

INTERNATIONAL STANDARD

ISO
182-2

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**Plastics — Determination of the tendency of
compounds and products based on vinyl chloride
homopolymers and copolymers to evolve
hydrogen chloride and any other acidic products
at elevated temperatures —
Part 2:**

pH method

<https://standards.iteh.ai/catalog/standards/sist/9d12935e-6daf-43af-9cf7-23df29cae1dd/iso-182-2-1990>

*Plastiques — Détermination de la tendance des compositions à base
d'homopolymères et copolymères du chlorure de vinyle à dégager du
chlorure d'hydrogène et éventuellement d'autres produits acides à
températures élevées —*

Partie 2: Méthode au pH



Reference number
ISO 182-2:1990(E)

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 182-2 was prepared by Technical Committee ISO/TC 61, *Plastics*.

Together with the three other parts of ISO 182, it cancels and replaces ISO Recommendation R 182:1970, of which the four parts of ISO 182 constitute a technical revision.

ISO 182 consists of the following parts, under the general title *Plastics* — *Determination of the tendency of compounds and products based on vinyl chloride homopolymers and copolymers to evolve hydrogen chloride and any other acidic products at elevated temperatures*:

- Part 1: Congo red methods
- Part 2: pH method
- Part 3: Conductometric method
- Part 4: Potentiometric method

Annex A of this part of ISO 182 is for information only.

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Plastics — Determination of the tendency of compounds and products based on vinyl chloride homopolymers and copolymers to evolve hydrogen chloride and any other acidic products at elevated temperatures —

Part 2: pH method

WARNING — The use of this part of ISO 182 may involve hazardous materials, operations and equipment. This part of ISO 182 does not purport to address all of the safety problems associated with its use. It is the responsibility of the user of this part of ISO 182 to establish appropriate safety and health practices and determine the applicability of regulatory limitations prior to use.

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1 Scope

1.1 This part of ISO 182 specifies a method for the determination of the thermal stability at elevated temperatures of compounds and products based on vinyl chloride homopolymers and copolymers (in the following text abbreviated to PVC) which undergo dehydrochlorination (the evolution of hydrogen chloride).

1.2 The method may be used as a quality-control test during manufacture and conversion of PVC compounds. It may be used also for the characterization of PVC compounds and products, especially with regard to the effectiveness of their heat-stabilizing systems.

It is suitable for coloured compounds and products where a discolouration test under the action of heat may be unsatisfactory.

1.3 The method is recommended for compounded materials and products only, although the method can be used for polymers in powder form under appropriate conditions to be agreed upon between the interested parties. It is not recommended for compounds in the form of dry blends since such materials may not be sufficiently homogeneous.

PVC compounds and products may evolve decomposition products in addition to hydrogen chloride at elevated temperatures. A limited number of these decomposition products may affect the pH of an absorbing solution. It is not possible to compensate for this effect within the scope of this part of ISO 182, and therefore care is necessary in comparing results for dissimilar compounds and products. In this case, a method suitable for the determination of the chloride ions in the absorbing solution shall be used (see ISO 182-4).

1.4 The method may also be applied to other plastics materials which can evolve hydrogen chloride or other hydrogen halides when heated under the conditions prescribed by the relevant specifications, or when agreed upon between the interested parties.

2 Normative references

The following standards contain provisions which, through reference in this text, constitute provisions of this part of ISO 182. 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 182 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 565:1990, *Test sieves — Metal wire cloth, perforated metal plate and electroformed sheet — Nominal sizes of openings.*

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

ISO 4793:1980, *Laboratory sintered (fritted) filters — Porosity grading, classification and designation.*

ISO 6353-2:1983, *Reagents for chemical analysis — Part 2: Specifications — First series.*

3 Definition

For the purposes of this part of ISO 182, the following definition applies.

stability time, t_s : The time, measured by reference to a predetermined change in the pH of an absorbing solution, required for a certain amount of hydrogen chloride to be evolved when a given mass of PVC compound or product is maintained at an elevated temperature under the conditions of test described in this part of ISO 182.

4 Principle

A test portion of the PVC compound or product is maintained at an agreed temperature in a gas stream and the hydrogen chloride evolved is absorbed in a 0,1 mol/l solution of sodium chloride. The amount of hydrogen chloride evolved is measured by recording the change in pH of the sodium chloride solution.

5 Reagents and materials

During the test, use only reagents of recognized analytical grade in accordance with ISO 6353-2.

5.1 Supply of pure nitrogen, containing less than 6 ppm of oxygen and less than 0,1 ppm of carbon dioxide by volume. The purity shall be such that, when the gas is passed through a 0,1 mol/l solution of sodium chloride at pH 6 for 1 h at a rate of 7,2 l/h \pm 0,1 l/h, the pH of the solution remains in the range 5,7 to 6,7. The gas shall be dried by passing it through a suitable drying agent, and the flow rate adjusted by means of a needle valve and measured using a suitable flowmeter.

5.2 Sodium chloride solution, $c(\text{NaCl}) = 0,1$ mol/l.

Dissolve 5,84 g \pm 0,01 g of sodium chloride in grade 3 distilled water as defined in ISO 3696, which has been boiled to remove carbon dioxide. Dilute to 1 litre with boiled distilled water of the same grade.

5.3 Sodium hydroxide solution, $c(\text{NaOH}) = 0,1$ mol/l.

5.4 Hydrochloric acid, $c(\text{HCl}) = 0,1$ mol/l.

6 Apparatus

The general arrangement of the apparatus is shown in figure 1. The figure shows a re-usable dehydrochlorination cell A. This cell may be replaced by a disposable cell B.

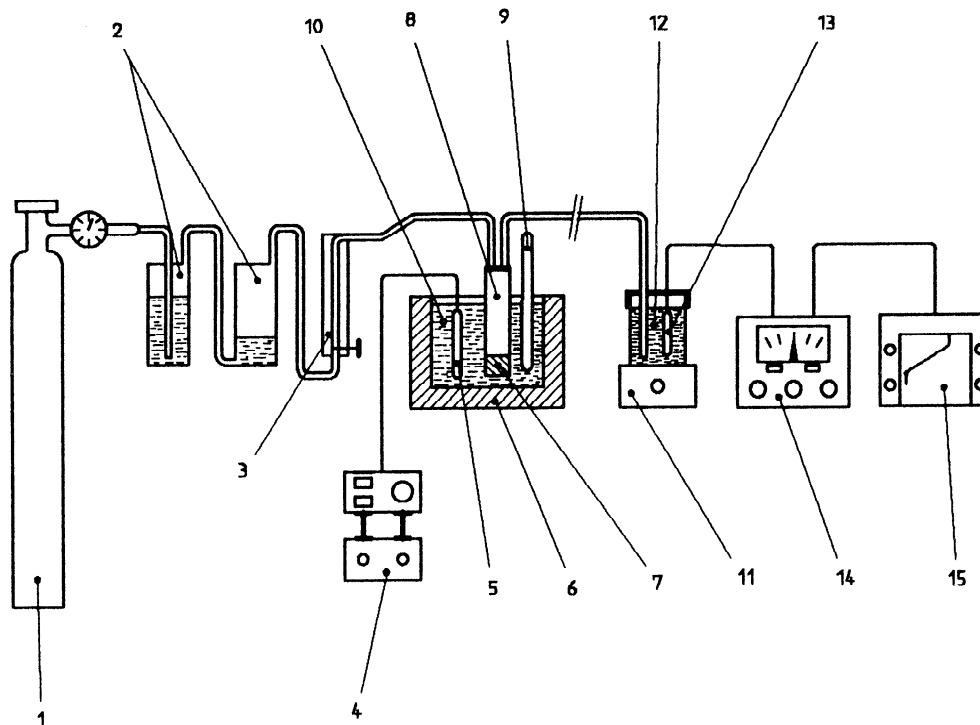
6.1 Dehydrochlorination cells

6.1.1 Cell A (re-usable), with shape and dimensions as shown in figure 2.

A recommended procedure for cleaning is given in annex A.

6.1.2 Cell B (disposable), with shape and dimensions as shown in figure 3.

6.1.3 Other types of cell may be employed if it has been proved that the results obtained are equivalent to those obtained with one of the cells described in 6.1.1 and 6.1.2.



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- | | |
|---|---------------------------------------|
| 1 N ₂ cylinder | 9 Thermometer (scale division 0,1 °C) |
| 2 Purification train | 10 Silicone oil |
| 3 Ball flowmeter | 11 Magnetic stirrer |
| 4 Electronic temperature controller (scale division 0,1 °C) | 12 Absorbing solution |
| 5 Temperature sensor | 13 Measuring electrode(s) |
| 6 Heating bath | 14 pH-meter |
| 7 PVC test portion | 15 Recorder |
| 8 Dehydrochlorination cell | |
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Figure 1 — General arrangement of apparatus

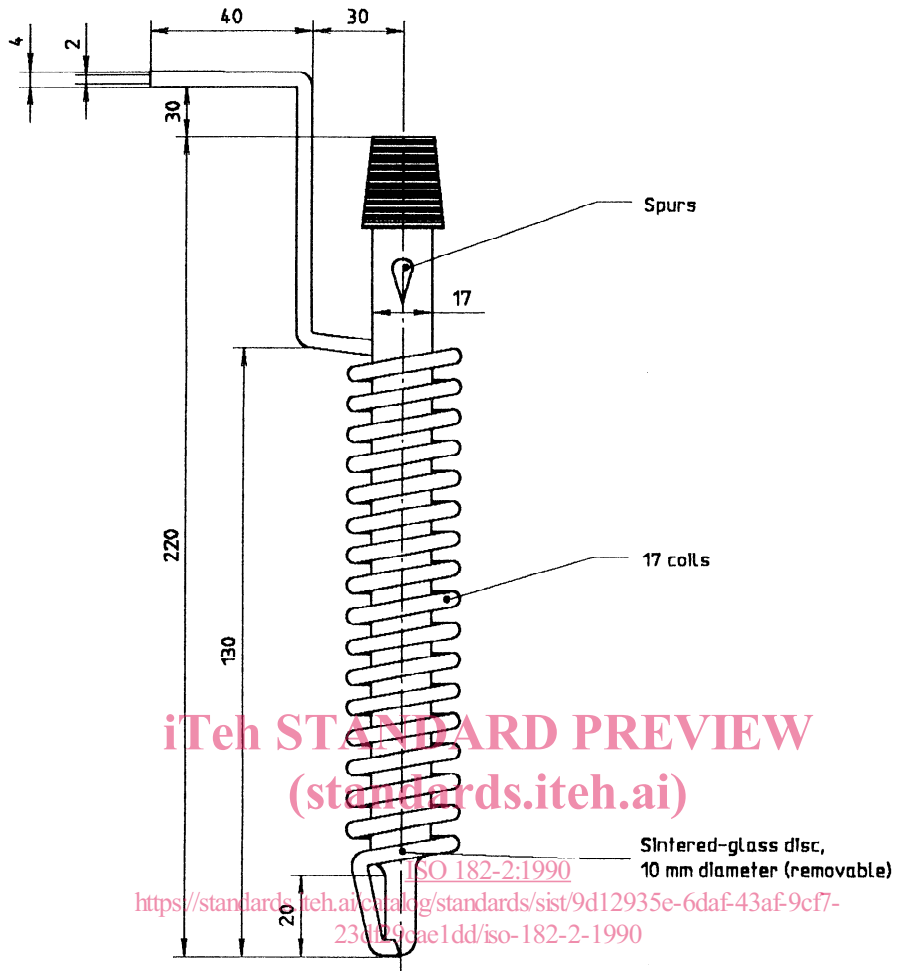


Figure 2 — Cell A (re-usable) for dehydrochlorination of PVC samples

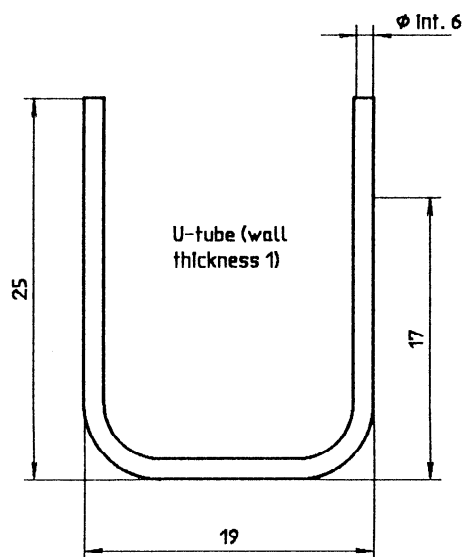


Figure 3 — Cell B (disposable) for dehydrochlorination of PVC samples

6.2 Test-portion holder, for use with cell A.

The test portion is supported on a porous sintered-glass disc (P 100, see ISO 4793), 10 mm in diameter.

To avoid the porous disc becoming blocked, it is advisable to place a thin layer of glass wool between it and the test portion.

A recommended procedure for cleaning is given in annex A.

6.3 Glass connection tube, for use with cell A, with dimensions as shown in figure 4. The connection tube is secured to the cell by two springs fixed to the hooks on the ground-glass joints.

6.4 Expansion joints and cell connections, for use with cell B.

Cell B is connected to the apparatus by flexible PTFE and silicone rubber tubes. Special joints are provided to allow for thermal expansion. The complete arrangement is shown in figure 5.

6.5 Oil bath, with a capacity of at least 10 litres. The bath shall be capable of operating in the temperature range 170 °C to 210 °C, and of maintaining the temperature with an accuracy of 0,1 °C.

The bath shall be designed so that the temperature distribution is even throughout, and have a thermal

capacity sufficient to avoid the temperature changing when the cell is immersed.

6.6 Thermometer, with a suitable scale for reading the bath temperature in the range 170 °C to 210 °C and with a scale division of 0,1 °C.

6.7 Balance, with a scale division of 1 mg.

6.8 Measurement cell.

A suitable measurement cell is shown in figure 6. Where the diameters of the measurement electrode and the feed tube for the gases from decomposition of the test portion are sufficiently small, a 200 ml conical flask is a suitable alternative measurement cell.

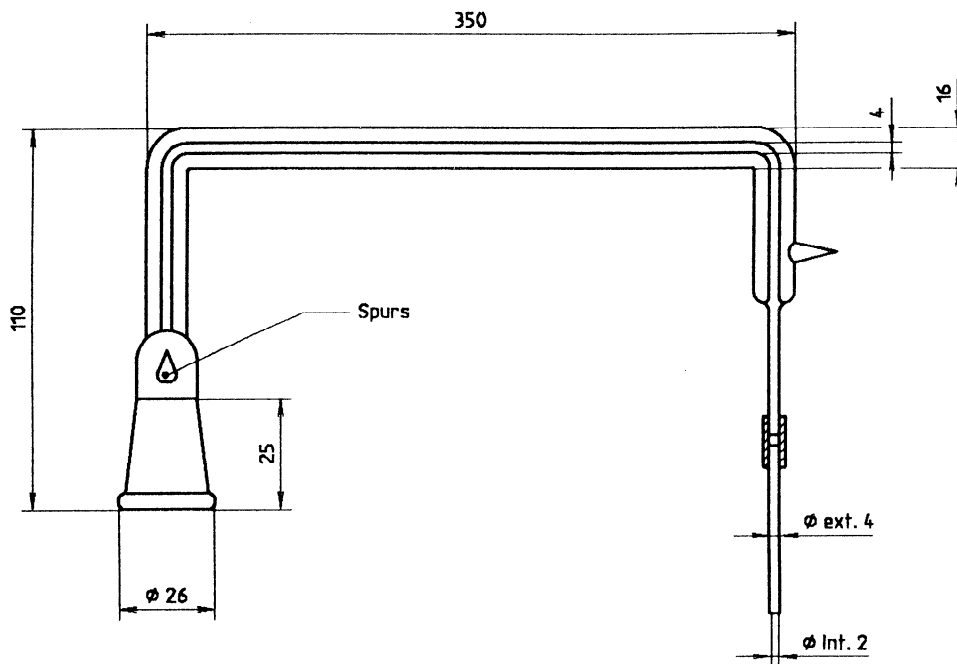
A recommended procedure for cleaning is given in annex A.

6.9 Magnetic stirrer, capable of providing gentle agitation within the measurement cell.

6.10 pH-meter with suitable electrodes, accurate to at least 0,01 pH units.

The pH-meter should preferably be provided with a device for automatic temperature compensation and equipped with an output for a chart recorder.

The apparatus shall be calibrated with buffer solutions covering the appropriate pH range.



a) Glass tube for use with cell A

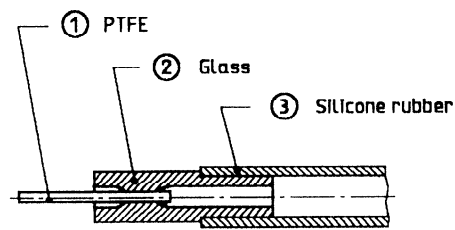
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b) PTFE tubing for use with cell B

Figure 4 — Tubes for connecting dehydrochlorination cell to measurement cell

Dimensions in millimetres



- 1 PTFE tube: ϕ ext. 4,1
 ϕ Int. 2,5
- 2 Glass tube: ϕ ext. 8
 ϕ Int. 6
- 3 Silicone rubber tube: ϕ ext. 12
 ϕ Int. 6

Figure 5 — Expansion joint for connection on each side of cell B

Dimensions in millimetres

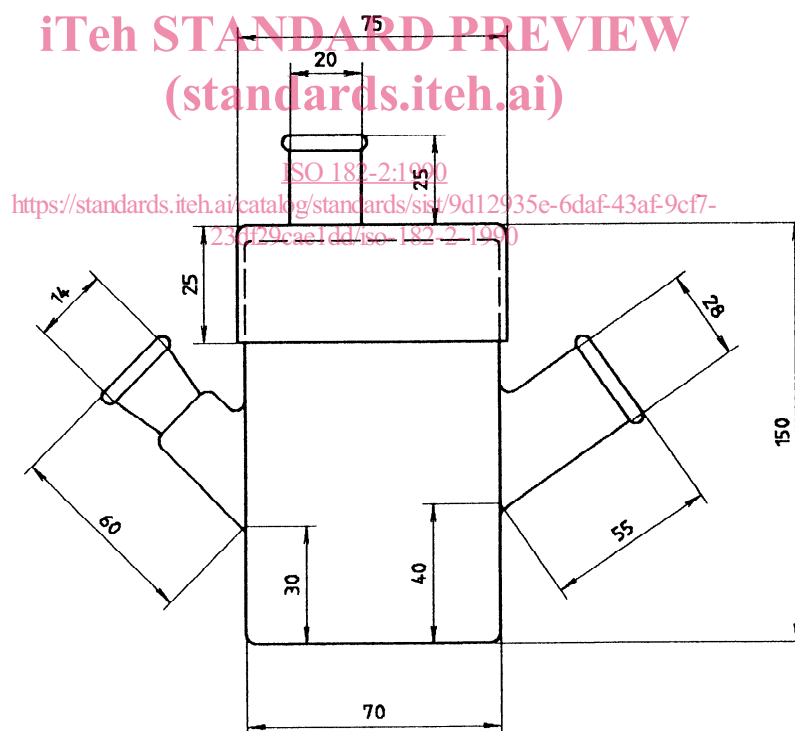


Figure 6 — Example of a suitable measurement cell