

KUMHO KTR[®] 401H

Technical Data Sheet

| Product Description |

KUMHO KTR[®] 401H polymer is a radial block copolymer based on styrene and butadiene with bound styrene of 32.5% mass. It is supplied in two physical forms, identified as follows in the grade nomenclature:

- KTR 401H supplied as porous pellets
- KTR 401HP supplied as powder

| Typical Properties |

Property	Value
Molecular structure	Radial (S-B) X 4
Physical form	Porous pellet / Powder
Styrene content (wt%)	32.5
Volatile matter (wt%)	0.5
Ash content (wt%)	0.08
Solution viscosity at 25°C (cps) - 5.23wt% in toluene	21.5
Tensile strength (kg _f /cm ²)	280
Elongation (%)	710
Tensile modulus at 300% (kg _f /cm ²)	34
Hardness, shore A / 5 sec (degree)	87
Melt flow index at 200°C, 5kg (g /10min)	max. 1
Specific gravity	0.94
Extended oil content (wt%)	0
Application	Bitumen modifier

* The above data is typical, therefore there may be a slight difference from the physical properties of the supplied product.

| Characteristics |

Fields	Characteristics
Bitumen modifier - road paving - roofing sheets	• Increase softening point of bitumen • Reduce the sensitivity to temperature change • Improve low temperature flexibility • Improve elasticity and impact resistance • Extend life span of pavement

| Package |

CAS NO	Packing unit (kg)	
	Paper bag (Pallet)	Jumbo bag
9003-55-8	15 (600)	450, 500

| Handling Precaution |

The direct exposure to sunlight, heat, and humidity may cause discoloration or deterioration.

Keep the product away from sunlight, humidity, and chemicals, and store in cool and dry places below 35°C.

| Extrusion Temperature Profile |

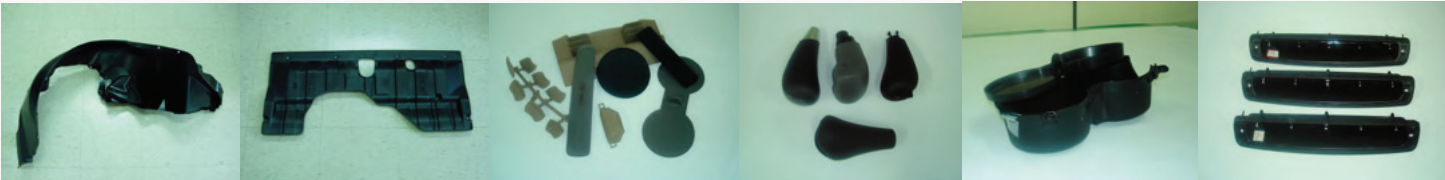
STE	Feed ()	Zone-1 ()	Zone-2 ()	Zone-3 ()	Head ()	Die ()
45 ~ 55A	150	170	180	180	175	175
55 ~ 65A	155	175	185	185	180	180
65 ~ 75A	160	180	190	190	180	180
75 ~ 90A	170	185	190	190	185	185
90A ~ 70D	175	185	195	195	190	190

STEh	Feed ()	Zone-1 ()	Zone-2 ()	Zone-3 ()	Head ()	Die ()
00 ~ 40A	135	150	160	170	170	170
40 ~ 60A	150	170	185	185	190	190
60 ~ 80A	160	180	185	185	190	190
80 ~ 90A	170	185	190	195	200	200
90A ~ 45D	180	190	200	200	205	205

| Injection Molding Parameter |

STE	Nozzle ()	Front ()	Center ()	Rear ()
45 ~ 55A	175	170	165	160
55 ~ 65A	175	170	165	160
65 ~ 75A	180	175	170	165
75 ~ 90A	180	175	170	165
90A ~ 70D	185	180	175	170

STEh	Nozzle ()	Front ()	Center ()	Rear ()
00 ~ 40A	150	170	170	170
40 ~ 60A	150	180	180	180
60 ~ 80A	160	190	190	190
80 ~ 90A	170	190	195	195
90A ~ 45D	170	190	200	200



SBS(Styrene Butadiene Styrene) : KTR™

| Product Description |

KUMHO KTR is a family of styrenic thermoplastic elastomers manufactured by Kumho Petrochemical Co., Ltd.
KUMHO KTR grades are linear or radial block copolymers synthesized with butadiene and styrene monomer in organic solvent. They have good tensile strength, elasticity and processability without chemical cross-linking such as vulcanization.

| Product Application |

KUMHO KTR grades are used in various industrial application sectors such as bitumen modification, compounds & plastic modification, adhesives, and footwear.

Garde	CAS NO	Package (kg)		Applications			
		Paper bag (Pallet)	Jumbo bag	Asphalt Modification	Plastic Modification	Adhesives	Footwear
KTR 101	9003-55-8	15(600)	200, 400, 500, 1000				
KTR 103		20(600)	500				
KTR 104		15(600)	500				
KTR 201		20(600)	500				
KTR 301	9003-55-8 Paraffinic White Oil (CAS:64742-54-7)	20(700)	-				
KTR 401	9003-55-8	15(600)	500, 1000				
KTR 401H		15(600)	450(Gayload), 500				
KTR 602		20(700)	-				

| Charateristics |

Fields	Characteristics
Bitumen modification - Roofing sheet - Road paving - Sound insulation materials	•Increase softening point of asphalt •Reduce the sensitivity to temperature change •Improve service temperature/adhesive strength •Give low temperature flexibility •Excellent elasticity and impact resistance •Extend life time of asphalt pavement
Plastics modifier - TV, PC housing - Toys - Mechanical goods	•Increase elasticity and impact property •Improve abrasion resistance •Good colorability •Can be reprocessed
Adhesives - Hot melt adhesive - Pressure sensitive adhesive	•Low temperature property and bending property •Excellent transparency •Can be dissolved in various solvents
Footwear - Shoe soles - Shoe materials	•Increase elasticity •Good colorability •Excellent low temperature flexibility •Improve abrasion resistance •Little temperature sensitivity of hardness

| Handling Precaution |

- The direct expose to sunlight, heat, and humidity may cause discoloration or quality deterioration.
- Keep the product away from direct sunlight, humidity and chemicals and store in a cool and dry place at temperatures below 35 .

| Typical Properties |

Properties		Test Method	KTP 101	KTR 103	KTR 104	KTR 201	KTR 301	KTR 401	KTR 401H	KTR 602
Structure		-	Linear	Linear	Linear	Linear	Radial	Radial	Radial	Linear
			(S-B) x 2	(S-B-S)	(S-B) x 2	(S-B) x 2	(S-B) x 4	(S-B) x 4	(S-B) x 4	(S-B-S)
Styrene Content (wt%)		NMR	31.5	31.5	32.0	31.5	41.0	31.0	32.5	40.5
Volatile Matter (wt%)		ASTM D5668	max. 0.3	max. 0.3	max. 0.3	max. 0.3	max. 0.3	max. 0.3	max. 0.3	max. 0.3
Ash Content (wt%)		ASTM D5667	0.1	0.1	0.1	0.1	0.4	0.1	0.4	0.1
Solution Viscosity at 25 (cps)	25wt% in toluene	ASTM D2196	4,500	2,000	900	1,200	-	-	-	600
	5.23 wt% in toluene	ASTM D445	-	-	-	-	-	23.8	21.5	-
Tensile Strength at 300% (kg f/cm ²)		ASTM D412	310	260	60	280	170	250	280	340
Elongation (%)		ASTM D412	800	740	1,400	950	800	700	710	820
Tensile Modulus at 300% (kg f/cm ²)		ASTM D412	26	33	18	40	21	31	34	55
Hardness [shore A] (degree)		ASTM D2240	77	75	70	71	61	82	87	91
Melt Flow Index (g/10min)	200 , 5kg	ASTM D1238	< 1	< 1	3	6	6	< 1	< 1	11
	190 , 5kg		-	-	-	-	-	-	-	-
Spe cific Gravity at 25		ASTM D297	0.94	0.94	0.94	0.94	0.93	0.94	0.94	0.95
Oil Con tent (wt%)		ASTM D5774	-	-	-	-	33.3	-	-	-
Physic al Form*		-	P, PW	P, PW	P	P	P	P	P, PW	P, D

* P = porous pellet, PW = powder, D = dense pellet



Description | STE is the compounded material based on styrenic block copolymers (SBS or SEBS) and thermoplastic resins. STE is applicable to various applications requiring rubber-like characteristics. Versatile formulations are available for either extrusion or injection molding process.

Characteristics | STE is available in a broad range of hardness. This material is ideal for applications requiring flexibility over a wide temperature range, excellent colorability, processing capability and durability.

Primary features and benefits include :

- Flexibility over a wide temperature range
- Low Shore-A hardness capability
- Superior processibility for extrusion and injection
- Abrasion resistance and durability
- Weatherability
- Odorless
- Easily colorable

Application | STE can be applied in various fields such as automotive parts, shoes material, appliance parts and commodities by injection molding or extrusion

- Automotive parts : Mud guard, Fender liner, Mat, Gear knob, Assist grip, Steering wheel cover, Lip bumper
- Appliance : Insulator, Tray, Gasket
- Shoes material : Outsole, Heel counter, Health slipper
- Commodities : Toys, Hose & Tube, Sports goods
- Alternatives to flexible-PVC

Packages | - 25kg / bag - 500kg / jumbo bag

Appearance | - Pellet



Physical and Mechanical Properties |

STE	Unit	Test Method	STE 2545	STE 2070	STE 1092	STE 2035	STE 2050	STE 2170
Hardness (shore-A,D)	degree	ASTM D2240	45A	68A	92A	49D	50D	70D
Density	g/cm ³	ASTM D0792	1.0	1.1	1.0	0.9	0.9	0.9
Tensile Strength	kg π /cm ²	ASTM D638	35	30	100	150	100	200
Elongation	%	ASTM D638	300	400	300	400	300	300
Melt Flow Index (190 , 5kg)	g/10min	ASTM D1238	16	20	10	20	20	20
Melt Temperature		-	160 ~ 190	160 ~ 190	160 ~ 190	160 ~ 190	160 ~ 190	160 ~ 190
Mold Temperature		-	30 ~ 60	30 ~ 60	30 ~ 60	30 ~ 60	30 ~ 60	30 ~ 60

STEh	Unit	Test Method	STEh 2000	STEh 2025	STEh 2035	STEh 2045	STEh 2055	STEh 2065	STEh 2075
Hardness (shore-A,D)	degree	ASTM D2240	0A	25A	35A	45A	55A	65A	75A
Density	g/cm ³	ASTM D0792	0.9	0.9	0.9	0.9	0.9	0.9	0.9
Tensile Strength	kg π /cm ²	ASTM D638	20	35	45	70	80	100	130
Elongation	%	ASTM D638	1,000	550	650	790	750	700	650
Melt Flow Index (190 , 5kg)	g/10min	ASTM D1238	10	10	15	20	25	25	30
Melt Temperature		-	160 ~ 190	160 ~ 190	160 ~ 190	170 ~ 200	170 ~ 200	170 ~ 200	170 ~ 200
Mold Temperature		-	30 ~ 60	30 ~ 60	30 ~ 60	30 ~ 60	30 ~ 60	30 ~ 60	30 ~ 60

*STE : SBS Compound, STEh : SEBS Compound
*The above data are typical value, therefore they may be slightly different according to measuring condition.