

OTHER APPLICATION**Molding, black****Potable water seal****Partial replacement of carbon black by Neuburg Siliceous Earth****70 Shore A, EPDM, peroxide cure****Specification E-DIN EN 681-1 (07/16)**

Guide formulations of HOFFMANN MINERAL	M 662.0	Control		SILLITIN Z 86		AKTISIL VM 56		
		10	22	4	11	21	6	17
Keltan 2650		100.00	100.00	100.00	100.00	100.00	100.00	100.00
Zinkoxyd aktiv		3.00	3.00	3.00	3.00	3.00	3.00	3.00
Stearic acid		0.30	0.30	0.30	0.30	0.30	0.30	0.30
Purex HS 45		80.00	60.00	50.00	40.00	60.00	50.00	40.00
SILLITIN Z 86		---	40.00	60.00	80.00	---	---	---
AKTISIL VM 56		---	---	---	---	40.00	60.00	80.00
Caldic PIB V 190		15.00	15.00	15.00	15.00	15.00	15.00	15.00
Safic-Chem OMB		0.75	0.75	0.75	0.75	0.75	0.75	0.75
Luperox 101XL45		5.33	5.33	5.33	5.33	5.33	5.33	5.33
TAC/GR 70		0.70	0.70	0.70	0.70	0.70	0.70	0.70
Total phr		205.08	225.08	235.08	245.08	225.08	235.08	245.08

AKTISIL VM 56:

- significant cost reduction
- fulfils the requirement profile of the standard even up to 50 % carbon black replacement at a high level
- lower Mooney viscosity and shorter conversion time t_{90}

SILLITIN Z 86:

- even more significant cost reduction potential than with AKTISIL VM 56
- positive effect on tear resistance DIN ISO 34-1 trouser specimen
- lower Mooney viscosity and shorter conversion time t_{90}
- 25 % carbon black replacement: fulfils requirement profile
- 37 % carbon black replacement: requires longer conversion time or post cure due to compression set requirement, change of elongation at break after hot air aging is borderline
- 50 % carbon black replacement: as the most cost-effective variant, however requires formulation optimization
For example, by replacing the antioxidant BPH with polymeric TMQ, both compression set and properties after hot air aging are significantly improved.
Polymeric TMQ currently listed in Positive List part 2 of the German Federal Environment Agency (as May 2020).

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		Control	SILLITIN Z 86			AKTISIL VM 56		
	M 662.0	10	22	4	11	21	6	17
Mooney Viscosity								
<i>DIN ISO 289-1</i>								
ML (1+4) @ 100°C	MU	72	63	65	63	64	64	63
ML (1+4) @ 120°C	MU	53	47	50	47	47	48	48
Rotorless curemeter, 180°C								
<i>DIN 53529, T3</i>								
Mmin	Nm	0.10	0.08	0.09	0.08	0.08	0.08	0.08
Mmax	Nm	0.80	0.76	0.73	0.70	0.79	0.70	0.71
Mmax-Mmin	Nm	0.71	0.68	0.65	0.62	0.71	0.62	0.63
Curing rate	Nm/min	0.22	0.24	0.24	0.24	0.24	0.23	0.25
t ₅	min	0.47	0.48	0.47	0.46	0.48	0.47	0.45
t ₉₀	min	7.0	6.6	6.3	6.1	6.6	6.4	6.2
Physical properties, Press cure @ 180°C								
Curing time	min	7.7	7.3	6.9	6.7	7.3	7.0	6.8
Hardness	Shore A	69	67	67	65	68	67	67
<i>DIN ISO 7619-1</i>								
Tensile strength	MPa	16	14	12	11	16	14	13
<i>DIN 53504, S2</i>								
Modulus 100 %	MPa	5.0	4.7	4.6	3.8	5.5	5.2	5.3
<i>DIN 53504, S2</i>								
Elongation at break	%	222	262	279	330	228	223	223
<i>DIN 53504, S2</i>								
Tear resistance (trouser)	N/mm	3.5	5.1	5.9	7.5	4.1	4.7	4.3
<i>DIN ISO 34-1, A</i>								
Tear resistance (delft)	N	38	42	43	42	41	43	42
<i>DIN ISO 34-2, A</i>								
Compression set								
<i>DIN ISO 815-1, B</i>								
72 h @ 23°C, 25 %	%	8.7	9.8	11	12	9.5	11	10
72 h @ -10°C, 25 %	%	20	21	24	27	20	24	26
24 h @ 125°C, 25 %								
Press cured t ₉₀ + 10 %	%	12	17	20	23	16	16	17
Press cured 12 min	%	11	16	18	19	16	16	15
Press cured t ₉₀ + 10 % and post cured 2 h @ 125°C	%	12	16	18	20	16	16	16

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		Control	SILLITIN Z 86			AKTISIL VM 56		
	M 662.0	10	22	4	11	21	6	17
Air aging, 168 h @ 125°C								
Hardness	Shore A	75	73	74	72	73	72	73
Tensile strength	MPa	17	15	14	13	15	16	15
Elongation at break	%	169	194	212	215	170	188	176
Δ Hardness	Shore A	+6	+6	+7	+7	+5	+5	+6
Δ Tensile strength	%	-8.2	+9.7	+8.9	+16	-5.2	-16	-11
Δ Elongation at break	%, rel.	-20	-27	-29	-39	-24	-18	-25
Immersion in water, 168 h @ 95°C								
Hardness	Shore A	70	67	66	64	69	68	67
Tensile strength	MPa	17	15	13	11	16	14	14
Elongation at break	%	208	289	325	391	239	247	250
Δ Hardness	Shore A	+1	0	-1	-1	+1	+1	0
Δ Tensile strength	%	+3.8	+6.5	+9.5	+4.6	-2.3	+2.4	+2.0
Δ Elongation at break	%, rel.	-6.4	+10	+16	+18	+5.0	+11	+12
Δ Volume	%	+1.1	+1.1	+1.6	+1.9	+1.6	+1.3	+1.7

More information on this topic is available in this technical report:

[Potable Water Seal EPDM Peroxide Cure](#)

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