



JAPANESE
INDUSTRIAL
STANDARD

Translated and Published by
Japanese Standards Association

JIS K 2536-3 : 2003
(PAJ)

**Liquid petroleum products—
Testing method of components
Part 3 : Determination of aromatic
components by gas chromatography**

ICS 75.080

Reference number : JIS K 2536-3 : 2003 (E)

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Foreword

This translation has been made based on the original Japanese Industrial Standard established by the Minister of Economy, Trade and Industry through deliberations at the Japanese Industrial Standards Committee according to the proposal of establishing a Japanese Industrial Standard from Petroleum Association of Japan (PAJ), with a draft of Industrial Standard based on the provision of Article 12 Clause 1 of the Industrial Standardization Law. Attention is drawn to the possibility that some parts of this Standard may conflict with a patent right, application for a patent after opening to the public, utility model right or application for registration of utility model after opening to the public which have technical properties. The relevant Minister and the Japanese Industrial Standards Committee are not responsible for identifying the patent right, application for a patent after opening to the public, utility model right or application for registration of utility model after opening to the public which have the said technical properties.

JIS K 2536 consists of the following 6 parts under the general title *Liquid petroleum products—Testing method of components*:

Part 1 : Fluorescent indicator adsorption method

Part 2 : Determination of total components by gas chromatography

Part 3 : Determination of aromatic components by gas chromatography

Part 4 : Determination of components by tandem type gas chromatography

Part 5 : Determination of oxygenate compounds by gas chromatography

Part 6 : Determination of oxygen content and oxygenate compounds by gas chromatography and oxygen selective detection.

Date of Establishment: 2003-06-20

Date of Public Notice in Official Gazette: 2003-06-20

Investigated by: Japanese Industrial Standards Committee
Standards Board

Technical Committee on Chemical Products

JIS K 2536-3:2003, First English edition published in 2005-01

Translated and published by: Japanese Standards Association
4-1-24, Akasaka, Minato-ku, Tokyo, 107-8440 JAPAN

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Printed in Japan

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**Liquid petroleum products—
Testing method of components
Part 3 : Determination of aromatic
components by gas chromatography**

1 Scope This part of **JIS K 2536** specifies the determination method of benzene, toluene, xylene and aromatic components in the liquid petroleum products of which the end point is not more than 220 °C by atmospheric pressure distillation test method specified in **JIS K 2254** according to gas chromatography.

- Remarks
- 1 The range of determination according to this Standard is not less than 0.1 mass % (volume %) for benzene, toluene, xylene and aromatic components respectively.
 - 2 Methanol, methyl-tert-butyl ether (hereafter referred to as “MTBE”) and kerosene content may be measured in addition to aromatic hydrocarbon by using TCEP column in this Standard according to the test conditions in table 3.
 - 3 When a doubt arises about the test results of benzene, toluene, xylene, aromatic components, methanol, MTBE and kerosene content obtained according to this Standard, the test shall be carried out according to **JIS K 2536-2**.
 - 4 The use of this Standard may involve hazardous reagents, 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 test.

Information : The test methods specified in respective parts of **JIS K 2536** are shown in informative table 1.

Informative Table 1 Classification of test methods

Standard part number	Classification	Components to be tested	Division of application	Unit	Example of applicable oil class
K 2536-1	Fluorescent indicator adsorption method	Saturates content Olefins content Aromatics content	It is applied to the petroleum products of which the end point is not more than 315 °C ⁽¹⁾ .	volume %	Automobile gasoline Aircraft gasoline Aircraft turbine fuel oil Kerosine
K 2536-2	Determination of total components by gas chromatography	Total components Benzene Toluene Xylene Methanol Ethanol MTBE ETBE Kerosene content	It is applied to the petroleum products of which the end point is not more than 250 °C ⁽¹⁾ .	mass % or volume %	Automobile gasoline Automobile gasoline Aircraft gasoline
	Annex (normative) Rapid determination of total components by gas chromatography				
K 2536-3	Determination of aromatic components by gas chromatography	Aromatic components content Benzene Toluene Xylene	It is applied to the petroleum products of which the end point is not more than 220 °C ⁽¹⁾ .		
K 2536-4	Determination of components by tandem type gas chromatography	Benzene Toluene Xylene Methanol MTBE Kerosene content	It is applied to the petroleum products of which the end point is not more than 250 °C ⁽¹⁾ .	volume %	Automobile gasoline
K 2536-5	Determination of oxygenate compounds by gas chromatography	Methanol MTBE			
K 2536-6	Determination of oxygen content and oxygenate compounds by gas chromatography and oxygen selective detection	Oxygen content Methanol Ethanol MTBE ETBE Other oxygenate compounds		mass % or volume %	Automobile gasoline

Note (1) The end point shall be in accordance with the atmospheric pressure distillation test method specified in **JIS K 2254**.

2 Normative references The following standards contain provisions which, through reference in this Standard, constitute provisions of this Standard. The most recent editions (including amendments) of the standards indicated below shall be applied.

- JIS K 0114 *General rules for gas chromatographic analysis*
 JIS K 0512 *Hydrogen*
 JIS K 1107 *High purity nitrogen*
 JIS K 2249 *Crude petroleum and petroleum products—Determination of density and petroleum measurement tables based on a reference temperature (15 °C)*
 JIS K 2251 *Crude petroleum and petroleum products—Sampling*
 JIS K 2254 *Petroleum products—Determination of distillation characteristics*
 JIS K 2536-2 *Liquid petroleum products—Testing method of components Part 2 : Determination of total components by gas chromatography*
 JIS K 8680 *Toluene*
 JIS K 8858 *Benzene*
 JIS K 9703 *2,2,4-Trimethylpentane*
 JIS Z 8401 *Guide to the rounding of numbers*
 JIS Z 8402-6 *Accuracy (trueness and precision) of measurement methods and results—Part 6 : Use in practice of accuracy values*

3 Definitions For the purposes of this Standard, the following definitions apply:

- a) **aromatic components content** the sum total of mono- or poly cyclic aromatic hydrocarbon and aromatic olefine hydrocarbon
- b) **kerosene content** total amount (vol %) of *n*-tridecane and *n*-tetradecane multiplied by coefficient, 14, in this test method

4 Principle of test The aromatic components content in the sample is selectively eluted from other saturates content and olefine content through a capillary column (hereafter referred to as “column”) coated by polar stationary liquid. This is detected by flame ionization detector and a chromatogram and peak area integral value are recorded. The individual aromatic hydrocarbon is identified in comparison with the component-known chromatogram, the concentrations (mass %) of benzene, toluene, xylene (including ethylbenzene) and other aromatic hydrocarbon are calculated according to the internal standard method and the aromatic components content is obtained by summing up the respective concentrations.

Remarks : Methanol, MTBE and kerosene content may be measured in addition to aromatic hydrocarbon by using TCEP column in this Standard according to the test conditions in table 3.

5 Test instrument and device The test instrument and device shall be as follows.

5.1 Gas chromatograph, being composed of main parts described in a) to e) shown below. For other specification on structure not indicated here, see the general matters of gas chromatograph given in **JIS K 0114**.

- a) **Sample injector**, being a split type capable of attaching a column and capable of maintaining at 230 °C to 250 °C in temperature.
- b) **Column oven**, capable of controlling in a temperature range of 40 °C to 250 °C with ± 0.5 °C of precision.
- c) **Column**, being a capillary of quartz or stainless steel of which the inner surface is coated or chemically combined with TCEP [1,2,3-tris (2-cyanoethoxy) propane] or PEG-20M (polyethylene-glycol-20M) as polar stationary liquid. An example is shown in table 1.

Table 1 Column (example)

Stationary liquid		TCEP	PEG-20M
Inside diameter	mm	0.22	0.25
Length	m	50	30
Film thickness of liquid layer	μm	0.42	0.25

- d) **Detector and detector container** For the detector, a flame ionization detector is used, and a detector container is capable of maintaining at the temperature of column or higher.
- e) **Data processing apparatus**, capable of recording the individual retention time of peak, peak area integral value and the rate (%) to total peak area integral value as well as the chromatogram.

5.2 Microsyringe, of appropriate capacity (1 μL to 10 μL) corresponding to the amount of sample injected.

1 μL microsyringe shall have a wire passed through up to the top of the needle and the total amount of sample weighed out shall be able to be injected.

Remarks : An automatic sample injector may be used.

6 Reagents The reagents shall be as follows:

- a) **cis-Decalin**, 99 mass % or over in purity.
- b) **n-Undecane**, 99 mass % or over in purity.
- c) **Benzene**, specified in **JIS K 8858**.
- d) **Toluene**, specified in **JIS K 8680**.
- e) **Ethylbenzene**, 99 mass % or over in purity.
- f) **1,2,4-Trimethylbenzene**, 99 mass % or over in purity.
- g) **n-Butylbenzene**, 99 mass % or over in purity.
- h) **2,2,4-Trimethylpentane**, specified in **JIS K 9703**.
- i) **Helium or nitrogen**, helium 99.9 volume % or over, or nitrogen specified in **JIS K 1107**.