

INTERNATIONAL STANDARD

ISO
5423

First edition
1992-02-01

Moulded plastics footwear — Lined or unlined polyurethane boots for general industrial use — Specification

*Articles chaussants moulés en plastique — Bottes industrielles doublées
ou non doublées en polyuréthane d'usage général — Spécifications*



Reference number
ISO 5423:1992(E)



Documents

Document Sharing Hub

Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

Draft International Standards adopted by the technical committees are circulated to the member bodies for voting. Publication as an International Standard requires approval by at least 75 % of the member bodies casting a vote.

International Standard ISO 5423 was prepared by Technical Committee ISO/TC 45, *Rubber and rubber products*.

Annexes A, B, C, D and E form an integral part of this International Standard. Annex F is for information only.

© ISO 1992

All rights reserved. No part of this publication may be reproduced or utilized in any form or by any means, electronic or mechanical, including photocopying and microfilm, without permission in writing from the publisher.

International Organization for Standardization
Case Postale 56 • CH-1211 Genève 20 • Switzerland

Printed in Switzerland

Moulded plastics footwear — Lined or unlined polyurethane boots for general industrial use — Specification

1 Scope

This International Standard specifies requirements for boots, moulded from polyurethane compound, for general industrial use. The boots may be either fabric-lined or unlined and of any style from ankle boots to full thigh height inclusive.

2 Normative references

The following standards contain provisions which, through reference in this text, constitute provisions of this International Standard. At the time of publication, the editions indicated were valid. All standards are subject to revision, and parties to agreements based on this International Standard are encouraged to investigate the possibility of applying the most recent editions of the standards indicated below. Members of IEC and ISO maintain registers of currently valid International Standards.

ISO 37:1977, *Rubber, vulcanized — Determination of tensile stress-strain properties*.

ISO 48:1979, *Vulcanized rubbers — Determination of hardness (Hardness between 30 and 85 IRHD)*.

ISO 458-1:1985, *Plastics — Determination of stiffness in torsion of flexible materials — Part 1: General method*.

ISO/R 463:1965, *Dial gauges reading in 0.01 mm, 0.001 in and 0.000 1 in*.

ISO 471:1983, *Rubber — Standard temperatures, humidities and times for the conditioning and testing of test pieces*.

ISO 10335:1990, *Rubber and plastics footwear — Nomenclature*.

3 Definitions

For the purposes of this International Standard, the definitions given in ISO 10335 apply.

4 Design requirements

NOTE 1 Suggested ranges for the heights of boots are given in annex F.

4.1 Soling pattern

The soling shall have radiused corners at the base of the sole pattern and the radius for such corners shall be not less than 1,5 mm.

NOTE 2 The pattern of the soling can have a significant effect on the formation of premature cracks.

4.2 Minimum thicknesses

The minimum thicknesses of the boot shall be in accordance with table 1 for each individual value obtained when measured as described in annex A.

4.3 Materials and components

The upper, soling and heel shall be moulded from homogeneously mixed polyurethane compound. It may be cellular or a combination of cellular and non-cellular.

Table 1 — Minimum thickness

Dimensions in millimetres

Boot component	Minimum thickness				
Boot upper	1,5 of which not less than 1,0 shall be of polyurethane compound				
Foxing					
a) at the heel	4,0				
b) elsewhere	3,0				
Boot bottom	Over cleats		Between cleats		
	Men's	Women's	Men's	Women's	
	a) full thickness	13,0	11,0	7,0	5,0
	b) outsole only	9,0	7,0	3,0	2,5
	Heel				
	a) full thickness	25,0	20,0	19,0	14,0
	b) wearing surface to filler block	9,0	4,0	3,0	2,5

5 Physical properties

5.1 General

Materials from the upper and material from the sole shall be tested as two separate compounds, even if the boot is known to have been made by a single injection process. Test pieces from the material of the boot shall be prepared by any of the permitted procedures given in ISO 37.

5.2 Resistance to flexing of boot upper

When tested in accordance with the method described in annex B with one test piece in each direction of flexing, no cracking of the types specified in annex B shall occur in either during 150 000 flex cycles.

5.3 Tensile properties

The modulus at 100 % elongation and the elongation at break of the upper and the soling shall be determined in accordance with the method described in ISO 37 at $23\text{ °C} \pm 2\text{ °C}$, using where practicable type 1 dumb-bell test pieces taken from the product.

The direction of test shall be along the sole and up the leg. If it is necessary, because of the shortage of material, to use the smaller, type 2, dumb-bell test piece, the size of the dumb-bell used shall be stated when expressing results.

Where practicable, test pieces shall be $2,0\text{ mm} \pm 0,2\text{ mm}$ thick; if necessary, in order to ensure that no fabric is included in the test pieces, thinner test pieces shall be used, and the thickness used shall be stated when expressing results. In the

case of a lined boot, the lining shall be removed by careful use of either a minimum amount of a suitable solvent, such as methyl ethyl ketone, or a leather-splitting machine. The test pieces after either of these treatments shall be conditioned for 24 h at $23\text{ °C} \pm 2\text{ °C}$ and tested at this temperature.

Five test pieces shall be used for each test and the middle value of each group of five test results shall be in accordance with the values given in table 2. Otherwise a) and b) shall be applied as follows:

- In the elongation at break test, if the middle value is below and the highest value is above the appropriate value given in table 2, five further test pieces shall be tested. The material shall be deemed to comply with the requirements of this International Standard only if the average of the middle two values of all ten results is now above the appropriate value.
- In the test for modulus at 100 % elongation, if the middle value is outside the appropriate range given in table 2, but some results are inside, five further test pieces shall be tested. The material shall be deemed to comply with the requirements of this International Standard only if the average of the middle two values of all ten results is within the appropriate range.

Table 2 — Limits for tensile properties

Boot component	Modulus at 100 % elongation	Minimum elongation at break
	MPa	%
Upper	1,3 to 4,6	250
Soling	2,1 to 5,0	300

5.4 Hardness

The hardness of the materials, measured not less than 96 h after moulding and determined in accordance with the appropriate method of ISO 48 at $23\text{ }^{\circ}\text{C} \pm 2\text{ }^{\circ}\text{C}$ after conditioning at that temperature for not less than 3 h, shall be as given in table 3.

For the soling compound, all measurements shall be taken on the prepared surface of a test piece which was adjacent to the wearing surface of the sole and which does not include any filler or upper compound. For the upper compound, all measurements shall be taken on the actual outer surface of the boot leg.

The minimum thickness of a test piece, for hardness testing, is 6 mm.

NOTE 3 For upper hardness testing, sections of boot leg material may be built up to achieve this minimum thickness.

Table 3 — Limits for hardness of polyurethane compound

Values in IRHD

Boot component	Hardness at $23\text{ }^{\circ}\text{C} \pm 2\text{ }^{\circ}\text{C}$	
	min.	max.
Upper	42	59
Soling and heel	50	67

5.5 Cold flex temperature of the upper

When parts of the upper are tested in accordance with ISO 458-1, applied as indicated below, the cold flex temperature shall be not higher than $-35\text{ }^{\circ}\text{C}$.

Two test pieces shall be used, cut such that the major axis of one test piece was aligned up the leg of the boot and that of the other across it.

A graph shall be prepared showing the relationships between deflection and temperature, and from this the temperature at an angle of 200° deflection of each test piece shall be determined. A deduction of $0,5\text{ }^{\circ}\text{C}$ shall be made for each 0,03 mm of the thickness of a test piece above 1,30 mm, and an addition of $0,5\text{ }^{\circ}\text{C}$ shall be made for each 0,03 mm of the thickness below 1,27 mm. The arithmetic mean of the two results shall be recorded as the cold flex temperature of the part under test.

5.6 Resistance of soling to cut growth (flexing test)

When parts of the soling are tested in accordance with annex C at a temperature of $-5\text{ }^{\circ}\text{C} \pm 2\text{ }^{\circ}\text{C}$, using three test pieces cut parallel to the centreline of the sole (see figure 1), the thickness of the soling compound shall be not less than 50 % of the test piece thickness and the number of flexing cycles to achieve 6 mm cut growth shall be not less than 150 000 for each test piece when the measurements of cut growth are confined to the outside surface of the test piece.

5.7 Split tear strength

When parts of the cellular soling are tested in accordance with the method given in annex D, the minimum strength in both directions shall be 3,5 N/mm of width.

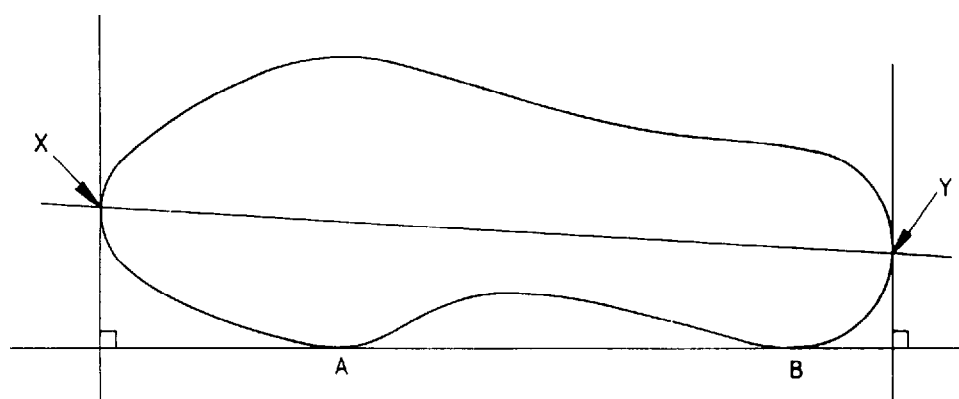


Figure 1 — Centreline of the boot

5.8 Resistance to hydrolysis

5.8.1 When parts of the upper and soling are tested as required in 5.3 after preparation and conditioning in accordance with annex E, the change in elongation at break shall not exceed 20 %.

5.8.2 When parts of the soling are tested in accordance with the method described in annex C, after preparation and conditioning in accordance with annex E, the testing being carried out at $-5\text{ }^{\circ}\text{C} \pm 2\text{ }^{\circ}\text{C}$, the original 2 mm cut shall have increased by not more than 6 mm after 150 000 cycles.

5.8.3 When parts of the upper are tested in accordance with the method described in annex B at $-5\text{ }^{\circ}\text{C} \pm 2\text{ }^{\circ}\text{C}$, after preparation and conditioning in accordance with annex E, no cracking shall occur during and up to 150 000 flex cycles.

6 Marking

Each article of footwear shall be indelibly and legibly marked with the following:

- a) the size, stamped on the inside or moulded on the waist of the outsole;
- b) the manufacturer's or supplier's identification, including the name, trademark or other means of identification of the country of manufacture, distributor or retailer;
- c) the reference number of this International Standard.