



**SLOVENSKI STANDARD**  
**SIST EN 15326:2007+A1:2009**  
**01-julij-2009**

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Bitumen and bituminous binders - Measurement of density and specific gravity - Capillary  
-stoppered pycnometer method

Bitumen und bitumenhaltige Bindemittel - Messung der Dichte und der relativen Dichte -  
Pycnometerverfahren mit Kapillarstopfen

Bitumes et liants bitumineux - Mesure de la masse volumique et de la densité - Méthode  
du pycnomètre à bouchon capillaire

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**Ta slovenski standard je istoveten z: EN 15326:2007+A1:2009**

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**ICS:**

75.140	Voski, bitumni in drugi naftni proizvodi	Waxes, bituminous materials and other petroleum products
91.100.50	Veziva. Tesnilni materiali	Binders. Sealing materials

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EUROPEAN STANDARD  
NORME EUROPÉENNE  
EUROPÄISCHE NORM

**EN 15326:2007+A1**

May 2009

ICS 75.140; 91.100.50

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English Version

## Bitumen and bituminous binders - Measurement of density and specific gravity - Capillary-stoppered pycnometer method

Bitumes et liants bitumineux - Mesure de la masse volumique et de la densité - Méthode du pycnomètre à bouchon capillaire

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This European Standard was approved by CEN on 10 February 2007 and includes Amendment 1 approved by CEN on 5 April 2009.

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This European Standard exists in three official versions (English, French, German). A version in any other language made by translation under the responsibility of a CEN member into its own language and notified to the CEN Management Centre has the same status as the official versions.

CEN members are the national standards bodies of Austria, Belgium, Bulgaria, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden, Switzerland and United Kingdom.

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**Contents**

Page

Foreword.....	3
1 Scope .....	4
2 Normative references .....	4
3 Terms and definitions .....	4
4 Principle.....	5
5 Reagents.....	5
6 Apparatus .....	5
7 Procedure .....	6
8 Calculations.....	9
9 Precision.....	10
10 Report .....	11
Bibliography .....	12

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## Foreword

This document (EN 15326:2007+A1:2009) has been prepared by Technical Committee CEN/TC 336 "Bituminous binders", the secretariat of which is held by AFNOR.

This European Standard shall be given the status of a national standard, either by publication of an identical text or by endorsement, at the latest by November 2009, and conflicting national standards shall be withdrawn at the latest by November 2009.

This document includes Amendment 1 approved by CEN on 2009-04-05.

This document supersedes EN 15326:2007.

The start and finish of text introduced or altered by amendment is indicated in the text by tags **A1** and **A1**.

According to the CEN/CENELEC Internal Regulations, the national standards organizations of the following countries are bound to implement this European Standard: Austria, Belgium, Bulgaria, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden, Switzerland and United Kingdom.

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**EN 15326:2007+A1:2009 (E)****1 Scope**

This European standard specifies a procedure for determining the specific gravity and density of bituminous binders at  $(25,0 \pm 0,2)$  °C using the capillary-stoppered pycnometer method. Emulsions are excluded from the scope of this method.

NOTE 1 This method can also be used for other hydrocarbon binders, for bituminous binders from other sources, e.g. recovered from asphalt or after hardening and for bituminous binders containing filler. However, a lower precision is to be expected.

NOTE 2 This test method may be performed at other temperatures (i.e. 15 °C). When doing so, the density values of water and isopropanol should be determined.

The pycnometer method shall be used as a reference method for determining the specific gravity and density of bituminous binders.

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

**2 Normative references**

The following referenced documents are indispensable for the application of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

EN 58, *Bitumen and bituminous binders – Sampling bituminous binders*

EN 1427, *Bitumen and bituminous binders – Determination of the softening point – Ring and Ball method*

EN 12594, *Bitumen and bituminous binders – Preparation of test samples*

**3 Terms and definitions**

For the purposes of this document, the following terms and definitions apply.

**3.1****density ( $\rho$ )**

mass per unit of volume of a material, measured in unit of  $\text{kg/m}^3$

NOTE 1 Standard temperature for determining the density of bituminous binders is  $(25,0 \pm 0,2)$  °C. Density,  $\rho$ , is calculated from specific gravity,  $d$ , of the bituminous binder.

NOTE 2 Density is used for converting volumes to mass as required by other standards, applications and in sale transactions.

**3.2****specific gravity ( $d$ )**

ratio of density of the bituminous binder,  $\rho$ , and density of a test liquid,  $\rho_T$ , measured under the same conditions, at 25,0 °C

$$d_{25/25} = \frac{\rho}{\rho_T} \quad (1)$$

## 4 Principle

Masses of equal volumes of bituminous sample and of test liquid are compared. Equal volumes are ensured by the pycnometer being filled so as to overflow when placed in a bath at the test temperature until thermal equilibrium is reached (approximately 30 min).

The calibrated pycnometer is filled approximately three quarters of its capacity with the bituminous binder to be tested and weighed with the stopper. The pycnometer is filled with a test liquid and weighed again. From the different masses, specific gravity and density shall be calculated.

## 5 Reagents

### 5.1 Test liquids

Freshly boiled and cooled distilled water or deionized water shall be used to fill the pycnometer, the low-form beaker (6.6) and the waterbath.

For testing petroleum cut-back and fluxed bitumen for which specific gravity at 25 °C is assumed to be lower than 1, isopropanol (propan-2-ol) with a density of  $(782,7 \pm 0,1)$  kg/m<sup>3</sup> at 25 °C shall be used.

### 5.2 Solvents

Appropriate solvents are required to clean the equipment used.

## 6 Apparatus

### 6.1 Pycnometer

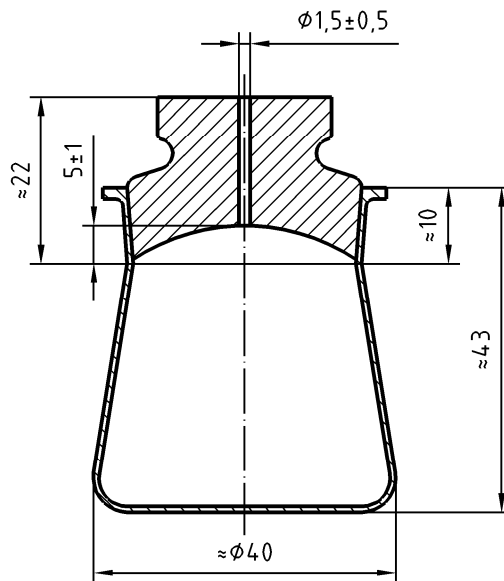
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Glass, consisting of a conical or cylindrical vessel carefully ground to receive an accurately fitting glass stopper. The stoppered pycnometer shall have a capacity of  $(25 \pm 2)$  cm<sup>3</sup>, and shall weigh not more than 40 g. The wide-mouth (Hubbard) form of pycnometer may be used as detailed in ISO 3507. In case larger samples are available, a larger Hubbard pycnometer with a 50 ml capacity may be used also detailed in ISO 3507; masses should be determined with the same accuracy.

The upper part of the stopper shall be smooth and perfectly flat. Its lower part shall be concave to allow air bubbles to easily escape through the opening. The concave part shall have a height of  $(5 \pm 1)$  mm in the middle.

An example of suitable pycnometer is illustrated in Figure 1.

Dimensions in millimetres



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Figure 1 — Example of a capillary-stoppered pycnometer

**6.2 Constant-temperature water bath**, having a depth greater than that of the pycnometer, capable of being maintained within  $(\pm 0,2) ^\circ\text{C}$  of the desired temperature.

### 6.3 Bath thermometer

Thermometer shall be readable to  $(\pm 0,1) ^\circ\text{C}$  and shall be linked to the agreed reference standards.

### 6.4 Balance

Laboratory balance capable to reach the required precision.

### 6.5 Appropriate oven

For temperatures up to  $220 ^\circ\text{C}$ , in order to melt any kind of bituminous binder. The appropriate temperature shall be adapted to the type of binder tested.

### 6.6 Low-form beaker

Capacity of 600 ml is convenient.

## 7 Procedure

### 7.1 General

Samples shall be taken and prepared according to EN 58 and EN 12594.



## 7.2 Preparation of equipment

### 7.2.1 Preparation of the water bath

Fill the water bath with distilled water or deionized water and maintain the temperature of the water bath within  $(25 \pm 0,2) ^\circ\text{C}$ .

### 7.2.2 Conditioning of the low –form beaker

Partially fill the 600 ml low-form beaker (6.6) with freshly boiled and cooled distilled or deionized water to a level that will allow the pycnometer to be immersed to a depth of not less than approximately 40 mm.

Partially immerse the beaker in the water bath to a depth sufficient to allow the bottom of the beaker to be immersed to a depth of not less than approximately 100 mm, while the top of the beaker is above the water level of the bath. Clamp the beaker in place for approximately 30 min.

## 7.3 Calibration of the pycnometer

### 7.3.1 General

The calibration shall be carried out at least once a year in accordance with the procedure detailed below. Such a calibration is valid only for the temperature at which it is carried out.

In this standard, except if mentioned explicitly, the reference to the pycnometer specifies the pycnometer body and its stopper.

During the year or in case of doubt about any result, a new determination of the mass of the empty pycnometer and the mass of the pycnometer filled with the test liquid shall be carried out.

The calibrated pycnometers shall be preserved from dust and from stains.

When first using a new pycnometer, register the pycnometer body and its stopper with a permanent readable marking that may not change the mass of the pycnometer through time (typically engraved glass). Mention clearly that the pycnometer body and its stopper are not dissociable.

### 7.3.2 Calibrations of the mass of the empty pycnometer and the mass of the pycnometer filled with the test liquid

#### 7.3.2.1 Determination of the mass of the empty pycnometer and the mass of the pycnometer with the test liquid by 2 operators

When evaluating the mass of the empty pycnometer (A) and the mass of the pycnometer filled with the test liquid (B), the measurements shall be carried out by at least 2 operators, if possible on the same day.

If only one operator carries out the 2 determinations, i.e. the determinations of the mass of the empty pycnometer (A) and the mass of the pycnometer filled with the test liquid (B), each of those two determinations shall be carried out twice within at least 24 h in between but no more than 72 h.

#### 7.3.2.2 Calibration of the mass of the empty pycnometer (A)

Thoroughly clean the pycnometer with solvent and remove the solvent completely by storing the pycnometer in an oven at approximately  $10 ^\circ\text{C}$  above the boiling point of the solvent used. Allow the pycnometer to cool to ambient temperature ( $18 ^\circ\text{C}$  to  $28 ^\circ\text{C}$ ) and clean it with care to prevent electrostatic charge.

Weigh the pycnometer to the nearest mg without handling it with fingers but with grippers. Designate this mass as A.