R.T. Vanderbilt Co. Norwalk, CT 06855
Viton® fluoroelastomer	Fluorinated synthetic rubber (FKM)	DuPont Wilmington, DE 19809
Wollastocoat® 10022[9] (10μ)	treated calcium metasilicate	NYCO Minerals, Inc Willsboro, NY 12996-0368

[1]Trademark of Degussa Corp.
[2]Trademark of Specialty Minerals Inc.
[3]Trademark of Akzo Nobel Polymer Chemicals LLC
[4]Trademark of Rohm and Haas Co.
[5]Trademark of Arkema (Atofina)
[6] Trademark of Struktol Co. of America.
[7] E.I. DuPont de Nemours & Co. Inc.
[8] Trademark of R.T. Vanderbilt Co.
[9] Trademark of NYCO Minerals, Inc

Test Procedures
(Test temperature is 23 °C [73 °F] except where specified otherwise.)

Property Measured	Test Procedure
Compression Set	ASTM D395, Method B (25% deflection)
Compression Set, O-rings	ASTM D395, Method B (25% deflection)
Hardness	ASTM D1414, durometer A
Mooney Scorch	ASTM D1646, small rotor at 121 °C
Mooney Viscosity	ASTM D1646, ten pass, 121 °C
ODR (oscillating disk rheometer)	ASTM D2084
Property Change After Oven Heat-Aging	ASTM D573
Stress/Strain Properties 100% Modulus Tensile Strength (T-B) Elongation (E-B)	ASTM D412, pulled at 8.5 mm/s (20” in/min)
Temperature Retraction (TR-10)	ASTM D1329
Volume Change In Fluids	ASTM D471

Note: Test temperature is 23 °C except where specified otherwise

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