INTERNATIONAL STANDARD

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Road vehicles — Unscreened high-tension ignition cable assemblies — General requirements and test methods

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

INTERNATIONAL ISO

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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.

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.

International Standard ISO 6856 was prepared by Technical Committee ISO/TC 22, *Road vehicles*.

This second edition cancels and replaces the first edition (ISO 6856:1981), of which it constitutes a technical revision.

Annex A of this International Standard is for information only.

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Road vehicles — Unscreened high-tension ignition cable assemblies — General requirements and test methods

1 Scope

This International Standard specifies the general requirements and test methods for unscreened high-tension ignition cable assemblies.

It applies to all types of unscreened high-tension ignition cable assemblies used in road vehicle applications.

2 Normative references

The following standards contain provisions which, through reference in this text, constitute provisions of this International Standard. At the time of publication, the editions indicated were valid. All standards are subject to revision, and parties to agreements based on this International Standard are encouraged to investigate the possibility of applying the most recent editions of the standards indicated below. Members of IEC and ISO maintain registers of currently valid International Standards.

ISO 3768:1976, *Metallic coatings — Neutral salt spray test (NSS test).*

ISO 3808-2:1980, *Road vehicles — Unscreened high-tension ignition cables — Part 2: Cable classes, types, applicable tests and special requirements.*

3 Test methods

3.1 Insertion and removal forces of high-tension connectors

The insertion and removal forces shall be measured at an ambient temperature of 23 °C ± 5 °C with the gauge specified in 3.1.3 (see figure 1), 3.1.4 (see figure 2) and 3.1.5 (see figure 3).

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

Insertion and removal forces shall be the forces between the high-tension 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.

3.1.1 Insertion force

The insertion force shall be measured at the first insertion.

Maximum value: 80 N

3.1.2 Removal force

The removal force measurement shall be carried out by 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.

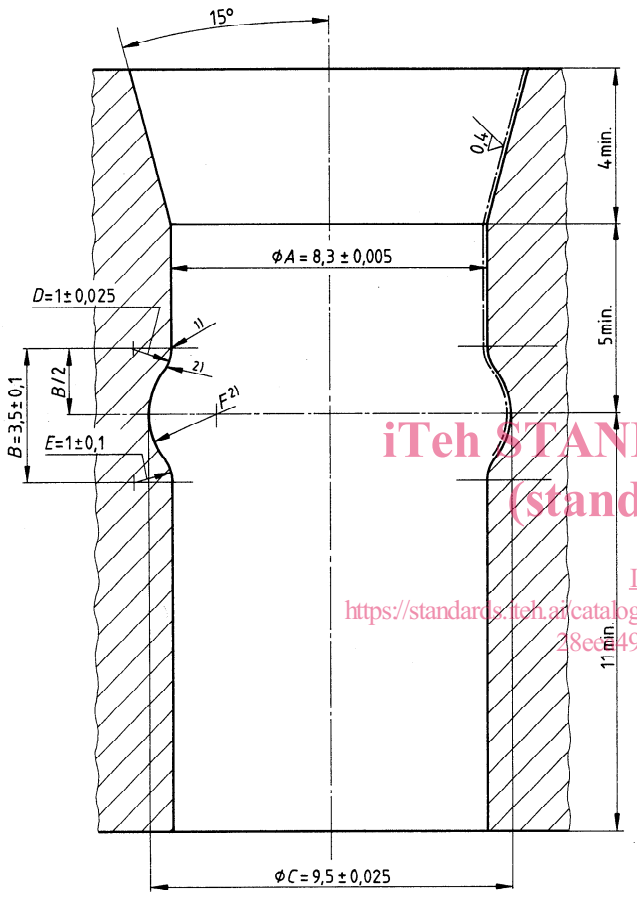
The minimum value of the removal force shall be measured at the tenth removal.

Maximum value: 70 N
Minimum value: 20 N

3.1.3 Gauge for measurement of insertion and removal forces of high-tension connectors for socket type high-tension connection for ignition coils and distributors

See figure 1.

Dimensions in millimetres,
surface roughness values in micrometres



1) Tangential slope from diameter A to radius D.

2) 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.

NOTES

1 The gauge shall be of hardened steel.

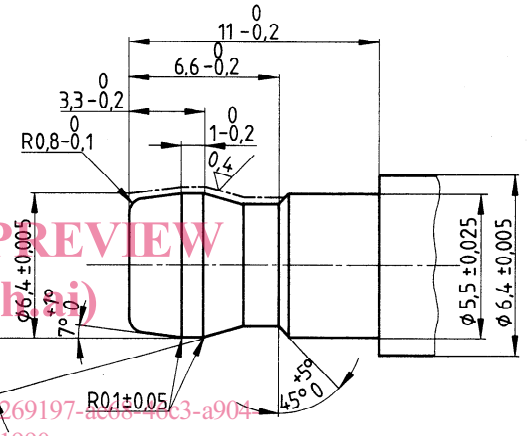
2 The tolerances given for the gauge dimensions also include wear tolerances. Dimensions A and D are the most critical.

Figure 1

3.1.4 Gauge for measurement of insertion and removal forces of high-tension connectors for spark-plugs with post terminals and for ignition coils and distributors with plug-type high-tension connections

See figure 2.

Dimensions in millimetres,
surface roughness values in micrometres



NOTES

1 The gauge shall be of hardened steel.

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

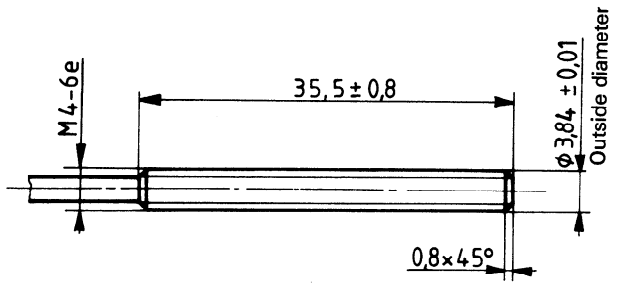
Dimension 6,4 ± 0,005 and angles 7° $^{+1^\circ}_{0}$ and 15° $^{+1^\circ}_{0}$ are the most critical.

Figure 2

3.1.5 Gauge for measurement of insertion and removal forces of high-tension connectors for spark-plugs with threaded terminals

See figure 3.

Dimensions in millimetres



NOTES

1 The gauge shall be of hardened steel.

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

Figure 3

3.2 Separation forces of cables from connector

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

Table 1

Cable classes according to ISO 3802-2	Test temperature
A, B	70 °C
C, D, E, F	90 °C

As soon as possible (1 min max.) after removing the specimen from the oven, or in the oven itself if the apparatus permits, the separation force shall be measured by 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.

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.

3.3 Electric insulation tests

3.3.1 Sealing tests

Install the cable assemblies to be tested in an appropriate fixture (for an example, see figure A.1), making sure the terminals fully index and that the covers, towers and high-tension connectors are properly positioned. Place the fixture and attached cables in a suitable tank and fill with a salt solution 3 % (*m*/*m*) of NaCl in water at a temperature of 23 °C ± 5 °C until the covers are submerged to a depth of approximately 2 mm above the top end of the covers (see figure A.1).

Connect an ignition system, as applicable, to the fixture through the terminals in the coil and distributor cap of the fixture. Ensure that the fixture and salt water are grounded to complete the high voltage circuit.

The connection cable and wires between the fixture's distributor and coil caps and the ignition system shall have copper conductors. A d.c. voltage of 14 V ± 0,5 V or 28 V ± 0,5 V, as appropriate, shall be supplied to the ignition system.

The functioning ignition system shall have a distributor type and speed to give 50 high voltage impulses per second. The system shall be adjusted to give an impulse voltage of 17 kV ± 1 kV peak.

For each test, new spark-plugs, distributor caps and coil caps shall be used.

Under the conditions described above and shown in figure A.1, the covers and nipples on new cable assemblies shall seal the engaged cable terminals from the salt water for a period of 1 h as evidenced by continuous firing.

3.3.2 Dielectric breakdown test

3.3.2.1 Spark-plug insulator

The spark-plug insulator shall resist dielectric puncture and the seal between the ignition cable and the spark-plug insulator shall resist dielectric tracking when subjected to the voltage levels listed in table 2.

Table 2

Cable size mm	Voltage level minimum (rms) kV
5	15
7	15
8	23

The cable assembly shall be considered acceptable if it withstands the specified voltage without puncturing dielectrically.

3.3.2.1.1 Test apparatus

a) 50 Hz to 60 Hz power source with a provision for adjusting the voltage to at least 35 kV peak.

b) Spark-plug insulator assembly insulated so as to prevent dielectric breakdown from the spark-plug electrode to ground.

c) Suitable metal container to immerse the spark-plug and cable assembly samples in tap water.

3.3.2.1.2 Test procedure

a) Assemble the cable assembly samples to the spark-plugs.

b) Immerse the samples in tap water of 23 °C ± 5 °C so that the insulators are completely immersed.

c) Connect the distributor end of the cable assembly to the high voltage source.

d) Connect the metal container to the ground side of the high voltage source.

e) Starting at 0 V, increase the voltage at a rate of 500 V/s until failure or until the specified minimum voltage level is achieved, whichever occurs first.

3.3.2.2 Distributor and coil insulators

The distributor and coil insulators shall resist dielectric puncture and the seal between the ignition cable and the distributor and coil insulators shall resist dielectric tracking when subjected to the voltage level listed in table 3.

Table 3

Cable size mm	Voltage level minimum (rms) kV
5	15
7	15
8	23

The cable assembly shall be considered acceptable if it withstands the specified voltage without puncturing dielectrically.

3.3.2.2.1 Test apparatus

a) 50 Hz to 60 Hz power source with a provision for adjusting the voltage to at least 35 kV peak.

b) Distributor cap assembly insulated so as to prevent dielectric breakdown from the interior contacts to ground.

c) Suitable metal container to immerse the distributor or coil cap and cable assembly samples in tap water.

3.3.2.2.2 Test procedure

a) Assemble the cable assembly samples to the distributor or coil cap.

b) Immerse the samples in tap water of 23 °C ± 5 °C so that the insulators are completely immersed.

c) Connect the spark-plug end of the cable assembly to the high voltage source.

d) Connect the metal container to the ground side of the high voltage source.

e) Starting at 0 V, increase the voltage at a rate of 500 V/s until failure or until the specified minimum voltage level is achieved, whichever occurs first.

3.4 Salt spray test

The specimen shall be subjected to a salt spray test for 48 h according to ISO 3768. The connection side of the specimen shall be directed downward into the test chamber and be fitted to the appropriate mating part.

At the end of the test time, the specimen shall be rinsed in flowing water with a temperature not exceeding +38 °C; the specimen shall then immediately be dried. The specimen shall not show any visible phenomena of corrosion. Changes in the ap-

pearance of the surface of metallic parts such as coloration shall be ignored.

3.5 Thermal shock test

The cable assembly shall be connected to its appropriate tower and/or plug prior to being subjected to the thermal shock test in a heat and cold chamber according to its test class in table 4.

The cable assembly shall be removed from the chamber and disconnected from its mating components. After cooling to room temperature of 23 °C ± 5 °C for at least 1 h, the cable assembly shall be reconnected to its mating components once only. No part of the cable assembly shall show signs of cracking when visually inspected.

3.6 Heat ageing test

The cable assembly shall be connected to its appropriate tower and/or plug prior to being subjected to the heat ageing test, the ignition cable hanging downwards, in a hot-air oven according to its test class in table 5.

The cable assembly shall be removed from the oven and disconnected from its mating components and re-connected, once only, after cooling to room temperature of 23 °C ± 5 °C for at least 1 h. No part of the cable assembly shall show signs of cracking when visually inspected.

3.7 Vibration test

The purpose of such a test is to test the resistance to vibration under normal running conditions. Since the location and the vibration strain differ according to the vehicle type, the test conditions shall be agreed between vehicle and equipment manufacturers to decide whether such a test is to be carried out.

NOTE 1 In those applications that require electromagnetic interference suppression, applicable regulations should be met.

3.8 Resistance to oil and fuel

Tests for resistance to oil and fuel shall be agreed between vehicle and equipment manufacturers.

Table 4

Test class	1	2	3	4	5	6
Test temperature [1], °C	−20 ± 3 and +90 ± 2	−20 ± 3 and +105 ± 2	−20 ± 3 and +120 ± 2	−30 ± 3 and +155 ± 2	−30 ± 3 and +180 ± 2	−30 ± 3 and +200 ± 3
Test time	20 cycles; exposure time: 1/2 h in each test chamber Rearrangement time: approximately 10 s					

1) According to differing environmental requirements, the high-tension cable, the connectors for the ignition coil, the distributor, the spark-plugs or the boots may, under certain circumstances, belong to different test classes. The test classes shall be agreed between the manufacturer of cable assemblies and the engine manufacturer.

Table 5

Test class	1	2	3	4	5	6
Test temperature [1], °C	70 ± 2	90 ± 2	105 ± 2	120 ± 2	155 ± 2	180 ± 2
Test time, h	168					

1) According to differing environmental requirements, the high-tension cable, the connectors for the ignition coil, the distributor, the spark-plugs or the boots may, under certain circumstances, belong to different test classes. The test classes shall be agreed between the manufacturer of cable assemblies and the engine manufacturer.

Annex A
(informative)

Test apparatus for sealing test (see 3.3.1)

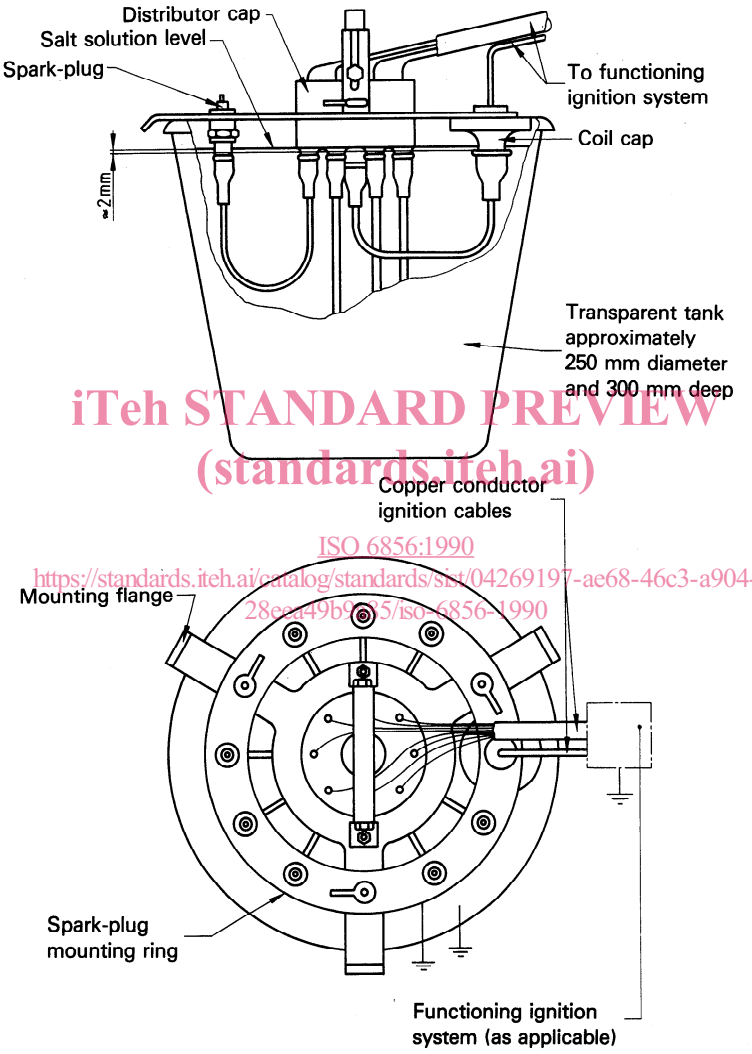


Figure A.1

UDC 629.11:621.43.04:621.315.68

Descriptors: road vehicles, internal combustion engines, controlled ignition engines, ignition systems, electric cables, ignition cables, electric connections, specifications, tests, mechanical tests, electrical tests, corrosion tests, thermal shock tests, artificial ageing tests.

Price based on 6 pages