

# International Standard



# 6271

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## Clear liquids — Estimation of colour by the platinum-cobalt scale

*Liquides clairs — Évaluation de la couleur au moyen de l'échelle platine-cobalt*

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## Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards institutes (ISO member bodies). The work of developing International Standards is carried out through ISO technical committees. Every member body interested in a subject for which a technical committee has been set up 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.

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 6271 was developed by Technical Committee ISO/TC 35, *Paints and varnishes*, and was circulated to the member bodies in May 1978.

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It has been approved by the member bodies of the following countries :

Australia	Italy	Romania
Austria	Kenya	South Africa, Rep. of
Brazil	Korea, Rep. of	Spain
Canada	Mexico	Switzerland
Egypt, Arab Rep. of	Netherlands	Turkey
Germany, F. R.	Norway	USSR
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The member bodies of the following countries expressed disapproval of the document on technical grounds :

France  
United Kingdom

# Clear liquids — Estimation of colour by the platinum-cobalt scale

## 0 Introduction

For the measurement of the colour of liquid chemical products ISO/TC 47, *Chemistry*, has prepared ISO 2211, *Liquid chemical products — Measurement of colour in Hazen units (platinum-cobalt scale)*.

For paint binders and solvents for the paint industry ISO 2211 was considered not to be accurate enough.

The present International Standard ISO 6271 is more precise in respect to :

- preparation of the colour stock solution (in one way only);
- quality of the colour stock solution (to be checked colorimetrically);
- use of tubes with greater viewing depth (to obtain a more distinct difference between successive colour standards);
- test procedure (one "standard procedure" only, instrumental measurements being "non-standard").

The more scientific term "platinum-cobalt colour" used here was preferred over the equivalent terms "Hazen colour" and "APHA colour".

## 1 Scope and field of application

This International Standard specifies a method of estimating the colour of clear liquids in Pt-Co units.

It is applicable to clear liquids having colour characteristics similar to those of the reference platinum-cobalt scale.

This method is to be applied whenever specified by an International Standard relating to a given product.

## 2 Principle

Comparison of the colour of a sample with those of colour standards, and expression of the result in terms of platinum-cobalt colour units.

## 3 Definition

**Pt-Co unit** : The colour of a solution containing 1 mg of platinum per litre in the form of the chloroplatinate ion, in the presence of 2 mg of cobalt(II) chloride hexahydrate per litre.

## 4 Reagents

During the test, use only reagents of recognized analytical grade and only distilled water or water of equivalent purity.

**4.1 Potassium chloroplatinate** ( $K_2PtCl_6$ ).

**4.2 Cobalt(II) chloride hexahydrate** ( $CoCl_2 \cdot 6H_2O$ ).

**4.3 Hydrochloric acid**, 38 % (m/m) solution,  $\rho$  approximately 1,19 g/ml.

## 5 Apparatus

Ordinary laboratory apparatus and

**5.1 Colour comparison tubes**, flat-based, 100 ml capacity, provided with ground-on, optically clear, glass caps. The tubes shall be matched with respect to the colour of the glass and shall have a graduation mark between 275 and 295 mm above the base. The tubes shall be selected so that the graduation mark heights match within 3 mm.<sup>1)</sup>

1) These colour comparison tubes (Nessler tubes) are obtainable commercially. Details may be obtained from the secretariat of ISO/TC 35 or from the ISO Central Secretariat.

**5.2 Colour comparator**, constructed to permit visual comparison of light transmitted through the colour comparison tubes (5.1) in the direction of their longitudinal axis. The comparator should be constructed so that white light is passed through, or reflected off, a white glass plate and directed with equal intensity through the tubes, and should be shielded so that no light enters the tubes from the sides.

**5.3 Spectrophotometer**, capable of measuring light transmittance at 430, 455, 480 and 510 nm with a photometric accuracy of 0,005 transmittance or better.

**5.4 Cells**, of optical path length 10 mm, for use with the spectrophotometer.

## 6 Preparation of colour standards

### 6.1 Colour stock solution, 500 Pt-Co units

Into a 400 ml beaker introduce 1,245 g of the potassium chloroplatinate (4.1) and 1,000 g of the cobalt(II) chloride hexahydrate (4.2). Add 100 ml of the hydrochloric acid solution (4.3) and warm, if necessary, to obtain a clear solution. After cooling, transfer quantitatively to a 1 000 ml one-mark volumetric flask, dilute to the mark with water and mix.

This solution has a colour of 500 Pt-Co units, provided that it conforms to the transmittance limits given in table 1 when measured in the cell (5.4) using the spectrophotometer (5.3).

**Table 1 — Transmittance and absorbance tolerance limits Pt-Co colour stock solution, 500 Pt-Co units**

Wavelength nm	Transmittance	Absorbance
430	0,759 to 0,776	0,110 to 0,120
455	0,716 to 0,741	0,130 to 0,145
480	0,759 to 0,785	0,105 to 0,120
510	0,861 to 0,881	0,055 to 0,065

### 6.2 Pt-Co standard matching solutions

Prepare successive standard matching solutions in the range required, as shown in table 2. Place the indicated volumes of colour stock solution (6.1) into a series of 100 ml colour comparison tubes (5.1), dilute to the mark with water and mix. Cap the tubes, seal the caps with shellac or a waterproof cement and mark the tubes with the corresponding Pt-Co number.

### 6.3 Storage

Store the colour stock solution (6.1) in a stoppered bottle in the dark. Under these conditions the solution (6.1) is stable for 1 year. The standard matching solutions (6.2), although stable for about 6 months when stored in the dark, should preferably be freshly prepared.

**Table 2 — Pt-Co standard matching solutions**

Colour	Volume of colour stock solution (6.1)
Pt-Co units	ml
0	0
5	1
10	2
15	3
20	4
25	5
30	6
35	7
40	8
50	10
60	12
70	14
80	16
90	18
100	20
125	25
150	30
175	35
200	40
250	50
300	60
350	70
400	80
450	90
500	100

## 7 Procedure

Pour into one of the colour comparison tubes (5.1) a quantity of the sample sufficient to fill it to the graduation mark, passing the sample through a filter if it has any visual turbidity, so that a clear solution is obtained.

Cap the tube, place it in the comparator (5.2) and compare with the standard matching solutions (6.2) until the closest match is obtained.

**NOTE** — Instruments are available which permit visual comparison of a liquid of a given depth, with a moving tinted glass disc corresponding to the different standard matching solutions. The use of such instruments, whose standards are very stable, is permissible provided that the instrument gives correct values when checked against the colour standards (6.1 and 6.2). The use of spectrophotometers for Pt-Co colour measurement is not permissible as in this way a major requirement of the method, i.e. similar colour characteristics, is disregarded.

## 8 Expression of results

**8.1** Express the colour of the sample as the number of Pt-Co colour units corresponding to the standard matching solution (6.2) having the closest match to the sample. If the colour lies midway between two standard matching solutions, report the darker of the two.

**8.2** If the colour characteristics of the sample differ from those of the standard matching solutions, so that a definite match cannot be obtained, report the range over which an apparent match is obtained and give a description of the observed colour, or report as "off hue".

## 9 Precision

The data given in 9.1 and 9.2 are applicable only to samples which match exactly the hue of the standard. Poorer precision will be obtained in varying degrees as the hue of the sample departs from that of the standards.

### 9.1 Repeatability (*r*)

The value below which the absolute difference between two single test results, on identical material, obtained by one operator in one laboratory using the same equipment within a short interval of time using the standardized test method, may be expected to lie with a 95 % probability, is 5,1 %.

### 9.2 Reproducibility (*R*)

The value below which the absolute difference between two single test results, on identical material, obtained by operators

in different laboratories, using the standardized test method, may be expected to lie with a 95 % probability, is 17 %.

## 10 Test report

The test report shall contain at least the following information :

- a) the type and identification of the product under test;
- b) a reference to this International Standard;
- c) any unusual features noted during the determination;
- d) the result of the test, expressed as a number of Pt-Co colour units (8.1) or a colour range followed by a colour description (8.2); if the result has been obtained on a filtered sample as described in clause 7, this should be mentioned;
- e) any deviation, by agreement or otherwise, from the test procedure described;
- f) the date of the test.

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