BRITISH STANDARD

BS 3482-6: 1991



# Methods of test for

# Desiccants —

## Part 6: Determination of adsorptive capacity

NOTE It is recommended that this Part be read in conjunction with BS 3482-1 "Sampling, and preparation and storage of test samples" which is issued separately.

# Committees responsible for this British Standard

The preparation of this British Standard was entrusted by the Chemicals Standards Policy Committee (CIC/-) to Technical Committee CIC/2, upon which the following bodies were represented:

Chemical Industries Association
Ministry of Defence
Royal Society of Chemistry
Society of British Aerospace Companies Limited
Society of Environmental Engineers

This British Standard, having been prepared under the direction of the Chemicals Standards Policy Committee, was published under the authority of the Standards Board and comes into effect on
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The following BSI references relate to the work on this standard:
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# Contents

# Foreword

This Part of BS 3482 has been prepared under the direction of the Chemicals Standards Policy Committee. This revision of BS 3482 comprises Part 1, which describes procedures for sampling and preparation and storage of test samples and a number of Parts describing methods of test for desiccants. This revision supersedes BS 3482:1962 which is withdrawn. It differs from BS 3482:1962 in that individual methods have been published in separate Parts and have been generally updated. Some additional methods not included in BS 3482:1962 have also been incorporated.

This Part of BS 3482 also supersedes the methods given in Appendix F of BS 2540:1960, Appendix F of BS 2541:1960 and Appendix E of BS 3523:1962 which are withdrawn.

A British Standard does not purport to include all the necessary provisions of a contract. Users of British Standards are responsible for their correct application.

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**Summary of pages**

This document comprises a front cover, an inside front cover, pages i and ii, pages 1 to 4, an inside back cover and a back cover.

This standard has been updated (see copyright date) and may have had amendments incorporated. This will be indicated in the amendment table on the inside front cover.

## 1 Scope

This Part of BS 3482 describes two methods for the determination of the adsorptive capacity of desiccants, method A at 50 % relative humidity and method B at 11 % relative humidity.

NOTE 1 The desiccant product standards specify which of the methods is to be used.

NOTE 2 The titles of the publications referred to in this standard are listed on the inside back page.

## 2 Method A. Determination at 50 % relative humidity

### 2.1 Principle

Air at 25 °C and 50 % relative humidity is passed through a column of desiccant of known mass until no further increase in mass is observed. The mass gained is expressed as a percentage of the original mass.

### 2.2 Reagents

**2.2.1** *General.* Use only reagents of recognized analytical grade and water complying with grade 3 of BS 3978.

**2.2.2** *Calcium nitrate saturated solution*

**2.2.3** *Calcium nitrate, solid*

### 2.3 Apparatus

**2.3.1** *Ordinary laboratory apparatus* and the following are required.

**2.3.2** *Air pumping apparatus*

NOTE 1 The items described in **2.3.2.1** to **2.3.2.9** comprise the air pumping apparatus.

NOTE 2 A suitable apparatus is illustrated in Figure 1.

**2.3.2.1** *Circulating pump*, capable of pumping air at the rate of 2 L/min.

**2.3.2.2** *Flow meter*, capable of measuring flow of air at a rate of at least 2 L/min.

**2.3.2.3** *Heat exchange coil*, of sufficient length and efficiency to ensure that air leaving the pump is brought to the bath temperature before entering the bubbler.

**2.3.2.4** *Bubbler*, about 250 mL capacity, fitted with a thermometer.

**2.3.2.5** *Spray catch bottle*, about 250 mL capacity, containing a glass wool filter.

**2.3.2.6** *Tube with side arm*, fitted with a thermometer for checking the temperature of the air entering the adsorption tubes.

**2.3.2.7** *Two adsorption tubes*, 150 mm in length and of 14 mm internal diameter, with stoppers.

**2.3.2.8** *Tubes*, of flexible plastics, forming leak-proof joints with the items described in **2.3.2.1** to **2.3.2.7**.

NOTE The joints should be tested before the determination by applying a 0.1 % (*m*/*m*) solution of sodium dodecyl sulphate to the joints not immersed in water and operating the pump (**2.3.2.1**). The absence of visible bubbles indicates leak-proofness.

**2.3.2.9** *Thermometers*, capable of indicating 25 °C to an accuracy of ± 0.2 °C, complying with BS 593.

**2.3.3** *Water bath*, capable of being maintained at 25 ± 0.2 °C, of size sufficient to contain the items described in **2.3.2.3** to **2.3.2.9**.

**2.3.4** *Desiccator*, containing anhydrous phosphorus pentoxide.

### 2.4 Preparation of the test sample

Prepare at least 50 g of dried sample from the laboratory sample by the method described in BS 3482-1.

### 2.5 Procedure

#### 2.5.1 *Test portions*

Take approximately 25 g of the test sample (**2.4**) and dry further at the specified temperature until the loss in mass after successive periods of 1 h is less than 0.010 g. Cool in the desiccator (**2.3.4**). Remove the sample from the desiccator and immediately weigh 10 g of sample, to the nearest 0.001 g, into each of the two stoppered adsorption tubes (**2.3.2.7**), which have previously been weighed to the nearest 0.001 g.

#### 2.5.2 *Moisture adsorption*

Approximately half fill the bubbler (**2.3.2.4**) with the saturated calcium nitrate solution (**2.2.2**) adding a little of the solid calcium nitrate (**2.2.3**) to excess.

Quickly assemble the air pumping apparatus (**2.3.2**) and the water bath (**2.3.3**) as shown in Figure 1 taking care with the underwater connections to ensure that they are leak-proof. Maintain the temperature of the water bath at 25 ± 2 °C.

Adjust the air flow from the pump (**2.3.2.1**) so that each stoppered adsorption tube (**2.3.2.7**) receives air at a rate of approximately 1 L/min, as measured by the flow meter (**2.3.2.2**).

#### 2.5.3 *Determination*

At intervals, remove the adsorption tubes, wipe them dry and reweigh each tube and its contents to the nearest 0.001 g. Continue to pass air, and repeat this process until no further increase in the masses of the tubes and their contents is observed.

### 2.6 Calculation and expression of results

Calculate the increase in mass of each tube and express the adsorptive capacity at 50 % relative humidity as a percentage by mass of the test portion in each tube from the following expression:

$$\frac{(m_3 - m_2)}{m_1} \times 100$$

where

$m_1$ is the mass of the dried test portion (**2.5.1**) (in g);

$m_2$ is the initial mass of the test portion and adsorption tube (**2.5.1**) (in g);

$m_3$ is the final mass of the test portion and absorption tube (**2.5.3**) (in g).

Calculate the mean of the two determinations as the adsorptive capacity of the sample. Invalidate two values that differ by more than 0.5 % (absolute).

### 2.7 Test report

The test report shall include the following information.

a) A complete identification of the sample.

b) A reference to this British Standard method, i.e. method A of BS 3482-6:1991.

c) The results, expressed in accordance with **2.6**.

d) Any unusual features noted during the determination.

## 3 Method B. Determination at 11 % relative humidity

### 3.1 Principle

Air at 25 °C and 11 % relative humidity is passed through a column of desiccant of known mass until no further increase in mass is observed. The mass gained is expressed as a percentage of the original mass.

### 3.2 Reagents

**3.2.1** *General.* Use only reagents of recognized analytical grade.

**3.2.2** *Lithium chloride*, saturated solution.

**3.2.3** *Lithium chloride*, solid.

### 3.3 Apparatus

The apparatus described in **2.3** is required.

### 3.4 Preparation of the test sample

Prepare at least 50 g of dried sample from the laboratory sample by the method described in BS 3482-1.

### 3.5 Procedure

#### 3.5.1 *Test portions*

Follow the procedure described in **2.5.1**.

#### 3.5.2 *Moisture adsorption*

Follow the procedure described in **2.5.2**, substituting "lithium chloride saturated solution (**3.2.2**)" for "calcium nitrate saturated solution (**2.2.2**)" and "solid lithium chloride (**3.2.3**)" for "solid calcium chloride (**2.2.3**)".

#### 3.5.3 *Determination*

Follow the procedure described in **2.5.3**.

### 3.6 Calculation and expression of results

Calculate the increase in mass of each tube and express the adsorptive capacity at 11 % relative humidity as a percentage by mass of the test portion in each tube from the following expression:

$$\frac{(m_3 - m_2)}{m_1} \times 100$$

where

$m_1$ is the mass of the dried test portion (**3.5.1**) (in g);

$m_1$ is the initial mass of the test portion and adsorption tube (**3.5.1**) (in g);

$m_1$ is the final mass of the test portion and adsorption tube (**3.5.3**) (in g).

Calculate the mean of the two determinations as the adsorptive capacity of the sample. Invalidate two values that differ by more than 0.5 % (absolute).

### 3.7 Test report

The test report shall include the following information.

a) A complete identification of the sample.

b) A reference to this British Standard method, i.e. method B of BS 3482-6:1991.

c) The results, expressed in accordance with **3.6**.

d) Any unusual features noted during the determination.

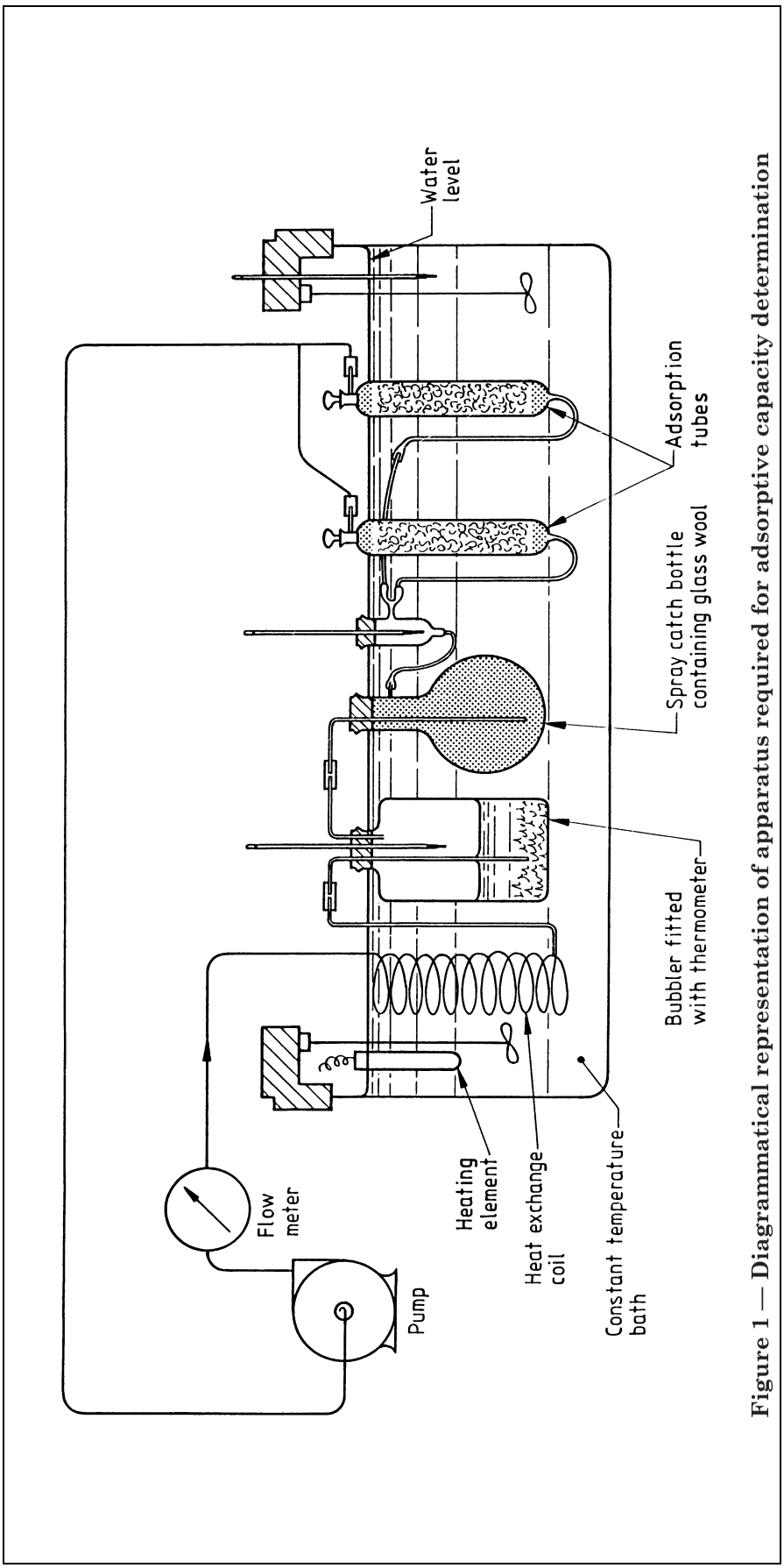


**Figure 1 — Diagrammatical representation of apparatus required for adsorptive capacity determination**

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# Publication(s) referred to

BS 593, *Specification for laboratory thermometers.*
BS 3482, *Methods of test for desiccants.*
BS 3482-1, *Sampling, and preparation and storage of samples.*
BS 3978, *Specification for water for laboratory use.*

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