

Laboratory Hari Shankar Singhania Elastomer & Tyre Research Institute,
HASETRI, Plot No. 437, R&D Center, Hebbal Industrial Area, Mysuru, Karnataka

Accreditation Standard ISO/IEC 17025: 2005

Certificate Number TC-5274

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Sl.	Product / Material of Test	Specific Test Performed	Test Method Specification against which tests are performed	Range of Testing / Limits of Detection
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CHEMICAL TESTING

I.	RUBBER AND RUBBER PRODUCTS			
1.	Polymer/ Elastomeric Materials	Ash Content	ASTM D5667 ISO 247	0.1 % to 45 %
		Dirt Content	ASTM D1278-91a ISO 249	0.1 % to 10 %
		Volatile Content	ASTM D5668 ISO 248 Part 2 ISO 248 Part 1	0.1 % to 10 %
		Mooney Viscosity	ASTM D1646	10 MU to 200 MU
		Oil Content of SBR	ASTM D5774	1 % to 40 %
		Metal Content	ASTM D4075 ISO 19050	0.01 % to 10 %
		Nitrogen Content	ASTM D2227 ISO 1656 ISO19051	0.1 % to 0.50 %
		Organic Acid	ASTM D5774 ISO7781	1 % to 5 %
		Soaps	ASTM D5774 ISO7781	0.01 % to 5 %
		Micro Structure (cis, trans and vinyl content)	IS 10016 (Part 4)	5 % to 100 %
		Tg	ASTM D7426/ E1356 ISO22768	-140 °C to 200 °C
		Microstrure of SBR	ISO 21561-1	Styrene: 0 to 50 % Vinyl: 5 % to 100 %
		Molecular Weight	ASTM D6474	1.37 x 10 ³ to 2.70 x 10 ⁶
2.	Fillers	Heat Loss of Carbon Black	ASTM D1509 ISO1126	0.01to10%

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		Ash Content	ASTM D1506 ISO 1125	0.01 % to 5 %
		Sieve Residue	ASTM D1508 ISO 1437	0.001 % to 100 %
		pH of C-Black	ASTM D1512-15b	1 to 14
		Toluene Extractable	ASTM D4527 ISO6209	0.1 % to 100 %
		Iodine No.	ASTM D1510 ISO 1304	5 to 150
		Surface Area of Carbon Black	ASTM D6556 ISO18852	1 m ² /g to 300 m ² /g
		Toluene Discoloration	ASTM D1618 ISO 3858	50 % to 98 %
		DBP Absorption	ASTM D2414 ISO 4656	10 cc/100g to 200 cc/100g
		pH of Silica	ASTM D6739	1 to 14
		Heat Loss of Silica	ASTM D6738	0.1 % to 10 %
		SiO ₂ Content	ASTM D297	0.1 % to 100 %
		Pour Density	ASTM D1513	10 kg/m ³ to 800 kg/m ³
		Tint Strength	ASTM D3265-17a ISO 5435	60 to 140
		Sulfur Content	ASTM D1619-16a ISO1138	0.1 % to 5 %
		Ignition Loss	ASTM D1208	0.1 % to 15 %
		COAN of Carbon Black	ASTM D3493	10 cc/100g to 200 cc/100g
		Surface Area of Silica	ASTM D1993- 03-e1	1 m ² /g to 300 m ² /g
3.	Latex (Natural / Synthetic)	pH	ASTM D1417	1 to 14
		Mooney Viscosity	ASTM D1417	10 to 200 MU
		Total Solid	ASTM D1417	1 % to 90 %
4.	Reinforcing Materials (Organic and Inorganic Cords)	Finish Oil Content	ASTM D2257	0.1 to 5 %
		Melting Point	ASTM E794	80 °C to 270 °C
		Crystallinity – Organic Cord (DSC)	ASTM E794	10 % to 90 %

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		Coating Weight (Steel and Bead Wire)	ASTM D2969	1 g/kg to 10 g/kg
		Composition of Coating of Inorganic Cord	ASTM D2969	Cu, Zn & Sn: 0.1 % to 100 %
		Dip Pick-up	ASTM D4963/D4963M-11	1 % to 15 %
5.	Finished Rubber Products/ Composites	Sp. Gr	ASTM D297	0.98 to 10
		Identification Polymer	ASTM D3677 ISO 4650	Qualitative
		Determination of Blend Ratio	ASTM D6370 ASTM E1131 ISO 9924-1	Qualitative
		Comp Analysis : Polymer	ASTM D6370 ASTM E1131 ISO 9924-1 ISO 9924-2 ISO 9924-3	1 % to 90 %
		Comp Analysis : C- Black	ASTM D6370 ASTM E1131 ISO 9924-1 ISO 9924-2 ISO 9924-3	0.3 % to 90 %
		Comp Analysis : Ash	ASTM D6370 ASTM E1131 ISO 9924-1 ISO 9924-2 ISO 9924-3	0.5 % to 60 %
		Comp Analysis : Extractable	ASTM D297 ISO1407	0.1 % to 50 %
		Comp Analysis : Sulphur	ASTM D1619-16a	0.5 % to 20 %
		Swell Index	ASTM D3616	1 to 50
		SiO ₂ Content	ASTM D297	90 % to 100 %

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		HCl Soluble Ash Content	ASTM D297	0 to 100 %
		HCl Insoluble Ash Content	ASTM D297	0 to 100 %
		Tg	ASTM D7426/ E1356-08 ISO 22768	-140 °C to 250 °C
		Metal Content	ASTM D2969 ISO19050	0.01 % to 15 %
II.	LUBRICANTS			
1.	Oils (Rubber Processing & General Industrial Oils)	Sp. Gr	ASTM D1298-12b	0.600 g/cm ³ to 1.300 g/cm ³
		Aniline Point	ASTM D611-12	10 °C to 150 °C
		Viscosity Gravity Constant, VGC	ASTM D2501	VGC: 0.7 to 1.0
		American Petroleum Institute Gravity	ASTM D1298 - 12b	API gravity: 13 to 104.7
		Pour Point	ASTM D97-17b	-10 °C to 25 °C
		Clay-Gel Analysis	ASTM D2007-11	Polars (P): 1 % to 20 % Saturates (S): 1 % to 99 % Asphalts(A): 0.1 % to 1 %
		Carbon Type Analysis	IS 13155	CA: 2 % to 40 % CP: 40 % to 70 % CN: 10 % to 30 %
		Glass Transition Temperature	ISO-28343	-140 °C to 30 °C
		Poly Cyclic Aromatic Content	IP 346	1 % to 15 %
		Kinematic Viscosity	ASTM D445	1 cSt to 125 cSt
		Flash Point	ASTM D92-12b	60 °C to 300 °C
		PAH Content	DIN 16143	
		Naphthalene		0.004 mg/L to 5 mg/L
		Acenaphthalene		0.004 mg/L to 5 mg/L

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		Fluorene		0.004 mg/L to 5 mg/L
		Phenanthrene		0.004 mg/L to 5 mg/L
		Anthracene		0.004 mg/L to 5 mg/L
		Floranthene		0.004 mg/L to 5 mg/L
		Pyrene		0.004 mg/L to 5 mg/L
		Benzo (a) Anthracene		0.004 mg/L to 5 mg/L
		Chrysene		0.004 mg/L to 5 mg/L
		Benzo(b)fluoranthene		0.004 mg/L to 5 mg/L
		Benzo (k)fluoranthene		0.004 mg/L to 5 mg/L
		Benzo(a)pyrene		0.004 mg/L to 5 mg/L
		Benzo(g,h,i)perylene		0.004 mg/L to 5 mg/L
		diBenzo (a,h) anthracene		0.004 mg/L to 5 mg/L
		Indenol (1,2,3-cd) Pyrene		0.004 mg/L to 5 mg/L
		Acenaphthalene		0.004 mg/L to 5 mg/L
III.	INDUSTRIAL & FINE CHEMICALS			
1.	Rubber Chemicals	Heat Loss	ASTM D4571 ISO CD 28641/ISO11235	0.01 % to 10 %
		Solubility	ASTM D1766 ISO11235	0.01 % to 100 %
		ZnO Content	ASTM D4315 ISO9298 Annex A	1 % to 100 %
		Melting Point	ASTM D1519 ISO CD 28641 ISO11235	50 °C to 200 °C
		Softening Point	ASTM E28 ISO CD 28641	50 °C to 110 °C
		Sieve Residue	ASTM D5461 ISO CD 28641 ISO11235	0.001 % to 100 %

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		Metal Content	SOP No. 32-WI-300	0.01 % to 15 %
		Ash Content	ASTM D4574 ISO CD 28641 ISO11235	0.1 % to 10 %
		pH	ASTM D4613 ISO CD 28641	1 to 14
		Oil Content (Sulphur)	ASTM D4573 ISO8332	1.5 % to 40 %
		Assay of Accelerator	ASTM D5051 ISO11235	80 % to 100 %
		Free MBT	ASTM D5044 ISO11235	0 to 5 %
		Acidity	ASTM D4569 ISO8332	0.001 % to 10 %
		High Temp Stability (Insoluble Sulphur)	IS 14127 ISO8332	1 % to 100 %
		Congealing Point (Wax)	ASTM D938 ISO CD 28641	1 °C to 100 °C
		Sulphur Content	ASTM D1619-16a ISO8332	0.3 % to 30 %
		Assay MBT	ASTM D1991 ISO11235	80 % to 100 %
		Purity of 6PPD	ASTM D4937	65 % to 100 %
IV.	SOLID FUELS			
1.	Coal	Proximate Analysis		
		Moisture	IS 1350 (Part 1)	0.1 % to 10 %
		Ash Content	IS 1350 (Part 1)	1 % to 50 %
		Volatile Matter	IS 1350 (Part 1)	5 % to 60 %
		Fixed Carbon	IS 1350 (Part 1)	Qualitative
		Gross Calorific Value	IS 1350 (Part 1)	2500 to 6000
		Sulfur Content	ASTM D4239	0.1 % to 5 %

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V.	WATER			
1.	Water (Packaged Drinking Water, Packaged Natural Mineral Water, Drinking Water, Surface/ Potable Water, Domestic Water, Bore Water, Cooling Water)	Odour	IS 3025 (Part 5)	Qualitative
		Turbidity	IS 3025 (Part 10)	0.1to 100 NTU
		Total Dissolved Solids	IS 3025 (Part 16)	10to 500 mg/l
		Specific Conductivity @ 25 °C	IS 3025 (Part 14): 1984	12.9 to 1413 µs/cm
		pH	IS 3025 (Part 11)	3 to 12
		Calcium as Ca	IS 3025 (Part 40)	0.35 mg/l to 200 mg/l
		Magnesium as Mg	IS 3025 (Part 46)	0.105 mg/l to 200 mg/l
		Iron as Fe	IS 3025 (Part 2)	0.07 mg/l to10 mg/l
		Copper as Cu	IS 3025 (Part 2)	0.035 mg/l to10 mg/l
		Manganese as Mn	IS 3025 (Part 2)	0.007 mg/l to10 mg/l
		Selenium as Se	IS 3025 (Part 2)	0.35 mg/l to10 mg/l
		Zinc as Zn	IS 3025 (Part 2)	0.035 mg/l to 10 mg/l
		Arsenic as As	IS 3025 (Part 2)	0.35 mg/l to 10 mg/l
	Lead as Pb	IS 3025 (Part 2)	0.7 mg/l to 10 mg/l	
	Cadmium as Cd	IS 3025 (Part 2)	0.035 mg/l to 10 mg/l	
	Chromium as Cr	IS 3025 (Part 2)	0.035 mg/l to 10 mg/l	

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MECHANICAL TESTING

I.	TEXTILE MATERIALS			
1.	Automotive			
a.	Organic Cords	Breaking Strength (force) of conditioned Cords Elongation at Break FASE	ASTM D 885-10a	BS: 3 to 1000 NEB: 1 % to 50 % FASE: 1 N to 200 N
		Twist in Yarns and Cords	ASTM D 885-10a	250 tpm to 500 tpm
		Linear Density	ASTM D 885-10a	500 denier to 8000 denier
		Thickness of cords	ASTM D 885-10a	0.10 mm to 10 mm
		H-Pull Adhesion	ASTM D 4776/D4776M-18	5 N to 550 N
		Thermal Shrinkage	ASTM D 4974-04	1 % to 10 %
		Strap peel adhesion force	ISO-36	0.182 N/mm to 36.3 N/mm (1 lbf/in to 200 lbf/in)
b.	Inorganic Cords-Steel & Bead Wire	Breaking force (Strength) Elongation at Break	ASTM D 2969-04	BS: 100 to 5000 NEB: 1 % to 9 %
		Linear Density of Steel Cord		2.0 g/m to 20 g/m
		Linear density of Bead wire		1.5 g/m to 30 g/m
		Thickness of cord		0.30 to 4.0 mm
		Breaking force (strength) Elongation at Break	ASTM D 4975-04	BS: 100 to 7000 NEB: 1 % to 9 %
		Diameter		0.40 mm to 4.0 mm
		Pull out force (Steel cord)	ASTM D 2229-10	200 N to 4000 N

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		Pull out force (Bead wire)	ASTM D 1871-04	200 N to 3000 N
		Torsion resistance	ASTM D 4975-14	10 Turns to 100 Turns
		Reverse Bend Test for Bead Wire	IS 1716-85	5 Bends to 50 Bends
II.	RUBBER & RUBBER PRODUCTS			
1.	Laboratory Cured/ Finished Product	Tensile stress @ 100 % e	ASTM D 412 ISO 37	1 MPa to 50 MPa
		Tensile stress @ 200 % e		
		Tensile stress @ 300 % e		
		Tensile Strength		
		Breaking elongation/ Elongation at break		50 % to 1000 %
		Type C Tear Strength	ASTM D 624-12	10 N/mm to 550 N/mm
		Unnicked angle tear strength	ISO 34-14 (Method B)	10 N/mm to 550 N/mm
		Thickness	ASTM D 3767-14 ISO 23529-16	1 mm to 12.0 mm
		Hardness	ISO 7619-10 ASTM D 2240-15/ISO 48-18 ASTM D 1415-12	30 to 95 Sh A 35 to 90 IRHD
		Abrasion Loss	ASTM D 5963-15 ISO 4649-16	1 mm ³ to 300 mm ³
		Heat Build Up	ASTM D 623-14 ISO 4666-3-15	1 °C to 100 °C
		Tension Set	ISO 2285-09	5 % to 100 %
		Elastic Modulus	ASTM D 5992-11	1 MPa to 50 MPa
		Loss Modulus	ISO 4664-11	
		Tangent of loss angle		0.01 to 0.98

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2.	Gum and Filled Elastomeric Compound	Maximum Torque	ASTM D 5289-17 ISO 6502-16	MH: 56.49 to 5649 Nmm (0.5 lbin to 50 lbin)
		Minimum Torque		ML:56.49 to 1129.84 Nmm (0.5 to 10lbin)
		Scorch time		ts2: 0.5 min to 25 min
		Cure time		tc90: 0.5 min to 50 min
		Mooney Viscosity	ASTM D 1646-17	MV: 20 MU to 200 MU
		Delta Mooney	ASTM D 3346-17	DM:20 MU to 200 MU
		Cure Index	ISO 289-15	CI:1 min to 50 min
		Scorch Safety	ASTM D 1646-17	1 min to 50 min
		Loss shear modulus by Rotorless Shear Rheometers	ASTM D 6204-15	0.1 MPa to 50 MPa
		Storage shear modulus by Rotorless Shear Rheometers		
Loss factor by Rotorless Shear Rheometers	0.01 to 1			
3.	Cured Elastomeric Compound	Tensile stress @ 100 % e	ASTM D 412-16 ISO 37-17	1 MPa to 40MPa
		Tensile stress @ 200 % e		
		Tensile stress @ 300 % e		
		Tensile Strength		
		Breaking elongation / Elongation at break		50 % to 1000 %
		Type C Tear Strength	ASTM D 624-12	10 N/mm to 550 N/mm
		Unnicked angle tear strength	ISO 34-14 (Method B)	10 N/mm to 550 N/mm
	Thickness	ASTM D 3767-14 ISO 23529-16	1 mm to 12.5 mm	

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		Hardness	ISO 7619-10 ASTM D 2240-15 ISO 48-18 ASTM D 1415-12	30 to 95 Sh A 35 to 90 IRHD
		Abrasion Loss	ASTM D5963-15 ISO 4649-16	1 mm ³ to 300 mm ³
		Heat Build Up	ASTM D 623-14 ISO 4666-3-15	1 °C to 100 °C
		Fatigue to Failure Test	ASTM D 4482-17	1 kC to 300 kC
		Tensile Set	ASTM D 412 -16	5 % to 100 %
		Tension Set	ISO 2285-09	5 % to 100%
		Accelerated Ageing (% change in value of measured property)	ASTM D 865-11 ISO 188 -11	0 to 100 %
		Degradation by Ozone	ASTM D 1149-16 ASTM D 1171-16 ISO 1431-1-12	Qualitative
4.	Cured Elastomeric Compound	Elastic Modulus	ASTM D 5992-11	1 MPa to 50 MPa
		Loss Modulus	ISO 4664-11	1 MPa to 50 MPa
		Tangent of loss angle		0.01 to 0.98
		Micro-hardness (IRHD)	ASTM D 1415-12 ISO 48-18	35 MIRHD to 90 MIRHD
		Rebound Resilience	ISO 4662-17	20 % to 80 %
		Density	ISO 2781-17	1.100 to 5.060
		Stress-Strain: Compression Mode	ISO 7743-17	0.2 MPa to 660 MPa
		Air Permeability	ISO 2782-16	1.0 x 10 to 17 to 1.0 x 10 to 12 m ² /Pa sec
		Determination of Stress Relaxation	ISO 6914-13	1 % to 60 %
		Creep in Compression	ISO 8013-12	1 % to 60 %

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		Stress relaxation on compression at ambient & elevated temperature	ISO3384-11	1 % to 60 %
		Compression set @ ambient and elevated temperature	ISO815-Part I- 14 ASTM – D395 -16	5 % to 90 %
5.	Automobile Tyre	Tyre Dimensions	IS 15636	400 mm to 1500 mm
		Outer Diameter (OD)	IS 15633	
		Sectional width (SW)	AIS 044 (Part I)	100 mm to 450 mm
		Tread Arc Width	AIS 044 (Part II)	80 mm to 500 mm
		Non Skid Depth	E/ECE/324 Regulation 30	5 mm to 40 mm
		Shoulder over all Diameter	E/ECE/324-07 Regulation 54-04FMVSS 119-99 FMVSS 109-13 ASTM F1502-05 ISO 10191-10 ISO 10454-93	400 mm to 1500 mm
		Tyre strength Test/ Plunger Energy Test/ Strength Test	IS 15636/IS 15633 AIS 044 (Part I) AIS 044 (Part 2) FMVSS 119 FMVSS 109 ASTM F414-00, SAE 918c ISO 10191-10 ISO 10454	500 kgf/cm to 70000 kgf/cm
		Endurance & Load/ Speed Performance/ High speed performance	IS 15636/IS 15633 AIS 044 (Part I) AIS 044 (Part II) FMVSS 119 FMVSS 109 E/ECE/324 Regulation 30 SAE 918c-05 ISO 10191 ISO 10454	Qualitative

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		Tyre Stiffness Test: Sx, Sy, Sz,	SAE-J2704 SAE-J2718-06 AIS-044 (Part II)-04 AIS 044 (Part I)	10 N to 100,000 N
		Tyre Footprint	SAE-J2704-05 ASTM F-870-00	Qualitative
		Bead Unseating Resistance	IS-15633-05 SAE-J918c AIS-044 Part II)-04 FMVSS-109-13 SAE 918c-05 ISO 10191-10	Qualitative
		Rolling Resistance	SAE-J1269-06 ISO 18164-05 ISO 28580	10 N to 750 N
		Rate of Loss of Inflation pressure of Tube less tyre	ASTM F1112-05	0 to 100 % loss per month
		Tyre Electrical Resistance	ASTM F1971-05 ISO 16392	0.1 MΩ to 2000 MΩ
		Coast down Rolling Resistance Test	SAE-2452 (Passenger Car Tyre)	-500 N to 500 N
		Static Loaded Radius measurement	JATMA: Section G-Point 5.2	205 mm to 1000 mm

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