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

*Véhicules routiers — Bougies d'allumage et leur logement dans la  
culasse — Caractéristiques élémentaires et dimensions*

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## Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

The procedures used to develop this document and those intended for its further maintenance are described in the ISO/IEC Directives, Part 1. In particular, the different approval criteria needed for the different types of ISO document should be noted. This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2 (see [www.iso.org/directives](http://www.iso.org/directives)).

ISO draws attention to the possibility that the implementation of this document may involve the use of (a) patent(s). ISO takes no position concerning the evidence, validity or applicability of any claimed patent rights in respect thereof. As of the date of publication of this document, ISO had received notice of (a) patent(s) which may be required to implement this document. However, implementers are cautioned that this may not represent the latest information, which may be obtained from the patent database available at [www.iso.org/patents](http://www.iso.org/patents). ISO shall not be held responsible for identifying any or all such patent rights.

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For an explanation of the voluntary nature of standards, the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the World Trade Organization (WTO) principles in the Technical Barriers to Trade (TBT), see [www.iso.org/iso/foreword.html](http://www.iso.org/iso/foreword.html).

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

This third edition cancels and replaces the second edition (ISO 28741:2013), which has been technically revised.

The main changes are as follows:

- subclause [4.3](#): new subclause for additional terminal options;
- implementation of M18 spark plugs.

Any feedback or questions on this document should be directed to the user's national standards body. A complete listing of these bodies can be found at [www.iso.org/members.html](http://www.iso.org/members.html).

## Introduction

The purpose of this document is to provide a compact and concise specification on spark plugs and their cylinder head housings, which has replaced the large number of existing individual International Standards on each type of spark plug.

It is intended to specify the main properties, the design requirements, and the dimensions of most of the existing types of spark plugs and their cylinder head housings. In this way, the user can work with one comprehensive International Standard valid for most types of spark plugs, instead of a number of International Standards, each of which is specified for one type only.

The testing of spark plugs is covered in ISO 11565.

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# Road vehicles — Spark-plugs and their cylinder head housings — Basic characteristics and dimensions

## 1 Scope

This document specifies the main properties and dimensions of spark plugs, including the terminals and the dimensions of their cylinder head housings, for use with any spark-ignited engines. The usage of spark plugs is not restricted to road vehicles only.

This document does not cover screened and waterproof spark plugs (see ISO 3412, ISO 3895 and ISO 3896).

## 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 68-1, *ISO general purpose screw threads — Basic profile — Part 1: Metric screw threads*

ISO 261, *ISO general purpose metric screw threads — General plan*

ISO 965-1, *ISO general purpose metric screw threads — Tolerances — Part 1: Principles and basic data*

ISO 965-3, *ISO general purpose metric screw threads — Tolerances — Part 3: Limit deviations for screw threads*

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

## 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/obp>
- IEC Electropedia: available at <https://www.electropedia.org/>

### 3.1 installed height

distance from the contact point of the cylinder head to the top of the spark-plug terminal, including the compressed gasket thickness with the spark plug installed at the specified installation torque

Note 1 to entry: For *conical seating* (3.5) the contact point is defined from the gauge point of the seat.

### 3.2 spark plug thread size

nominal size of the spark-plug thread used to interface between the spark plug and the cylinder head thread

Note 1 to entry: These are standard metric threads according to the ISO 965 series, with the exception of the M14 × 1,25 thread.

### 3.3

#### **hexagon**

feature of the spark plug shell that is used to install the spark plug into the cylinder head, interfacing with the installation socket while the spark plug is installed into the cylinder head

### 3.4

#### **bi-hexagon**

12-point installation feature in which a 12-point socket wrench is used to install the spark plug

### 3.5

#### **conical seating**

conical section of the spark plug shell on some spark plug types, which is used for the seal interface between the spark plug and the cylinder head

Note 1 to entry: There is typically no gasket used between the conical mating surfaces.

### 3.6

#### **flat seating**

flat surface of some spark plug types which is perpendicular to the spark plug axis and is used for the seal interface between the spark plug and the cylinder head

Note 1 to entry: This seal typically uses a gasket between the flat seat of the spark plug and the mating flat surface of the cylinder head.

### 3.7

#### **high voltage terminal**

part of the spark plug that is used as the contact point between the high-voltage ignition source and the spark plug

Note 1 to entry: The connection between the high-voltage ignition source and the spark plug terminal can be made with a threaded fastener, with a snap clip that interfaces with the solid terminal or by spring-loaded mechanical contact.

### 3.8

#### **installation tightening torque**

rotational force applied to the spark plug *hexagon* (3.3) to ensure proper seating and sealing of the spark plug to the cylinder head

Note 1 to entry: The value of the correct installation tightening torque can vary from conditions that affect the friction between the spark plug threads and the cylinder head threads. These include cylinder head material, spark plug shell plating, thread lubrication, and contamination from combustion deposits. It is advisable to ensure that spark plugs are not over-torqued during installation, as this can damage spark plug integrity and can result in engine damage. Spark plugs with smaller thread sizes require a lower installation tightening torque.

### 3.9

#### **insulator diameter**

*e*

nominal diameter of the insulator in a defined region of the insulator between the top of the shell and the terminal of the spark plug, which interfaces with a corresponding region of the high-voltage boot of the ignition lead or ignition coil

Note 1 to entry: The fit is the key to suppression of high-voltage leakage around the spark plug insulator (flashover).



### 3.10 spark plug reach

*a*

distance from the spark-plug seating surface (flat seat) or from the gauge diameter (conical seat) to the point on the shell designed to be aligned with the combustion chamber surface on the cylinder head with the spark plug properly installed

Note 1 to entry: It is advisable to design the spark plug reach and the cylinder head housing in such a way that they match, so as to ensure correct fit of the spark plug into the combustion chamber.

### 3.11 spark plug projection

*b-a*

distance that any part of the spark plug projects past the *spark plug reach* (3.10) into the combustion chamber

Note 1 to entry: It is important to consider this dimension for possible interference with the engine piston at top dead centre.

## 4 High voltage terminals

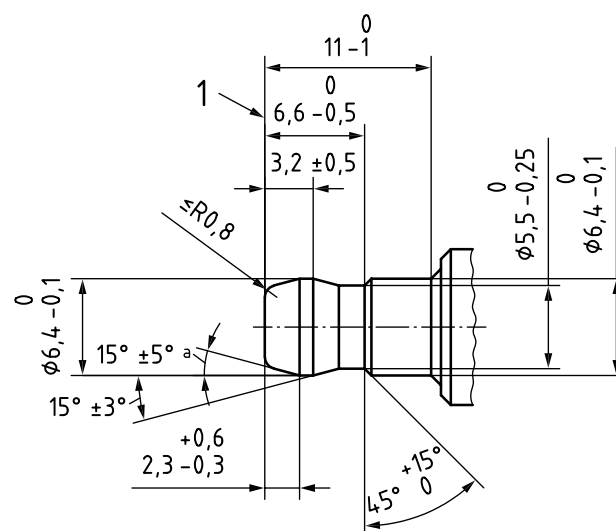
### 4.1 General

The type of terminal to be used shall be agreed between spark plug manufacturer and customer.

### 4.2 SAE terminals

The dimensions of so-called solid post SAE terminals shall be in accordance with [Figures 1](#) and [2](#).

Nuts for use with threaded terminals shall have the same external dimensions as those of the solid post terminal and shall have internal threads to 6H tolerance prior to assembly on the threaded terminals.



Dimensions in millimetres

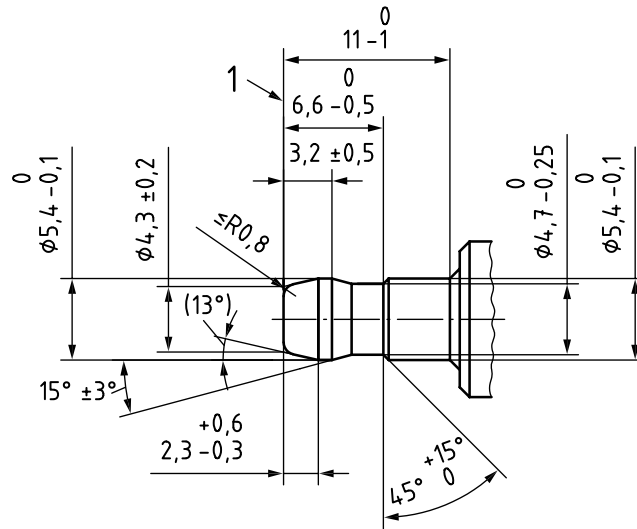
#### Key

- 1 reference plane
- <sup>a</sup> For existing products, values between 7° and 30° are allowed.

Figure 1 — Solid post terminal

The measurement of the minimum diameter of 6,3 mm shall be taken at any or all points around the post circumference. A ring gauge shall be used for measuring the maximum diameter of 6,4 mm.

Dimensions in millimetres



**Key**

1 reference plane

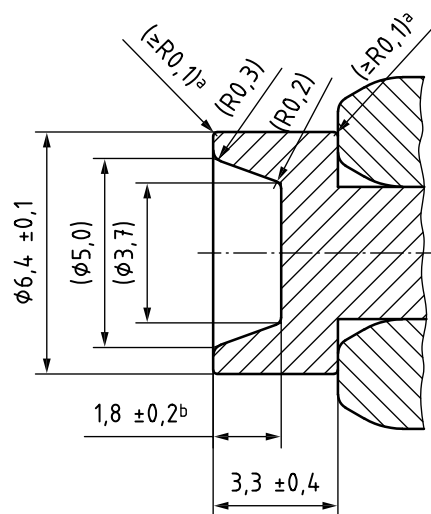
**Figure 2 — Solid post terminal for M10 x 1 bi-hexagon 12 mm spark plugs**

The measurement of the minimum diameter of 5,3 mm shall be taken at any or all points around the post circumference. A ring gauge shall be used for measuring the maximum diameter of 5,4 mm.

**4.3 Cup terminals**

Alternatively, especially for engines with high ignition voltage requirement, a so-called cup terminal in accordance with [Figure 3](#) shall be used.

Dimensions in millimetres



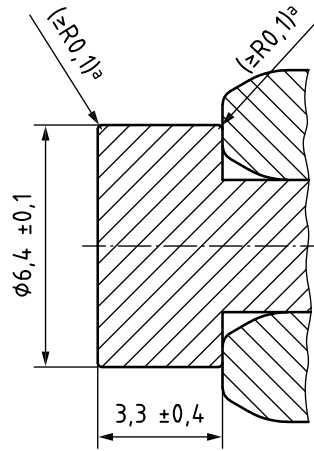
<sup>a</sup> Intention: no sharp edges, chamfer is allowed too.

<sup>b</sup> Bottom surface is allowed to have cone shape for manufacturing reasons.

**Figure 3 — Cup terminal**

A variant of the cup terminal, which does not include the inner geometry is allowed too as shown in [Figure 4](#). The outer dimensions are identical.

Dimensions in millimetres



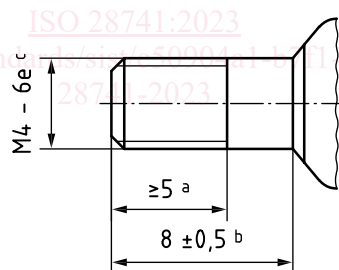
<sup>a</sup> Intention: no sharp edges, chamfer is allowed too.

**Figure 4 — Flat top terminal**

#### 4.4 Threaded terminal dimensions

The dimensions of threaded terminals shall be in accordance with [Figure 5](#).

Dimensions in millimetres



<sup>a</sup> Length of usable thread.

<sup>b</sup> Cylindrical part.

<sup>c</sup> Depending on manufacturing process, tolerance class 7e is acceptable on finished product.

**Figure 5 — Threaded terminal**

## 5 Dimensions, threads and related items

### 5.1 Spark plug reach

The plug reach shall be in accordance with [Table 5](#) or [7](#) (see also [Figures 6](#) to [11](#)).

The following basic types of spark plug reach are defined:

— short: S

- medium: M
- long: L
- extended long: EL
- extra long: XL
- extended extra long: EXL

## 5.2 Gasket

The task of the gasket shall be to ensure a gas tight interface between the cylinder head and the spark plug under all operating conditions possible. The corresponding test conditions are defined in ISO 11565.

When unused spark plugs with flat seating have been tightened once with a torque, as specified in [Clause 7](#) and [Table 3](#), on threads that are clean, smooth, and dry, the gasket thickness shall be as specified in [Table 3](#). Non-captive gaskets may be used in special cases.

## 5.3 Threads, limiting dimensions and tolerances

The threads of spark plugs and the corresponding tapped holes in the cylinder heads shall conform to ISO 68-1, ISO 261, ISO 965-1 and ISO 965-3. Their limiting dimensions, minor diameters, basic profiles and initial clearances are specified in [Tables 1](#) and [2](#) respectively.

**Table 1 — Limiting dimensions**

Dimensions in millimetres

Thread size	Tolerance class	Dimension	Major diameter		Pitch diameter		Minor diameter	
			max.	min.	max.	min.	max.	min.
M18 × 1,5	6e	Plug thread (on finished plug)	17,933	17,697	16,959	16,819	16,092	not specified
	6H	Tapped hole in the cylinder head	not specified	18,000	17,216	17,026	16,676	16,376
M14 × 1,25	6e	Plug thread (on finished plug)	13,937	13,725	13,125	12,993	12,404	not specified
	6H	Tapped hole in the cylinder head	not specified	14,000	13,368	13,188	12,912	12,647
M12 × 1,25	6e	Plug thread (on finished plug)	11,937	11,725	11,125	10,993	10,404	not specified
	6H	Tapped hole in the cylinder head	not specified	12,000	11,368	11,188	10,912	10,647
M10 × 1	6g	Plug thread (on finished plug)	9,974	9,794	9,324	9,212	8,747	not specified
	6H	Tapped hole in the cylinder head	not specified	10,000	9,500	9,350	9,153	8,917