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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

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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).

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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.

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.

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.

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

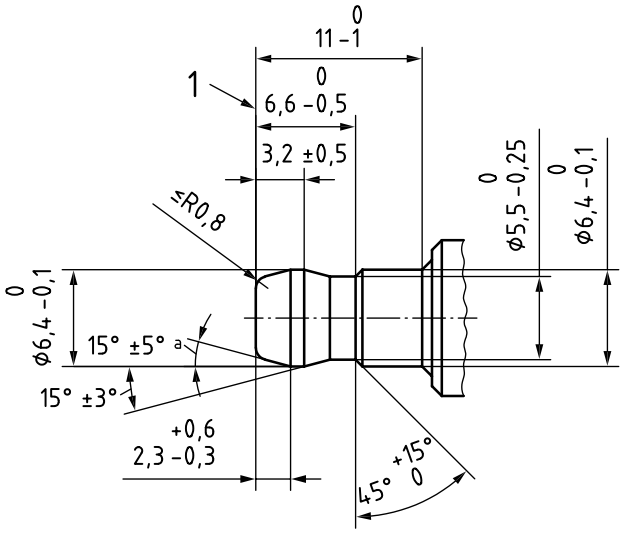
The type of terminal to be used shall be agreed between spark plug manufacturer and customer.

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

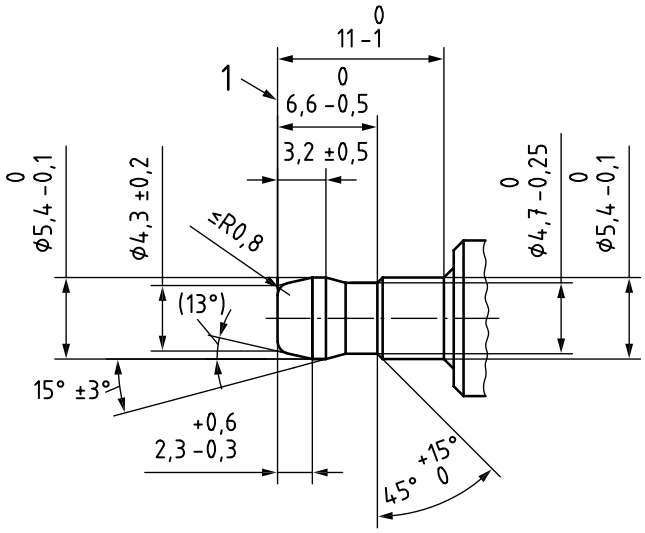


Key
1 reference plane
[a] For existing products, values between 7° and 30° are allowed.

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

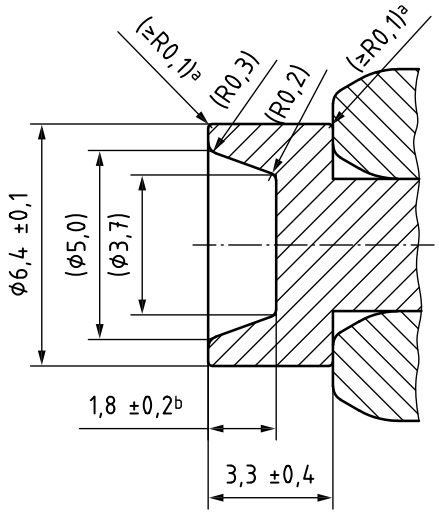
Figure 2 — Solid post terminal for M10 x 1 bi-hexagon 12 mm spark plugs

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



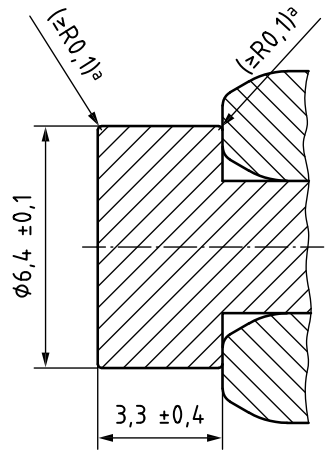
a Intention: no sharp edges, chamfer is allowed too.

b 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



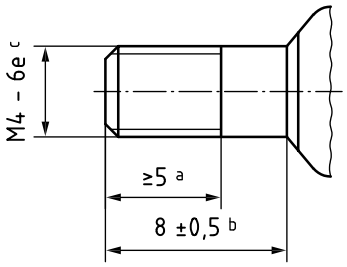
a Intention: no sharp edges, chamfer is allowed too.

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



a Length of usable thread.

b Cylindrical part.

c 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

Table 2 — Minor diameters, basic profiles and initial clearances for threads used

Dimensions in millimetres

Thread size	Minor diameter[a] d_{3max}	Fundamental deviation[b] es
M18 × 1,5 – 6e	d_{3max} = (16,376 – 0,067 – 0, 217) = 16,092	0,067
M14 × 1,25 – 6e	d_{3max} = (12,647 – 0,063 – 0,180) = 12,404	0,063
M12 × 1,25 – 6e	d_{3max} = (10,647 – 0,063 – 0,180) = 10,404	0,063
M10 × 1 – 6g	d_{3max} = (8,917 – 0,026 – 0,144) = 8,747	0,026

[a] The maximum value of the minor diameter, d_{3max}, is calculated according to ISO 965-1:2013, Clause 11 with a truncation of H/6, in accordance with the following formula: $d_{3max} = D_1 - es - 2(H/4 - H/6)$.

[b] The fundamental deviation (term used in ISO 965-1 instead of "initial clearance"), *es*, between the pitch diameters of the thread and of the tapped hole is intended to prevent the possibility of seizure, as a result of combustion deposits on the bare threads, when removing the spark plugs. This clearance is also intended to enable spark plugs with threads in accordance with this document to be fitted in existing tapped holes.

6 Other dimensions of spark plugs and their cylinder head housings

The other dimensions of spark plugs and their cylinder head housings shall be as indicated in Figures 6 to 11, Tables 6 to 10, and Figures A.1, A.2, and C.1.

The installed height, *l*, shall be measured when the spark plug has been tightened, as specified in Table 3 or 4. The contour of the insulator is optional; however, between the reference planes defined by the dimensions *c* and *d*, its diameter shall be *e*, as specified in Table 6 or 9.

The non-ribbed insulator design is preferred because it provides superior protection to dielectric tracking between the spark plug insulator and the cover.

The lengths of the cylinder head housing, *Z* and *Z′* (see Figures 10, 11, A.2, and C.1), shall be sufficient to ensure that the end of the spark plug thread does not project into the combustion chamber at any point when the spark plug is tightened to its maximum specified torque.

Alternative cylinder head housing with a combination of conical and flat seating is possible (see Annex C).

7 Installation torque

The installation tightening torque values in Tables 3 and 4 apply to new spark plugs without lubricant on the threads (production-related remains of lubricants are permitted). If threads are lubricated, the torque value in the table shall be reduced by approximately one-third to avoid overstressing.

Engine manufacturers may specify a different torque for the first spark-plug installation.

The torque values for measuring the gasket thickness and the installed height are also given in Table 3.

Table 3 — Tightening torque for spark plugs with flat seating

Thread size *n*	Cast-iron seating Torque N m	Aluminum alloy seating Torque N m	Measurement of gasket thickness and installed height		
			Torque N m	Gasket thickness mm	Installed height *l*
M18 x 1,5	45 to 70	35 to 50	50	1,0 to 2,2	see Table 6
M14 × 1,25	20 to 40	20 to 30	30	1,0 to 2,0	
M12 × 1,25	15 to 25	15 to 25	25	0,8 to 1,6	
M10 × 1	10 to 15	10 to 15	15	0,7 to 1,6	

Table 4 — Tightening torque for spark-plugs with conical seating

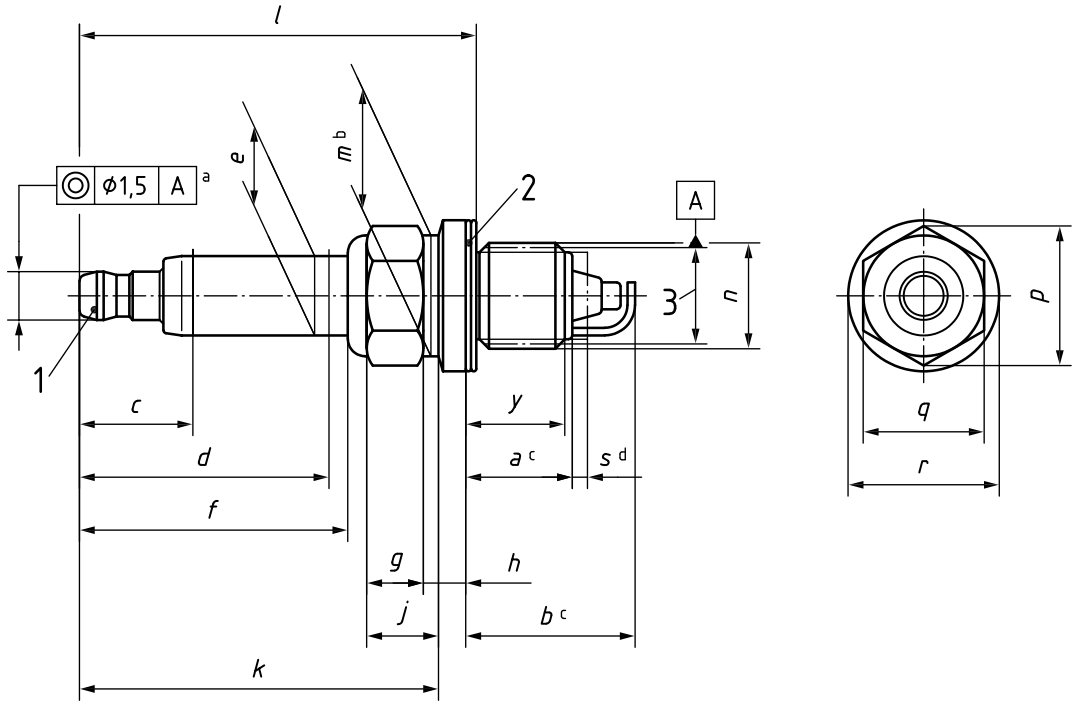
Thread size *n*	Cast-iron seating Torque N m	Aluminum alloy seating Torque N m	Measurement of installed height	
			Torque N m	Installed height *l*
M18 × 1,5	20 to 30	not specified	30	see Table 9
M14 × 1,25	10 to 20	10 to 20	20	
M12 × 1,25	10 to 20	10 to 15	15 (for Al alloy seating), 20 (for cast-iron seating)	

8 Spark plug dimensions

8.1 Spark plugs with flat seating

Figures 6 and 7 show the design principle for spark plugs with flat seating. The dimensions indicated in these figures are defined in Tables 6 and 7.

Dimensions in millimetres



Key

1 terminal according to options in Table 5

2 captive gasket

3 pitch diameter

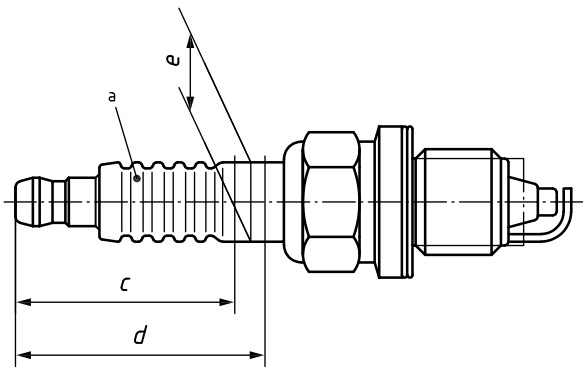
a This coaxiality does not apply to M14 x 1,25 spark plugs with 20,8 mm hexagon, to all compact types of spark plugs and to spark plugs with 12,7 mm reach.

b Optional.

c Dimension *b*-*a* is the spark plug projection, which is the maximum protrusion of any part of the spark plug into the combustion chamber.

d Dimension *s* is the protrusion of the metal shell into the combustion chamber.

Figure 6 — Example of spark plug with SAE terminal, non-ribbed insulator and hexagon



a Number and shape of ribs are optional.

Figure 7 — Example of spark plug with SAE terminal, ribbed insulator and hexagon

Table 5 — Possible spark-plugs designs with flat seating

Terminal	Insulator	Installation
SAE	Non-ribbed	Hex.
SAE	Ribbed	Hex.
Cup	Non-ribbed	Hex.
Cup	Ribbed	Hex.
Threaded	Non-ribbed	Hex.
Threaded	Ribbed	Hex.
SAE	Non-ribbed	Bi-hex.
SAE	Ribbed	Bi-hex.
Cup	Non-ribbed	Bi-hex.
Cup	Ribbed	Bi-hex.
Threaded	Non-ribbed	Bi-hex.
Threaded	Ribbed	Bi-hex.

Table 6 — Main dimensions of spark plugs with flat seating

Dimensions in millimetres

Thread size *n*	**Hexagon size** *q*	**Reach**		**Further shell dimensions**			**Installed height** *l*			**Insulator diameter** *e*[c] ±0,3
		Type[a]	*a*[b]	*s*[b]	*y* +0,3 –1,2	*b*	**SAE terminal**	**Threaded terminal**	**Cup terminal**	
M18 x 1,5	22,2	L	19	0	18	≤38,5	≤92,5	./.	./.	14,5 +0,5 / -0,6
	20,8									
M14 × 1,25	20,8	M	12,7	0	11,7	≤21	≤68	≤65	≤68	12,2
		L	19	0	18	≤27				
	19	S	9,5	0	9	≤16	≤48	≤45	≤48	
	16	L	19	0	18	≤27	$52,5^{+1}_{-2}$	49,5 ± 1,5	$52,5^{+1}_{-2}$	10,5
		EL	19	1,5 to 6	18	≤31				
		XL	26,5	0	25,5	≤34,5				
		EXL	26,5	1,5 to 6	25,5	≤38,5				

[a] See 5.1.

[b] The tolerance of (a + s) is ±0,2.

[c] The tolerance of the insulator diameter is ±0,3 mm, unless another tolerance is stated.

[d] If agreed between spark plug and engine manufacturer, an insulator diameter of e = (8,0 ± 0,3) mm is also acceptable.

Table 6 *(continued)*

Thread size *n*	Hexagon size *q*	Reach		Further shell dimensions			Installed height *l*			Insulator diameter *e*[c] ±0,3
		Type[a]	*a*[b]	*s*[b]	*y* +0,3 −1,2	*b*	SAE terminal	Threaded terminal	Cup terminal	
M12 × 1,25	16	L	19	0	18	≤27	$52{,}5^{+1}_{-2}$	49,5 ± 1,5	$52{,}5^{+1}_{-2}$	10,5
		EL	19	1,5 to 6	18	≤31				
		XL	26,5	0	25,5	≤34,5				
		EXL	26,5	1,5 to 6	25,5	≤38,5				
	14	L	19	0	18	≤27				9,0
		EL	19	1,5 to 6	18	≤31				
		XL	26,5	0	25,5	≤34,5				
		EXL	26,5	1,5 to 6	25,5	≤38,5				
	Bi-hex. 14	L	19	0	18	≤27				10,5
		EL	19	1,5 to 6	18	≤31				
		XL	26,5	0	25,5	≤34,5				
		EXL	26,5	1,5 to 6	25,5	≤38,5				
M10 × 1	16	S	9,5	0	9	≤16	≤44,5	≤43	≤44,5	10,5
		M	12,7	0	11,7	≤19				
		M	12,7	0	11,7	≤21	$52{,}5^{+1}_{-2}$	49,5 ± 1,5	$52{,}5^{+1}_{-2}$	
		L	19	0	18	≤27				
		EL	19	1,5 to 6	18	≤31				
		XL	26,5	0	25,5	≤34,5				
		EXL	26,5	1,5 to 6	25,5	≤38,5				
	14	L	19	0	18	≤27	$52{,}5^{+1}_{-2}$	49,5 ± 1,5	$52{,}5^{+1}_{-2}$	9,0
		XL	26,5	0	25,5	≤38,5				
	Bi-hex. 12	L	19	0	18	≤27				7,5[d]
		XL	26,5	0	25,5	≤38,5				

[a] See 5.1.

[b] The tolerance of (a + s) is ±0,2.

[c] The tolerance of the insulator diameter is ±0,3 mm, unless another tolerance is stated.

[d] If agreed between spark plug and engine manufacturer, an insulator diameter of e = (8,0 ± 0,3) mm is also acceptable.

Table 7 — Further dimensions of spark plugs with flat seating

Dimensions in millimetres

Thread size n	Hexagon size q	Terminal	Insulator	c	d	f_{min}	g_{min}	h_{min}	j_{min}	k_{min}	Ø m_{max}	Ø r	P_{min}
M18 x 1,5	$22,2^{+0,13}_{-0,4}$	SAE	non-ribbed	16	38	50	4	4	5	59		≤24,8	24,5
			ribbed	33									
	$20,8^{+0}_{-0,4}$		non-ribbed	16									23
			ribbed	33									
M14 × 1,25	$20,8^{+0}_{-0,4}$	SAE or cup	non-ribbed	15	33	a	4	10	a	a	a	≤20,8	23
			ribbed	29									
		threaded	non-ribbed	12	30								
			ribbed	26									
	19 h13	SAE or cup	non-ribbed	15	24	a	3	3	a	a	a	a	21
			ribbed	20									
		threaded	non-ribbed	12	21								
			ribbed	17									
	16 h13	SAE or cup	non-ribbed	15	33	34	4		5	44	16	≤20	17,5
			ribbed	29									
		threaded	non-ribbed	12	30	31				41			
			ribbed	26									
M12 × 1,25	16 h13	SAE or cup	non-ribbed	15	33	34	4	6	5	a	a	15,3 to 17,5	17,5
			ribbed	29									
		threaded	non-ribbed	12	30	31							
			ribbed	26									
	14 h13	SAE or cup	non-ribbed	15	33	34				44	14	≤17,5	15,4
			ribbed	29									
		threaded	non-ribbed	12	30	31				41			
			ribbed	26									
	14 h13 Bi-hex.	SAE or cup	non-ribbed	15	33	34				44			
			ribbed	29									
		threaded	non-ribbed	12	30	31				41			
			ribbed	26									

[a] Value not specified.

Table 7 *(continued)*

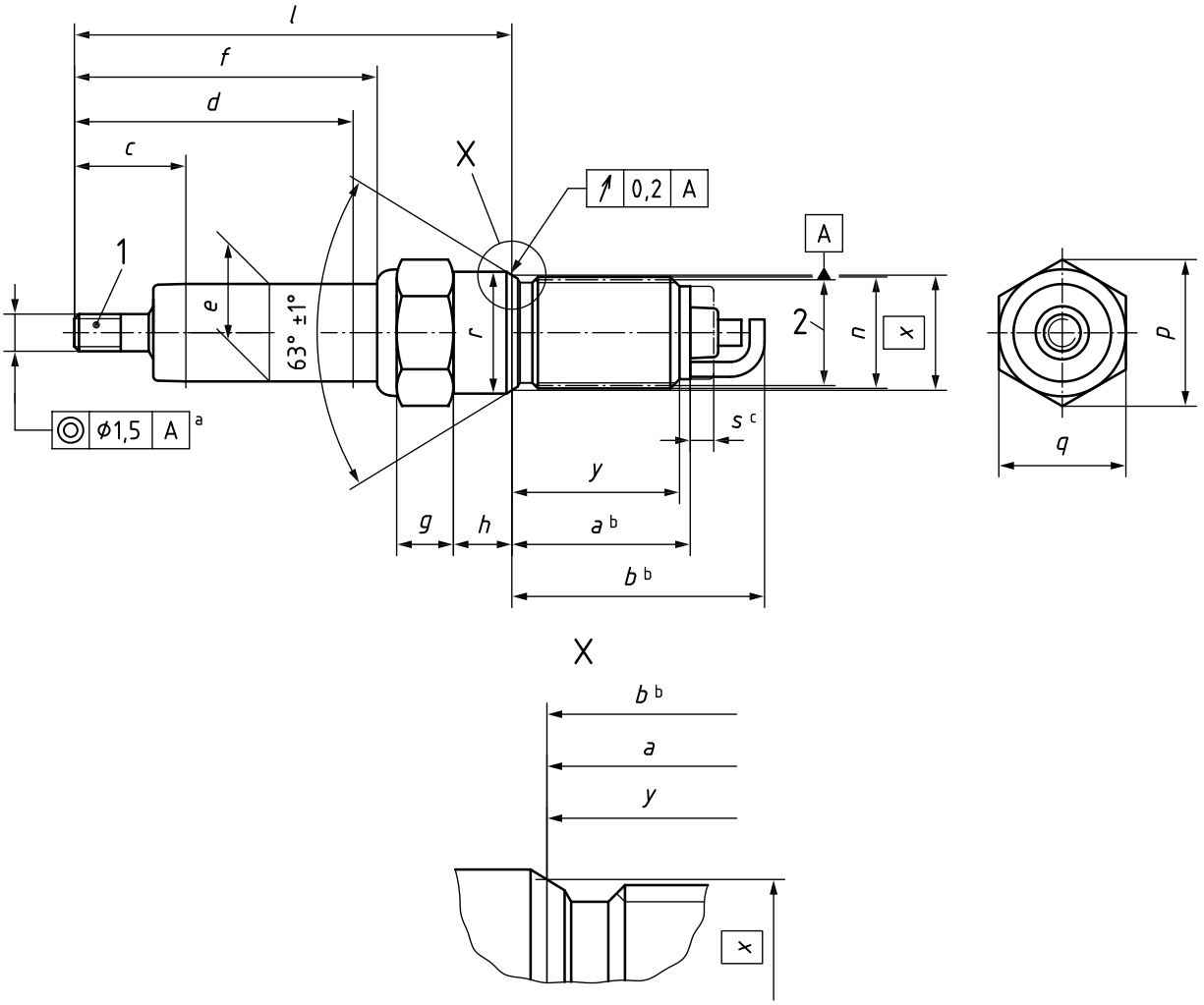
Thread size n	**Hexagon size** q	**Termi-nal**	**Insulator**	c	d	f_{min}	g_{min}	h_{min}	j_{min}	k_{min}	Ø m_{max}	Ø r	P_{min}
M10 × 1	16 h13	SAE or cup	non-ribbed	15	33	34	4	6	a	a	a	≤16	17,5
			ribbed	29									
		threaded	non-ribbed	12	30	31							
			ribbed	26									
		SAE or cup	non-ribbed	12	21	a	3	3	4				
			ribbed	17									
		threaded	non-ribbed	10,5	19,5								
			ribbed	15,5									
	14 h13	SAE or cup	non-ribbed	15	33	34	4	6	5	44	14		15,4
			ribbed	29									
		threaded	non-ribbed	12	30	31				41			
			ribbed	26									
	12 h12 Bi-hex.	SAE or cup	non-ribbed	15	33	34				44	12		13,3
			ribbed	29									
		threaded	non-ribbed	12	30	31				41			
			ribbed	26									

[a] Value not specified.

8.2 Spark plugs with conical seating

Figures 8 and 9 show the design principle for spark plugs with conical seating. The dimensions indicated in these figures are defined in Tables 9 and 10.

Dimensions in millimetres



Key

1 solid post terminal

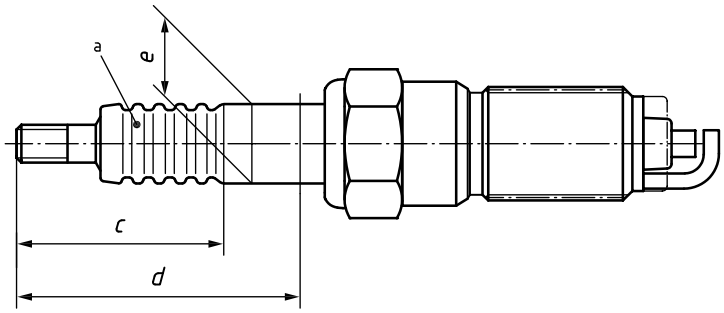
2 pitch diameter

a This coaxiality does not apply to M18 x 1,5 spark plugs r to any compact types of spark plugs.

b Dimension *b*-*a* is the spark plug projection, which is the maximum protrusion of any part of the spark plug into the combustion chamber.

c Dimension *s* is the protrusion of the metal shell into the combustion chamber.

Figure 8 — Example of spark plug with SAE terminal and non-ribbed insulator



a Number and shape of ribs are optional.

Figure 9 — Example of spark plug with solid post terminal and ribbed insulator

Table 8 — Possible spark plug designs with conical seating

Terminal	Insulator	Installation
SAE	Non-ribbed	Hex
SAE	Ribbed	Hex
Cup	Non-ribbed	Hex
Cup	Ribbed	Hex
Threaded	Non-ribbed	Hex
Threaded	Ribbed	Hex

Table 9 — Main dimensions of spark plugs with conical seating

Dimensions in millimetres

Thread size *n*	**Hexagon size** *q*	**Reach**		**Further shell dimensions**			**Installed height** *l*			**Insulator diameter** *e* ±0,3
		Type[a]	*a*[b]	*s*[b]	*y* $^{+0,3}_{-1,2}$	*b*	**SAE terminal**	**Threaded terminal**	**Cup terminal**	
M18 × 1,5	20,8		10,9	[c]	9,9	≤20	≤68	≤65	./.	12,2
M14 × 1,25	16	M	11,2	[c]	10,2	≤19	53^{+1}_{-2}	50 ± 1,5	53^{+1}_{-2}	10,5
		L	17,5	[c]	16,5	≤25				
		XL	25	[c]	24	≤32,5				
		—	7,8	[c]	7,3	≤14	≤38	≤35	./.	10,5
M12 × 1,25	14	L	17,5	[c]	16,5	≤25	53^{+1}_{-2}	n.a.	53^{+1}_{-2}	9,0
		XL	25	c	24	≤32,5				

a See 5.1.

b The tolerance of (a + s) is ±0,3.

c Value not specified.

Table 10 — Further dimensions of spark plugs with conical seating

Dimensions in millimetres

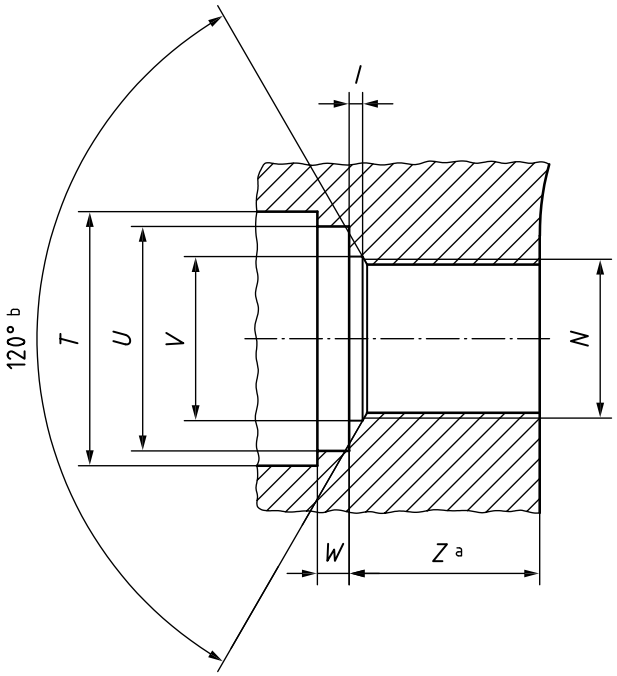
Thread size n	Hexagon size q	Terminal	Insulator	c	d	f_{min}	g_{min}	h_{min}	Ø r	Ø x	P_{min}
M18 × 1,5	$20{,}8^{+0}_{-0{,}4}$	SAE	non-ribbed	15	33	a	4	12	19,9 to 20,8	19	23
			ribbed	29							
		threaded	non-ribbed	12	30	a					
			ribbed	26							
M14 × 1,25	16 h13	SAE or cup	non-ribbed	15	33	34	4	8,2	15,5 to 16,0	14,8	17,5
			ribbed	29							
		threaded	non-ribbed	12	30	31					
			ribbed	26							
		SAE or cup	non-ribbed	15	24	a	3	3			
			ribbed	20							
		threaded	non-ribbed	12	21	a					
			ribbed	17							
M12× 1,25	14 h13	SAE or cup	non-ribbed	15	33	34	4	8,2	13,4 to 14,3	12,8	15,4
			ribbed	29							

[a] Value not specified.

9 Cylinder head housings

9.1 Cylinder head housing for spark plugs with flat seating

Figure 10 shows the design principle of the cylinder head housings for spark plugs with flat seating. The dimensions indicated in Figure 10 are defined in Table 11.



a The Z length of the cylinder head housing shall be sufficient to ensure that the end of the spark plug thread does not project into the combustion chamber at any point when the spark plug is tightened to maximum torque.

b Nominal.

Figure 10 — Cylinder head housing for flat seating

Table 11 — dimensions for flat seating

Dimensions in millimetres

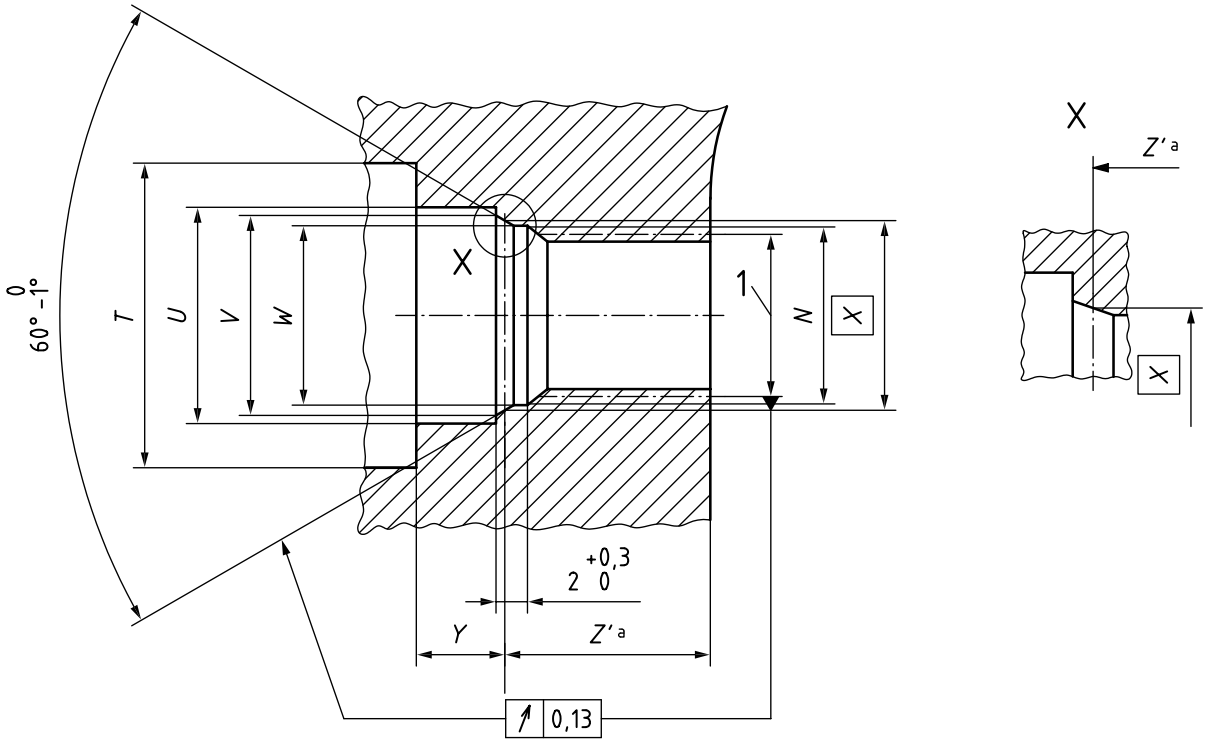
Thread size *N*	**Hexagon size of spark-plug** *q*	Ø T_{min}	Ø U_{min}	Ø V_{max}	W_{max}	I_{max}
M18 x 1,5	22,2	33	25	19	9	
	20,8	30	22	19	9	
M14 × 1,25	20,8	30	22	14,5	9	1,7
	19				2	
	16	24	21,2		3	
M12 × 1,25	16	24	19	12,5	5	
	14	21				
	Bi-hex. 14					
M10 × 1	16	25	17	10,5	5	
					2[b]	
	14	21			5	
	Bi-hex. 12	19				

a Combined seat in accordance with Annex C is possible.

b Applied only to compact types of spark plugs.

9.2 Cylinder head housing for spark plugs with conical seating

Figure 11 shows the design principle of cylinder head housings of spark plugs with conical seating. The dimensions indicated in Figure 11 are defined in Table 12.



Key

1 pitch diameter

a The Z' length of the cylinder head housing shall be sufficient to ensure that the end of the spark plug thread does not project into the combustion chamber at any point when the spark plug is tightened to maximum torque.

Figure 11 — Cylinder head housing for conical seating

Table 12 — Cylinder head housing dimensions for conical seating

Dimensions in millimetres

Thread size N	**Hexagon size of spark-plug** q	$\varnothing T_{min}$	$\varnothing U_{min}$	$\varnothing V^{+0,3}_{0}$	$\varnothing W^{+0,15}_{0}$	$\varnothing X$	Y_{max}
M18 × 1,5	20,8	31	22	19,5	18,25	19	9
M14 × 1,25	16	24	17	15,1	14,25	14,8	5,5
							2[b]
M12 × 1,25	14	21	15	13,1	12,25	12,8	5,5

a Combined seat in accordance with Annex C is possible.

b Applied only to compact types of spark plugs.

Annex A
(normative)

Spark plugs with half thread and their cylinder head housings

Figure A.1 shows the design principle of a spark-plug with half thread including the related dimensions. The dimensions of the cylinder head housing for spark plugs with half thread are shown in Figure A.2.

Dimensions in millimetres

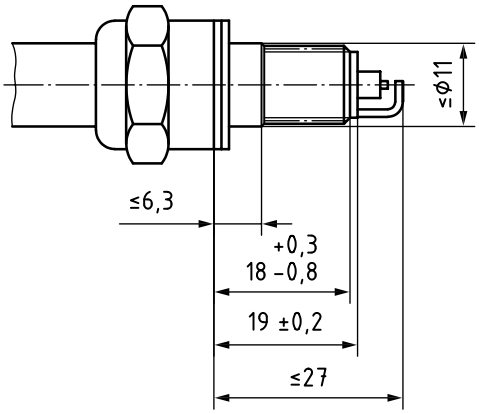
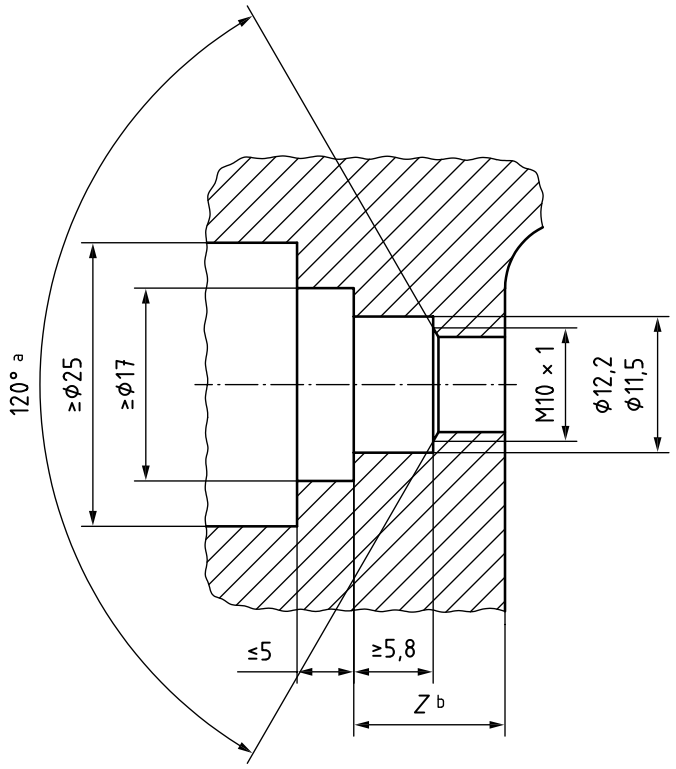


Figure A.1 — Spark plug with half thread

Dimensions in millimetres



a Nominal.

b The Z length of the cylinder head housing shall be sufficient to ensure that the end of the spark plug thread does not project into the combustion chamber at any point when the spark plug is tightened to maximum torque.

Figure A.2 — Cylinder head housing for spark plug with half thread

Annex B
(informative)

Optional terminals for compact spark plugs

Annex B specifies the dimensions of the solid post terminals and threaded terminals for non-automotive application spark plugs (Figures B.1 - B.3).

Dimensions in millimetres

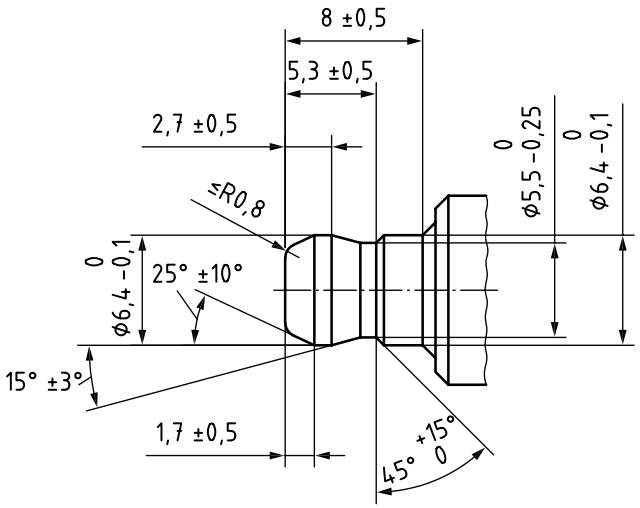


Figure B.1 — Solid post terminal for compact spark plugs

Dimensions in millimetres

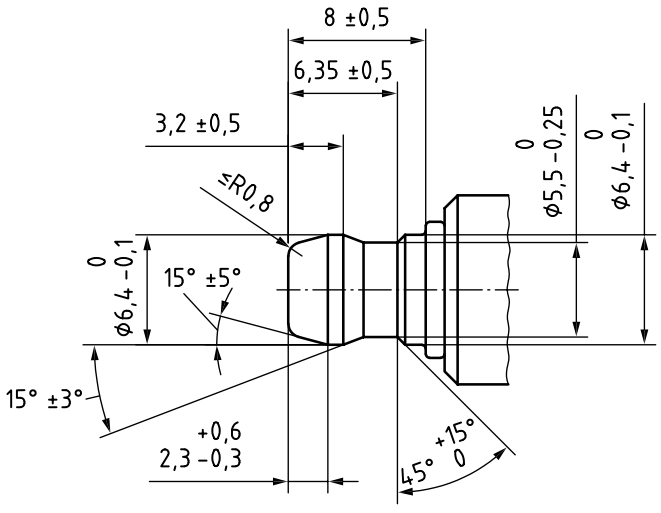
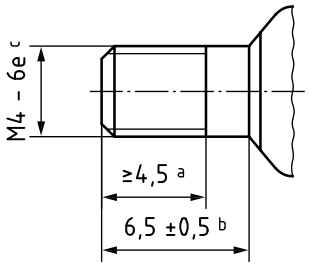


Figure B.2 — Alternative solid post terminal for compact spark plugs

Dimensions in millimetres



a Length of thread.

b Cylindrical part.

c Depending on manufacturing process, class 7e is acceptable on finished product.

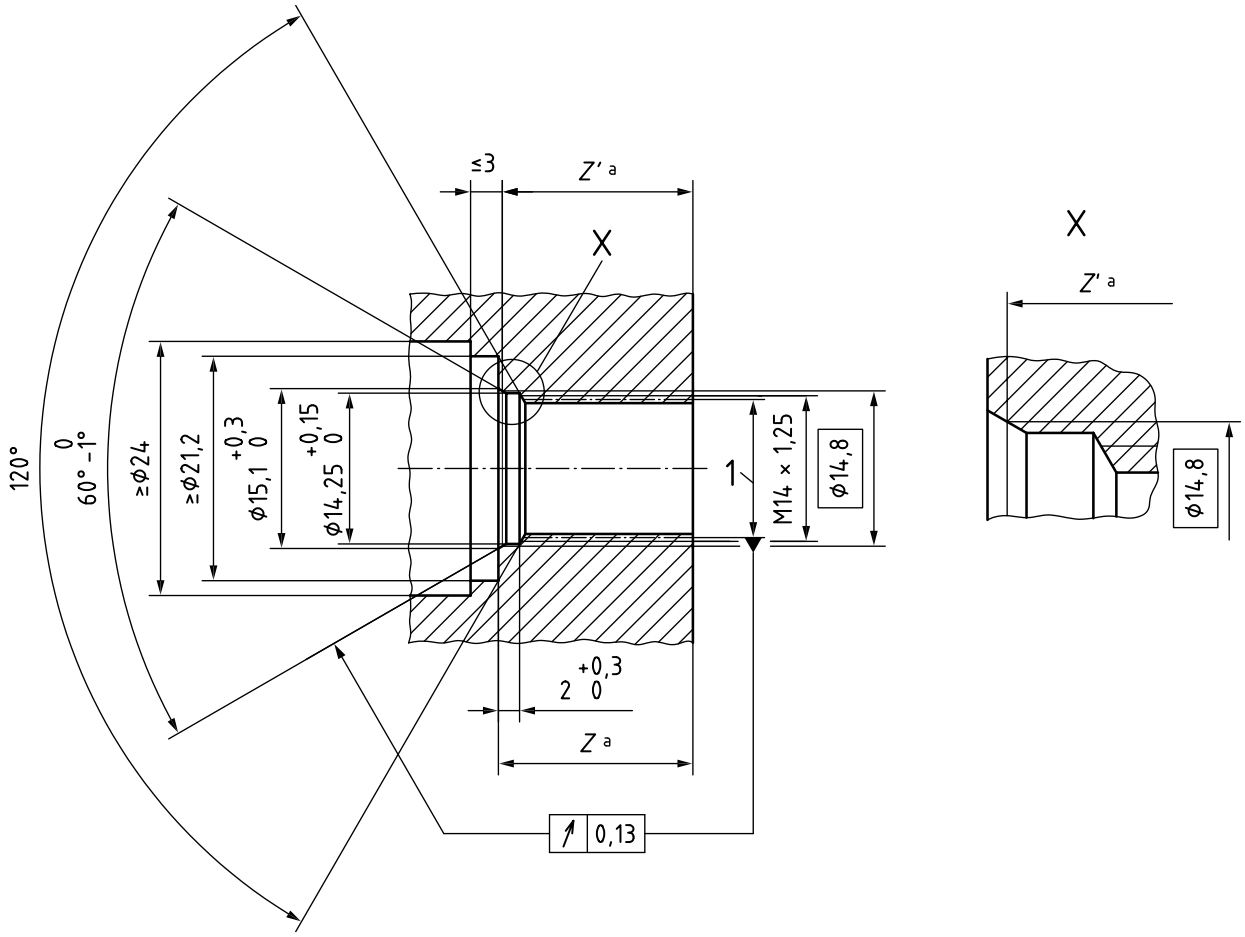
Figure B.3 — Threaded terminal for compact spark plugs

Annex C
(normative)

Optional combination cylinder head housing for park plugs with conical or flat seating

This combination cylinder head housing is only used for 14 mm spark plugs with a seating diameter of less than 21 mm.

Dimensions in millimetres



Key

1 pitch diameter

a The Z and Z' lengths of the cylinder head housing shall be sufficient to ensure that the end of the spark plug thread does not project into the combustion chamber at any point when the spark plug is tightened to maximum torque. Z' is the distance from the end of the cylinder head to the measurement point of the gauge diameter.

Figure C.1 — Optional combination cylinder head housing

Bibliography

[1] ISO 965-1:2013, *ISO general purpose metric screw threads — Tolerances — Part 1: Principles and basic data*

[2] ISO 3412, *Road vehicles — Screened and waterproof spark-plugs and their connections — Types 1A and 1B*

[3] ISO 3895, *Road vehicles — Screened and waterproof spark-plug and its connection — Type 2*

[4] ISO 3896, *Road vehicles — Screened and waterproof spark-plug and its connection — Type 3*

[5] ISO 4095, *Aerospace — Bihexagonal drives — Wrenching configuration — Metric series*

[6] ISO 11565, *Road vehicles — Spark-plugs — Test methods and requirements*

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