

British Standard

Testing corrosion inhibiting, engine coolant concentrate ('antifreeze')

Part 1. Methods of test for determination of physical and chemical properties

Section 1.1 Ancillary procedures

Essais du liquide de refroidissement anti-rouille du moteur (antigel)

Partie 1. Méthodes d'essai de détermination des propriétés physiques et chimiques

Section 1.1 Méthodes auxiliaires

Prüfung von korrosionshemmendem Kühlmittelkonzentrat für Motoren (Frostschutzmittel)

Teil 1. Prüfverfahren zur Bestimmung der physikalischen und chemischen Eigenschaften

Abschnitt 1.1 Hilfsverfahren

NOTE. It is recommended that this Section be read in conjunction with the information given in the 'General introduction', published separately as BS 5117 : Part 0.

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1 Scope

This Section of BS 5117 describes methods for the determination of concentration, pH and reserve alkalinity of aqueous solutions of engine coolant concentrate.

NOTE 1. The engine coolant concentrate is referred to hereafter as 'the product'.

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

Compliance with a British Standard does not of itself confer immunity from legal obligations.

2 Definitions

For the purposes of this British Standard the definitions given in BS 5117 : Part 0 together with the following apply.

reserve alkalinity. The number of millilitres of hydrochloric acid solution ($c(\text{HCl}) = 0.1 \text{ mol/L}$) required for titration of a solution containing 10 mL of product to a pH value of 5.5.

3 Determination of concentration of diluted product

3.1 Introduction

This clause describes methods for the determination of the approximate concentration of aqueous solutions of the product.

3.2 Principle

Either the density at 20 °C or the refractive index at 20 °C of a test portion is determined and the concentration is then obtained by reference to tables of the density or refractive index of solutions of the product under test, as appropriate.

3.3 Apparatus

Ordinary laboratory apparatus and the following are required.

3.3.1 Hydrometer, complying with BS 718, type L 50 or M 50 for medium surface tension liquids, density range 1.0 g/mL to 1.5 g/mL.

3.3.2 Hydrometer cylinder and water bath, as described in 3.3.2.1 and 3.3.2.2 or **hydrometer tube with water jacket**, as described in 3.3.2.3.

3.3.2.1 Hydrometer cylinder, complying with BS 718.

3.3.2.2 Water bath, capable of being controlled at a temperature of $20 \pm 0.2^\circ\text{C}$, of depth sufficient to immerse the hydrometer cylinder to 25 mm above the level of the test portion in the cylinder.

3.3.2.3 Hydrometer tube with water jacket, in which water temperature of $20 \pm 0.2^\circ\text{C}$, of depth sufficient to immerse the jacket.

3.3.3 Thermometer, complying with BS 593, of appropriate range, capable of indicating a temperature of 20°C to the nearest 0.1°C .

3.3.4 Density meter, capable of determining the density of solutions of the product at 20°C to ± 0.001 .

3.3.5 Refractometer, capable of determining refractive index to the nearest 0.001, equipped with means of temperature control.

3.3.6 Reference tables, relating concentration of solutions of the product under test to density or refractive index, as appropriate.

NOTE. Published tables are available for certain formulations: otherwise, special reference tables will have to be prepared.

3.3.7 Source of illumination for refractometer, preferably a sodium lamp.

3.4 Method using a hydrometer

3.4.1 Test portion. Pour sufficient of the diluted product into the hydrometer cylinder to allow the hydrometer to float clear of the bottom.

3.4.2 Procedure

3.4.2.1 Carry out the following as described in either (a) or (b).

(a) Place the hydrometer cylinder (3.3.2.1) in the water bath (3.3.2.2) controlled at a temperature of $20 \pm 0.2^\circ\text{C}$ and adjust the water level to not less than 25 mm above that of the test portion. Stir the test portion gently with the thermometer (3.3.3) and observe the temperature until the test portion is uniformly at a temperature of $20 \pm 0.2^\circ\text{C}$.

(b) If a hydrometer tube with water jacket (3.3.2.3) is used, circulate water, at a temperature of $20 \pm 0.2^\circ\text{C}$, through the jacket and bring the temperature of the test portion to $20 \pm 0.2^\circ\text{C}$.

3.4.2.2 Remove the thermometer and insert the hydrometer (3.3.1) slowly, avoiding the inclusion of air bubbles, until it just floats. Take care not to wet the emergent stem of the hydrometer.

3.4.2.3 After a further 15 min, slightly depress the hydrometer (3.3.1) into the test portion and then allow it to return to its floating position.

3.4.2.4 Read the hydrometer, as described in BS 718, to ± 0.001 and record the result.

3.4.2.5 Using the density reference table (3.3.6), read the concentration of the diluted product.

3.5 Method using a density meter

Determine the density of the diluted product at $20 \pm 0.2^\circ\text{C}$ to ± 0.001 by means of the density meter (3.3.4).

Using the density reference table (3.3.6), read the concentration of the diluted product.

3.6 Method using a refractometer

Ensure that the prisms of the refractometer (3.3.5) are clean and dry. Circulate water, at a temperature of $20 \pm 0.2^\circ\text{C}$, through the water jacket of the refractometer.

Place a few drops of the well mixed diluted product on the prisms of the refractometer and, after closing the prism block, read off the refractive index of the solution. Record the result to the nearest 0.001.

Using the reference tables of refractive index, read the concentration of the diluted product.

3.7 Expression of results

The concentration of the diluted product is expressed, to the nearest 0.5, as a percentage by volume [% (V/V)].

4 Determination of pH

4.1 Introduction

This clause describes a method for the determination of the pH of aqueous solutions of the product at a specified temperature.

NOTE. The method as described is intended for the determination of the pH of solutions prepared from the product as supplied but the procedure may be adapted for solutions obtained from engine cooling systems, test rigs, etc.

4.2 Principle

The product is diluted with water to the specified concentration. The pH of this solution is determined electrometrically at the specified temperature.

4.3 Apparatus

Ordinary laboratory apparatus and the following are required.

4.3.1 pH meter, with glass/calomel electrode assembly, complying with BS 2586 and BS 3145.

4.3.2 Beakers, tall-form, 100 mL capacity.

4.3.3 One-mark volumetric flask, of 100 mL capacity, complying with class A of BS 1792.