INTERNATIONAL STANDARD 2115

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Plastics — Aqueous dispersions of polymers and copolymers — Determination of white point temperature and minimum film-forming temperature

Matières plastiques — Dispersions aqueuses de polymères et copolymères — Détermination de la température de point blanc et de la température minimale de formation de film

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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 2115 was drawn up by Technical Committee ISO/TC 61, *Plastics*. This second edition was submitted directly to the ISO Council, in accordance with clause 6.12.1 of the Directives for the technical work of ISO.

This edition cancels and replaces the first edition (ISO 2215-1974), which had been approved by the Member Bodies of the following countries :

Australia	Hungary	Romania
Austria	India	South Africa, Rep. of
Belgium	Israel	Spain
Canada	Italy	Sweden
Czechoslovakia	Japan	Switzerland
Egypt, Arab Rep. of	Netherlands	Turkey
France	New Zealand	United Kingdom
Germany	Poland	U.S.A.
Greece	Portugal	U.S.S.R.

No Member Body had expressed disapproval of the document.

Plastics — Aqueous dispersions of polymers and copolymers — Determination of white point temperature and minimum film-forming temperature

1 SCOPE AND FIELD OF APPLICATION

This International Standard specifies a method for the determination of the "white point" temperature of aqueous dispersions of polymers and copolymers, and the minimum film-forming temperature.

2 DEFINITION

When an aqueous dispersion of polymers and copolymers is spread out on a support, the water evaporates and the polymer particles interact to form

— either an opaque white mass if the temperature conditions are unfavourable,

— or a continuous transparent film if the temperature conditions are favourable.

2.1 "white point" temperature : The limiting temperature below which an opaque mass, and above which a transparent film, is formed.

2.2 minimum film-forming temperature : The limiting temperature above which a continuous homogeneous film without cracks is formed.

3 PRINCIPLE

Application of a suitable temperature gradient between a hot source and a cold source on a metal plate (aluminium, stainless steel or copper) which may be either perfectly level and smooth or which may be channelled from the cold source to the hot source.

Spreading out of one or more films of the dispersion on the level plate, or filling of the channels (starting at the end nearer the hot source) with the dispersion.

Drying with a current of moisture-free air and determination of the temperature at which the coalesced (transparent) section of the dispersion meets the uncoalesced (white) section.

4 APPARATUS

4.1 Test apparatus (see figure 1 as an example) consisting essentially of a rectangular plate, of aluminium, stainless steel or copper, whose surface may either be perfectly level and polished, or may contain channels (5)[1] — four for example — 0,3 mm deep.[2]

At one end of the plate is a rheostat-controlled electrical resistance (2), which constitutes the hot source. At the opposite end is the cold source, consisting either of an insulated (7) container (3) in which refrigerant is placed or of a coil inserted into the end of the plate and through which a refrigerant mixture is circulated.

Evenly spaced along the plate are holes (4) into which thermometers can be inserted to measure the temperature gradient of the plate when equilibrium is reached. The first hole (10) is positioned at the cold end of the plate at right angles to the beginning of the channels, if the plate has them.

Provision should be made for placing a glass cover (6) above the plate, leaving a space through which can be directed a slight current of dry air (dried, for example, by passing through a column packed with calcium chloride) at room temperature, from the cold end to the hot end.

4.2 Devices for temperature measurement, having an accuracy of 0,1 °C in the range from − 10 to + 50 °C; for instance, mercury-in-glass thermometers, thermocouples, surface thermometer, etc.

4.3 Film spreader, made of stainless steel, capable of producing simultaneously and successively

— either films in the channels (see figure 2),

— or films about 0,1 mm thick and 20 to 25 mm wide on plates without channels.

1) Numbers in parentheses are references to parts of the apparatus shown in figure 1.

2) Tests with either level or channelled plates, on different dispersions, have given identical results.

5 PROCEDURE

5.1 Establishment of temperature gradient

Put in place the devices for temperature measurement (4.2).

Use the hot source (2) and cold source (3) to establish a suitable temperature gradient for the dispersion being tested, i.e. so that :

a) the "white point" temperature to be determined occurs in the centre section of the plate;

b) the temperature range of the two extreme thermometers is between 20 and 40 °C and remains constant during the test.

NOTE — As far as possible, the temperature gradient should be linear, i.e. the temperature differences between successive devices for temperature measurement should all be of the same order.

Wait until thermal equilibrium is reached, i.e. until the devices for temperature measurement show very little further variation.

5.2 Determination

When using a level plate, spread out the dispersion with the film spreader, starting from the end with the highest temperature.

In the case of a channelled plate, pour into the channels, at the end of the plate with the highest temperature, a quantity of dispersion slightly in excess of the total capacity of the channels. Spread this out using the film spreader.

In both cases, replace the glass cover (6) so as to obtain a sealed chamber and circulate through this, from the cold end to the hot end, a current of dry air at room temperature and at a low, constant rate of flow.

Wait until there is complete separation of the section transformed into film (transparent) and the untransformed section (white). Measure the distance between the first point of temperature measurement (10) and the line of separation.

Note the temperatures indicated by the various devices for temperature measurement inserted into the plate and plot a graph using distance intervals between devices as the abscissae and the plate temperatures as the ordinates.

NOTE — If the temperature gradient is linear, the curve obtained is a straight line and in practice it is then unnecessary to plot a graph.

Using the graph, determine the "white point" temperature of the dispersion being tested. If a surface thermometer is used, the "white point" temperature can be determined directly.

Determine the lowest temperature where a continuous, homogeneous film without cracks is formed. This is the minimum film-forming temperature.

6 EXPRESSION OF RESULTS

Record the temperatures rounded off to the nearest degree Celsius.

The measuring precision is ± 1 °C.

7 TEST REPORT

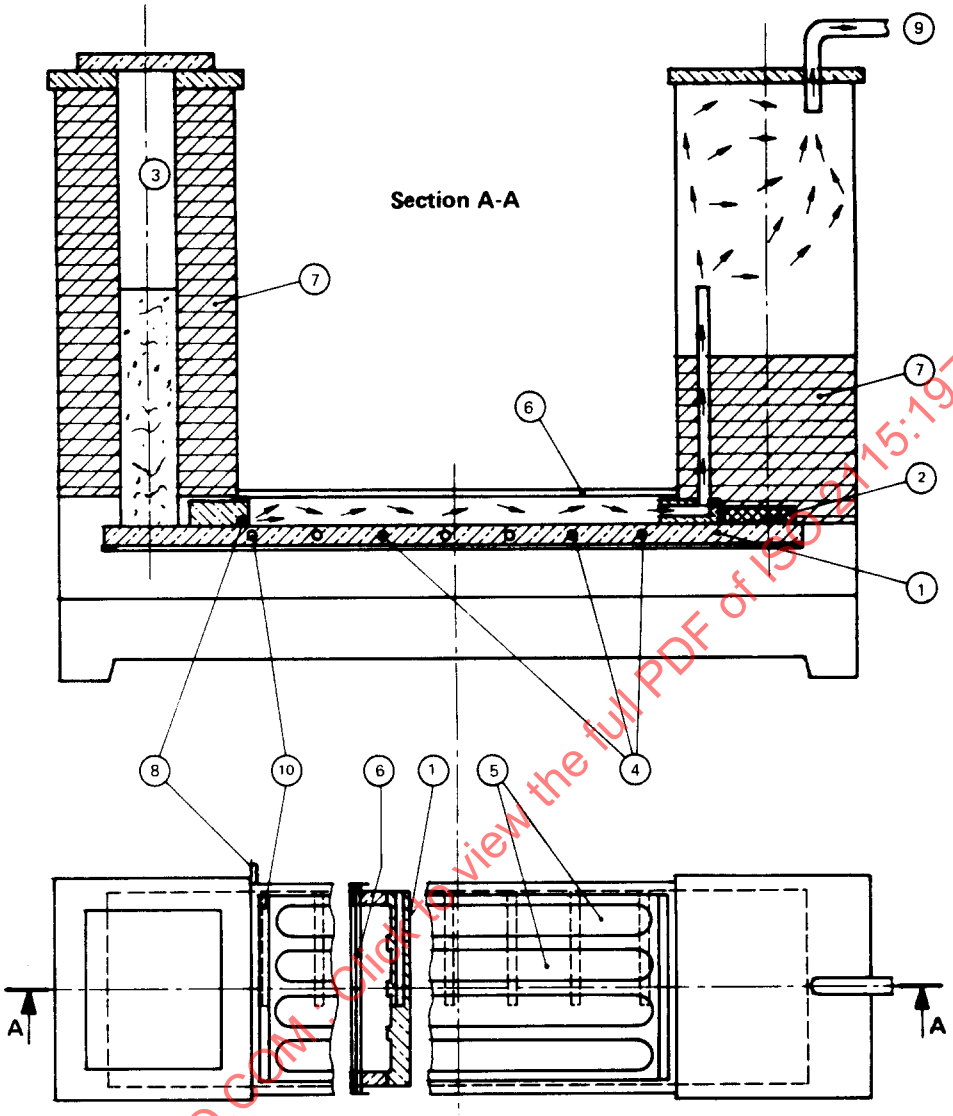
The test report shall give the following information :

a) the identification characteristics of the dispersion tested;

b) the type of testing apparatus;

c) the value of the "white point" temperature in degrees Celsius;

d) the minimum film-forming temperature in degrees Celsius.



Key

1. Rectangular metal plate
2. Electrical resistance
3. Reservoir for refrigerant mixture
4. Holes for thermometers (diameter : 5 mm)
5. Channels in the upper surface of the plate (depth : 0,3 mm)
6. Glass cover
7. Insulating material
8. Dry air inlet
9. Air outlet
10. First thermometer hole

FIGURE 1 — **Diagram of test apparatus given as an example (the plate in this diagram is channelled but this feature is not essential)**

Dimensions in millimetres

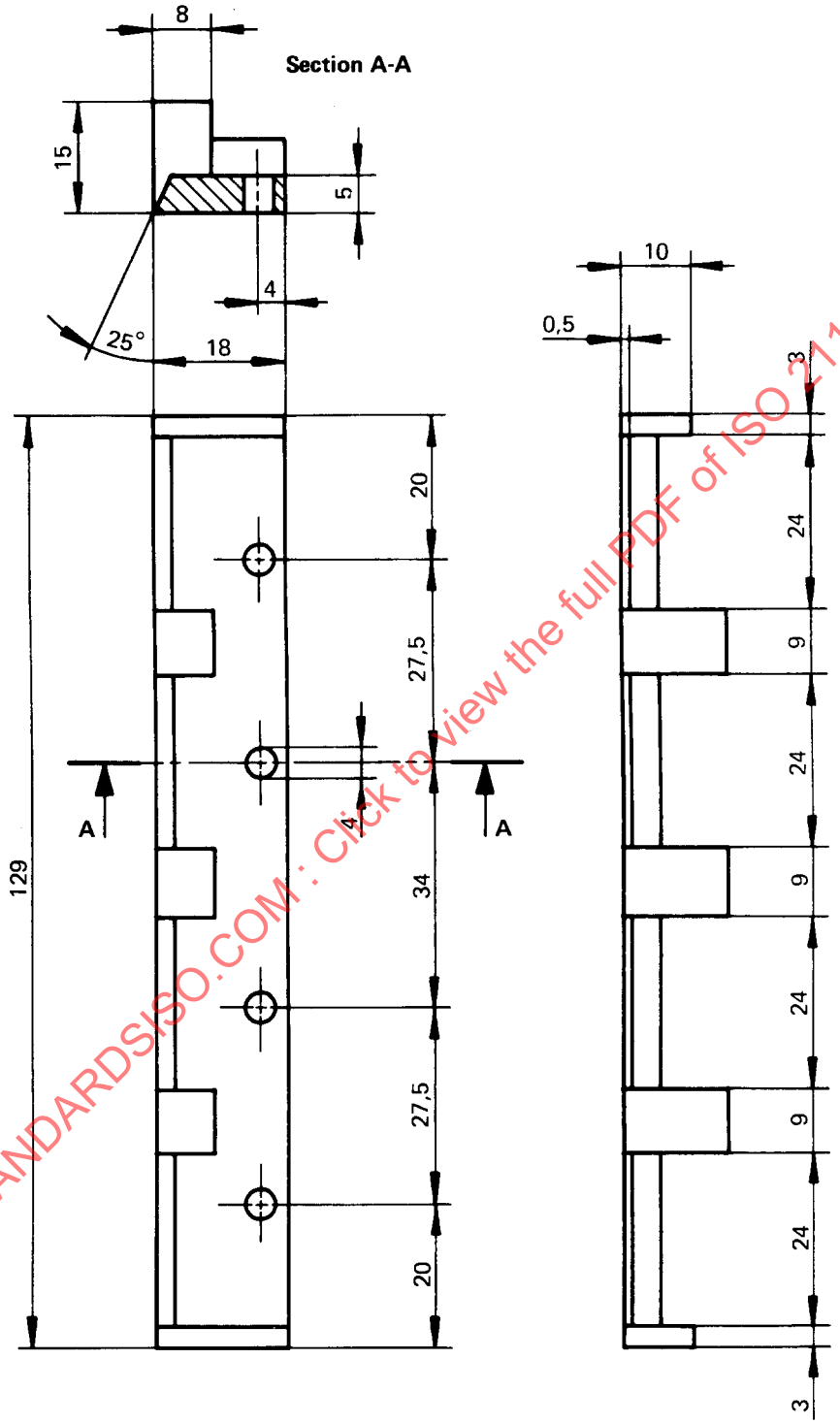


FIGURE 2 – **Example of a film spreader for a channelled plate**