INTERNATIONAL STANDARD 2049

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Petroleum products — Determination of colour

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FOREWORD

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Draft International Standards adopted by the Technical Committees are circulated to the Member Bodies for approval before their acceptance as International Standards by the ISO Council.

International Standard ISO 2049 was drawn up by Technical Committee ISO/TC 28, *Petroleum products*.

It was approved in June 1971 by the Member Bodies of the following countries:

Austria	India	South Africa, Rep. of
Belgium	Ireland	Spain
Bulgaria	Italy	Sweden
Chile	Korea, Rep. of	Switzerland
Czechoslovakia	Netherlands	Turkey
Egypt, Arab Rep. of	New Zealand	United Kingdom
France	Poland	U.S.A.
Germany	Portugal	U.S.S.R.
Greece	Romania	

No Member Body expressed disapproval of the document.

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Petroleum products — Determination of colour

1 SCOPE AND FIELD OF APPLICATION

This International Standard specifies a method for the visual determination of the colour of a variety of petroleum products such as lubricating oils, heating oils, diesel fuel oils, and petroleum waxes.

2 APPARATUS

2.1 Colorimeter, consisting of a light source, glass colour standards, sample container housing with cover, and viewing piece, as described in the Annex.

2.2 Sample container, of clear colourless glass. For referee tests use the glass sample jar shown in the Figure. For routine tests, it is permissible to use a glass jar such as is used for cloud and pour-point tests, i.e. a cylindrical jar with a flat bottom of 30 to 33.5 mm internal diameter and 115 to 125 mm external height.

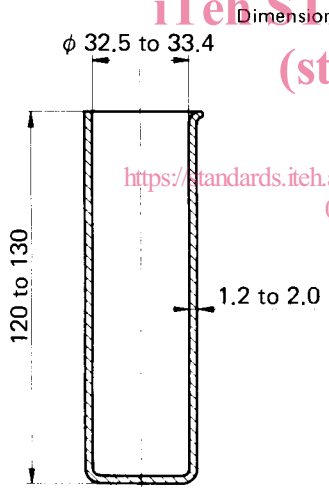

FIGURE — **Glass sample jar**

3 PREPARATION OF SAMPLE

3.1 Liquid petroleum products such as lubricating oils

Fill the sample container to a depth of 50 mm or more and observe the colour. If the sample is not clear, heat it to a temperature 6 °C above the point at which the cloud or haze disappears, and determine the colour at that temperature. If the sample is darker than 8 colour to ISO 2049 (see Table in Annex), mix 15 volumes of the sample into 85 volumes of solvent (3.3) and determine the colour of the mixture.

3.2 Petroleum waxes, including petrolatum

Heat the sample to a temperature 11 to 17 °C above the melting point of the wax. If the sample is darker than 8 colour to ISO 2049, mix 15 volumes of melted sample with 85 volumes of solvent (3.3) brought to the same temperature and determine the colour of the mixture at that temperature.

3.3 Solvent

Kerosene, used for diluting dark samples as described in 3.1 and 3.2: this solvent shall have a colour lighter than a potassium dichromate ($K_2Cr_2O_7$) solution formed by dissolving 4.8 mg of pure anhydrous potassium dichromate in 1 l of distilled water.

4 PROCEDURE

4.1 Place a sample container, filled to a depth of at least 50 mm with distilled water, in that compartment of the colorimeter through which the standard glasses will be observed. Place the sample in its container in the other compartment. Cover both containers to exclude all exterior light.

4.2 Switch on the light source of the colorimeter and compare the colour of the sample with that of the standard glasses. Determine which glass best matches the colour of the sample.

5 EXPRESSION OF RESULTS

5.1 Report as the colour of the sample, the designation of the glass producing a matching colour, for example: "7.5 colour to ISO 2049".

5.2 If the colour of the sample is intermediate between those of two standard glasses, record the designation of the darker glass preceded by the letter "L", for example: "L7.5 colour to ISO 2049". Never report the colour of a sample as being darker than a given standard except those darker than 8, for which the designation "D8 colour to ISO 2049" is to be given.

5.3 If the sample has been diluted with solvent (3.3), report the colour of the mixture followed by the abbreviation "Dil", for example: "L7.5 Dil colour to ISO 2049".

6 PRECISION

The following criteria shall be used for judging the acceptability of results (95 % confidence level):

6.1 Repeatability

Duplicate results by the same operator using the same apparatus shall not differ by more than 0.5 of a colour number.

6.2 Reproductibility

The results submitted by each of two laboratories shall not differ by more than 0.5 of a colour number.

ANNEX

DESCRIPTION OF COLORIMETER AND ASSOCIATED APPARATUS

A.1 COLORIMETER

The instrument shall illuminate and permit observation of the test sample and any one of the colour standards simultaneously, either by direct viewing or by use of an optical eyepiece. The instrument shall show two illuminated areas of equal size and shape, one filled with light transmitted by a colour standard, the other with light transmitted by the test sample. These illuminated areas shall be disposed symmetrically about a vertical median line, and shall be separated in a horizontal direction so that the horizontal separation of the closest portions subtends at the eye of the observer an angle of not less than 2 ° and not more than 3.6 °. Each illuminated area shall cover a circle of diameter subtending an angle of at least 2.2 °, and may be enlarged up to any size and shape provided that no two illuminated points in the field of view are separated by a distance subtending an angle of more than 10 °.

NOTE — The angle subtended by a line of length d, in a plane perpendicular to the line of sight and separated from the eye of the observer by a distance D, is given in degrees by 57.3 d/D. The angle subtended by the image of this line, seen by viewing it through an eyepiece of magnification M, is given in degrees by 57.3 Md/D, where D is the distance between the eye of the observer and the plane of the image.

A.2 ARTIFICIAL DAYLIGHT SOURCE

(see Note 1)

This may be a separate unit or an integral part of the colorimeter. The source shall consist of a lamp of colour temperature 2 750 K, a daylight filter glass (see Note 2), and a flashed opal glass. The combined elements shall possess spectral characteristics similar to those of diffused daylight. The specified light source shall provide a translucent background of 900 ± 100 lx brightness against which the colour standards and sample may be viewed. The background of illuminated opal glass shall be free from glare and shadows. The light source must be designed so that there is no extraneous light interfering with the observation.

NOTES

1 When electric current is not available, the colorimeter may be designed to use diffused daylight provided that direct sunlight is avoided. Coloured objects shall be excluded from the immediate foreground when using diffused daylight.

2 A spectrophotometric test of an acceptable daylight filter glass shall indicate a transmittance of radiant energy of not less than 0.60 at 410 nm with a smooth curve down to a transmittance below 0.10 at 700 nm. This curve shall also be without the pronounced hump which is characteristic of excess cobalt, the typical cobalt curve having an increased transmittance at 570 nm above a straight line drawn between the points indicating transmittance at 540 nm and 590 nm and also a transmittance band above 660 nm. The transmittance of an acceptable filter shall not at 570 nm exceed by more than 0.03 that indicated by a straight line drawn between the points indicating transmittance at 540 nm and 590 nm, nor shall the transmittance for 700 nm exceed that for any shorter wavelength (such as 660 nm) by more than 0.03.

An acceptable daylight filter shall also possess such characteristics that the chromaticity coordinates x, y, z and the luminous transmittance τ (λ) when calculated from the spectral transmittance data using the 1931 CIE Standard Illuminant A, are as follows:

$\tau(\lambda)$: 0.107 to 0.160
x : 0.314 to 0.330
y : 0.337 to 0.341
z : 0.329 to 0.349

A.3 GLASS COLOUR STANDARDS

Sixteen glass colour standards are specified in the following Table. The standards shall be mounted in such a way that they may be conveniently manipulated. The width of the glass colour standards shall be not less than 14 mm.

TABLE — **Glass colour standards**

Colour to ISO 2049	Chromaticity co-ordinates [1]			Luminous transmittance (CIE standard source C) τ (λ)
	red	green	blue	
0.5 ...	0.462	0.473	0.065	0.86 ± 0.06
1.0 ...	0.489	0.475	0.036	0.77 ± 0.06
1.5 ...	0.521	0.464	0.015	0.67 ± 0.06
2.0 ...	0.552	0.442	0.006	0.55 ± 0.06
2.5 ...	0.582	0.416	0.002	0.44 ± 0.04
3.0 ...	0.611	0.388	0.001	0.31 ± 0.04
3.5 ...	0.640	0.359	0.001	0.22 ± 0.04
4.0 ...	0.671	0.328	0.001	0.152 ± 0.022
4.5 ...	0.703	0.296	0.001	0.109 ± 0.016
5.0 ...	0.736	0.264	0.000	0.081 ± 0.012
5.5 ...	0.770	0.230	0.000	0.058 ± 0.010
6.0 ...	0.805	0.195	0.000	0.040 ± 0.008
6.5 ...	0.841	0.159	0.000	0.026 ± 0.006
7.0 ...	0.877	0.123	0.000	0.016 ± 0.004
7.5 ...	0.915	0.085	0.000	0.008 1 ± 0.001 6
8.0 ...	0.956	0.044	0.000	0.002 5 ± 0.000 6

1) Tolerances on the chromaticity co-ordinate are ± 0.006.