



BSI Standards Publication

Leather — Chemical tests for the determination of certain azo colourants in dyed leathers

Part 1: Determination of certain aromatic amines derived from azo colourants

National foreword

This British Standard is the UK implementation of EN ISO 17234-1:2024. It is identical to ISO 17234-1:2024. It supersedes BS EN ISO 17234-1:2020, which is withdrawn.

The UK participation in its preparation was entrusted to Technical Committee TCI/69, Footwear & Leather.

A list of organizations represented on this committee can be obtained on request to its committee manager.

Contractual and legal considerations

This publication has been prepared in good faith, however no representation, warranty, assurance or undertaking (express or implied) is or will be made, and no responsibility or liability is or will be accepted by BSI in relation to the adequacy, accuracy, completeness or reasonableness of this publication. All and any such responsibility and liability is expressly disclaimed to the full extent permitted by the law.

This publication is provided as is, and is to be used at the recipient's own risk.

The recipient is advised to consider seeking professional guidance with respect to its use of this publication.

This publication is not intended to constitute a contract. Users are responsible for its correct application.

© The British Standards Institution 2025
Published by BSI Standards Limited 2025

ISBN 978 0 539 27949 8

ICS 59.140.30

Compliance with a British Standard cannot confer immunity from legal obligations.

This British Standard was published under the authority of the Standards Policy and Strategy Committee on 31 January 2025.

Amendments/corrigenda issued since publication

Date	Text affected
------	---------------

English Version

Leather - Chemical tests for the determination of certain
azo colourants in dyed leathers - Part 1: Determination of
certain aromatic amines derived from azo colourants (ISO
17234-1:2024)

Cuir - Essais chimiques pour le dosage de certains
colorants azoïques dans les cuirs teints - Partie 1:
Dosage de certaines amines aromatiques dérivées des
colorants azoïques (ISO 17234-1:2024)

Leder - Chemische Prüfungen zur Bestimmung
bestimmter Azofarbstoffe in gefärbten Ledern - Teil 1:
Bestimmung bestimmter aromatischer Amine aus
Azofarbstoffen (ISO 17234-1:2024)

This European Standard was approved by CEN on 9 December 2024.

CEN members are bound to comply with the CEN/CENELEC Internal Regulations which stipulate the conditions for giving this European Standard the status of a national standard without any alteration. Up-to-date lists and bibliographical references concerning such national standards may be obtained on application to the CEN-CENELEC Management Centre or to any CEN member.

This European Standard exists in three official versions (English, French, German). A version in any other language made by translation under the responsibility of a CEN member into its own language and notified to the CEN-CENELEC Management Centre has the same status as the official versions.

CEN members are the national standards bodies of Austria, Belgium, Bulgaria, Croatia, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Republic of North Macedonia, Romania, Serbia, Slovakia, Slovenia, Spain, Sweden, Switzerland, Türkiye and United Kingdom.



EUROPEAN COMMITTEE FOR STANDARDIZATION
COMITÉ EUROPÉEN DE NORMALISATION
EUROPÄISCHES KOMITEE FÜR NORMUNG

CEN-CENELEC Management Centre: Rue de la Science 23, B-1040 Brussels

European foreword

This document (EN ISO 17234-1:2024) has been prepared by Technical Committee ISO/IULTCS "International Union of Leather Technologists and Chemists Societies" in collaboration with Technical Committee CEN/TC 289 "Leather" the secretariat of which is held by UNI.

This European Standard shall be given the status of a national standard, either by publication of an identical text or by endorsement, at the latest by June 2025, and conflicting national standards shall be withdrawn at the latest by June 2025.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. CEN shall not be held responsible for identifying any or all such patent rights.

This document supersedes EN ISO 17234-1:2020.

Any feedback and questions on this document should be directed to the users' national standards body/national committee. A complete listing of these bodies can be found on the CEN website.

According to the CEN-CENELEC Internal Regulations, the national standards organizations of the following countries are bound to implement this European Standard: Austria, Belgium, Bulgaria, Croatia, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Republic of North Macedonia, Romania, Serbia, Slovakia, Slovenia, Spain, Sweden, Switzerland, Türkiye and the United Kingdom.

Endorsement notice

The text of ISO 17234-1:2024 has been approved by CEN as EN ISO 17234-1:2024 without any modification.

Contents

Page

Foreword	iv
1 Scope	1
2 Normative references	1
3 Terms and definitions	1
4 General	1
5 Principle	3
6 Safety precautions	3
7 Apparatus	3
8 Reagents	4
9 Sampling and preparation of samples	5
10 Procedure	5
10.1 Degreasing	5
10.2 Reductive cleavage	5
10.3 Liquid-liquid extraction	5
10.4 Check of the analytical system	6
11 Chromatographic analyses	6
12 Calibration	6
13 Evaluation	6
13.1 Calculation of amine in the sample	6
13.2 Reliability of the method	7
14 Test report	7
Annex A (informative) Chromatographic analyses	8
Annex B (informative) Reliability of the method	11
Annex C (informative) Assessment guide — Interpretation of analytical results	12
Annex D (informative) Procedure for liquid/liquid extraction without diatomaceous earth	18
Annex E (normative) Colourants — Method for the determination of certain aromatic amines	21
Annex F (normative) Leather and colourants — Method for the determination of free aromatic amines	22
Bibliography	25

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.

The procedures used to develop this document and those intended for its further maintenance are described in the ISO/IEC Directives, Part 1. In particular, the different approval criteria needed for the different types of ISO document should be noted. This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2 (see www.iso.org/directives).

ISO draws attention to the possibility that the implementation of this document may involve the use of (a) patent(s). ISO takes no position concerning the evidence, validity or applicability of any claimed patent rights in respect thereof. As of the date of publication of this document, ISO had not received notice of (a) patent(s) which may be required to implement this document. However, implementers are cautioned that this may not represent the latest information, which may be obtained from the patent database available at www.iso.org/patents. ISO shall not be held responsible for identifying any or all such patent rights.

Any trade name used in this document is information given for the convenience of users and does not constitute an endorsement.

For an explanation of the voluntary nature of standards, the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the World Trade Organization (WTO) principles in the Technical Barriers to Trade (TBT), see www.iso.org/iso/foreword.html.

IULTCS, originally formed in 1897, is a world-wide organization of professional leather societies to further the advancement of leather science and technology. IULTCS has three Commissions, which are responsible for establishing international methods for the sampling and testing of leather. ISO recognizes IULTCS as an international standardizing body for the preparation of test methods for leather.

This document was prepared by the Chemical Test Commission of the International Union of Leather Technologists and Chemists Societies (IUC Commission, IULTCS) in collaboration with the European Committee for Standardization (CEN) Technical Committee CEN/TC 289, *Leather*, in accordance with the Agreement on technical cooperation between ISO and CEN (Vienna Agreement).

It is based on IUC 20 published in J. Soc. Leather Tech. Chem., **86**, pp. 299-305, 2002, and declared an official method of the IULTCS in June 2003.

This fourth edition cancels and replaces the third edition (ISO 17234-1:2020), which has been technically revised.

The main changes are as follows:

- normative [Annexes E](#) and [F](#) have been added.

A list of all parts in the ISO 17234 series can be found on the ISO website.

Any feedback or questions on this document should be directed to the user's national standards body. A complete listing of these bodies can be found at www.iso.org/members.html.

Leather — Chemical tests for the determination of certain azo colourants in dyed leathers —

Part 1:

Determination of certain aromatic amines derived from azo colourants

1 Scope

This document specifies a method to determine certain aromatic amines derived from azo colourants.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

ISO 2418, *Leather — Chemical, physical, mechanical and fastness tests — Position and preparation of specimens for testing*

ISO 3696, *Water for analytical laboratory use — Specification and test methods*

ISO 4044, *Leather — Chemical tests — Preparation of chemical test samples*

ISO 17234-2, *Leather — Chemical tests for the determination of certain azo colorants in dyed leathers — Part 2: Determination of 4-aminoazobenzene*

3 Terms and definitions

No terms and definitions are listed in this document.

ISO and IEC maintain terminology databases for use in standardization at the following addresses:

- ISO Online browsing platform: available at <https://www.iso.org/obp>
- IEC Electropedia: available at <https://www.electropedia.org/>

4 General

Certain azo colourants can release, by reductive cleavage of azo group(s), one or more of the aromatic amines listed in EU Regulation 1907/2006, Annex XVII, Appendix 8^[2] and GB 20400-2006^[3] (see [Table 1](#)).

ISO 17234-1:2024(en)
IULTCS/IUC 20-1:2024(en)

Table 1 — Aromatic amines listed in EU Regulation 1907/2006, Annex XVII, Appendix 8^[2] and GB 20400-2006^[3]

No.	CAS number	Index number	EC number	Substances
1	92-67-1	612-072-00-6	202-177-1	biphenyl-4-ylamine 4-aminobiphenyl xenylamine
2	92-87-5	612-042-00-2	202-199-1	benzidine
3	95-69-2	612-196-00-0	202-441-6	4-chloro- <i>o</i> -toluidine
4	91-59-8	612-022-00-3	202-080-4	2-naphthylamine
5 ^a	97-56-3	611-006-00-3	202-591-2	<i>o</i> -aminoazotoluene 4-amino-2',3-dimethylazobenzene 4- <i>o</i> -tolylazo- <i>o</i> -toluidine
6 ^a	99-55-8	612-210-00-5	202-765-8	5-nitro- <i>o</i> -toluidine 2-amino-4-nitrotoluene
7	106-47-8	612-137-00-9	203-401-0	4-chloroaniline
8	615-05-4	612-200-00-0	210-406-1	4-methoxy- <i>m</i> -phenylenediamine 2,4-diaminoanisole
9	101-77-9	612-051-00-1	202-974-4	4,4'-methylenedianiline 4,4'-diaminodiphenylmethane
10	91-94-1	612-068-00-4	202-109-0	3,3'-dichlorobenzidine 3,3'-dichlorobiphenyl-4,4'-ylenediamine
11	119-90-4	612-036-00-X	204-355-4	3,3'-dimethoxybenzidine <i>o</i> -dianisidine
12	119-93-7	612-041-00-7	204-358-0	3,3'-dimethylbenzidine 4,4'-bi- <i>o</i> -toluidine
13	838-88-0	612-085-00-7	212-658-8	4,4'-methylenedi- <i>o</i> -toluidine
14	120-71-8	612-209-00-X	204-419-1	6-methoxy- <i>m</i> -toluidine <i>p</i> -cresidine
15	101-14-4	612-078-00-9	202-918-9	4,4'-methylene-bis-(2-chloro-aniline) 2,2'-dichloro-4,4'-methylene-dianiline
16	101-80-4	612-199-00-7	202-977-0	4,4'-oxydianiline
17	139-65-1	612-198-00-1	205-370-9	4,4'-thiodianiline
18	95-53-4	612-091-00-X	202-429-0	<i>o</i> -toluidine 2-aminotoluene
19	95-80-7	612-099-00-3	202-453-1	4-methyl- <i>m</i> -phenylenediamine 2,4-toluylenediamine 2,4-diaminotoluene
20	137-17-7	612-197-00-6	205-282-0	2,4,5-trimethylaniline
21	90-04-0	612-035-00-4	201-963-1	<i>o</i> -anisidine 2-methoxyaniline
22 ^b	60-09-3	611-008-00-4	200-453-6	4-aminoazobenzene
23 ^c	95-68-1	612-027-00-0	202-440-0	2,4-xylidine 2,4-dimethylbenzene-1-amine
24 ^c	87-62-7	612-161-00-X	201-758-7	2,6-xylidine 2,6-dimethylbenzene-1-amine

^a The CAS-numbers 97-56-3 (no. 5) and 99-55-8 (no. 6) are further reduced to CAS-numbers 95-53-4 (no. 18) and 95-80-7 (no. 19).

^b Azo colourants that are able to form 4-aminoazobenzene generate under the condition of this method aniline (CAS-number 62-53-3) and 1,4-phenylenediamine (CAS number 106-50-3). The presence of these colourants shall be tested using ISO 17234-2.

^c Additional aromatic amines in GB 20400-2006.

5 Principle

After degreasing, the leather sample is treated with sodium dithionite in an aqueous buffer solution (pH 6) at 70 °C in a closed vessel. The amines released in the process of reductive cleavage are transferred to a *t*-butyl methyl ether (8.5) phase by means of liquid-liquid extraction using diatomaceous earth columns. The *t*-butyl methyl ether (8.5) extract is then concentrated under mild conditions in a rotary vacuum evaporator and the residue is dissolved in a suitable solvent, depending on the method used to determine the amines (see [Annex A](#)).

Determination of the amines is performed by means of liquid chromatography (LC) using a diode array detector (DAD) or mass selective detector (LC-MS), by capillary gas chromatography with a mass selective detector (GC-MS) or by capillary electrophoresis with a diode array detector (CE-DAD), or qualitatively with (high-performance) thin layer chromatography (TLC, HPTLC).

The amines shall be identified by means of at least two different chromatographic separation methods in order to avoid any possible misinterpretations caused by interfering substances (such as position isomers of the amines to be identified) and hence any incorrect statements. Amine quantification shall be performed by LC-DAD, LC-MS or GC-MS.

A screening method using liquid-liquid extraction without diatomaceous earth columns is described in [Annex D](#).

If it is required to analyse the colourant itself, the method in [Annex E](#) shall be used.

If it is required to analyse for residual free aromatic amines in the leather or colourant, the method in [Annex F](#) shall be used.

6 Safety precautions

WARNING — The aromatic amines listed in [Clause 4](#) are classified as substances known to be or suspected to be human carcinogens.

6.1 It is the user's responsibility to use safe and proper techniques when handling materials in this test method. Consult manufacturers for specific details, such as material safety data sheets and other recommendations.

6.2 Good laboratory practice should be followed. Wear safety glasses in all laboratory areas and a dust respirator and single-use gloves while handling powder colourants and aromatic amines.

6.3 National and local safety regulations can apply.

7 Apparatus

The usual laboratory equipment and, in particular, the following is used.

7.1 Suitable reaction vessel, made of temperature-resistant glass with a gas-tight closure.

7.2 Suitable heating system, at (70 ± 2) °C.

7.3 Polypropylene or glass column, inside diameter 25 mm to 30 mm, length 130 mm to 150 mm, packed with 20 g of diatomaceous earth, fitted with glass fibre filter at the outlet.

The diatomaceous earth columns are either bought pre-packed and used as is, or 20 g of diatomaceous earth can be packed into a glass or polypropylene column of the dimensions given.

7.4 Vacuum rotary evaporator with vacuum control and water bath.

7.5 Pipettes, in required sizes or variables pipettes.

7.6 Ultrasonic bath with thermostat.

7.7 Chromatographic equipment, selected from the following.

7.7.1 Liquid chromatography (LC) and DAD or MS.

7.7.2 Capillary gas chromatography (GC), with MS.

7.7.3 Capillary electrophoresis (CE), with DAD.

7.7.4 Thin layer chromatography (TLC) or high-performance thin layer chromatography (HPTLC).

NOTE A description of the chromatographic equipment ([7.7](#)) is given in [Annex A](#).

8 Reagents

Unless otherwise specified, analytical grade chemicals shall be used.

8.1 *n*-hexane.

8.2 Citrate buffer solution, 0,06 mol/l, pH = 6, preheated to $(70 \pm 2) ^\circ\text{C}$.

8.3 Aqueous sodium dithionite solution, $\rho = 200 \text{ mg/ml}^{1)}$, freshly prepared, to be used immediately after resting for 1 h in a closed vessel.

8.4 Sodium hydroxide aqueous solution, a mass fraction of 40 %.

8.5 *t*-butyl methyl ether.

8.6 Methanol.

8.7 Acetonitrile.

8.8 Amines, listed in [Table 1](#) (highest available purity standard).

8.9 Standard solutions.

8.9.1 Stock solution of the amines ([8.8](#)), 400 µg/ml in ethyl acetate for TLC.

8.9.2 Stock solution of the amines ([8.8](#)), 200 µg/ml of each amine in an appropriate solvent.

NOTE Acetonitrile is an appropriate solvent for this stock solution, resulting in good stability of amines.

8.9.3 Standard solution for amine process control, 30 µg amine per millilitre solvent, freshly prepared from stock solutions ([8.9.1](#) or [8.9.2](#)) depending on the analytical method.

1) ρ = mass concentration.