# International Standard 6856

INTERNATIONAL ORGANIZATION FOR STANDARDIZATION•МЕЖДУНАРОДНАЯ ОРГАНИЗАЦИЯ ПО СТАНДАРТИЗАЦИИ•ORGANISATION INTERNATIONALE DE NORMALISATION

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

*Véhicules routiers — Assemblages de câble d'allumage haute tension non blindé — Spécifications générales et méthodes d'essai*

**First edition — 1981-03-01**



**UDC 621.43.04 : 621.315.68** **Ref. No. ISO 6856-1981 (E)**

**Descriptors :** road vehicles, electric cables, joining, specifications, tests, electrical tests, vibration tests, thermal tests, thermal shock tests.



Price based on 7 pages

## Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards institutes (ISO member bodies). The work of developing International Standards is carried out through ISO technical committees. Every member body interested in a subject for which a technical committee has been set up 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.

Draft International Standards adopted by the technical committees are circulated to the member bodies for approval before their acceptance as International Standards by the ISO Council.



International Standard ISO 6856 was developed by Technical Committee ISO/TC 22, *Road vehicles*, and was circulated to the member bodies in September 1979.



It has been approved by the member bodies of the following countries :



| | | |
|---|---|---|
| Australia | Italy | Spain |
| Austria | Japan | Sweden |
| Belgium | Korea, Rep. of | Switzerland |
| Brazil | Mexico | United Kingdom |
| Chile | Netherlands | USA |
| France | Poland | USSR |
| Germany, F. R. | Romania | |
| India | South Africa, Rep. of | |

No member body expressed disapproval of the document.



Printed in Switzerland

INTERNATIONAL STANDARD ISO 6856-1981 (E)/ERRATUM

Published 1981-12-15

INTERNATIONAL ORGANIZATION FOR STANDARDIZATION • МЕЖДУНАРОДНАЯ ОРГАНИЗАЦИЯ ПО СТАНДАРТИЗАЦИИ • ORGANISATION INTERNATIONALE DE NORMALISATION

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



## ERRATUM



*Page 1*

Clause 3, second line : delete footnote reference "[1)]".

Delete the footnote "1) At present at the stage of draft."

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

## 4 Test methods

### 4.1 Insertion and removal forces of high-tension connectors for ignition coils and distributors

The insertion and removal forces shall be measured at an

#### 4.1.2 Removal force

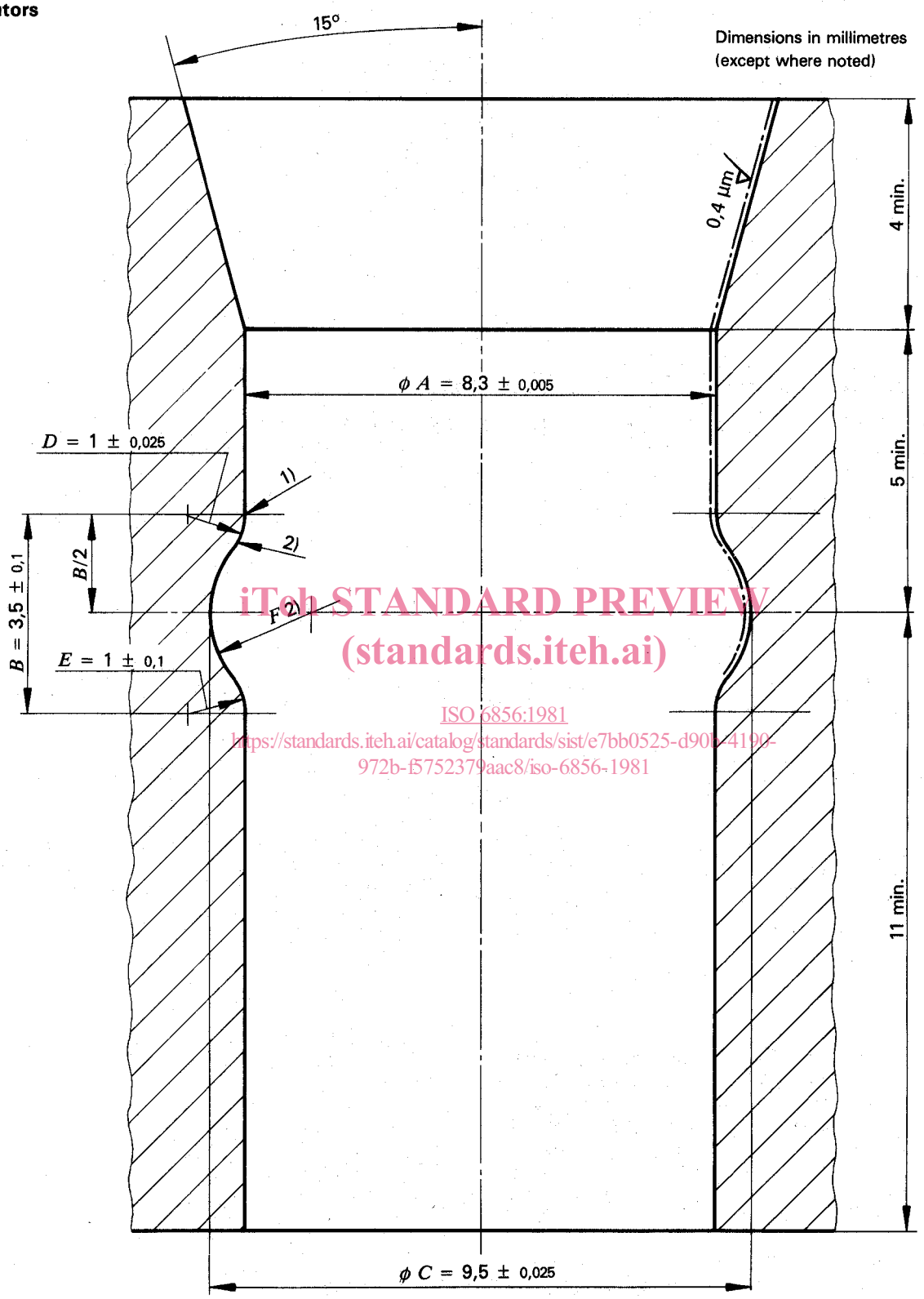
The removal force shall be measured by a static test. It shall be measured at the tenth operation.

Maximum value : 60 N

Minimum value : 20 N.

1) At present at the stage of draft.

### 4.1.3 Gauge for measurement of insertion and removal forces of high-tension connectors for ignition coils and distributors






1) Tangential slope from diameter $A$ to radius $D$.

2) Tangential slope from radius $D$ to radius $F$. The value of $F$ is implicitly determinated 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 include also the wear tolerances. The dimensions $A$ and $D$ are the most critical dimensions.

**Figure 1**

## 4.2 Insertion and removal forces of high-tension connectors for spark plugs

The insertion and removal forces shall be measured at an ambient temperature of 23 ± 5 °C with the gauge as specified in 4.2.3 (see figure 2).

The gauge and the connector shall be dry and clean.

Insertion and removal forces shall be the forces between spark plug terminal and cable connector. Any other force from covers or boots shall not be taken into account.

### 4.2.1 Insertion force

The insertion force shall be measured at the first insertion.

Maximum value : 70 N.

### 4.2.2 Removal force

The removal force shall be measured by a static test. It shall be measured at the tenth operation.

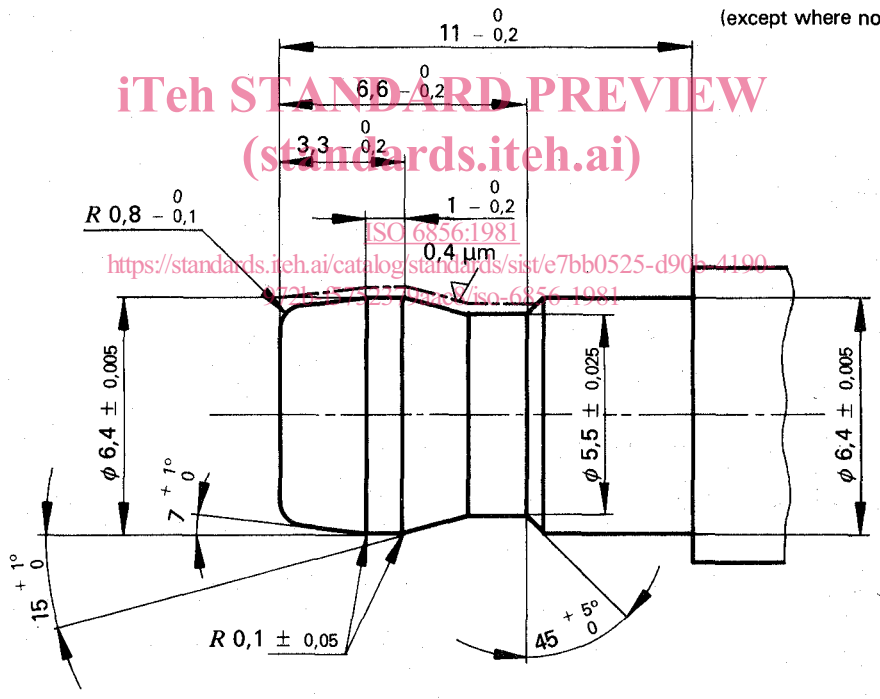
Maximum value : 60 N

Minimum value : 20 N

### 4.2.3 Gauge for measurement of insertion and removal forces of high-tension connectors for spark plugs



Dimensions in millimetres
(except where noted)




NOTES

1 The gauge shall be of hardened steel.

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

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

**Figure 2**

### 4.3 Separation forces of cables from connector

Place the cable assembly for one hour in a hot air oven with natural draught and expose it to the test temperature as indicated in the following table. After one hour, lift the cable with the appropriate weight (dead weight method), as specified in the following table, for a minimum time of 5 s. There shall be neither mechanical separation nor electrical interruption between the cable and the connector.

**Table 1**

| Cable classes according to ISO 3808/2 | Test temperature | Separation force for | |
|---|---|---|---|
| | | spark plug connectors | distributor and ignition coil connectors |
| *A, B* | 70 °C | 70 N | 62 N |
| *C, D, E, F* | 90 °C | | |

### 4.4 Electric insulation tests

#### 4.4.1 Sealing test

Install the cable assemblies to be tested in an appropriate fixture (for an example, see figure 3), 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 ± 5 °C until the covers are submerged to a depth of approximately 2 mm above the top end of the covers (see figure 3).



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 ± 0,5 V or 28 ± 0,5 V, as appropriate, shall be applied 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 ± 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 3, the covers and nipples on new cable assemblies must seal the engaged cable terminals from the salt water for a period of 1 h as evidenced by the continuous firing.

#### 4.4.2 Dielectric breakdown test

##### 4.4.2.1 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 below.

**Table 2**

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

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

**4.4.2.1.1** Test apparatus

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

b) A spark plug insulator assembly insulated in such a manner as to prevent dielectric breakdown from the spark plug electrode to ground.

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

**4.4.2.1.2** Test procedure

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

b) Immerse the samples in tap water of 23 ± 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.

##### 4.4.2.2 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 below.

**Table 3**

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

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

**4.4.2.2.1** Test apparatus

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

b) A distributor cap assembly insulated in such a manner as to prevent dielectric breakdown from the interior contacts to ground.

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

**4.4.2.2.2** Test procedure

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

b) Immerse the samples in tap water of 23 ± 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.

## 4.5 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 appearance of the surface of metallic parts such as coloration shall be ignored.

## 4.6 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 and re-connected, once only, after cooling to room temperature of 23 ± 5 °C for at least 1 h. No part of the cable assembly shall show signs of cracking when visually inspected.



## 4.7 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.



**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<br>Rearrangement time : approximately 10 s | | | | | |

1) According to differing requirements, the high tension cable, the connectors for the ignition coil, the distributor, the spark plug 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 requirements, the high tension cable, the connectors for the ignition coil, the distributor, the spark plug 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.

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 ± 5 °C for at least 1 h. No part of the cable assembly shall show signs of cracking when visually inspected.

### 4.8 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 should be agreed between vehicle and equipment manufacturers to decide whether such a test shall be conducted.

NOTE — In those applications that require electromagnetic interference suppression, applicable regulations shall be complied with.

### 4.9 Resistance to oil and fuel

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