

هيئة الإمارات للمواصفات والمقاييس

Emirates Authority for Standardization & Metrology
(ESMA)

Final Draft Standard

UAE.S /FDS / 5018:2016

Review

الجازولين الخالي من الرصاص – المتطلبات وطرق الاختبار

Unleaded Gasoline - Requirements and Test Methods

UNITED ARAB EMIRATES

ICS: 75.160.20

Prepared by
National Technical Committee Standard for Oil & Gas

This document is a UAE draft standard circulated for comment. It is, therefore subject to change and may not be referred to as UAE standard until approved by the board of directors.

التقديم

هيئة الإمارات للمواصفات والمقاييس هي الجهة الرسمية الوطنية عن إعداد وإصدار المواصفات القياسية الإماراتية واللوائح الفنية والتي تتولى إعدادها لجان فنية وطنية متخصصة تضم مختصين من الجهات الحكومية والخاصة ذات العلاقة. وقد قامت اللجنة الفنية الوطنية لمواصفات النفط والغاز بتحديث المواصفة القياسية الإماراتية الالزامية رقم UAE.S 20001:2006 "الجازولين الخالي من الرصاص" وإعداد مشروع تحديث لهذه المواصفة القياسية وقامت الهيئة بتعميمه على كافة الجهات المعنية الحكومية والخاصة لإبداء الملاحظات والآراء حوله، وقد تم وضع المشروع بالصيغة النهائية بناءً على الملاحظات والآراء الواردة، وتم اعتماده وإصداره كمواصفة قياسية إماراتية إلزامية بعد تعديل الرقم والعنوان ليصبح، رقم UAE.S 5018:2016 "الجازولين الخالي من الرصاص- المتطلبات وطرق الاختبار" بقرار من مجلس الوزراء. والتي ستلغي وتحل محل المواصفة القياسية السابقة رقم UAE.S 20001:2006.

Foreword

Emirates Authority for Standardization & Metrology (ESMA) is the national Standard body, one of its main functions is preparing and issuing UAE national standards.

National technical committee, for Oil and Gas Standards, review UAE compulsory standard no. UAE.S 20001:2006 for "Unleaded Gasoline" and prepared updated draft of this standard and have been circulated to all partnership for information and comments, received comments had been considering in the finale draft before approved and issued as compulsory standard by UAE Ministerial Cabinet. The approved compulsory standard no. UAE.S 5018:2016 will replace and supersede the UAE standard no. UAE.S 20001:2006.

Introduction:

Emirates Authority for Standardization and Metrology is established by federal law No. 28 in 2001 as a National Standardization Body.

- Fuel quality is main part of the system of emission control level in gasoline vehicle engine. Vehicle exhaust emission which is main source of air pollution in cities all over the world. According to that ESMA is working in parallel to control vehicle exhaust emission by improving standard specification of fuel quality and the standards of controlling gaseous emission level of vehicles.*
- In 2002 ESMA had issued the first UAE standard specification of unleaded gasoline, NO. UAE.S 20001:2002 which prepared by a technical committee formed for drafting proposal of standard specifications for petroleum products, with specialists and experts members representing the ministry of oil, national oil companies and environmental bodies. That time was the start of transformation in United Arab Emirate for the use of unleaded gasoline, the most important characteristic of that specification of this fuel after stopping the use of lead compounds for improvement gasoline octane number, was also reduced the sulfur content to 500 ppm.*
- ESMA through the National Technical Committee for Standardization of Oil and Gas, made the First review this standard to improve the characteristics of unleaded gasoline to reduce total sulfur content from 500 ppm to 100 ppm and other criteria, the updated standard approved and issued UAE.S 20001:2006.*
- National Technical Committee for Standardization of Oil and Gas make second review for unleaded gasoline standard and prepare this updated standard, to improvement the properties of gasoline to be more compatible with internal combustion engine vehicles supplied with catalyst converter using for reduce gases contaminated ratios of vehicle exhaust. Important change in characteristic of this new version is reducing total sulfur in this fuel from 100 to 50 ppm, not to allow adding any metallic additives to improve the octane number, only oxygenated additives (MTBE) is allowed. Number and title of standard amended to UAE.S 5018 "unleaded gasoline- requirements and test methods".*

Unleaded Gasoline - Requirements and Test Methods

1 Scope

This Emirates standard specifies requirements and test methods for marketed and delivered unleaded gasoline (ULG). It is applicable for use in spark ignited engine vehicles designed to run on ULG this fuel type contain three grades according to octane numbers-viz, regular 91, special 95 and super 98.

2 Complementary References

The following referenced documents applicable for the usage 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.

2.1 Standards

- 2.1.1 UAE.S GSO 1080 Determination of gum in gasoline and aviation fuel by jet evaporation
- 2.1.2 UAE.S GSO 1086 Methods of Test for Gasoline - Determination of Vapour- Liquid Ratio.
- 2.1.3 UAE.S GSO ISO 2160 Petroleum products - Corrosiveness to copper - Copper strip test.
- 2.1.4 UAE.S GSO ISO 5163 Petroleum products - Determination of knock characteristics of motor and aviation fuels - Motor method
- 2.1.5 UAE.S GSO ISO 3007 Petroleum products and crude petroleum - Determination of vapour pressure - Reid method
- 2.1.6 UAE.S GSO ISO 3170 Petroleum Liquids - Manual Sampling.
- 2.1.7 UAE.S GSO ISO 3405 Petroleum Products - Determination of Distillation Characteristics at Atmospheric Pressure.
- 2.1.8 UAE.S GSO ISO 3675 Crude petroleum and liquid petroleum products - Laboratory determination of density - Hydrometer method
- 2.1.9 UAE.S GSO ISO 3830 Petroleum products - Determination of lead content of gasoline - Iodine monochloride method.
- 2.1.10 UAE.S GSO ISO 3837 Liquid petroleum products - Determination of hydrocarbon types - Fluorescent indicator adsorption method
- 2.1.11 UAE.S GSO ISO 5163 Petroleum products - Determination of knock characteristics of motor and aviation fuels - Motor method
- 2.1.12 UAE.S GSO ISO 5164 Petroleum products - Determination of knock characteristics of motor fuels - Research method.

- 2.1.13 UAE.S GSO ISO 20846 petroleum products - determination of sulfur content of automotive fuels - ultraviolet fluorescence method.
- 2.1.14 UAE.S GSO ISO 20847 petroleum products - determination of sulphur content in automotive fuels - energy dispersive x-ray fluorescence spectrometry.
- 2.1.15 UAE.S GSO ISO 22854 liquid petroleum products -determination of hydrocarbon types and oxygenates in automotive-motor gasoline – multi dimensional gas chromatography method.
- 2.1.16 UAE.S GSO ISO 20884 Petroleum Products - Determination of Sulphur content of automotive fuels by wavelength dispersive x-ray fluorescence spectrometry.
- 2.1.17 UAE.S GSO ASTM D130 standard test method for corrosiveness to copper from petroleum products by copper strip test.
- 2.1.18 UAE.S GSO ASTM D1319 Standard Test Method for Hydrocarbon Types in Liquid Petroleum Products by Fluorescent Indicator Adsorption.
- 2.1.19 UAE.S GSO ASTM D2699 Standard Test Method for Research Octane Number of Spark-Ignition Engine Fuel
- 2.1.20 UAE.S GSO ASTM D2700 Standard Test Method for Motor Octane Number of Spark-Ignition Engine Fuel.
- 2.1.21 UAE.S ASTM D4057 Standard Practice for Manual Sampling of Petroleum and Petroleum Products.
- 2.1.22 UAE.S GSO ASTM D4815 Standard method for determination of MTBE, ETBE, TAME, DIPE, tertiary-AMyl alcohol and C1 to C4 alcohols in gasoline by gas chromatography.
- 2.1.23 UAE.S GSO ASTM D5845 Standard Test Method for Determination of MTBE, ETBE, TAME, DIPE, Methanol, Ethanol and tert-Butanol in Gasoline by Infrared Spectroscopy.
- 2.1.24 ISO 6246:1995 Petroleum products - Gum content of light and middle distillate fuels - Jet evaporation method
- 2.1.25 ISO 7536 Petroleum products - Determination of oxidation stability of gasoline - Induction period method
- 2.1.26 ASTM D86 Standard Test Method for Distillation of Petroleum Products and Liquid Fuels at Atmospheric Pressure
- 2.1.27 ASTM D323 Standard Test Method for Vapor Pressure of Petroleum Products (Reid Method)
- 2.1.28 ASTM D381 Standard Test Method for Existent Gum in Fuels by Jet Evaporation.
- 2.1.29 ASTM D525 Standard Test Method for Oxidation Stability of Gasoline (Induction Period Method).

- 2.1.30 ASTM D2622 Standard Test Method for Sulfur in Petroleum Products by Wavelength Dispersive X-ray Fluorescence Spectrometry.
- 2.1.31 ASTM D3237 Standard Test Method for Lead in Gasoline by Atomic Absorption Spectroscopy.
- 2.1.32 ASTM D3606 Standard Test Method for Determination of Benzene and Toluene in Finished Motor and Aviation Gasoline by Gas Chromatography
- 2.1.33 ASTM D3831 Standard Test Method for Manganese in Gasoline by Atomic Absorption Spectroscopy
- 2.1.34 ASTM D4045 Standard Test Method for Sulfur in Petroleum Products by Hydrogenolysis and Rateometric Colorimetry
- 2.1.35 ASTM D4052 Standard Test Method for Density, Relative Density, and API Gravity of Liquids by Digital Density Meter.
- 2.1.36 ASTM D5059 Standard Test Methods for Lead in Gasoline by X-Ray Spectroscopy.
- 2.1.37 ASTM D5188 standard test method for vapor-liquid ratio temperature determination of fuels (evacuated chamber and piston based method).
- 2.1.38 ASTM D5453 standard test method for determination of total sulfur in light hydrocarbons, motor fuels and oils by ultraviolet fluorescence.
- 2.1.39 ASTM D6550 standard test method for determination of olefin content of gasolines by supercritical-fluid chromatography.
- 2.1.40 ASTM D5580 standard test method for determination of benzene, toluene, ethylbenzene, p/m-xylene, o-xylene, c9 and heavier aromatics, and total aromatics in finished gasoline by gas chromatography
- 2.1.41 ASTM D6378 Standard test method for determination of vapor pressure (VPx) of petroleum products, hydrocarbons and hydrocarbon-oxygenate mixtures (Triple Expansion Method)
- 2.1.42 ASTM D7039 standard test method for sulfur in gasoline, diesel fuel, jet fuel, kerosene, biodiesel, biodiesel blends, and gasoline-ethanol blends by monochromatic wavelength dispersive x-ray fluorescence spectrometry.
- 2.1.43 ASTM D7111 standard test method for determination of trace elements in middle distillate fuels by inductively coupled plasma atomic emission spectrometry (ICP-AES).
- 2.1.44 ASTM D7525 standard test method for oxidation stability of spark ignition fuel-rapid small scale oxidation test (RSSOT).
- 2.1.45 UOP 389 trace metals in organics by ICP-OES.

2.2 UAE Regulation

2.2.1 Ministerial Cabinet Decree no (21) / 2015 UAE Regulation for Petroleum Products Control.

3 Definitions and Abbreviations

3.1 Definitions:

3.1.1 Gasoline

A Fuel produced by refining crude oil, used in internal combustion engines with spark ignition. These engines are also known as petrol engines /gasoline engines.

3.1.2 Unleaded Gasoline (ULG)

Gasoline produced without addition of lead compounds for improving its octane ratings.

3.2 Abbreviations:

ESMA : Emirates Authority for Standardization and Metrology

GSO : GCC Standardization Organization

GCC : Gulf Cooperation Council

ASTM : American Society for Testing of Materials

ULG : Unleaded Gasoline

MTBE : Methyl tertiary Butyl Ether

ETBE : Ethyl tertiary Butyl Ether

TAME : Tertiary Amyl Methyl Ether

MMT : Methylcyclopentadienyl Manganese Tricarbonyl

4. Characteristics and Requirements

Following characteristics and requirements shall be available in this type of gasoline:

4.1 It shall be suitable for use as fuel for internal combustion spark ignited engine vehicles and shall be free from any adulterant or contaminant that may render the fuel unacceptable for use in such engines.

4.2 It shall be unleaded and free of any other metal based additives.

4.3 It shall be free from water and sediments.

4.4 Additives:

4.4.1 In order to meet the RON requirements, use of ethers as specified under 4.4.2 is allowed. Authorized Distribution Companies shall be responsible to follow the norms specified above.

4.4.2 For octane number improvement ether compounds; **MTBE**, **ETBE** and **TAME** are only the permitted additives.

- 4.4.3 Metallic compound additives such as MMT and Ferrocene (Iron Carbonyl etc.) are not allowed.
- 4.4.4 Compounds containing phosphorus shall not be added as additives to unleaded gasoline.
- 4.4.5 The use of dyes and markers is allowed provided they do not cause harmful side effects to vehicle and fuel distribution systems.
- 4.5 It shall comply with the requirements covered under the Table/Annex (1) of Characteristics and Requirements for ULG.
- 4.6 ULG shall be free from any additive, not specified in this standard, which may render the fuel unacceptable for use in spark ignition engines. Any additives other than those specified under clause 4.4.2 shall be approved by ESMA prior to its use.

5. Sampling Methods

Samples shall be obtained for inspection and testing in accordance with standard of sampling, as outlined under clause, 2.1.6 or 2.1.21.

Note:

In view of the sensitivity of some test methods referred to in this Standard, particular attention shall be paid to compliance with any guidance on sampling containers, which is included in the test method standard.

6. Testing and Inspection

Testing and inspection of samples for determining properties mentioned in Table/Annex (1) carried out according to the said testing methods for every property listed by said table.

7. Pump marking

Labelling shall be clearly visible, easily legible and displayed at any point of pump where ULG. Pump marking shall consist of easily recognised visual symbols that:

- 7.1 Identify the ULG as complying with this standard.
- 7.2 The title and colour shall be labelled marking dispenser pumps adequately according to research octane number of ULG, to help customers identify the appropriate fuels for their vehicles as follows:
- Super [RON 98] Blue colour.
 - Special [RON 95] Green colour.
 - Regular (Eplus) [RON 91] Red colour.

8. Conformity and quality control

Conformity of Gasoline shall be deemed according to “Ministerial Cabinet Decree no (21) / 2015 UAE Regulation for Petroleum Products Control”. The samples of product shall be taken as indicated in the testing method referred to clause 6 of this standard.

If testing results of samples, are found in compliance with the characteristics and requisites mentioned in clause 4. If found inconsistent with one or more of such characteristics it will be then deemed noncompliant.

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Annex 1
Table
Characteristics and Requirements for Unleaded Gasoline

Property	Units	Limits		Test Method
		Min.	Max.	
Colour (RON: 91/95/98)	-	Red(Regular)/Green(Special)/Blue(SUPER)		Visual
Octane Number, Research(RON:91/95/98)	-	91.0/95.0/98.0	-	UAE.S GSO ASTM D2699 UAE.S GSO ISO 5164
Octane Number, Motor(RON: 91/95/98)	-	82.5/85.0/88.0	-	UAE.S GSO ISO 5163 ASTM D2700
Appearance	-	Liquid, Clear & Bright		Visual
Odour	-	Marketable		Olfactory
Copper Strip Corrosion(3 h at 50°C)		-	1	UAE.S GSO ISO 2160 UAE.S GSO ASTM D130
Density at 15°C (RON: 91/95/98)	Kg /m ³	710	770/790/790	UAE.S GSO ISO 3675 ASTM D4052
Distillation;				
10 % Vol recovered at	°C	-	65	UAE.S GSO ISO 3405, ASTM D86
50 % Vol recovered at	°C	77	115	
90 % Vol recovered at	°C	-	180	
End Point	°C	-	205/215/215	
Residue	Vol. %	-	2.0	
Gum, Existent	mg/100 ml	-	4.0	UAE.S GSO 1080, ISO 6246 ASTM D381
Induction Period	minute	360	-	ISO 7536, ASTM D525, D7525
Lead Content ¹	mg/l	-	5.0	UAE.S GSO ISO 3830 ASTM D3237, D5059
*Manganese Content ²	mg/l	-	5.0	UAE.S GSO ASTM D3831 ASTM D7111, UOP 389
Reid Vapour Pressure at 37.8°C				UAE.S GSO ISO 3007, ASTM D323, D6378
Summer (Mar-Oct)	kPa	0.45	0.60	
Winter (Nov-Feb)	kPa	0.45	0.70	
**Sulphur , Total ³	mg/kg	-	50	UAE.S GSO ISO 20846, UAE.S GSO ISO 20847, UAE.S GSO ISO 20884, ASTM D7039, D5453, D2622,
Allowed Oxygenate: MTBE/ ETBE/TAME (If added)	Vol. %	-	15	UAE.S GSO ISO 22854, UAE.S GSO ASTM D4815, UAE.S GSO ASTM D5845
TV/L 20 (Summer)	°C	Report		UAE.S GSO 1086, ASTM D5188
Aromatics	Vol. %	-	40	UAE.S GSO ISO 22854 UAE.S GSO ISO 3837 UAE.S GSO ASTM D1319, ASTM D5580,
Benzene	Vol. %	-	1.5	UAE.S GSO ISO 22854 UAE.S GSO ASTM D 1319 ASTM D5580, D3606
Olefins	Vol. %	-	10.0	UAE.S GSO ISO 22854 UAE.S GSO ISO 3837 ASTM D1319, D6550

Footnotes:
(1) It shall be unleaded and free of any metal based additives. No intentional addition of metal based additives is permitted (See also 4.4.3. & 4.4.4).
(2) Manganese levels would be revised going forward (See also 4.4.3).
(3)Sulphur levels will be revised to progressively lower limits in the next few years.

Annex 2

References

- 1- *EN 228:2012 Automotive fuels - Unleaded petrol - Requirements and test methods.*
- 2- *Worldwide Fuel Charter.
Fifth Edition Sept. 2013*
- 3- *ASTM D4814 Standard Specification for Automotive Spark-Ignition Engine Fuel.*

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