Vamac® Ultra XF

Ethylene Acrylic Elastomer - Technical Data

Description

Vamac® Ultra XF is an intermediate Mooney viscosity grade at 23 MU (ML1+4, 100°C), between Vamac® GXF (17.5 MU) and Vamac® Ultra HT (29 MU). This offering provides customers with a broader choice of ethylene-acrylic elastomers for applications such as Turbo Charger Hose, other hose applications, or applications where excellent resistance to dynamic flex fatigue is needed. Such applications typically suffer in flex fatigue resistance when polymer blends are used to achieve the optimum processing performance.

Product Properties

Property	Target Values	Method
Mooney Viscosity ML1+4 at 100 °C	23	ASTM D1646
Volatiles	≤0.5 wt %	Internal DuPont Test
Form (25kg nominal bale size)	51.6 x 34.4 x 13.6 cm	Visual Inspection
Color	Clear to light yellow translucent	Visual Inspection

Processing

Vamac® Ultra XF fits in when Vamac® GXF compounds for a required Hardness levels would be too low in viscosity or in compound green strength, to avoid collapse of the uncured hose, or to avoid that reinforcement yarns cut into the veneer layer. This may happen when hoses are designed to withstand higher internal pressures and thicker yarns are applied at higher stress levels. On the other side, Vamac® Ultra XF may be used when Vamac® Ultra HT would result in problems like too high compound viscosity or high pressure at the extruder head for the same Hardness range.

Physical Properties

The higher viscosity of Vamac® Ultra XF vs. Vamac® GXF results in slight improvements in Compression Set, Tensile and Elongation at Break. Compression Set according to VW PV3307 is especially improved. Heat ageing and fluid ageing performance is comparable to Vamac® GXF.

VME-A11216-00-C0321

Vamac® Ultra XF

Ethylene Acrylic Elastomer - Technical Data

Handling Precautions

Because Vamac® ethylene-acrylic elastomers contain small amounts of residual methyl acrylate monomer, adequate ventilation should be provided during storage and processing to prevent worker exposure to methyl acrylate vapor. Additional information may be found in the Vamac® product Safety Data Sheet (SDS), and DuPont™ bulletin, *Safe Handling and Processing of Vamac®*.

Test Compounds

Vamac® Ultra XF was compared to Vamac® GXF and Vamac® Ultra HT in identical compounds, and in compounds with varying curative levels and a carbon black type with lower structure and larger particle size.

				Ultra XF		
Compound Formulation	GXF	Ultra XF	Ultra HT	High Diak™	Low Diak™	SRF black
Vamac® GXF	100					
Vamac® Ultra XF		100		100	100	100
Vamac® Ultra HT			100			
Spheron® SOA (FEF N 550)	60	60	60	60	60	
Corax® N 772 (SRF)						80
Alcanplast® PO 80	10	10	10	10	10	10
Naugard 445	2	2	2	2	2	2
Vanfre® VAM	1	1	1	1	1	1
Stearic Acid Reagent (95%)	1	1	1	1	1	1
Vulcofac® ACT 55	2	2	2	2	2	2
Rubber chem Diak™ no 1	1.1	1.1	1.1	1.3	0.9	1.1

VME-A11216-00-C0321

Vamac® Ultra XF

Ethylene Acrylic Elastomer - Technical Data

Compound Rheology	GXF	Ultra XF	Ultra HT	Ultra XF High Diak™	Ultra XF Low Diak™	Ultra XF SRF black
Mooney Scorch 45 minutes at 121°C (ISO 289-2:1994)						
Initial Mooney, MU	23	29	34	29	28	26
Minimum Mooney, MU	15	19	22	19	19	17
Ts1, min	5.2	4.9	5.3	4.7	4.8	4.8
Ts2, min	6.4	5.9	6.5	5.6	5.8	5.8
T5, min	9.2	8.2	9.2	7.8	8.4	8.0
T10, min	12.7	11.0	12.4	10.5	11.9	10.6
MDR cure rate 15 min at 180°C, arc 0.5° (ISO 6502:1999)						
ML, dNm	0.54	0.68	0.77	0.67	0.69	0.75
MH, dNm	11.0	10.9	13.3	12.7	8.6	12.1
Ts1, min	0.70	0.70	0.68	0.69	0.70	0.60
Ts2, min	1.04	1.03	0.97	1.01	1.05	0.90
T10, min	0.72	0.70	0.76	0.76	0.62	0.65
T50, min	2.3	2.3	2.5	2.7	1.9	2.3
T90, min	7.5	8.3	7.7	8.9	7.5	8.4
Tan delta at MH	0.068	0.070	0.055	0.053	0.100	0.076
Peak rate, dNm/min	4	5	5	5	4	5

VME-A11216-00-C0321

Vamac® Ultra XF

Ethylene Acrylic Elastomer - Technical Data

Compression Set & Air Oven Ageing	GXF	Ultra XF	Ultra HT	Ultra XF High Diak™	Ultra XF Low Diak™	Ultra XF SRF black
Compression Set – Type B (ISO 815-1:2008)						
70 hours at 150°C, %	27	26	23	26	39	32
70 hours at 175°C, %	37	36	28	35	45	39
Compression Set, VW 22 hours at 175°C (VW PV 3307:2004-08)						
Measured after 5 seconds, %	77	65	60	54	83	64
Heat ageing 168 hours at 175°C (ISO 188:2007)						
Hardness Shore A, 1s (ISO 7619-1:2004)	75	75	75	77	70	74
Delta Hardness, pts	2	2	3	3	2	3
Tensile Strength, MPa	12.9	13.3	15.1	15.4	10.1	13.2
Delta Tensile Strength, %	-23	-25	-17	-17	-36	-20
Elongation at Break, %	325	328	357	286	377	264
Delta Elongation at Break, %	6	3	10	-1	10	7
50% Modulus, MPa	2.3	2.5	2.5	3.1	2.0	2.4
Delta 50% Modulus, %	-1	7	7	15	2	10
100% Modulus, MPa	4.4	4.8	5.0	6.2	3.6	4.8
Delta 100% Modulus, %	-15	-12	-7	-5	-16	-10
Heat ageing 504 hours at 175°C (ISO 188:2007)						
Hardness Shore A, 1s (ISO 7619-1:2004)	82	81	79	81	76	81
Delta Hardness, pts	9	8	7	7	8	10
Tensile Strength, MPa	9.7	9.2	10.6	11.1	7.3	9.1
Delta Tensile Strength, %	-42	-48	-42	-40	-54	-45
Elongation at Break, %	195	192	203	181	205	170
Delta Elongation at Break, %	-37	-39	-38	-38	-40	-31
50% Modulus, MPa	3.4	3.2	3.1	3.3	2.5	3.3
Delta 50% Modulus, %	44	35	33	23	32	52
100% Modulus, MPa	5.9	5.6	5.9	6.5	4.4	5.8
Delta 100% Modulus, %	15	3	9	1	3	10

dupont.com

Vamac® Ultra XF

Ethylene Acrylic Elastomer - Technical Data

				Ultra XF		
Fluid Ageing	GXF	Ultra XF	Ultra HT	High Diak™	Low Diak™	SRF black
Fluid Ageing 168 hours at 150°C in Lubrizol OS 206304 (ISO 1817:2005)						
Hardness Shore A, 1s (ISO 7619-1:2004)	64	65	63	66	57	64
Delta Hardness, pts	-9	-8	-9	-8	-11	-7
Tensile Strength, MPa	15.9	16.3	17.2	17.2	14.7	14.2
Delta Tensile Strength, %	-6	-8	-6	-7	-7	-15
Elongation at Break, %	266	243	282	246	279	204
Delta Elongation at Break, %	-14	-23	-14	-15	-19	-17
50% Modulus, MPa	2.3	2.4	2.1	2.7	1.8	2.1
Delta 50% Modulus, %	-3.4	0.9	-9.5	-1.5	-6.3	-4.6
100% Modulus, MPa	5.6	6.0	5.5	7.0	4.5	5.7
Delta 100% Modulus, %	9.8	10.3	2.4	8.2	5.4	8.1
Weight Change, %	11	11	11	10	11	9
Volume Change, %	17	16	17	15	17	15
Initial Specific Gravity, g/cm^3	1.22	1.22	1.22	1.22	1.22	1.27
Fluid Ageing 504 hours at 150°C in Lubrizol OS 206304 (ISO 1817:2005)						
Hardness Shore A, 1s (ISO 7619-1:2004)	65	65	64	67	58	64
Delta Hardness, pts	-8	-8	-8	-7	-10	-7
Tensile Strength, MPa	15.3	16.2	18.4	16.9	15.2	13.3
Delta Tensile Strength, %	-9	-8	1	-9	-4	-20
Elongation at Break, %	221	226	251	206	251	176
Delta Elongation at Break, %	-28	-29	-23	-29	-27	-28
50% Modulus, MPa	2.5	2.3	2.3	3.0	1.9	2.3
Delta 50% Modulus, %	8	-3	-3	10	-3	6
100% Modulus, MPa	6.4	6.0	6.3	7.8	4.8	6.6
Delta 100% Modulus, %	24	9	16	20	13	25
Weight Change, %	12	10	12	10	11	9
Volume Change, %	18	16	18	16	17	15

VME-A11216-00-C0321