INTERNATIONAL STANDARD

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Textiles — Tests for colour fastness —

Part Z09:
Determination of cold water solubility of water-soluble dyes

Textiles — Essais de solidité des teintures —
Partie Z09: Détermination de la solubilité dans l'eau froide des colorants solubles dans l'eau

Reference number
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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.

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.

International Standard ISO 105-Z09 was prepared by Technical Committee ISO/TC 38, *Textiles*, Subcommittee SC 1, *Tests for coloured textiles and colorants*.

ISO 105 was previously published in thirteen "parts", each designated by a letter (e.g. "Part A"), with publication dates between 1978 and 1985. Each part contained a series of "sections", each designated by the respective part letter and by a two-digit serial number (e.g. "Section A01"). These sections are now being republished as separate documents, themselves designated "parts" but retaining their earlier alphanumeric designations. A complete list of these parts is given in ISO 105-A01.

Annex A of this part of ISO 105 is for information only.

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Textiles — Tests for colour fastness —

Part Z09:
Determination of cold water solubility of water-soluble dyes

1 Scope

This part of ISO 105 describes a method for the determination of solubility of water-soluble dyes at 25 °C in aqueous solution without previous heating. The method is not intended to measure absolute solubility.

NOTE 1 Several factors which may influence test results are listed in annex A.

2 Normative references

The following standards contain provisions which, through reference in this text, constitute provisions of this part of ISO 105. At the time of publication, the editions indicated were valid. All standards are subject to revision, and parties to agreements based on this part of ISO 105 are encouraged to investigate the possibility of applying the most recent editions of the standards indicated below. Members of IEC and ISO maintain registers of currently valid International Standards.

ISO 1773:1976, *Laboratory glassware — Boiling flasks (narrow-necked).*

ISO 3819:1985, *Laboratory glassware — Beakers.*

ISO 3696:1987, *Water for analytical laboratory use — Specification and test methods.*

3 Principle

Several solutions of known concentration, including the solubility limit, of the dye to be tested are prepared at 25 °C. The solutions are then filtered under suction at this temperature in a heatable Nutsch filter and the cold water solubility limit determined by visual assessment of the filter residues and the measured flow-through time of the filtrate.

4 Apparatus and reagents

4.1 Glass beaker, capacity 400 ml, conforming to ISO 3819.

4.2 Heating bath, thermostatically controlled, to 25 °C ± 2 °C, with magnetic stirring bar 40 mm long by 6 mm diameter; speed of stirrer 500 r/min to 600 r/min.

4.3 Nutsch filter (Büchner funnel), heatable, of glass, stainless steel or porcelain; inner diameter 70 mm, capacity at least 200 ml, having more than 100 holes with a total surface area of holes (evenly distributed) of not less than 200 mm^2.

4.4 Thermostatic device (optional), with circulation pump to adjust temperature of Nutsch filter.

4.5 Vacuum apparatus.

4.5.1 Suction bottle, capacity 1 litre to 2 litres.

4.5.2 Piston or membrane pump, of sufficiently high suction capacity to create a full vacuum of at least 50 kPa under pressure.

4.5.3 Apparatus to adjust and maintain a given vacuum, preferably coupled with a manometer.

4.6 Stopwatch, to measure flow-through time.

4.7 Filter paper, circular, 70 mm ± 2 mm diameter.

NOTE 2 Filter papers of the following characteristics have been found suitable:

Property	Two typical sets of values	
Grammage, g/m^2	92	121
Thickness, µm	210	330
Air resistance, Gurley, s/100 ml	3,6	1
Wet burst strength, kPa	> 1	> 4
Surface appearance	smooth	smooth

See ISO 105-A01:1994, clause 8, note 1 for information on sources of supply of suitable filter paper.

The type of filter paper used and the manufacturer shall be listed in the test report.

4.8 Water, complying with grade 3 of ISO 3696, used as dye solvent.

An amount of 200 ml is designated as normal. More water may be added to the solution, but such additions shall be reported together with the cold water solubility values.

NOTE 3 No account is taken of changes in volume caused by the addition of dye.

5 Preparation of solutions

5.1 The concentrations at which the dye solutions are prepared shall be chosen considering the expected cold water solubility limit of the dye:

Expected limit to fall between	Stepwise increase in dye concentration approaching limit
1 g/l to 10 g/l	1 g/l
10 g/l to 50 g/l	5 g/l
50 g/l to 100 g/l	10 g/l
above 100 g/l	20 g/l

5.2 Strew a known amount of the test dye into a glass beaker (4.1) containing 200 ml water under agitation (4.8) at 25 °C ± 2 °C (maximum strewing time 5 s) in the thermostatically controlled heating bath (4.2). Continue stirring for a maximum total stirring time of 2 min or 5 min. Filter the solution immediately (see clause 6). Stirring time shall be indicated in the test report along with cold water solubility limit.

Repeat the process for each concentration of dye under test.

6 Filtering the solutions

NOTE 4 In order to avoid any temperature shock effects, it is essential that heated solutions are filtered through equipment already brought to the same temperature as the solution under test. Ideally this is best done using a jacketed filter funnel, but acceptable results can also be obtained using preheated funnels, either by immersion in a water bath or oven, or by passing water preheated to the test temperature through the equipment immediately prior to carrying out the test. When using this latter technique, the amount of water should be determined locally in order that the filter funnel can be heated to the same temperature irrespective of its geometry and the ambient conditions. In all cases when using preheating techniques rather than a jacketed funnel, the test solution should be passed through the test equipment immediately after removing it from its heating medium.

6.1 Bring the Nutsch filter (4.3) to the dissolving temperature of 25 °C (see 4.4) and maintain this temperature during the entire filtration operation.

6.2 Immediately before filtering, wet out two filter papers (4.7) in a double layer with at least 50 ml water at 25 °C in the Nutsch filter.

6.3 Adjust the vacuum (4.5) to between 3 kPa to 4 kPa, which is equivalent to 300 mm to 400 mm water column pressure.

6.4 Filter the dye solution (5.2) at 25 °C ± 2 °C and measure the flow-through time with the stopwatch (4.6).

6.5 If the solution does not filter within 2 min at a stabilized vacuum, filter it for an additional maximum 2 min under full vacuum (see 4.5.2).

6.6 After the solution has flowed through, continue to extract the filter uniformly under full vacuum for 1 min.

6.7 Allow the filters to dry completely at room temperature before evaluation.

7 Evaluation

7.1 Compare visually the dried filters after filtration of the various dye solutions of known concentrations. The cold water solubility limit is taken as that concentration at which filter residues are seen. Residues that are difficult to see may possibly be detected by gently rubbing the filter surface with a fingertip.

7.2 Flow-through time may be used as a further evaluation criterion. A sudden sharp increase in flow-through time when moving up the range of solution concentrations indicates that the cold water solubility limit has been exceeded.

8 Test report

The test report shall include the following information:

a) number and year of publication of this part of ISO 105, i.e. ISO 105-Z09:1995;

b) full identification of the dyestuff under test;

c) type of filter paper used and its manufacturer;

d) stirring time (2 min or 5 min) used in preparation of dyestuff solutions (see 5.2);

e) cold water (25 °C) solubility limit of the dyestuff, expressed in grams per litre;

f) flow-through time, where applicable (see 7.2);

g) any special observations during the test or evaluation procedure;

h) any deviation, by agreement or otherwise, from the procedure specified (e.g. amounts of solvent other than 200 ml, etc.).

Annex A
(informative)

Factors affecting results

This test method has given good results over several years. However, it should be pointed out that test conditions which deviate from those specified may lead to quite different results.

For example, the results may be influenced when:

a) A different filter is used. The filter selected for the test should represent a compromise with respect to permeability and should do full justice to the practical conditions.

b) Water having different hardness or added electrolyte is used.

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