
**Animal and vegetable fats and oils —
Determination of Lovibond colour**

*Corps gras d'origines animale et végétale — Détermination de la couleur
Lovibond*



Foreword

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Annexes A and B of this International Standard are for information only.

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International Organization for Standardization
Case postale 56 • CH-1211 Genève 20 • Switzerland
Internet iso@iso.ch

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Animal and vegetable fats and oils — Determination of Lovibond colour

1 Scope

This International Standard specifies a method for the determination of the Lovibond colour of animal and vegetable fats and oils.

2 Normative reference

The following standard contains provision which, through reference in this text, constitute provisions of this International Standard. At the time of publication, the edition indicated was 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 edition of the standard indicated below. Members of IEC and ISO maintain registers of currently valid International Standards.

ISO 661:1989, *Animal and vegetable fats and oils — Preparation of test sample*.

3 Principle

The colour of the light transmitted through a known path length of liquid fat or oil is matched with the colour of the light originating from the same source transmitted through glass colour standards. The results are conventionally expressed in Lovibond units.

4 Apparatus

Usual laboratory apparatus and, in particular, the following.

4.1 Colorimeter

The Lovibond Universal tintometers Model F (BS684) and Model F/C are suitable.¹⁾

NOTE The older Models AF905 and AF900/C Model E tintometers are suitable but no longer available. The Lovibond AF710, Lovibond Schofield, Wesson and AOCS colorimeters are NOT suitable.

¹⁾ The Lovibond tintometers and the Munsell Notation 5Y 9/1 are available from The Tintometer Ltd, Waterloo Road, Salisbury, Wiltshire, SP1 2JY, United Kingdom. These tintometers are examples of products available commercially. This information is given for the convenience of users of this International Standard and does not constitute an endorsement by ISO of these products.

4.2 Lighting cabinet

Any of the models given in 4.2.1 and 4.2.2 are suitable.

4.2.1 Models F (BS684) and Model F/C

The tintometer shall be maintained in a good, clean condition in accordance with the manufacturer's instructions. The viewing tube shall contain a Skan Blue daylight correction filter and a diffusing lens, and shall have a field of view subtending 2° at the eye. It shall be mounted in the cabinet such that the sample and the white reference field are viewed at 60° to the normal.

4.2.2 Tintometer AF905/E, AF900/C and Model E

These are painted internally matt white and contain, behind ground glass diffusing screens, two 60 W pearl (uncoated) lamps operated at the correct mains voltage and positioned one on either side of the viewing tube so that each illuminates the white reflecting reference surface at an angle of 45°.

BOTH lamps shall be changed as soon as either envelope shows signs of discoloration and, in any event, after 100 h of use. A suitable logging system shall be used to register lamp usage.

The viewing tube shall contain a Skan Blue daylight correction filter and a diffusing lens and shall have a field of view subtending 2° at the eye. It shall be mounted in the cabinet such that the sample and white reference field are viewed at 90° to the normal. The lighting cabinet, diffusing screens and reflectance surfaces shall be kept free from stains and regularly cleaned. The internal paintwork shall be inspected regularly for ageing/discoloration and shall be repainted matt white when the surfaces become darker than Munsell Notation 5Y 9/1.¹⁾ The viewing tube shall be maintained in accordance with the manufacturer's instructions.

4.3 Colour racks

These shall be fitted with colourless compensating slides on the lower section and shall contain glass colour standards (in Lovibond units) as follows:

Red	0,1 to 0,9	1,0 to 9,0	10,0 and 70,0
Yellow	0,1 to 0,9	1,0 to 9,0	10,0 to 70,0
Blue	0,1 to 0,9	1,0 to 9,0	10,0 to 40,0
Neutral	0,1 to 0,9	1,0 to 3,0	

The colour standards shall be kept clean and free from oil and grease by wiping with cotton buds dipped in warm water containing detergent and dried by wiping with cotton wool. Solvents shall not be used for cleaning.

NOTE Certified Conformance glass colour standards (available from The Tintometer Ltd), can be used to check that the instrument is operating correctly.

4.4 Spillage tray

This is required for the Model Type E only.

4.5 Glass cells

These shall be made of good quality optical glass and shall have a good standard finish, with optical path lengths as follows:

1,6 mm (1/16 inch); 3,2 mm (1/8 inch); 6,4 mm (1/4 inch); 12,7 mm (1/2 inch); 25,4 mm (1 inch); 76,2 mm (3 inch); 133,4 mm (5 1/4 inch).

5 Requirements for operators

All operators shall have satisfactory colour vision and shall have their colour vision retested at intervals of no longer than 5 years. The colour vision tests shall be carried out by a qualified optician.

Operators who normally wear spectacles or contact lenses may continue to wear them, **but tinted or light-sensitive spectacles/lenses shall not be worn.**

6 Sampling

It is important that the laboratory receive a sample that is truly representative and has not been damaged or changed during transport or storage.

Sampling is not part of the method specified in this International Standard. A recommended sampling method is given in ISO 5555.

7 Preparation of test sample

Prepare the sample in accordance with ISO 661. The fat or oil shall be completely liquid, clear and bright when the determination is made.

8 Procedure

8.1 The determination shall be carried out in subdued ambient light. In particular, the tintometer shall NOT be set up facing a window or in direct sunlight.

If the prepared sample is not fully liquid at room temperature, heat it to a temperature about 10 °C above its melting point.

The glass cell (4.5) shall be thoroughly clean and dry and, if necessary, pre-warmed so that no solid matter separates from the sample during the colour determination.

8.2 Pour the liquid sample into a glass cell (4.5) of sufficient optical path length to give colour readings within the ranges given in 4.3.

8.3 Place the cell containing the sample within the lighting cabinet (4.2) so that it is close to the viewing tube.

8.4 Close the lid of the lighting cabinet and immediately determine the colour of the sample by using the colour racks (4.3), initially in the ratio of 10,0 yellow to 1,0 red Lovibond units (in all sections), to obtain an approximate match, then correcting, without necessarily maintaining the ratio of 10 yellow to 1 red and using the minimum of blue OR neutral filters (blue and neutral filters shall not be used simultaneously) until an accurate colour match is obtained. Not more than 9,0 blue or 3,0 neutral shall be used.

CAUTION: THE OPERATOR SHALL LOOK AWAY FROM THE EYEPIECE AFTER EACH 30 s OF MATCHING TO AVOID EYE FATIGUE.

NOTE 1 Colourless compensating slides are necessary to balance the brightness of the fields of view of the sample and colour filters due to the light loss at the glass surfaces.

NOTE 2 In order to make a precise colour match, it may be necessary to introduce neutral or blue glasses, but NOT both, to reduce the brightness of the standard relative to that of the sample.

8.5 The test shall be carried out by two trained operators and the mean values reported. If the results of the two operators vary too widely, then a third operator shall carry out the test. The mean value of the closest two readings shall be reported.

9 Expression of results

Express the results in terms of the following:

- a) the numbers of red, yellow and blue or neutral standards necessary to obtain the match;
- b) the optical path length of the cell used.

Only standard cell sizes (4.5) shall be used. Colour measurements taken in one cell size shall not be used to calculate colour values for another cell size.

10 Precision

10.1 Interlaboratory test

Details of an interlaboratory test on the precision of the method are given in annex A. The values derived from this interlaboratory test may not be applicable to concentration ranges and matrices other than those given.

10.2 Repeatability

The absolute difference between two independent single test results, obtained with the same method on identical test material in the same laboratory by the same two operators using the same equipment within a short interval of time, will in not more than 5 % of cases exceed the repeatability limit (r) given in table 1.

10.3 Reproducibility

The absolute difference between two single test results, obtained with the same method on identical test material in different laboratories by different operators using different equipment, will in not more than 5 % of cases exceed the reproducibility limit (R) given in table 1.

Table 1 — Repeatability and reproducibility limits

Colour scale	Level	r	R
Red: 133,4 mm cell (5¼ inch)	2	0,2	0,8
	5	0,7	2
Yellow: 133,4 mm cell (5¼ inch)	20	3	5
	50	6	12

11 Test report

The test report shall specify:

- all information necessary for the complete identification of the sample;
- the test method used, with reference to this International Standard;
- any operating conditions not specified in this International Standard, or regarded as optional, together with details of any incidents which may have influenced the test results;
- the results obtained, in Lovibond units.

Annex A (informative)

Results of an interlaboratory trial

An international collaborative test involving nine laboratories analysing two samples of oils was organized by FOSFA International and the results obtained were subjected to statistical analysis in accordance with ISO 5725-1 and ISO 5725-2 to give the precision data reported in table A.1.

Table A.1 — Results of interlaboratory trial

Sample	Palm oil (RBD)		Crude palm kernel oil	
	Red	Yellow	Red	Yellow
Colour scale: 133,4 mm cell (5 ¼ inch)	Red	Yellow	Red	Yellow
Number of laboratories	9	9	9	9
Number of accepted results	9	9	9	7
Mean value, in Lovibond units	2,3	21,6	5,0	47,7
Repeatability standard deviation, s_r , in Lovibond units	0,07	1,22	0,25	2,35
Repeatability limit, r , in Lovibond units	0,20	3,42	0,71	6,58
Reproducibility standard deviation, s_R , in Lovibond units	0,29	1,80	0,76	4,34
Reproducibility limit, R , in Lovibond units	0,81	5,04	2,12	12,26
NOTE RBD means refined, bleached and deodorized.				

Annex B (informative)

Bibliography

- [1] ISO 5555:1991, *Animal and vegetable fats and oils — Sampling*.
- [2] ISO 5725-1:1994, *Accuracy (trueness and precision) of measurement methods and results — Part 1: General principles and definitions*.
- [3] ISO 5725-2:1994, *Accuracy (trueness and precision) of measurement methods and results — Part 2: Basic method for the determination of repeatability and reproducibility of a standard measurement method*.

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