INTERNATIONAL STANDARD

ISO 6856

Third edition
2005-02-15

Road vehicles — Unscreened high-voltage ignition cable assemblies — Test methods and general requirements

Véhicules routiers — Assemblages de câbles d'allumage haute tension non blindés — Méthodes d'essai et exigences générales

Reference number
ISO 6856:2005(E)

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Published in Switzerland

Foreword

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International Standards are drafted in accordance with the rules given in the ISO/IEC Directives, Part 2.

The main task of technical committees is to prepare International Standards. Draft International Standards adopted by the technical committees are circulated to the member bodies for voting. Publication as an International Standard requires approval by at least 75 % of the member bodies casting a vote.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights.

ISO 6856 was prepared by Technical Committee ISO/TC 22, *Road vehicles*, Subcommittee SC 1, *Ignition equipment*.

This third edition cancels and replaces the second edition (ISO 6856:1990), which has been technically revised.

Road vehicles — Unscreened high-voltage ignition cable assemblies — Test methods and general requirements

1 Scope

This International Standard specifies test methods and general requirements for unscreened high-voltage ignition cable assemblies, and is applicable to all such assemblies used in road vehicle applications.

2 Normative references

The following referenced documents are indispensable for the application 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 9227, *Corrosion tests in artificial atmospheres — Salt spray tests*

ISO 3808-2, *Road vehicles — Unscreened high-tension ignition cables — Part 2: Cable classes, types, applicable tests and special requirements*

3 Test methods

3.1 General

3.1.1 Preconditioning

Precondition all test samples at (23 ± 5) °C and at 10 % to 75 % relative humidity for 24 h before starting any test sequence.

3.1.2 General test conditions

All tests shall be carried out at an ambient temperature of (23 ± 5) °C, unless otherwise specified.

Each test sequence shall be started with unused test samples.

Cables shall be in accordance with ISO 3808-2, and the cable(s) used shall be noted in the test report.

Cable attachment shall be performed in accordance with customer requirements and/or industry specification.

During the whole test sequence, no lubrication or other additional means on the contact surface making possible better test results shall be permitted. Production-related remains of lubricants on the contacts are allowed.

3.1.3 Visual examination

3.1.3.1 Test

Carry out visual examination with the naked eye, corrected, if necessary, to give normal strength of vision and normal colour perception, at the most favourable viewing distance and with suitable illumination.

3.1.3.2 Requirements

Visual examination in accordance with 3.1.3.1 shall allow identification, appearance, workmanship and finish of the item to be checked against the relevant specification.

During visual examination, special care shall be taken to ensure that — as a minimum requirement — no cracking, significant discoloration, deformation or (where applicable) ingress of water is in evidence.

3.2 Insertion and removal forces of high-voltage connectors

3.2.1 General

The insertion and removal forces shall be measured at an ambient temperature of (23 ± 5) °C, using a gauge as shown in Figure 1, 2, 3 or 4 dependant on the high-voltage connector type.

The gauge and the connector to be measured shall be dry and clean.

Insertion and removal forces shall be the forces between the high-voltage terminal of the ignition coils, the distributors or the spark-plugs and the cable connector. Any other force from covers or boots shall not be taken into account.

Perform ten insertions and removals.

3.2.2 Insertion force

The insertion force shall be measured at the first insertion.

Maximum value: 80 N

3.2.3 Removal force

3.2.3.1 Test

The removal force measurement shall be carried out by using a suitable test apparatus at a constant test speed of 100 mm/min or 200 mm/min or 500 mm/min. The exact speed used shall be agreed between customer and supplier and recorded in the test report.

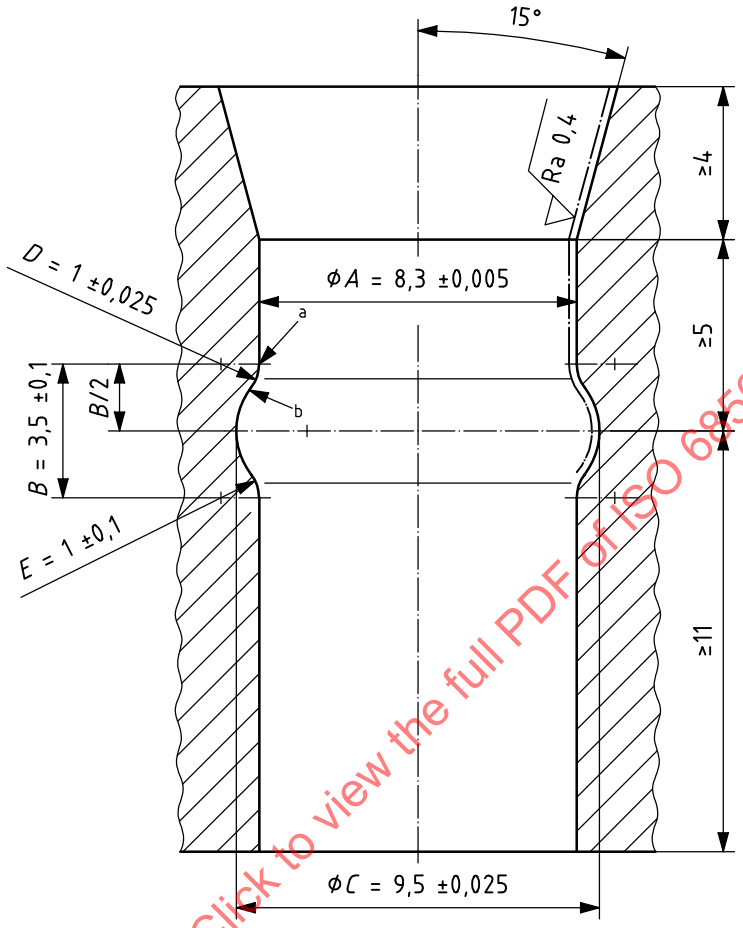
The removal force shall be measured at the tenth removal.

3.2.3.2 Requirements

Maximum value: 70 N

Minimum value: 20 N

Dimensions in millimetres
Surface roughness values in micrometres



The gauge shall be of hardened steel.

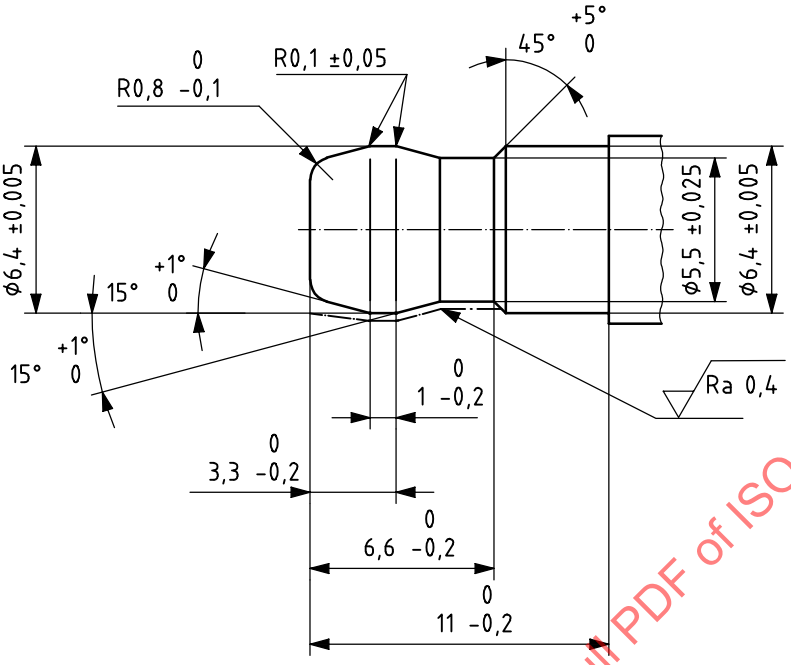
NOTE The tolerances given for the gauge dimensions also include wear tolerances. Dimensions A and D are the most critical.

a Tangential slope from diameter A to radius D.

b Tangential slope from radius D to radius F. The value of F is implicitly determined by the values of dimensions A, B, C, D and E.

Figure 1 — Gauge for measurement of insertion and removal forces of high-voltage connectors — Socket type high-voltage connection for ignition coils and distributors

Dimensions in millimetres
Surface roughness values in micrometres



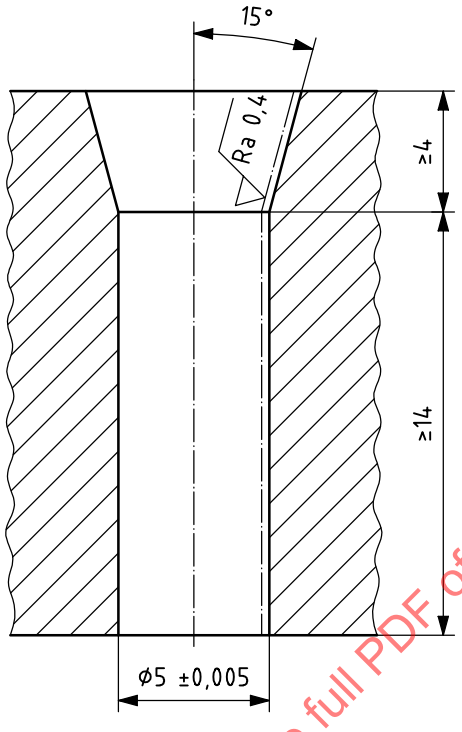
The gauge shall be of hardened steel.

The tolerances given for the gauge dimensions also include wear tolerances.

Dimension (6,4 mm ± 0,005 mm) and angle $15\,^{+1}_{0}\,^{\circ}$ are the most critical.

Figure 2 — Gauge for measurement of insertion and removal forces of high-voltage connectors — Spark-plugs with solid-post terminals, and ignition coils and distributors with plug-type high-voltage connections

Dimensions in millimetres

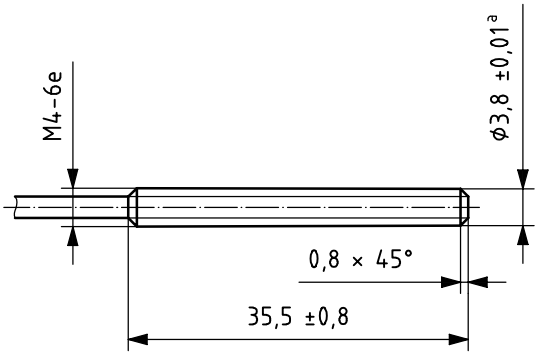


The gauge shall be of hardened steel.

The tolerances given for the gauge dimensions also include wear tolerances.

Figure 3 — Gauge for measurement of insertion and removal forces of high-voltage connectors — Ignition coils and distributors (5 mm cable type)

Dimensions in millimetres



The gauge shall be of hardened steel.

The tolerance given for the outside diameter of the gauge threaded part also includes wear tolerance.

[a] Outside diameter.

Figure 4 — Gauge for measurement of insertion and removal forces of high-voltage connectors — Spark-plugs with threaded terminals

3.3 Separation forces of cables from connector

3.3.1 Test

Place the cable assembly in a hot air oven with natural draught and expose it to the test temperature for 1 h in accordance with Table 1.

Table 1 — Test temperatures for separation forces

Cable classes according to ISO 3808	Test temperature °C
A, B	70
C, D, E, F	90

As soon as possible (1 min max.) after removing the specimen from the oven, or in the oven itself if the apparatus permits, measure the separation force using a suitable test apparatus at a constant test speed of 100 mm/min, 200 mm/min or 500 mm/min. The exact speed used shall be agreed between customer and supplier and recorded in the test report.

3.3.2 Requirements

There shall be neither mechanical separation nor electrical interruption between the cable and the connector until the force is at least 10 N above the first measured removal force.

Whether any change of ohmic resistance in the case of suppression cables may be permitted following the test is to be agreed between customer and supplier.

3.4 Electrical insulation tests

3.4.1 General

The two following tests 3.4.2 and 3.4.3 are intended to be carried out alternatively. Either may be chosen according to the intention of the user; there is no need to perform both tests with one sample.

3.4.2 Sealing test (in NaCl/water solution)

3.4.2.1 Arrangement of samples

Fit the samples with test cable(s) and connect them to the corresponding part(s) in accordance with the application. Do not disconnect the connections at any time during the entire test.

3.4.2.2 Preconditioning of the samples

Preconditioning causes any trapped air to escape, producing a tight seat between the connecting parts.

Expose the samples to 20 temperature shocks of $(+90 \pm 2)$ °C to (-20 ± 2) °C. Then test the entire arrangement in accordance with Figure 5 in a 3 % NaCl/water solution. The ends of the sealing parts shall be a minimum of 2 mm below the surface of the liquid.

3.4.2.3 High-voltage pulses

Apply pulses in accordance with the following specifications.

Voltage rise time [(0,1 to 0,9) U_{sec}]: (80 ± 25) µs at 150 pF.

Pulse width (0,1 U_{sec}): (290 ± 85) µs at 150 pF.

3.4.2.4 Test conditions

Pulse rate: 50 Hz or 60 Hz.

Test duration: 24 h.

Voltage: see Table 2.

Start of test: immediately after immersion of the sample in the liquid.

Table 2 — Voltage classes and peak voltages

Voltage class	a	b	c	d	e	f
Peak voltage kV ± 1,0 kV	13	16	19	22	26	31

3.4.2.5 Requirement

During the entire test no spark-over or breakdown is permitted.

3.4.3 Breakdown test

3.4.3.1 Arrangement of the samples

Fit the samples with test cable(s) and connect them to the corresponding part(s) in accordance with the application. Do not disconnect the connections at any time during the entire test.

3.4.3.2 Preconditioning of samples

Preconditioning causes any trapped air to escape, producing a tight seat between the connecting parts.

Expose the samples to 20 temperature shocks of (+ 90 ± 2) °C to (– 20 ± 2) °C. Then test the entire arrangement in steel balls in accordance with Figure 5.

3.4.3.3 High-voltage pulses

Apply pulses in accordance with the following specifications.

Voltage rise time [(0,1 to 0,9) U_{sec}]: (80 ± 25) µs at 150 pF.

Pulse width (0,1 U_{sec}): (290 ± 85) µs at 150 pF.

3.4.3.4 Test conditions

Pulse rate: 50 Hz or 60 Hz.

Test duration: 1 h.

Voltage: see Table 3.

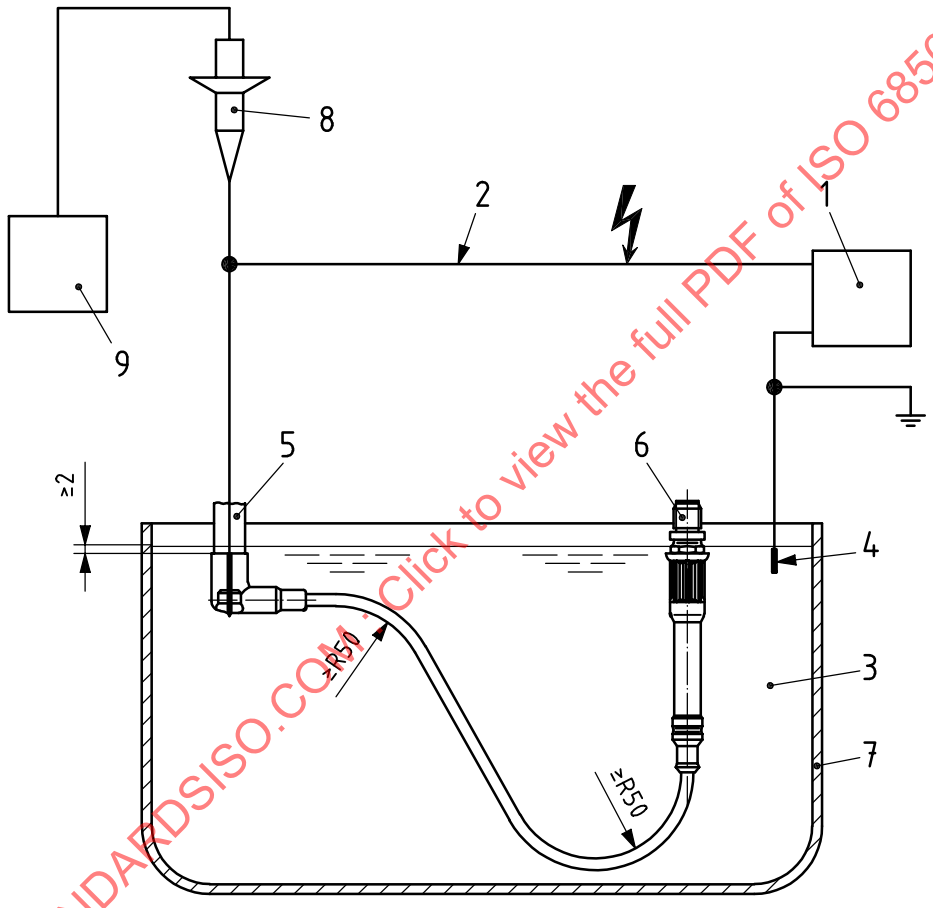
Table 3 — Voltage classes and peak voltages

Voltage class		a	b	c	d	e	f
Peak voltage	kV ± 1,0 kV	19	22	25	28	31	35

3.4.3.5 Requirement

During the entire test no spark-over or breakdown is permitted.

Dimensions in millimetres



Key

1 high-voltage pulse generator
2 high-voltage ignition cable
3 NaCl/water solution according to 3.4.2 or steel balls ∅ ≈ 3 mm according to 3.4.3
4 electrode (grounded)
5 high-voltage terminal (as agreed between vehicle and equipment manufacturers) (e.g. distributor, ignition coil)
6 spark-plug insulator
7 transparent container
8 high-voltage probe 1:1 000
9 oscilloscope

Figure 5 — Electrical insulation test set-up