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## Leather — Determination of surface reflectance

*Cuir — Détermination du facteur de réflexion en surface*



Reference numbers  
ISO 17502:2013(E)  
IULTCS/IUF 472:2013(E)

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Tel. + 41 22 749 01 11  
Fax + 41 22 749 09 47  
E-mail [copyright@iso.org](mailto:copyright@iso.org)  
Web [www.iso.org](http://www.iso.org)

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## **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.

International Standards are drafted in accordance with the rules given in the ISO/IEC Directives, Part 2.

The main task of technical committees is to prepare International Standards. 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.

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

ISO 17502 was prepared by the European Committee for Standardization (CEN) Technical Committee CEN/TC 289, *Leather*, in collaboration with the Fastness Tests Commission of the International Union of Leather Technologists and Chemists Societies (IUF Commission, IULTCS), in accordance with the Agreement on technical cooperation between ISO and CEN (Vienna Agreement).

IULTCS, originally formed in 1897, is a worldwide 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.

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# Leather — Determination of surface reflectance

## 1 Scope

This International Standard specifies a method for determining the reflectance properties of a leather surface for visible and near infrared radiation. The reflection value in the near infrared determines if a leather may be classified as solar reflective.

The method is applicable to all types of leather, in particular for coloured leather.

## 2 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

### 2.1

#### **solar reflective leather**

leather that reflects at least 55 % of the radiation when the diffuse reflectance of the surface is measured at 900 nm

## 3 Principle

The reflective properties of leathers exposed to solar radiation, especially automotive, motorcycle and shoe leather, have an influence on the comfort of the user. Leathers with good near infrared reflective characteristics have a lower temperature when exposed to direct solar radiation.

The solar reflective properties of leather may be determined by measuring the diffuse reflectance with an Ulbricht integrating sphere in the near infrared wavelength range of 700 nm to 1 100 nm. If the measured % reflection at 900 nm is 55 % or higher, then the leather is classified as solar reflective.

## 4 Apparatus and materials

**4.1 Spectrophotometer**, capable of measuring the diffuse reflection at 900 nm wavelength. A suitable spectrophotometer is one with an Ulbricht integrating sphere with a 90° and 8° geometry for the spectrophotometer and light ports, respectively, as well as a suitable light source and detector for determining the diffuse reflectance of the leather surface.

Spectrophotometer systems with fibre-optic cables to link the light source, integrating sphere and spectrophotometer, as well as suitable software to measure the % reflection at specific wavelengths and to record the reflectance spectrum over the visible and near infrared wavelengths, 400 nm to 1 100 nm, are recommended.

NOTE An example of a suitable spectrophotometer system is given in [Annex B](#).

**4.2 White diffuse reflectance standard**, a white reference material with > 98 % reflection in the wavelength range 250 nm to 1 500 nm, for calibrating the integrating sphere spectrophotometer.

NOTE An example of a suitable standard is given in [Annex B](#).

## 5 Test specimens

A dry leather specimen, measuring approximately 300 mm × 200 mm.

## 6 Procedure

**6.1** Check that the spectrophotometer system (4.1) is set up to measure reflectance. Check that in the wavelength range 400 nm to 1 100 nm the white and black references are reading 100 % and 0 %, respectively. If necessary, re-set the spectrophotometer calibration so that the references have these reflectance values.

It is important for accurate reflectance measurements that the spectrophotometer calibration is checked each time it is started or if the last measurement was more than one hour before. The white reference tile (4.2) is used to set the 100 % reflectance limit. The 0 % reflectance limit is set by the black reference, which is made by either completely blocking the light source at the lamp or switching the light source off.

**6.2** Place the test specimen on a flat surface with the surface to be tested uppermost.

**NOTE** Normally, the surface tested is the outer surface exposed to solar radiation. For finish coated leathers with a low reflectance value, it may be useful to determine if the uncoated side also has a low reflectance. This indicates if the pigments in the coating or dyes in the leather are responsible for the low reflectance.

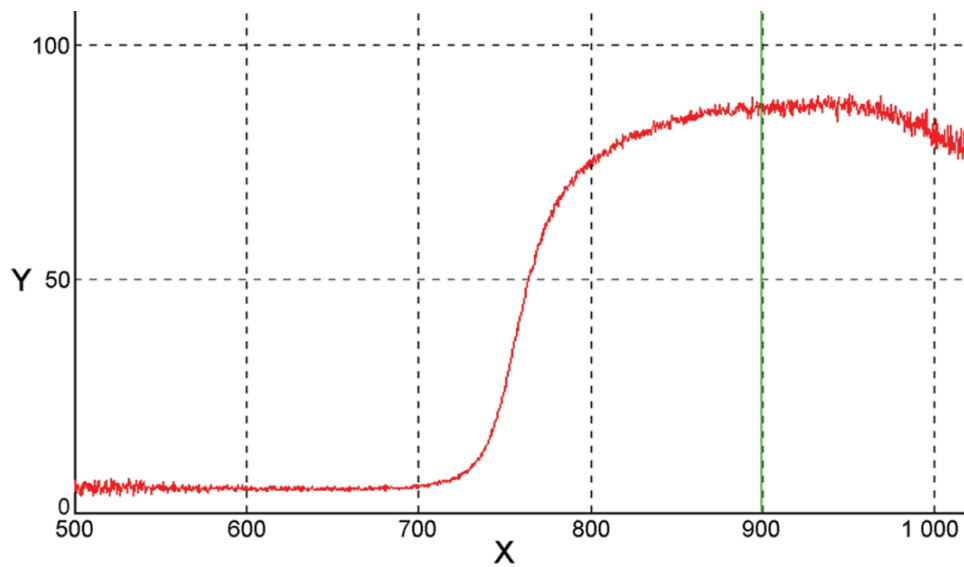
**6.3** To measure the reflectance, place the integrating sphere flat on the surface of the leather sample. Check that the sphere opening is flat on the sample and no stray light may enter. Record the % reflectance value at 900 nm (to the nearest 1 %).

**6.4** Repeat the reflectance measurement (6.3) at least three times in different locations on the test specimen. Record the average % reflectance value at 900 nm in the test report (to the nearest 1 %).

If the variation in % reflectance value is more than 10 %, then this should be noted on the test report.

**NOTE** Variations in % reflectance can be caused by non-uniform application of dyes and pigments or by the use of absorbing components on the leather surface prior to the finish coat application.

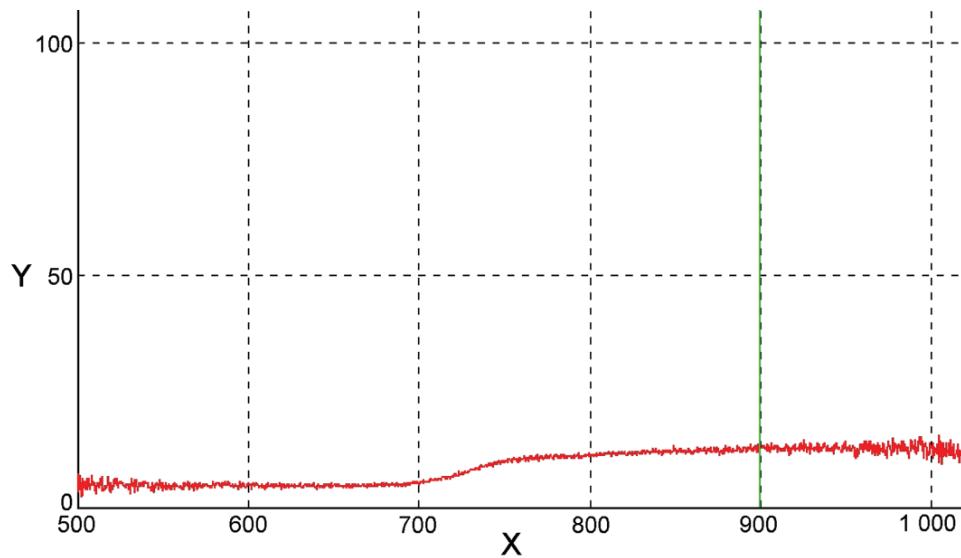
If required, the reflectance spectrum in the visible and near infrared wavelengths may be recorded, as shown in [Figure 1](#) and [Figure 2](#).



**Key**

- X Wavelength, in nm
- Y % reflectance

**Figure 1 — Spectrum of a black leather with solar reflective properties**



**Key**

- X Wavelength, in nm
- Y % reflectance

**Figure 2 — Spectrum of a black leather without solar reflective properties**

## **7 Test report**

The test report shall include the following information:

- a) a reference to this International Standard, i.e. ISO 17502;
- b) a description of the type of leather and which surface has been tested;
- c) the % reflectance value at 900 nm (to the nearest 1 %) and if the specimen tested may be classified as solar reflective;
- d) details of any deviations from the procedure specified;
- e) the date of the test.



## Annex A (informative)

### Precision

At the 55 % reflectance level, the measurement precision at 95 % confidence is:

- repeat measurements  $\pm 2$  in the % reflectance value;
- between laboratory measurements  $\pm 4$  in the % reflectance value.

## Annex B (informative)

### Apparatus and materials

#### B.1 General

Examples of suitable products are given below. This information is given for the convenience of users of this International Standard and does not constitute an endorsement by ISO of these products.

#### B.2 Spectrophotometer

A suitable spectrophotometer system (4.1) may be obtained using the compact, “user-configured” type of equipment available from scientific suppliers of spectrophotometers. Components for a suitable system are:

- Ulbricht integrating sphere, diameter 30 mm, port diameter 6 mm;
- halogen light source for the 360 nm to 1 700 nm range;
- visible – near infrared spectrophotometer for the 400 nm to 1 100 nm range;
- optical fibre cables (400 µm core diameter), suitable for near infrared light transmission, to link the light source, integrating sphere and spectrophotometer;
- white reference tile;
- spectrophotometer operating software and computer.

Other spectrophotometers may be used, provided that they are capable of measuring the diffuse reflection of a surface in the near infrared and in particular at 900 nm.

#### B.3 White diffuse reflectance standard

Any white diffuse reflectance standard (4.2) may be used, provided that it complies with the specification of being more than 98 % reflective from 250 nm to 1 500 nm. Typically, the standard will be encased in a metal housing to protect the surface from damage.

A suitable white diffuse reflectance standard may be obtained from scientific suppliers of spectrophotometers.



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