All About Resins

TECHNICAL DATASHEET

Crosslinkers

ALNOVOL® PN 320/PAST

TYPE

Non-self-curing phenolic resins of the novolak type

FORM OF DELIVRY (f.o.d.)

Pellets

USES

Reinforcement of rubber
Spirit laquers, Alnovol PN 320 is usable to petrol-resistant coatings, sealers and electro insulating varnishes.

PRODUCT DATA

The data are determined by our quality control for each batch (lot) before release.

Determined per batch:

Softening Point DIN EN ISO 4625-1		
softening point Ring & Ball (5 °C/min)	[°C]	108 - 120
Dynamic Viscosity (Ubbelohde) DIN 53177		
dynamic viscosity 50% MP (23 °C)	[mPa.s]	1400 - 2200
Iodine Colour Number DIN 6162		
iodine colour number		<=20
Phenol, residual (GC) DIN EN ISO 8974		
content	[%]	<= 0,3

Not continually determined:

Melting Interval DIN 53181		
melting range	[°C]	79 - 89
Colour Scale (Gardner) DIN EN ISO 4630-1		
Gardner colour value		<=9
Density (Solids) DIN EN ISO 1183-1		
density analogous, approx. (B)	[g/cm³]	1,20

SOLUBILITY

Soluble in the commonly used alcohols, glycol ethers, esters and ketones. Insoluble in aliphatic and aromatic hydro-carbons.

DOSAGE

10 to 20 pts by wt Alnovol PN 320 to 100 pts by wt rubber. Higher additions are possible.

PROPERTIES AND USES

Rubber

Alnovol PN 320 and is suitable for rein-forcing natural rubber, styrene-butadiene rubber and nitrile rubber. Alnovol PN 320 is odourless and an environmental product due to its very low content of free phenol. This resin is readily absorbed by the rubbermix and they have a strong plasticizing effect.

Paint

Alnovol PN 320 dry by solvent evaporation. It is commonly applied as a solution in ethanol. Solution of Alnovol PN 320 dry very rapidly to hard coatings with good resistance to water, weak acids and also petrol, mineral oils and tar. Coatings are weakly yellowish and possess moderate. The addition of small amounts of plasticizing components such as suitable alkyd resins or polyvinyl butyral has proved to be an effective way of modifying.

Spirit varnishes

Alnovol PN 320 serve as a binder for fast-drying spirit varnishes. Such varnishes are used, for instance, in iron foundries for coating moulds and for coating toys and other consumer goods. Other fields of application are brewery enamels for vats and barrels and French polish.

Coatings with resistance to petrol and mineral oils

Alnovol PN 320 is combined with the ®Phenodur grades PR 373 or PR 263 and, if necessary, plasticizing alkyd resins and/or polyvinyl butyral for the manufacture of coatings which dry by solvent evaporation. Such coatings are resistant to petrol and mineral oils and are used for protecting the interior of tanks, storage containers, pipe systems and machine housings.

Sealers

Combinations of Alnovol PN 320 and Vialkyd AC 421 have proved suitable for producing barrier coatings for preventing the passage of tar, bitumen and similar substances into subsequent coats.

PROCESSING

Rubber

For better dispersion of the resin, the temperature of the mix at the end of the mixing operation after the resin addition should be raised of more than 90 °C and should reach 120 °C. For curing hexamethylenetetramine or another methylene group donor, e. g. Cyrez 963 L or 964 LF, is required. For proper curing a resin to hardener ratio of 7 : 3 in the case of Cyrez 963 is recommended if hexamethylenetetramine is used the ratio is 9 : 1. The resin can be incorporated into the rubber together with fillers, antioxidants, zinc oxide and stearic acid in the first mixing stage. The hardener should be added together with the vulcanizing system in the secondmixing stage. The reinforced vulcanizate has a higher modulus, increased hardness and better resistance to tear propagation.

Paint

Alnovol PN 320 is dissolved at normal temperature in alcohols or mixtures of alcohols, ketones, esters and glycol ethers and, if necessary, mixed with solutions of the modifying resins mentioned above.

STORAGE

At temperatures up to 25 °C storage stability packed in original containers amounts to at least 365 days.

DISTINGUISHING FEATURES

Paint

The use of Alnovol PN 320 results to a lighter colour. Alnovol PN 430 coatings are harder and possess better water resistance and stability to ageing than coatings produced with Alnovol PN 320.

TYPICAL COMPOUNDS

1. Natural rubber compounds

Typical formulation	Pts by wt	Pts by wt
Natural rubber (RSS)	100,0	100,0
HAF carbon black	80,0	80,0
Stearic acid	1,5	1,5
Zinc oxide RS	5,0	5,0
Antioxidants	2,0	2,0
ALNOVOL PN 320	-	9,0
Hexamethylenetetramine	-	1,0
Sulphur	2,5	2,5
Benzothiazyl-2-cyclohexylsulfenamide	0,9	0,9
Tetramethylthiuammonosulfide	0,3	0,3

Test values before vulcanization	Unit	Value	Value
Mooney L 1 + 4 (100 °C)	[ME]	69	71
Test values after vulcanization	(20 min.at 145 °C)		
Tensile strength	[Mpa]	18	17
Elongation at break	[%]	171	178
Modulus at 10% elongation	[Mpa]	1,7	3,1
Modulus at 50% elongation	[Mpa]	4,6	5,6
Modulus at 100% elongation	[Mpa]	9,9	10,3
Hardness (Shore A)	[°]	80	90
Resilience	[%]	35	34

2. Styrene-butadiene rubber compounds

Typical formulation	Pts by wt	Pts by wt
Buna Hüls EM 1620	150,0	150,0
Stearic acid	1,5	1,5
Zinc oxide RS	5,0	5,0
Antioxidants	2,0	2,0
ALNOVOL PN 320	-	9,0
Hexamethylenetetramine	-	1,0
Sulphur	2,0	2,0
Benzothiazyl-2-cyclohexylsulfenamide	1,0	1,0
Tetramethylthiuramdisulfide	0,2	0,2

Test values before vulcanization	Unit	Value	Value
Mooney L 1 + 4 (100 °C)	[ME]	48	58
Test values after vulcanization	(25 min.at 150 °C)		
Tensile strength	[Mpa]	15	15
Elongation at break	[%]	139	145
Modulus at 10% elongation	[Mpa]	1,8	2,4
Modulus at 50% elongation	[Mpa]	4,3	5,1
Modulus at 100% elongation	[Mpa]	10,1	10,4
Hardness (Shore A)	[°]	75	83
Resilience	[%]	38	38