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Road vehicles — Spark--plugs- — Test methods and requirements

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Foreword

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This document was prepared by Technical Committee ISO/TC 22, *Road vehicles*, Subcommittee SC 32, *Electrical and electronic components and general system aspects.*

This ~~second~~third edition cancels and replaces the ~~first~~second edition edition (ISO 11565:2006), which has been technically revised. It also incorporates the Technical Corrigendum ISO 11565:2006/Cor. 1:2007.

The main changes are as follows:

— ~~—~~ ~~Dividing~~the test procedures ~~in~~have been divided into spark plugs for natural aspirated engines and boosted engines~~;~~

— ~~Modification of~~the test sequences have been modified.

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Road vehicles — Spark-plugs — Test methods and requirements

1 Scope

This document specifies the test methods and requirements for the mechanical and electrical performance of spark-plugs for use with spark ignition engines.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements 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.

ISO 6518-1, *Road vehicles — Ignition systems — Part 1: Vocabulary*

ISO 28741, *Road vehicles — Spark-plugs and their cylinder head housings — Basic characteristics and dimensions*

IEC 60068-2-6, *Environmental Testing — Part 2-6: Tests — Test Fc: Vibration (sinusoidal)*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO 6518-1 and the following apply.

ISO and IEC maintain terminology databases for use in standardization at the following addresses:

— ISO Online browsing platform: available at https://www.iso.org/obphttps://www.iso.org/obp

— IEC Electropedia: available at https://www.electropedia.org/https://www.electropedia.org/

4 Test methods and requirements

4.1 General

The tests shall be carried out at an ambient temperature of (20 ± 15) °C and a relative humidity of (65 ± 20) % unless otherwise specified.

For each test sample in Table 1,Table 1, the test sequence is indicated by "xX" from top to bottom.

Each test sequence shall be started with unused samples.

“Type A” refers to normally aspirated engines and “Type B” refers to boosted engines.

Which type (A or B) to be applied for each test shall be agreed between the customer and the supplier.

Table 1 — Test sequences

Characteristic to be checked	In accordance with sub-clause	Test sample					
		A	B	C	D	E	F
General characteristics (visual examination)	4.24.2	X	X	X	X	X	X
Dimensions	4.34.3	X	X	X	X	X	X
Resistance of incorporated element for RFradio frequency suppression	4.7.14.7.1	-	-	-	-	-	X
Loading life of the incorporated resistor	4.84.8						X
Mechanical strength of the shell	4.4.14.4.1	X					
Tear off resistance of the high voltage terminal	4.4.24.4.2	-	X			-	-
Bending resistance	4.4.34.4.3			X			
Gas tightness	4.54.5			-	X		
Withstand voltage of the insulator	4.7.24.7.2				X		
Vibration resistance	4.4.44.4.4		-		X		
Gas tightness	4.54.5				X		
Withstand voltage of the insulator	4.7.24.7.2				X		
Thermal shock, thermal resistance	4.64.6				-	X	
General characteristics (visual examination)	4.24.2		X	X	X	X	

4.2 General characteristics

4.2.1 Test

Check the following characteristics specified in 4.2.24.2.2 by visual examination. Carry out the visual examination withusing the naked eye, at normal strength of vision, and normal colour perception, at the most favourable viewing distance and with suitable illumination.

Visual examinationThe user shall allow identification,be able to identify the item and verify its appearance, workmanship and finish of the item to be checked against the relevant specification based on a visual examination.

4.2.2 Requirements

4.2.2.1 The external gasket, if any, shall be in accordance with theconform to ISO 28741 for the relevant spark plug.

4.2.2.2 The scavenging area shall be clean and without any foreign body.

4.2.2.3 The electrodes shall be fixed in position.

4.2.2.4 The shell shall be properly fixed to the insulator. NoThere shall be no visible sign of corrosion is allowed. The thread shall be free from burrs or damage.

4.2.2.5 The insulator shall be smooth and uniform without abnormal appearance. The insulator shall not show chips, cracks or signs of shock damage.

4.2.2.6 The marking shall be as specified between customer and supplier.

4.3 Dimensions

4.3.1 Test

The dimensions shall be checked in accordance with ISO 28741, using random samples.

4.3.2 Requirement

All dimensions shall conform to ISO 28741.

4.4 Mechanical performance

4.4.1 Mechanical strength of the shell

4.4.1.1 General

The purpose of this test is to determine the breaking torque of the shell and to show the safety margin toof the required installation torque.

4.4.1.14.4.1.2 Test fixture

The test fixture shall have the thread and the seat accordingof the test fixture shall conform to ISO 28741.

The test fixture shall have a hardness of HRC 20 or greater. The surface roughness across the seating surface shall be R_a max.maximum 0,2 µm. To cover wear of the seating surface during several tests, the spark plug manufacturer may test with a seating surface of R_a max. 0,8 µm. All threads shall be free of lubricants.

4.4.1.24.4.1.3 Test

Install the fully assembled spark plug on the test fixture specified in 4.4.1.14.4.1.2 and tighten it with a torque wrench or a corresponding device, until the shell breaks.

4.4.1.34.4.1.4 Requirement

The measured torque shall not be less than the values stated in Table 2.Table 2.

Table 2 — Breaking torque

-	M10 x 1,0	M12 x 1,25	M14 x 1,25	M18 x 1,5
flatFlat	≥25 Nm	≥35 Nm	≥60 Nm	≥80 Nm
conicalConical	-	≥35 Nm	≥40 Nm	≥60 Nm

4.4.2 Tear-off resistance of the high voltage terminal

The purpose of this test is to ensure that the tensile strength of the terminal is higher than the tensile load of the spark plug connector during operation and removal. This test is valid only for those connector types, which that apply longitudinal forces while dis-/connecting and disconnecting.

4.4.2.1 Test

Mount the spark plug on a tensile strength test bench using a suitable device. Apply a force linearly increasing from zero to (400 ± 10) N with a rate of less than 500 N/s to the high voltage terminal in the axial direction.

4.4.2.2 Requirement

After the test, the spark plug shall be intact.

4.4.3 Bending resistance

4.4.3.1 General

The purpose of this test is to ensure that the bending moment of the insulator is higher than the undesired, but possible lateral load caused by installation tools. The maximum allowed lateral moment is 15 Nm.

4.4.3.14.4.3.2Test

Mount the spark plug on a suitable test block at the maximum installation torque specified in ISO 28741. Apply a force perpendicular to the insulator axis and within 5 mm of the insulator's end. The moment arm shall be defined as referenced from the seating surface (gauging point for conical seating) of the spark plug in the cylinder head. The touch down velocity of the force applied shall be less than 10 mm/min to avoid impact damage.

4.4.3.24.4.3.3Requirement

The spark plug shall withstand to a bending moment of 15 Nm.

NOTE A testAn example of a device to test the bending resistance of the insulator is shown as an example given in Annex A.Annex A.

4.4.4 Vibration resistance

4.4.4.1 General

The purpose of this test is to precondition the spark plug to simulate engine operation. Further tests shall be performed after the preconditioning.

4.4.4.14.4.4.2Test

Subject the spark plug, mounted and tightened as specified in ISO 28741, to a vibration test Fc in accordance with IEC 60068-2-6:

— ——frequency range: 50 Hz to 500 Hz, sinusoidal;

— ——sweep rate: 1- octave/min;