



SLOVENSKI STANDARD
SIST EN 13016-2:2000
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Liquid petroleum products - Vapour pressure - Part 2: Determination of absolute vapour pressure (AVP) between 40°C and 100°C

Flüssige Mineralölerzeugnisse - Dampfdruck - Teil 2: Bestimmung des absoluten Dampfdruckes (AVP) im Temperaturbereich 40 °C -100 °C

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Produits pétroliers liquides - Pression de vapeur - Partie 2: Détermination de la pression de vapeur absolue (PVA) entre 40 °C et 100 °C

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Ta slovenski standard je istoveten z: EN 13016-2:2000

ICS:

75.160.20 V^\[æ[iãæ Liquid fuels

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EUROPEAN STANDARD

EN 13016-2

NORME EUROPÉENNE

EUROPÄISCHE NORM

August 2000

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English version

Liquid petroleum products - Vapour pressure - Part 2:
Determination of absolute vapour pressure (AVP) between 40 °C
and 100 °C

Produits pétroliers liquides - Pression de vapeur - Partie 2:
Détermination de la pression de vapeur absolue (PVA)
entre 40 °C et 100 °C

Flüssige Mineralölerzeugnisse - Dampfdruck - Teil 2:
Bestimmung des absoluten Dampfdruckes (AVP) im
Temperaturbereich 40 °C -100 °C

This European Standard was approved by CEN on 4 August 2000.

CEN members are bound to comply with the CEN/CENELEC Internal Regulations which stipulate the conditions for giving this European Standard the status of a national standard without any alteration. Up-to-date lists and bibliographical references concerning such national standards may be obtained on application to the Central Secretariat or to any CEN member.

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 Central Secretariat has the same status as the official versions.

CEN members are the national standards bodies of Austria, Belgium, Czech Republic, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Luxembourg, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland and United Kingdom.

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EUROPEAN COMMITTEE FOR STANDARDIZATION
COMITÉ EUROPÉEN DE NORMALISATION
EUROPÄISCHES KOMITEE FÜR NORMUNG

Central Secretariat: rue de Stassart, 36 B-1050 Brussels

Foreword

This European Standard has been prepared by Technical Committee CEN/TC 19 "Petroleum products, lubricants and related products", the secretariat of which is held by NNI.

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 February 2001, and conflicting national standards shall be withdrawn at the latest by February 2001.

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

Annex A is for information only.

This European Standard is one of a series of standards as listed below:

EN 13016, *Liquid petroleum products - Vapour pressure*

Part 1: Determination of air saturated vapour pressure (ASVP).

Part 2: Determination of absolute vapour pressure (AVP) between 40 °C and 100 °C.

NOTE Part 1 is based on IP 394¹⁾ and ASTM D 5191²⁾.

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¹⁾ IP 394: Determination of air saturated vapour pressure (ASVP)

²⁾ ASTM D 5191:1996: Test method for vapor pressure of petroleum products (mini method)

Introduction

Vapour pressure is one measure of the volatility characteristics of fuels used in many differing types of engines with large variations in operating temperatures. Fuels having high vapour pressure may vaporize too readily in the fuel handling systems, resulting in decreased flow to the engine and possible stoppage by vapour lock. Conversely, fuels of low vapour pressure may not vaporize readily enough, resulting in difficult starting, slow warm-up and poor acceleration.

1 Scope

This European Standard specifies a method for the determination of absolute vapour pressure of liquid petroleum products at elevated temperatures.

The conditions used in the test described in this standard are a vapour to liquid ratio of 3:2 and an initial injection temperature of 37,8 °C or 31,0 °C.

The method described is suitable for testing air-saturated samples that exert an air saturated vapour pressure of between 50 kPa and 500 kPa at temperatures between 40 °C and 100 °C.

This European Standard is applicable to fuels containing oxygenated compounds up to the limits stated in the relevant EC Directive³⁾.

NOTE 1 If a sample container of 1 l is utilized and the initial sample injection is into a test chamber at 37,8 °C, the initial measurement corresponds with the measurement in Part 1 of this standard.

NOTE 2 For the purposes of this European Standard, the term “% (V/V)” is used to represent the volume fraction.

WARNING The use of this standard can 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 to determine the applicability of regulatory limitations prior to use.

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2 Normative references

This European Standard incorporates by dated or undated reference, provisions from other publications. These normative references are cited at the appropriate places in the text and the publications are listed hereafter. For dated references, subsequent amendments to or revisions of any of these publications apply to this European Standard only when incorporated in it by amendment or revision. For undated references the latest edition of the publication referred to applies (including amendments).

EN ISO 3170, *Petroleum liquids - Manual sampling (ISO 3170: 1988, including Amendment 1: 1998)*.

³⁾ EC Directive 85/536/EEC, Council Directive on crude-oil savings through the use of substitute fuel components in petrol.

3 Terms and definitions

For the purposes of this standard, the following terms and definitions apply:

3.1

air saturated vapour pressure

ASVP

total pressure exerted in vacuo by air-saturated petroleum products, components and feedstocks, in the absence of undissolved water, the total pressure being the sum of the partial pressure of the sample and the partial pressure of the dissolved air

3.2

absolute vapour pressure

AVP

air saturated vapour pressure minus the partial pressure due to dissolved air in the liquid

4 Principle

A cooled air-saturated sample of known volume is injected into an evacuated, temperature controlled chamber in two equal test portions. After the injection of each test portion, the air saturated vapour pressure is determined. The partial pressure of the dissolved air is calculated from the two resulting pressures.

The temperature of the test chamber is then increased to a specified value and the air-saturated vapour pressure determined. The absolute vapour pressure (AVP) is calculated by subtracting the partial pressure of the dissolved air in the liquid, which has been corrected for temperature and compensated for compressive effects and solubility, from the air saturated vapour pressure. The procedure may be repeated at further temperatures.

5 Reagents

5.1 Pentane, reagent grade 99,5 % (V/V) minimum purity.

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6 Apparatus

6.1 Instrument

6.1.1 The instrument shall conform to the general requirements given in 6.1.2 to 6.1.6.

NOTE Full details of suitable instruments are not given because of differences in the way that the basic principles are applied by individual manufacturers.

The instrument shall be installed, operated and maintained in accordance with the manufacturer's manual.

6.1.2 The system shall be configured to enable the test chamber to be evacuated and isolated, the sample to be drained and the system flushed and purged as necessary.

6.1.3 The test chamber shall be vacuum-tight, with provision for the injection of the sample in two test portions, and shall be capable of containing between 5 ml and 15 ml of liquid and vapour with an accuracy of 1 % over the test temperature range. The test chamber shall be capable of controlling the temperature of the sample over the range 30 °C to 100 °C within $\pm 0,1$ °C and of indicating the temperature with a resolution of at least 0,1 °C.

NOTE 1 The test chambers used in the instruments which generated the precision statements were manufactured from either aluminium or stainless steel.

NOTE 2 Test chambers with capacities less than 5 ml or greater than 15 ml may be used but the precision of the method can be affected.

6.1.4 The apparatus shall be capable of measuring the vapour pressure over the range of 0 kPa to 600 kPa, by means of a pressure transducer, with an accuracy of 0,8 kPa and a resolution of 0,1 kPa.

6.1.5 If a vacuum pump is required for use with the instrument, it shall be capable of reducing the pressure in the test chamber to less than 0,01 kPa absolute.

6.1.6 If a vacuum-tight syringe or similar equipment is required for measuring or injecting the required volume of sample into the test chamber, it shall be sized appropriately to the required sample size with an accuracy of at least 1 %.

6.2 Cooling equipment, air or iced-water bath or refrigerator, capable of cooling the samples to a temperature of between 0 °C and 1 °C.

NOTE An intrinsically safe refrigerator should be used with petroleum products.

6.3 Barometer, capable of measuring atmospheric pressure within an accuracy of 0,1 kPa or better and calibrated and/or verified against an instrument certified by an authorized certification body.

6.4 Vacuum gauge or pressure transducer, covering at least the range 0 kPa to 0,67 kPa, calibrated and/or verified against an instrument certified by an authorized certification body.

6.5 Temperature measuring device, in the required temperature ranges, with a resolution of 0,1 °C and scale error of less than 0,1 °C, calibrated and/or verified against an instrument certified by an authorized certification body.

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7 Sampling

7.1 Due to the extreme sensitivity of vapour pressure measurements to losses through evaporation and the resulting changes in composition, the utmost precaution and the most meticulous care shall be taken in the drawing and handling of samples.

7.2 Samples shall be drawn in accordance with EN ISO 3170. However, the water displacement technique shall not be used.

NOTE The drawing of samples using automatic techniques such as described in EN ISO 3171⁴⁾, is not recommended unless a variable volume sample receiver is used to collect and transport the sample to the test laboratory. The use of a fixed volume receiver, pressurized or not, may well result in loss of light ends from the product being sampled thereby affecting the vapour pressure measurement.

7.3 The sample shall be supplied in a vacuum-tight container made of a material which does not allow vapours to escape through its walls or lid. The container shall be a minimum of 70 % (V/V) full of sample at the time of receipt.

7.4 Samples shall be placed in a cool place as soon as possible after they have been obtained and held there until the test has been completed. Samples in leaking containers shall not be considered for testing, but shall be discarded and new samples obtained.

8 Sample preparation

8.1 The vapour pressure determination shall be the first test on a sample. For referee testing, only two equal test portions shall be taken from the container; for routine testing, it is permitted for further samples to be taken from the same container

8.2 Before the sample container is opened, place it in the cooling equipment (6.2) and allow sufficient time for the container and contents to cool to between 0 °C and 1 °C.

NOTE Sufficient time to reach this temperature may be ensured by direct measurement of the temperature of a similar liquid in a similar container placed in the same bath at the same time as the sample.

8.3 With the sample at a temperature of 0 °C to 1 °C, remove the container from the cooling equipment and wipe dry with an absorbent material. Unseal the container (if it is not transparent) and examine the sample content.

8.4 The sample content shall be 70 % (V/V) to 80 % (V/V) of the container capacity. Discard the sample if its volume is less than 70 % (V/V) of the container capacity. If the container is more than 80 % (V/V) full, pour out enough sample to bring the container contents within the 70 % (V/V) to 80 % (V/V) range. Under no circumstances shall any sample be returned to the container if it has been poured out previously. Reseal the container and return it to the cooling equipment (6.2).

8.5 To ensure that the sample is air saturated, remove the container from the cooling equipment (6.2) when the sample is at a temperature of 0 °C to 1 °C. Wipe the container dry with absorbent material, unseal it momentarily taking care that no water enters, reseal it and shake vigorously. Return the container to the cooling equipment for a minimum of 2 min.

8.6 Repeat 8.5 twice. Return the sample to the cooling equipment until commencing the test.

⁴⁾ EN ISO 3171: Petroleum liquids - Automatic pipeline sampling (ISO 3171: 1988)

9 Preparation of apparatus

9.1 Prepare the instrument for operation in accordance with the manufacturer's instructions.

9.2 Prepare the test chamber, as required to avoid contamination of the test portion, according to the manufacturer's instructions. When an evacuated chamber is used, determine visually from the instrument display that the test chamber pressure is stable and does not exceed 0,1 kPa. When the pressure is not stable, or exceeds this value, check that no traces of volatile components are present in the chamber from a previous sample, that there are no leaks, or check the calibration of the transducer.

9.3 If a syringe is used for injection of the test portion, cool it to between 0 °C and 1 °C in the cooling equipment (6.2) before drawing in the sample. Avoid water contamination of the syringe reservoir by sealing the outlet of the syringe during the cooling process.

9.4 Prior to injection of the test portion check that the temperature of the test chamber is at the required temperature in the range of 40 °C to 100 °C to within $\pm 0,1$ °C.

10 Calibration of apparatus

10.1 Pressure transducer

10.1.1 Check the calibration of the transducer on a monthly basis or when required as indicated from the quality control checks. The calibration of the transducer shall be checked using two reference points; zero pressure ($< 0,1$ kPa) and at the ambient barometric pressure which has been corrected for temperature using the following values:

- a) at temperatures between 10 °C and 19 °C, subtract 0,1 kPa from the barometer reading;
- b) at temperatures between 20 °C and 29 °C, subtract 0,2 kPa from the barometer reading;
- c) at temperatures above 30 °C, subtract 0,3 kPa from the barometer reading.

NOTE 1 A mercury column barometer is the most accurate and suitable device for calibrating the atmospheric pressure display of the apparatus, however, these barometers are either calibrated at 0 °C or are manufactured using the density of mercury as defined at 0 °C. This means that, when the barometer is used in the laboratory at ambient temperature, the reading of the barometer will be slightly high. The necessary correction varies with temperature and atmospheric pressure, but the corrections given in a) to c) are sufficient for the method described.

NOTE 2 Calibration at a third point, e.g. 350 kPa, using a calibrated gauge or a calibrated source of pressure, such as a dead-weight tester, should be carried out if this is recommended by the manufacturer.