

AKTISIL Q

Field of application: Elastomers

1. Description

AKTISIL Q is based on a specially designed and activated SILLITIN V 90* whose surface has been modified with a methacryl functional group. The by-products split off during the treatment reaction are largely removed during the production process which firmly attaches the functional group to the filler surface. This helps minimize undesirable side effects, as they are potentially encountered with in-situ mixing (direct addition of additive to the compound).

During vulcanization the methacryl groups of the AKTISIL Q react with the polymer in the presence of radicals.

Characteristics

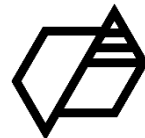
Appearance		free-flowing powder
Color CIELAB scale:	L* a* b*	94.7 0.3 4.1
Residue > 40 µm		25 mg/kg
Volatile matter at 105 °C		0.3 %
Density		2.6 g/cm ³
Particle size distribution	D ₅₀ D ₉₇	4 µm 18 µm
Oil absorption		43 g/100 g

Packaging

Paper bags		à 25 kg
EVA bags		≤ 20 kg
Big Bags		550 - 900 kg

Shelf life

2 years if stored properly under dry conditions.



2. Applications

In elastomer applications AKTISIL Q is used as a functional filler either on its own or in combination with other non-reinforcing or reinforcing fillers. The best effect is achieved in radical cured systems (peroxide, high energy radiation) and FKM (bisphenolic and peroxide cure).

AKTISIL Q is used where high tensile strength and moduli along with very low tensile and compression set are of importance as well as excellent processing properties, high oil resistance and acid resistance in FKM.

Even more so, the extrusion of silicone rubber profiles and hoses containing AKTISIL Q will result in products with excellent surface quality, reduced or prevented stickiness, very smooth edges of profiles and high collapse resistance.

Fields of application

- Colored or very bright silicone rubber products with good oil resistance:
 - extruded profiles, hoses, cables
 - molded gaskets and O-rings
 - roller coverings
 - flame retardant compounds as partial replacement of ATH up to 30 %
- FKM bisphenolic and peroxide cure, the latter with very good acetic acid resistance (blow-by gas condensate)

Methods of processing:

All usual methods, in case of silicone rubber especially extrusion.

Elastomers:

- silicone rubber (Q) in combination with all typical peroxides
- elastomers and specialty rubbers crosslinked by free radicals including FKM

Dosage:

silicone rubber (Q): 25 - 125 phr, preferred 25 - 75 phr

FKM: 20 - 50 phr, preferred 30 - 45 phr



3. Benefits

Aktisil Q compared to:

- Silicone base compound:
 - good extrusion properties along with high collapse resistance
 - reduced or even total prevention of stickiness of extrusions
 - high tensile moduli
 - low compression set, even without post-cure, up to 75 phr even better than the silicone base compound
 - comparable aging properties
 - considerable improvement of oil resistance
 - reduction or total prevention of blooming when using bis-(2.4-dichlorobenzoyl)-peroxide

- Quartz flour vinyl silane treated:
 - higher hardness, 75 phr Aktisil Q = 100 phr quartz flour
 - reduced abrasivity and wear on processing machinery
 - improved collapse resistance of extrusions
 - reduced or even total prevention of stickiness of extrusions
 - lower compression set at equal hardness
 - slightly improved oil resistance
 - reduction or total prevention of blooming when using bis-(2.4-dichlorobenzoyl)-peroxide

- Diatomaceous earth:
 - possibility of higher loadings, 75 to 100 phr Aktisil Q = 50 phr diatomaceous earth
 - improved smoothness of profile edges (extrusion)
 - markedly lower compression set
 - considerably improved oil resistance

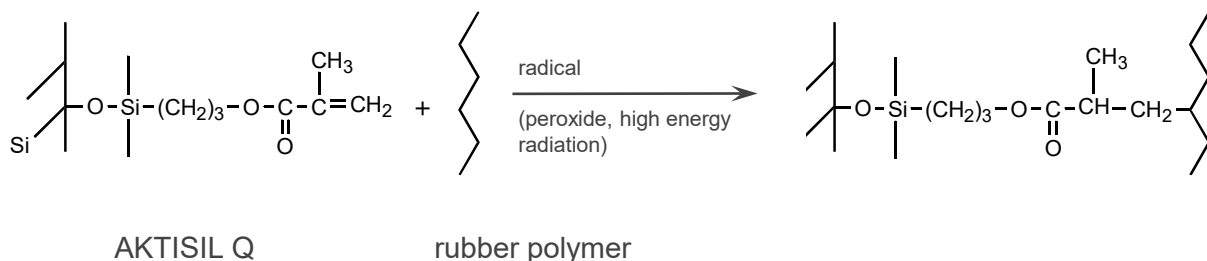
- FKM bisphenolic cure:

low viscosity, high elongation at break, very low compression set, good resistance to oil and water

- FKM peroxide cure:

low viscosity, very low compression set (even without post cure), no loss of elongation at break after hot air aging, good resistance to fuel, oil and acetic acid

4. Possible reaction during vulcanization at user's plant (model)





5. Effects of AKTISIL Q in silicone rubber compounds

Compound no. 608. 5		Bis-(2.4-dichlorobenzoyl)-peroxide (50%)					2.5-Bis-(t-butylperoxy)-2.5-dimethylhexan (45%)					Dicumyl peroxide (40%)				
Peroxide level	phr	1.5					1.2					0.99				
Elastosil R401/40	phr	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100
Aktisil Q	phr		25	50	75	100		25	50	75	100		25	50	75	100
After press cure		5 min. / 115 °C					5 min. / 165 °C*					5 min. / 180 °C				
Tensile strength	MPa	9.9	8.9	8.6	8.2	7.9	10.7	9.6	8.8	8.2	8.0	10.8	9.5	8.9	8.5	8.2
Elongation at break	%	505	440	315	225	180	800	610	430	315	235	700	560	405	300	225
Modulus 100 %	MPa	1.0	1.8	2.9	3.6	4.9	0.7	1.2	1.7	2.6	3.4	0.7	1.2	1.9	2.8	3.8
Hardness	Shore A	43	54	61	69	75	38	47	55	64	72	39	49	56	64	73
Tear strength DIN ISO 34-1, A	N/mm	9.7	1.8	1.9	1.2	1.1	11.5	14.0	3.7	2.0	1.4	11.6	3.7	2.7	1.6	1.3
Rebound	%	62	61	59	55	52	40	50	50	46	45	50	54	52	52	47
Compression set 24 h / 175 °C	%	41	36	34	34	38	35	24	24	23	25	18	12	11	13	17
after post-cure 4 h / 200°C																
Tensile strength	MPa	8.9	8.9	8.1	7.8	7.5	11.2	8.8	7.5	6.8	6.7	11.1	8.7	8.5	8.0	7.2
Elongation at break	%	500	435	300	220	170	860	585	435	300	230	770	510	410	305	210
Modulus 100 %	MPa	1.0	1.8	2.8	3.8	4.9	0.7	1.1	1.8	2.5	3.2	0.8	1.3	1.9	2.9	3.4
Hardness	Shore A	44	54	61	69	75	40	48	57	66	74	40	50	57	65	73
Tear strength DIN ISO 34-1, A	N/mm	8.4	1.8	1.7	1.4	1.3	12.2	12.8	4.2	2.3	1.6	10.2	4.4	2.9	1.9	1.6
Rebound	%	38	34	32	33	27	53	52	49	45	42	54	54	50	47	41
Compression set 24 h / 175 °C	%	38	38	37	35	38	24	16	17	18	21	17	12	13	16	20
Immersion in Reference Oil IRM 903 72 h / 150°C (post-cured samples)**																
Δ Tensile strength	%	-57	-26	-19	-6	-4	-72	-41	-24	-16	-15	-69	-43	-26	-16	-14
Δ Elongation at break	% rel.	-49	-30	-30	-13	-20	-55	-40	-21	-7	-11	-54	-43	-27	-9	-7
Δ Modulus 100 %	%	-3	2	1	5	14	-4	6	2	-2	8	-1	2	6	3	1
Δ Hardness	Shore A	-22	-21	-21	-23	-23	-22	-22	-25	-26	-27	-21	-22	-23	-24	-26
Δ Weight	%	47	34	28	22	18	52	39	31	25	22	52	39	31	25	22
Δ Volume	%	58	47	41	35	31	65	55	47	41	38	64	54	46	41	37

**results with non-post-cured samples are comparable or even better

* at 180 °C: properties similar to those after post cure

Effects of Aktisil Q in FKM and additional informations please see at www.hoffmann-mineral.com

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