



Footwear Testing Guide & Requirements



MTS' Testing Services on Consumer Products

Modern Testing Services is a global, strategic partner for fast, accurate, and cost effective quality assurance solutions in the consumer products industry. Utilizing our expertise throughout the sourcing process increases speed-to-market efficiency, decreases costs, and better positions your products to meet or exceed customer expectations. MTS is committed to helping clients protect their brand image by providing comprehensive product knowledge vital to making timely critical business decisions.

Our laboratories have obtained international accreditation from relevant accreditation bodies and industry associations. Our testing services are approved by standardization committees in EU, the US, and at global (ISO) level, such accreditations include:

- European Commission (EC) Notified Body
- United Kingdom Accreditation Service (UKAS)
- Consumer Product Safety Improvement Act (CPSIA)
- Hong Kong Laboratory Accreditation Scheme (HOKLAS)
- China National Accreditation Service (CNAS)
- Taiwan Accreditation Foundation (TAF)
- International Maritime Organization (IMO)

MTS offers footwear testing services for a wide array of footwear categories, from indoor slippers to high-end designer shoes. We are accredited to perform chemical, quality and performance tests, including, but not limited to, testing for:

- Azo dyes and azo colourants
- Colorfastness on leather/synthetic leather/textiles
- Sole Flex Resistance
- Sole Abrasion Resistance
- Slip Resistance
- Bally Flex Resistance
- Heel Impact Resistance
- Heel Fatigue Test

Today, retailers are faced with far more than the age-old dilemma of whether to accept a nominal amount of manufacturing defects. Complex local, state, and federal regulations are challenging footwear manufacturers to produce safer, higher quality, and more environmentally friendly products than ever before. MTS will ensure your products are compliant with all applicable US and international regulations. In addition, physical, performance, and special claims testing with MTS will ensure the product consistently meets or exceeds your customer's expectations. This booklet will help to guide you through some of the common questions our Technical consultants are often asked.

Testing Guide for Restricted Substances in Major Footwear & Components

	Animal Fibres	Cellulosic Textile	Synthetic Textile	PVC Plastic & PVC coatings	Non-PVC plastic & coatings	Leather	Metal	Rubber	Adhesives	Paints and coatings	Foam	Paper
Azo dyes		✓	✓✓			✓						
Allergenic/Carcinogenic Disperse Dyes			✓✓ ⁴									
Chromium (VI)						✓✓	✓			✓		
Phthalates				✓✓ ¹					✓			
Flame retardants (HBCDD, TRIS, TEPA, Deca-BDE)	✓	✓	✓	✓ ⁶	✓						✓	
Nickel (release)							✓ ⁵					
Diaminodiphenylmethane (MDA)					✓			✓	✓	✓		
Total Lead / Lead compounds				✓	✓					✓		
Soluble heavy metals				✓	✓	✓				✓		✓
Formaldehyde	✓	✓	✓			✓			✓		✓	
Dimethylacetamide			✓									
Organic Tin				✓		✓		✓		✓		
Alkyl/Nonyl phenyl ethoxylates (APEO/NPEO)	✓	✓	✓									✓
Dimethyl formamide (DMF)					✓					✓		
Perfluorooctanate sulphonate (PFOS) ²	✓	✓	✓			✓						
Polycyclic Aromatic Hydrocarbons (PAH)			✓		✓	✓		✓				
Short chain chlorinated phenols (SCCP) ³		✓	✓					✓		✓		

1. Flexible PVC including Plastisol prints
2. May be found in stain and soil resistant treatments and water repellent finishes
3. Rot proofing agent
4. May be used for dyeing polyester and acetate fibers
5. Requirements applicable to skin contact items such as jewelry, rivets and metal press fasteners
6. High risk for PVC coatings

Key to symbols

- ✓ Chemical may be found in indicated substrate ✓✓ Commonly used chemical may be found in indicated substrate

Remark: This table is not a definitive or exhaustive list of chemicals and their end-uses. It is intended only as a guideline as to the most likely substrates in which some of the commonest restricted substances may occur. The indication of possible presence of substance does not infer that it will always be present nor that it is always necessary to conduct testing to prove the absence of said chemical.

Common Chemical Testing for Footwear

Substance	Legislation	Test Method	Reason for Concern
Azo dyes and azo colourants	REACH 1907/2006 Annex XVII Entry 43	Textiles: EN 14362-1 & EN 14362-3 Leather – CEN ISO/TS 17234	The prohibited amines are carcinogenic
Nickel	REACH 1907/2006 Annex XVII Entry 27	EN 1811 + A1 / Coated materials tested after EN 12472	Nickel can cause skin allergies
Lead (and its compounds)	REACH 1907/2006 Annex XVII Entry 63	EN 16711-1 & EN ISO 16711-2	Harmful to the environment; Toxic for reproduction
Cadmium	REACH 1907/2006 Annex XVII Entry 23 and EU Regulations 494/2011 and 835/2012	BS EN 1122 Method B	Carcinogenic. Harmful to the environment
PFOS (Perfluorooctane Sulphonates)	POP Directive 850/2004 as amended EU by Regulation 757/2010	Solvent extraction followed by LC-MS	Persistent in the environment, bioaccumulative; harmful to mammals
Phthalates	REACH 1907/2006 Annex XVII Entries 51 & 52	EN 14372 Textiles EN ISO 14389	Carcinogenic; endocrine disruptors
Dimethyl fumarate	REACH 1907/2006 Annex XVII Entry 61	Solvent extraction followed by GC-MS	Causes painful skin contact dermatitis, itching, irritation, redness and burns
Chromium VI	REACH 1907/2006 and Regulation 201/2014	ISO 17075	Carcinogenic;
NPEO (Nonyl Phenyl Ethoxylate) & APEO (Alkyl Phenyl Ethoxylate)	REACH 1907/2006 Annex XVII Entry 46 as amended by Regulation 2016/26	AFIRM method Textiles: EN ISO 18254-1 Leather: EN ISO 18512-1 & EN ISO 18512-2	Bio- accumulative; toxic to the environment and to human health; reprotoxic
Flame retardants	REACH 1907/2006 Annex XVII	Solvent extraction followed by GC-MS or LC-MS. EN ISO 17881-1 (Brominated FRs) & EN ISO 17881-2 (Phosphorus based FRs)	Persistent organic pollutant; carcinogen; reprotoxic; mutagen
SCCP (Short Chain Chlorinated Paraffins)	REACH 1907/2006 Annex XVII Entries 32 to 38 inclusive POP Regulation 850/2004 as amended by Regulation 2015/2030	Solvent extraction followed by NCI-GC-MS	Toxic to environment.
Chlorinated Phenols (Pentachlorophenol)	REACH 1907/2006 Annex XVII Entry 22	DIN 53313 (Leather)	Bio- accumulative; persistent in the environment, toxic to aquatic species. suspected carcinogen
Biocides	EU Biocidal Product Directive 98/8/EC	Solvent extraction followed by GC-MS or LC-MS	Harmful to health and environment
Polycyclic Aromatic Hydrocarbons (PAH)	REACH 1907/2006 Annex XVII Entry 50 as amended by Regulations 1272/2013 and 326/2015	AfPS GS 2014 Footwear: ISO/TS 16190	Carcinogenic
Allergenic Disperse Dyes	Eco-labelling schemes	DIN 54231 (textiles)	Irritant
Carcinogenic Disperse Dyes	Eco-labelling Schemes	DIN 54231 (textiles)	Carcinogenic

Remark: It is the responsibility of the supplier to ensure compliance of their products with EU Regulation 1907/2006 (REACH) together with any additional requirements imposed in this document. The list of chemicals falling under REACH is updated regularly and the number of chemicals covered is expanding. It is the responsibility of the supplier to monitor and ensure the continued compliance of their products against the EU REACH Regulations.



Common Quality & Performance Testing for Footwear

Test Name	Test Method	Requirement*	Sample Size
Fabric Construction & Fiber Composition			
Fiber Content	AATCC 20/20A, ISO 1833, EN directive 73/74/EEC, EN directive 96/73/EC, GB/T 2910	Single: no tolerance Blend: -3% - +3%	Material: 2 A4 Garment: 1 pc
Thread Count	ASTM D3775, AS 2001.2.5, BS EN 1049-2, GB/T 4668, ISO 7211/2	+5% / -5% as claimed	0.5 metre
Stitch Density	ASTM D3887	+5% / -5% as claimed	1 metre
Yarn Size	ASTM D1059, BS ISO 7211-5, FZ/T 01093	+5% / -5% as claimed	1 metre
Fabric Weight	ASTM D3776/D3776M-09a (Option C), AS 2001.2.13, ISO 3801, BS EN 12127, GB/T 4669	+5% / -5% as claimed	1 metre
Colorfastness**			
Colorfastness to Crocking/ Rubbing	AATCC 8/116, AS 2001.4.3, BS EN ISO 105-X12, GB/T 3920, SATRA TM 167, ISO 11640	Dry: 4.0; Wet: 3.0; Dark Color: Dry: 3.0; Wet: 2.0	2 X A4
Colorfastness to Perspiration	AATCC 15, AS 2001.4 E04, BS EN ISO 105-E04, SATRA TM335, GB/T 3922	CC: 4.0; CS: 3.0; SS: 4.5	A4
Colorfastness to Light	AATCC 16, ISO 105 B02 ‡; GB/T 8427/14576, SATRA TM 160	CC:4.0	A4
Colorfastness to Water	AATCC 107, AS 2001.4 E01, BS EN ISO 105-E01, SATRA TM 335, GB/T 5713	CC: 4.0; CS: 3.0; SS: 4.5	A4
Colorfastness to Chlorine Bleach	TS-001, ISO 105-N01	CC:4.0	A4
Colorfastness to Non-Chlorine Bleach	TS-001, ISO 105-N02	CC:4.0	A4
Colorfastness to Chlorinated Pool Water	AATCC 162, ISO 105-E03, GB/T 8433, SATRA TM 356	CC:4.0	A4
Colorfastness to Sea water	AATCC 106, BS EN ISO 105-E02, GB/T 5714	CC: 4.0; CS: 3.0; SS: 4.5	A4
Colorfastness to Ozone	AATCC 109, ISO 105-G03	CC:4.0	A4
Colorfastness to Burnt Gas Fume	AATCC 23, ISO 105-G02	CC:4.0	A4
Colorfastness to Saliva (<36mon only)	DIN 53160, LMBG 82.10, GB/T 18886	CC:4.0; CS: 4.0	A4
Colorfastness to Phenolic Yellowing	ISO 105 X18	CC:4.0	A4
UV Resistance to Yellowing	ASTM D 1148, HG/T 3689	CC:4.0	A4
Colorfastness to Water Spotting	BS EN ISO 15700, AATCC 104, SATRA TM 185 BS EN ISO 105 E07 GB/T 5717	CC:4.0	A4
Colorfastness to Hot Pressing	AATCC 133, ISO 105 X11, GB/T 6152	CC:4.0	A4
Colorfastness to Dye Transfer	BS EN ISO 15701, AATCC 163	CC:4.0	A4
Contact Storage Test for Discolouration	SATRA TM 343	CC:4.0	A4

Remark: (*) The "requirement" shown in this document is an example of MTS recommended minimum requirement, it is not designed for specific order, market or customer. It is suggested to consult your buyer before submitting testing applications.

(**) CS in UK/EU is usually grade 4.5. ‡ For EU, test method uses blue wool standards to assess light fastness.

(***) Consult MTS for specific requirements.

Common Quality & Performance Testing for Footwear (Cont.)

Test Name	Test Method	Requirement*	Sample Size
Physical			
Tensile Strength	ASTM D5034/D5035, AS 2001.2.3.2, EN ISO 13934-1/2, GB/T 3923.1/2, ISO 5081-1/-2, SATRA TM 29, ISO 37 GB/T 528	General Fabrics: <3.5 oz/sq.yard: Min 30lbs 3.5-5.0 oz/sq.yard: Min.35lbs >5.0 oz/sq.yard: Min.40lbs Denim Fabrics: <8.0 oz/sq yard: Min.50lbs 8.0-12.0 oz/sq.yard: Min.80lbs >12.0 oz/sq.yard: Min.100lbs Lining and Pocketing Fabrics: ≤3.0 oz/sq.yard: Min.20lbs >3.0 oz/sq.yard: Min.30lbs	13935-2: 1.5 metres Others:1 metre
Tearing Strength (Elemendorf)	ASTM D1424 /D2261; AS 2001.2.8, EN ISO 13937-1, GB/T 3917.1, SATRA TM 65, SATRA TM 218, SATRA TM 30, ISO 3377, SATRA TM 162, QB/T 4198	General Fabrics: <3.5 oz/sq.yard: Min 2.0lbs 3.5-5.0 oz/sq.yard: Min.2.5lbs >5.0 oz/sq.yard: Min.3.0lbs Denim Fabrics: <8.0 oz/sq yard: Min.4.0lbs 8.0-12.0 oz/sq.yard: Min.5.0lbs >12.0 oz/sq.yard: Min.6.0lbs Lining and Pocketing Fabrics: ≤3.0 oz/sq.yard: Min.1.5lbs >3.0 oz/sq.yard: Min.2.0lbs	1 metre
Bursting Strength	ASTM D3786/D3786M-09, AS 2001.2.4, EN ISO 13938-1/-2, GB/T 7742.1, ASTM D 2210	<3.5 oz/sq.yard: Min 30psi 3.5-8.0 oz/sq.yard: Min.45psi >8.0 oz/sq.yard: Min.55psi	1 metre
Lastometer Ball Burst Test	SATRA TM 24, QB/T 2712, ISO 3379, ASTM D 2207	200N	A4
Seam Strength	SATRA TM 180, BS 5131 5.13	5N /mm	1 pair
Martindale Abrasion Resistance	SATRA TM 31, ASTM D4966, EN ISO 12947, BS EN 13520, GB/T 3903.16	Slight wearing	A4
Abrasion Resistance (Taber)	ASTM D3884, SATRA TM 163, QB/T 2726	Slight Abrasion	1 metre
Sole Flex Resistance	SATRA TM 133, SATRA TM 60, ISO 17707, QB/T 2885, BS 5131 2.1 ISO 4643, HG/T 2411	No Cracking	1 pair of shoes
Sole Abrasion Resistance	ASTM D3886 (Mod.) , ASTM D 1630 ISO 4649 , SATRA TM 174 ASTM D5963, QB/T 2884	Consult MTS for specific requirements***	1 piece sole
Slip Resistance	ASTM F 609 Mod	Static:0.40; Kinetic:0.30	1 piece sole
Snapping/ Unsnapping	MTS-S045 / ASTM D4846, CEN/TR 16792 Annex B	2.0 – 5.0 lbs	10 pcs snap
Zipper Strength	ASTM D2061, EN 16732	Chain Crosswise Strength: 77lbs Separating Unit: 26.4lbs	10 pcs Zipper
Zipper Operability	ASTM D2062, EN 16732	max 1.6lbs	3 pcs Zipper
Bally Flex Resistance	ISO 5402, ISO 7854, SATRA TM 55, ASTM D 6182, QB/T 2714	Slight Cracking	A4
Bend Test After Cold Store	ASTM D 2136, ISO 4675	No cracking	A4
Hardness	ASTM D2240 , SATRA TM 205 ISO 868 , GB/T 3903.4	TPR: 55-65 shore A PVC: 70-90 shore A EVA: 50-55 shore A (with skin) PU: 50-60 shore A Rubber: 55-65 shore A PCU: 60-70 shore A	1 piece sole

Common Quality & Performance Testing for Footwear (Cont.)

Test Name	Test Method	Requirement*	Sample Size
Physical			
Density	SATRA TM 134,HG/T 2872,ASTM D 792	/	1 piece sole
Attachment Strength of Shoe Lace	SATRA TM 175, QB/T 1652	150N	6 pieces laces
Lace Knot Slippage	SATRA TM 195	30 Knot undone 12 Knot sipping	5 pieces laces
Abrasion Resistance for Lace	SATRA TM 154 Method 1 GB/T 3903.36 Method 1	No damage	6 pieces laces
Breaking Strength of Shoe Lace	SATRA TM 94, QB/T 2675	Dry:250N Wet:200N	6 pieces laces
Sole or Foxing Bond Strength	SATRA TM 411,ISO 17708 QB/T 2886,GB/T 21396	3N/mm	1 pair of shoes
Rapid Sole Adhesion	SATRA TM 404,BS 5131 5.1, GB/T 3903.3	150N	1 pair of shoes
Whole top line strength	SATRA TM 143	500N	1 pair of shoes
Attachment Strength for Ornament	SATRA TM 117, SATRA TM 149, SATRA TM 150, SATRA TM 151 BS 5131 5.11	/	1 pair of shoes
Strength of Sandal Toe Post	SATRA TM 181	150N	1 pair of shoes
Whole Shoe Flexing	SATRA TM 92	No damage	1 pair of shoes
Dynamic Waterproof Test	SATRA TM 77	No water leak	1 pair of shoes
Top Piece Strength	SATRA TM 108,BS 5131 5.9	140N	5 pieces shoes
Heel Attachment Strength	SATRA TM 113,ASTM F 2232 BS EN 12785	1000N	1 pair of shoes
Corrosion Resistance	SATRA TM310 Method 2 ISO 22775 Method 2 ASTM B117,ISO 9227 GB/T 3903.19 Method 2	No corrosion	3 pieces metals
Three Point Bending for Buckle	SATRA TM 141	200N	3 pieces metals
Break/ Pipiness Test	BS 5131 3.5,SATRA TM 36	/	A4
Lacquer Adhesion	SATRA TM 406, ASTM D 3359	No peel off	1 pair of shoes
Heel Impact Resistance	SATRA TM 20,BS 5131 4.8 QB/T 2863	No cracking	3 pieces heels
Heel Fatigue Test	SATRA TM 21, BS 5131 4.9 QB/T 2864	No cracking	3 pieces heels
Hydrolysis Resistance	BS EN 12477 ,SATRA TM 344	No change	1 pair of shoes
Functional Test			
Water Vapour Permeability	BS 7209	> 500 gr./sq m / 24 hours	0.5 metre
Water Resistance- Rain Test	AATCC 35	Maximum 1g of water penetration @2 ft/2 minute	1 metre
Water Repellency- Spray Test	AATCC 22 / ISO 4920 / GB/T 4745	90 (ISO 4)	1 metre
Oil Repellency	AATCC 118, EN ISO 14419 ,SATRA TM 201	Original : 6 (Not wet by n- decane) After 3 laundering : 4 (Not wet by n-tetradecane)	1 metre
Soil Resistance	AATCC 130	Class 4.0 minimum	1 metre
Water Resistance- Hydrostatic Pressure Test	AATCC 127, ISO 811	>5,000 mm (UK: >1500mm)	1 metre
Air permeability	ASTM D737, EN ISO 9237	Woven: > 20 cfm Knit: > 160 cfm	0.5 metre

In the unpredictable waves of evolving regulatory requirements, Modern Testing Services “MTS” has been the trustworthy beacon that has navigated our clients across the uncertain waters of sourcing, supply and demand. A partnership with MTS immediately reinforces supply chain efficiency by implementing decades of technical expertise, industry best practices, and creative solutions necessary to maintaining a competitive business advantage.

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