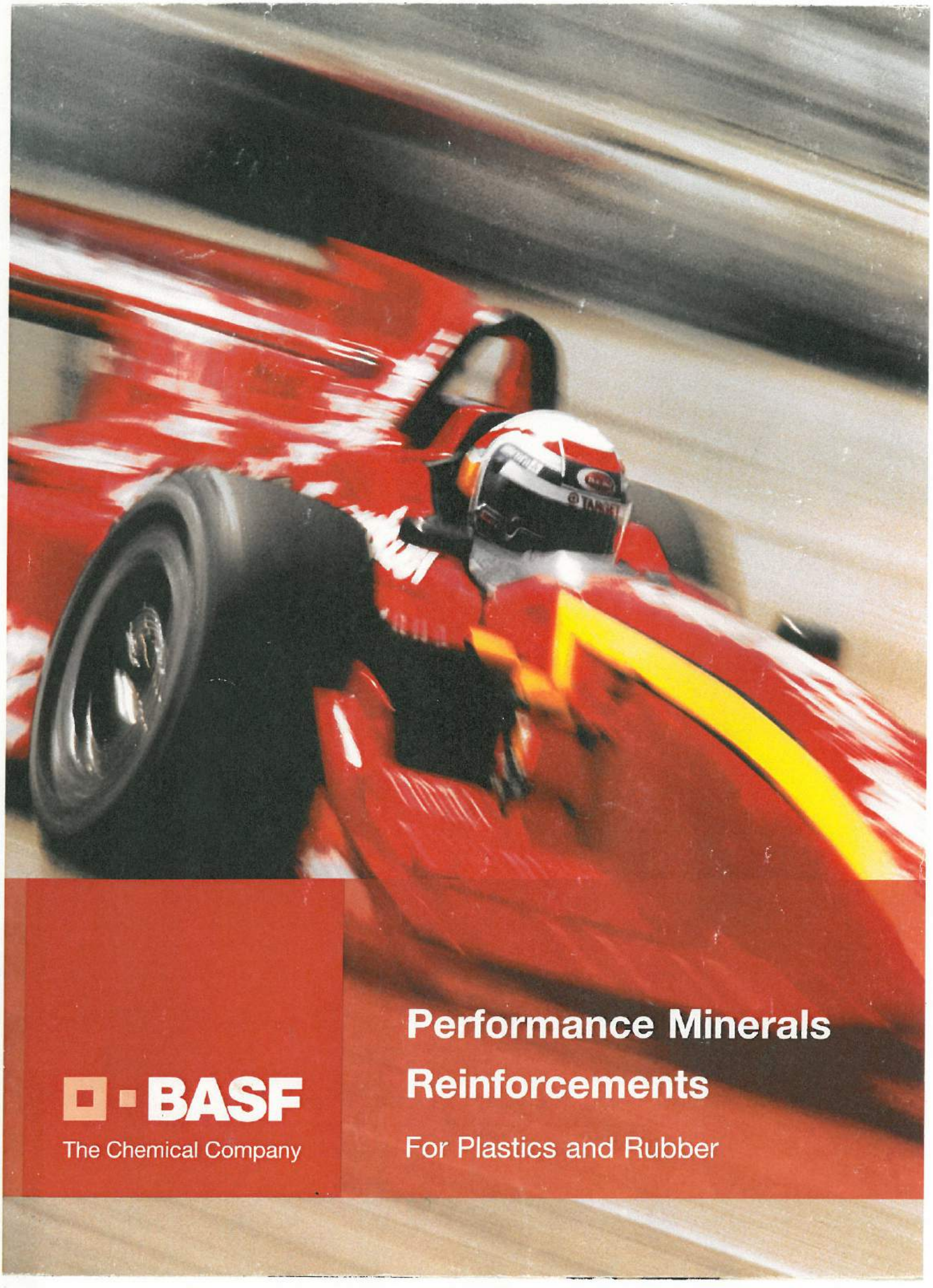
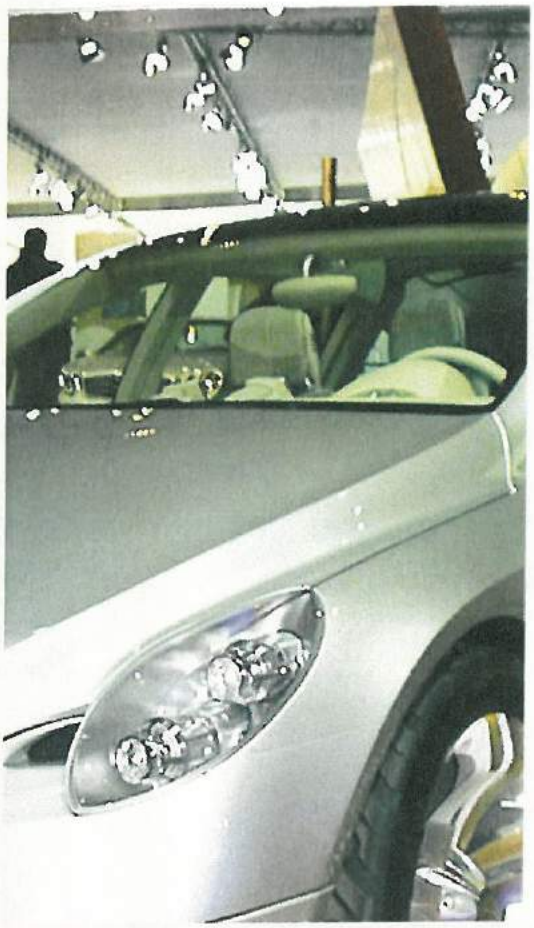


Performance Minerals Reinforcements

For Plastics and Rubber

BASF

The Chemical Company



For a century, BASF Corporation has been a worldwide leader in material and surface sciences

BASF's goal is to provide our customers with mineral solutions that help them improve their products by providing:

- Superior toughness for mineral-filled engineering resins
- Exceptional electrical insulative properties
- Improved processing efficiency
- Improved physical properties - aiding durability
- Improved surface appearance
- Controlled rheology
- Increased profitability potential

BASF IS MORE THAN A PERFORMANCE MINERALS SUPPLIER

As a world leader in performance mineral product support, BASF provides ongoing product development, technical resources, logistics and innovation. We are committed to providing unparalleled capacity, supply, and quality at a competitive price.

BASF's performance minerals-based product line of performance additives made from kaolin (aluminum silicate) add value in a wide variety of polymeric applications.

MINERAL SOLUTIONS FOR PLASTIC

In plastics, ASP®, SATINTONE® and TRANSLINK® specialty aluminum silicates provide many features, including excellent reinforcement, electrical insulative properties, TiO_2 extension and improved polymer processability. TRANSLINK surface modified grades improve dispersion and provide synergy between the polymer matrix and the mineral surface. This yields improved strength and stiffness while maintaining a high level of impact strength.

MINERAL SOLUTIONS FOR ELASTOMERIC SYSTEMS

In elastomers, ASP, SATINTONE and TRANSLINK specialty aluminum silicates function as extenders, reinforcing extenders and processing aides. Hydrous grades such as our BUCA® and CATALPO® products offer dependable cure rates, color and strength because of their carefully controlled particle size distributions and neutral pH. Surface modified TRANSLINK grades provide excellent modulus and tear strength in a wide variety of rubber compounds. In EPR power cables, SATINTONE and TRANSLINK products provide excellent dispersion and exceptional electrical insulative properties.

The typical platy / laminar structure of hydrous grade kaolin. Finer and coarser grades are processed to create narrow particle-size distributions.

The typical, randomly fused particles result from heat treatment (calcination). This process results in de-hydroxylation or partial removal of chemically bound moisture.

Calcined kaolins offer improved reinforcing properties and better opacity due to their fine particle-size, high degree of porosity and highly aggregated morphology, resulting in better light scattering.

BASF SPECIALTY ALUMINUM SILICATE

Kaolin is a naturally occurring aluminum-silicate mineral that is mined from high purity deposits located in the heart of the kaolin belt in central Georgia. The natural form of kaolinite contains stacked hexagonal platelets in a laminar structure (see SEM micrographs on the left).

BASF creates specialty kaolin-based performance additives through a series of refining steps to control particle size distribution and removal of naturally occurring contaminants to enhance appearance and minimize ionic impurities. The refining (water-washing) process can include centrifuging, delamination, magnetic separation, ozonation and ultra-flotation (a BASF patented process that results in a fine particle size, platy material with very low residue).

KAOLIN PRODUCT TYPES

BASF's hydrous grade products have been water-washed to remove residue and salts, provide narrow particle size distribution, improve brightness and neutralize pH.

Delamination is a manufacturing step whereby the slurried kaolin is processed through mills that are specially designed to separate kaolin platelets. This process creates products with aspect ratios averaging as high as 14 : 1.

To produce calcined grades, the purified kaolin material is subjected to heat treatment with temperatures as high as 1000°C. Calcining breaks down the crystalline structure of the kaolin particle. This process drives off crystalline bound -OH groups (often referred to as crystalline water) and brightens the product.

Surface-modified grades are treated with functional additives. These surface treatments create synergy between the inorganic kaolin particle and the organic polymer by providing an organic bridge with which to bond. Translink surface-modified, kaolin-based reinforcements consistently give better polymer performance in demanding applications by providing:

- Improved processing
- Enhanced mechanical strength
- Improved toughness - durability
- Improved impact & flexural strength
- Improved electrical insulative properties
- A high degree of hydrophobicity

Surface-modified kaolins can include hydrous, delaminated or calcined grades. For more than forty years, BASF has been a leader in mineral surface treatment technology and operates the most state-of-the-art surface treatment facility in the business.

For optimum dispersion in polymeric systems, most grades of kaolin are available in pulverized form.

BASF PERFORMANCE MINERALS FOR POLYMERIC SYSTEMS

TYPICAL PHYSICAL PROPERTIES

PRODUCT	Physical Form	Modifications	GE Brightness (% Reflectance)	Whiteness Index (L Value)	Screen Residue, +325 Mesh(%)	pH (28% solids)	Median Stokes Equivalent Particle Diameter (um))	BET Surface Area (m2/g)	Oil Absorption, Rubout (D-281)	Bulk Density, (lbs/ft3 / g/m3) Loose	Bulk Density (lbs/ft3 / g/m3) Tamped
KAOLIN											
Hydrous Spray-Dried											
ASP® G 92	Beads	Dispersant	90	96	0.01	6 - 8	0.2	20.5	40-50	44/700	58/930
ASP 072	Beads	Dispersant	90	96	0.01	6 - 8	0.3	21.0	40-50	44/700	58/930
ASP 102	Beads	Dispersant	86	95	0.01	6 - 8	0.4	18.3	40-50	44/700	58/930
ASP 602	Beads	Dispersant	86	95	0.01	6 - 8	0.6	18.0	35-45	44/700	58/930
ASP 672	Beads	Dispersant	90	94	0.01	6 - 8	0.6	15.2	35-45	44/700	58/930
Hydrous Pulverized											
ASP 200	Pulverized	None	86	95	0.01	3.5-5	0.4	20.7	40-50	18/290	30/480
BUCA®	Pulverized	Dispersant	86	95	0.01	6 - 8	0.4	21.3	40-50	16/260	20/320
ASP 170	Pulverized	Dispersant	90	96	0.01	6 - 8	0.4	19.2	40-50	15/240	20/320
ASP 600	Pulverized	None	85	95	0.01	3.5-5	0.6	19.1	35-45	20/320	30/480
CATALPO®	Pulverized	Dispersant	85	95	0.01	6 - 8	0.6	17.1	40-50	15/240	20/320
ASP 400P	Pulverized	None	80	92	0.15	3.5-5	3.5	8.6	30-40	25/400	40/640
ASP 900P	Pulverized	None	83	93	0.15	3.5-5	1.5	12.2	30-40	25/400	40/640
Delaminated											
ASP NC	Pulverized	Dispersant	87	96	0.01	6 - 8	0.7	14.0	40-50	16/260	25/400
Hydrous Surface Modified											
ASP 101	Pulverized	Stearate	86	95	0.03	3.5-5	0.4	19.8	40-50	18/290	30/480
Calcined											
Satintone® 5HB	Pulverized	Dehydroxylated	92	97	0.02	5 - 7	0.8	15.4	85-95	13/210	20/320
Satintone Special	Pulverized	Dehydroxylated	91	97	0.01	5 - 7	1.2	10.4	60-70	16/260	30/480
Satintone W (Whitetex)	Pulverized	Dehydroxylated	91	97	0.05	5 - 7	1.4	10.3	50-60	20/320	30/480
Ultrex® 96	Pulverized	Dehydroxylated	95	98	0.02	5 - 7	0.8	12.3	85-95	16/260	22/350
Metakaolin											
Satintone SP-33	Pulverized	Dehydroxylated	85	96	0.07	5 - 7	1.3	12.9	50-60	16/260	30/480
Calcined Surface Modified											
Translink® 37	Pulverized	Vinyl functional	90	97	0.02**	N/A	1.4**	10.1	45-55	20/320	35/560
Translink 77	Pulverized	Vinyl functional	91	97	0.02**	N/A	0.8**	16.3	80-90	13/210	21/340
Translink 445	Pulverized	Amino functional	90	96	0.02**	8-10	1.4**	10.4	45-55	20/320	35/560
Translink 555	Pulverized	Amino functional	91	97	0.02**	8-10	0.8**	17.1	80-90	13/210	21/340
Translink HF-900	Pulverized	Amino functional	90	97	0.05**	8-10	1.4**	10.5	70-80	20/320	35/560

**Pre-treatment Value

APPLICATION MATRIX

PRODUCT	PLASTICS											WIRE & CABLE			RUBBER				
	BMC / SMC	Film, Anti-block	Plastisols プラスチゾル	Polyamide	Polyolefins	Pultrusion	RIM	Polyester Gel Coats	TiO_2 Extension	Phenolics	TPO/TPE	EPR Power Cables	PVC Wire	Electrical Connectors	MRG	Pharmaceutical	Tires, White Sidewall	Electircal Capacitors	Silicone
KAOLIN																			
Hydrous Spray-Dried																			
ASP® G 92															X		R		
ASP 072															R		R		
ASP 102															R				
ASP 602															R				
ASP 672															R				
Hydrous Pulverized																			
ASP 200	R					R						X			R				
BUCA®	X														R				
ASP 170		R							R										
ASP 600	X					R				R		X			X				
CATALPO®	X														R				
ASP 400P	R					R				R									
ASP 900P	R					R				R					X				
Delaminated																			
ASP NC															R				
Hydrous Surface Modified																			
ASP 101		R													X				
Calcined																			
Satintone® 5HB			R	R				R	R						R				R
Satintone Special			R					R	R		R	R			R				
Satintone W (Whitetex)				R	R				R			R	X		R	R		R	
Ultrex® 96									R			R							
Metakaolin																			
Satintone SP-33													R						
Calcined Surface Modified																			
Translink® 37								R		R		R		R		X		R	X
Translink 77								R				X		R		X		R	X
Translink 445				R			X					R			R				X
Translink 555				R			X												X
Translink HF-900				R			X												

Key: R = Recommended
X = Can be used

Other Typical Physical Properties

	KAOLIN	
	ASP, BUCA & CATALPO GRADES	ULTREX, SATINTONE & TRANSLINK GRADES
Decomposition Temperature (°C) Approx.	1800	
Specific Heat Capacity (cal/gram)	0.20 - 0.22	
Free Moisture, % (as produced)	1.0	0.5
MOHS Hardness	2 - 2.5	2.5 - 3
Refractive Index	1.56	1.62
Dielectric Constant	2.6	1.3
Specific Gravity	1.58	2.63
L.O.I. (%)	13.6 - 14.2	< 0.5

Note: Satintone SP-33 is metakaolin, which yields a lower specific gravity of 2.50

Typical Chemical Analysis of Kaolin

(Moisture Free Basis)

	KAOLIN	KAOLIN		
	ASP, BUCA & CATALPO HYDROUS GRADES	ULTREX, SATINTONE & TRANSLINK CALCINED GRADES with average particle size (m)		
		< 1.0	1.0 - 1.7	> 1.7
Al_2O_3 %	38.8	44.2	44.6	45.5
SiO_2 %	45.2	52.0	52.3	52.9
Na_2O %	0.05 - 0.3	0.2	0.1 - 0.3	0.3
TiO_2 %	0.6 - 1.7	1.7	1.4 - 1.9	0.6
CaO %	0.02	0.1	0.03	0.01
Fe_2O_3 %	0.3 - 0.9	1.1	0.4 - 0.8	0.3
MgO %	0.03	0.03	0.04	0.03
K_2O %	0.05 - 0.2	0.2	0.1 - 0.2	0.1
P_2O_5 %	trace	trace		

The major constituents shown in the analysis are essentially combined as complex aluminum silicate rather than as free oxides.

Typical values expressed as a range reflect variations among grades.

For calcined grades, values will vary slightly according to the available surface area.

TECHNICAL SERVICE

BASF's technical services group consists of highly motivated and skilled application specialists who are quick to respond to technical issues and to recommend the right product to improve the appearance and/or performance of your polymeric system.

RESEARCH & DEVELOPMENT

In support of sales and technical service, Research has always played a central role in providing ingenious solutions to our customers' needs in many diverse industries. Our laboratories house a staff of highly trained scientists and technicians with the latest analytical and physical testing equipment.

GLOBAL SUPPLY CAPABILITY

BASF maintains a worldwide network of sales, distributor and logistic service / support for total customer satisfaction.
PACKAGING - BASF provides a variety of packaging options, that include 50 lb. and 25 kg paper/low melt PE bags, super-sacks and bulk. Stretch wrapping is standard for all bag shipments.

TOTAL QUALITY PROCESS

ISO - BASF was the first kaolin manufacturer to recognize the importance of the ISO concept. All of BASF's kaolin operations are ISO 9001:2000 certified. At BASF, quality is more than just good product. The quality process includes all aspects of your purchasing experience, including packaging, delivery and customer care.

Put BASF Performance Minerals Extenders To Work For You.

For more information about BASF performance minerals please contact us at: **www.basf.com/kaolin** or contact us as directly by phone or e-mail at:

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e-mail: kaolin-europe@basf.com

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