AUTOMOTIVE INDUSTRY
Profile, solid, black

Car body seals, electrically non-conductive
60 Shore A, EPDM, sulfur cure

Guide formulations of HOFFMANN MINERAL	M 568.2	14	16	15	17	18	19
Keltan 8340A)*		100.00	100.00	100.00	100.00	100.00	100.00
Zinkoxyd aktiv		5.00	5.00	5.00	5.00	5.00	5.00
Stearic acid		1.00	1.00	1.00	1.00	1.00	1.00
PEG 3400		2.00	2.00	2.00	2.00	2.00	2.00
Kezadol GR		10.00	10.00	10.00	10.00	10.00	10.00
Corax N 550/30		135.00	60.00	60.00	60.00	60.00	60.00
SILLITIN N 85		---	155.00	---	---	---	---
SILLITIN Z 86		---	---	155.00	---	---	---
SILLITIN P 87		---	---	---	155.00	---	---
AKTISIL MM		---	---	---	---	155.00	---
AKTISIL PF 216		---	---	---	---	---	155.00
Process Oil P 460 (ex Sunpar 2280)		65.00	65.00	65.00	65.00	65.00	65.00
Rhenogran DPG-80		0.50	0.50	0.50	0.50	0.50	0.50
Rhenogran MBTS-80		1.30	1.30	1.30	1.30	1.30	1.30
Rhenogran ZBEC-70		0.50	0.50	0.50	0.50	0.50	0.50
Rhenogran S-80		2.00	2.00	2.00	2.00	2.00	2.00
Rhenogran CLD-80		2.00	2.00	2.00	2.00	2.00	2.00
Rhenogran TP-50		0.75	0.75	0.75	0.75	0.75	0.75
Rhenogran CBS-80		0.50	0.50	0.50	0.50	0.50	0.50
Vulkalent E/C		1.00	1.00	1.00	1.00	1.00	1.00
Total phr		326.55	406.55	406.55	406.55	406.55	406.55

)* No longer available. Recommended: Keltan 8550C; results may therefore differ

Compound preparation

Mixer Farell 3D, tangential, volume 70 l

Loading	%		72
Rotor speed	rpm		35
Start temperature (wall)	°C		50
Mixing method:			
Polymer	min		0-1
Rest except sulfur and accelerators	min		1-2
Mixing	min		2-4
Sweep	min		4-4.5
MIxing	min		4.5-6
Dump temperature	°C	135	100-120

Dump onto cooled mill (30°C)
add sulfur and accelerators

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Mooney Viscosity								
ML (1+4) 120°C	DIN 53523, T3	MU	70.9	54.9	52.1	54.9	52.9	50.8
ML (1+4) 100°C	DIN 53523, T3	MU	91.5	75.0	74.2	73.2	70.3	67.9
Mooney Scorch								
ML (5 MU) 120°C	DIN 53523, T4	min	8.25	12.25	17.42	11.63	13.72	12.92
Rotorless curemeter, 170°C								
Mmin	DIN 53529, T3	Nm	0.138	0.105	0.106	0.120	0.107	0.099
Mmax	DIN 53529, T3	Nm	0.723	0.672	0.723	0.751	0.763	0.700
t_5	DIN 53529, T3	min	0.61	0.96	1.28	1.02	0.97	0.96
t_{90}	DIN 53529, T3	min	5.30	6.10	7.50	7.60	7.70	7.60
Rotorless curemeter, 180°C								
Mmin	DIN 53529, T3	Nm	0.130	0.098	0.101	0.114	0.099	0.090
Mmax	DIN 53529, T3	Nm	0.669	0.647	0.716	0.760	0.789	0.698
t_5	DIN 53529, T3	min	0.52	0.73	0.87	0.75	0.71	0.71
t_{90}	DIN 53529, T3	min	2.50	3.38	4.77	5.40	5.50	5.23
Vacuum extruder, ∅ 90 mm 16D								
Screw speed		rpm			15-18			
Extrusion rate		m/min			7,5			
Temperatures	zone 1 (screw)	°C	75		50			
	zone 2	°C	75		40			
	zone 3	°C	80		50			
	zone 4	°C	90		60			
	zone 5 (head)	°C	110		70			

Cure	
UHF (2 x 6 kW)	length 6 m, air temperature 200°C, typical exit temperature 185°C
Hot air tunnel	length 3 x 9 m, air temperature 270°C
Cooling	length 2 x 9 m, water temperature 10°C

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Physical properties								
extruded profile, UHF/hot air 270°C, theoretical residence time 3.6 min								
Density	DIN EN ISO 1183-1	g/cm³	1.171	1.367	1.359	1.355	1.362	1.360
Hardness (piled S2)	DIN ISO 7619-1	Shore A	64	58	57	58	60	62
Modulus 50 %	DIN 53504, S2	MPa	1.82	1.43	1.33	1.44	1.57	1.77
Modulus 100 %	DIN 53504, S2	MPa	4.39	2.04	1.98	2.13	2.99	3.42
Modulus 200 %	DIN 53504, S2	MPa	9.72	3.10	3.16	3.39	5.00	5.76
Modulus 300 %	DIN 53504, S2	MPa	13.72	4.35	4.35	4.65	5.87	7.03
Tensile strength	DIN 53504, S2	MPa	13.9	7.4	8,1	8.5	8.6	8.9
Elongation at break	DIN 53504, S2	%	310	510	535	535	480	415
Tear resistance	DIN ISO 34-1, A	N/mm	7.6	8.9	10.5	10.7	11.9	8.4
Compression set	**VW-PV 3307**							
100 h @ 23°C, 50 % defl.	5 s relaxation	%	20.2	21.2	23.2	24.1	21.0	16.7
100 h @ 70°C, 50 % defl.	5 s relaxation	%	42.4	50.6	54.8	56.3	48.1	50.0
22 h @ 70°C, 50 % defl.	5 s relaxation	%	33.0	40.5	42.2	44.3	32.5	34.5
22 h @ 70°C, 50 % defl.	60 min relaxation	%	23.4	32.1	32.5	35.9	25.9	25.3
72 h @ 23°C, 50 % defl.	5 s relaxation	%	18.2	19.8	19.5	23.8	17.5	13.4
72 h @ 23°C, 50 % defl.	60 min relaxation	%	9.1	11.3	12.2	12.5	10.0	8.4
Volume resistivity								
Press cure @ 170°C		**min**	**5.8**	**6.7**	**8.3**	**8.4**	**8.5**	**8.4**
Press cured	DIN IEC 93	Ω cm	3×10^5	6×10^{11}	6×10^{12}	1×10^{13}	2×10^{12}	2×10^{13}
Relaxation 2 h @ 70°C	DIN IEC 93	Ω cm	2×10^5	4×10^{12}	4×10^{11}	8×10^{12}	1×10^{12}	2×10^{13}
Air aging, 168 h @ 100°C								
extruded profile, UHF/hot air 270°C, theoretical residence time 3.6 min								
Hardness (piled S2)		Shore A	67	65	63	66	66	68
Modulus 50 %		MPa	2.52	1.89	1.79	1.90	2.20	2.74
Modulus 100 %		MPa	6.18	2.66	2.69	2.89	4.16	5.20
Modulus 200 %		MPa	12.58	4.03	4.14	4.50	6.16	7.62
Modulus 300 %		MPa	---	5.61	5.51	5.98	7.55	---
Tensile strength		MPa	14.8	7.2	8.3	8.7	8.9	8.8
Elongation at break		%	255	385	435	425	390	275
Tear resistance	DIN ISO 34-1, A	N/mm	5.4	5.3	8.5	6.4	7.0	3.8
Δ Hardness (piled S2)		Shore A	+3	+7	+6	+8	+6	+6
Δ Modulus 50 %		%	+38.6	+31.9	+34.2	+32.5	+40.3	+54.5
Δ Modulus 100 %		%	+40.8	+30.5	+35.9	+35.8	+39.5	+52.0
Δ Modulus 200 %		%	+29.5	+30.1	+30.9	+33.0	+23.0	+32.3
Δ Modulus 300 %		%	---	+29.0	+26.7	+28.4	+28.5	---
Δ Tensile strength		%	+6.3	-2.7	+2.9	+2.1	+2.4	-0.7
Δ Elongation at break		%, rel.	-16.9	-25.0	-18.6	-20.3	-18.7	-33.8
Δ Tear resistance		%	-28.6	-40.7	-18.8	-40.8	-41.4	-55.0

More information on this topic

Comparison of Mineral Fillers in Non-Conductive Car Body Seals

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