SURFACE VEHICLE STANDARD

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Superseding J2032 JAN2019

Ignition Cable Assemblies

RATIONALE

Five-Year Review on the SAE J2032 standard. Review and revise as necessary.

A revision to 3.1 of the current document was made to include a visual examination of the part and to clarify the test paragraphs and any typographic changes to the document.

1. SCOPE

This SAE Standard specifies the general requirements and test methods for non-shielded, high-voltage ignition cable assemblies.

1.1 Field of Application

This document applies to all types of non-shielded, high-voltage ignition cable assemblies used in road vehicle applications.

2. REFERENCES

2.1 Related Publications

The following publications are provided for information purposes only and are not a required part of this SAE Technical Report.

2.1.1 SAE Publications

Available from SAE International, 400 Commonwealth Drive, Warrendale, PA 15096-0001, Tel: 877-606-7323 (inside USA and Canada) or +1 724-776-4970 (outside USA), www.sae.org.

SAE J200 Classification System for Rubber Materials

SAE J551 Performance Levels and Methods of Measurement of Electromagnetic Radiation from Vehicles and Devices (30 to 1000 MHz)

SAE J2031 High-Tension Ignition Cable

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3. PERFORMANCE REQUIREMENTS AND TEST METHODS

3.1 Visual Examination

3.1.1 Test

Visual examine with the naked eye all parts of the assembly.

3.1.2 Requirements

During visual examination special care shall be taken to ensure that as a minimum requirement there is no cracking, significant discoloration, or deformation.

3.2 Conductor Integrity

All finished assemblies will be tested to confirm conductor's expected resistance range prior to testing, utilizing an ohm-meter.

3.3 Insertion and Removal Forces

3.3.1 Requirements

The testing of devices as listed below "a" through "c," shall be conducted at room temperature 23 °C ± 5 °C (see 3.2.2). Testing at decreased or elevated temperatures and forces other than as follows are acceptable based upon agreement of the manufacturer and the customer. Also, for non-typical terminals such as 5 mm terminals, the manufacturer and the customer must agree on acceptable requirements and fixtures.

a. Female terminal (typical[1] 7- and 8-mm terminals)

b. Male terminal (typical[1] 7- and 8-mm terminals)

c. Assembly (insulator/boot/nipple) and terminal

The insulators on either end of an ignition cable assembly are also known and referred to in the industry as a boot or nipple.

Table 1 - Insertion and removal force expectations

System	Terminal Type	Initial Insertion (N)	5th Removal (N)	Cable Type	Application
Terminal Only	Female	20-80	20-70	7 and 8 mm	Spark Plug Distributor Coil
	Male	20-58	20-44.5	7 and 8 mm	Distributor ---------- Coil
Assembly: (Insulator/ Boot/ Nipple) w/Terminal	Female	20 (N) min. Maximum forces to be agreed upon between manufacturer and customer.	20 (N) min. Maximum forces to be agreed upon between manufacturer and customer.	7 and 8 mm	Spark Plug Distributor Coil
	Male	20 (N) min. Maximum Forces to be agreed upon between manufacturer and customer.	20 (N) min. Maximum forces to be agreed upon between manufacturer and customer.	7 and 8 mm	Distributor ---------- Coil

[1] Geometry of Figure 1 depicts the likeness of a typical male terminal; the geometries of Figures 2 and 3 depict likenesses of typical female terminals. Geometries of Figure 4, Types A and B, depict likenesses of typical male terminals for 4 mm stud high-voltage connections.

3.3.2 Procedure

The test shall be conducted at room temperature 23 °C ± 5 °C with the insulator in its proper position for female terminals and without the insulator for male terminals. The initial insertion and removal shall be done on a terminal gage for female terminals as shown in Figures 1 and 2 or terminal gage for male terminals as shown in Figure 3.

All devices shall use a terminal test gage of a design and material agreed upon between terminal manufacturer and customer.

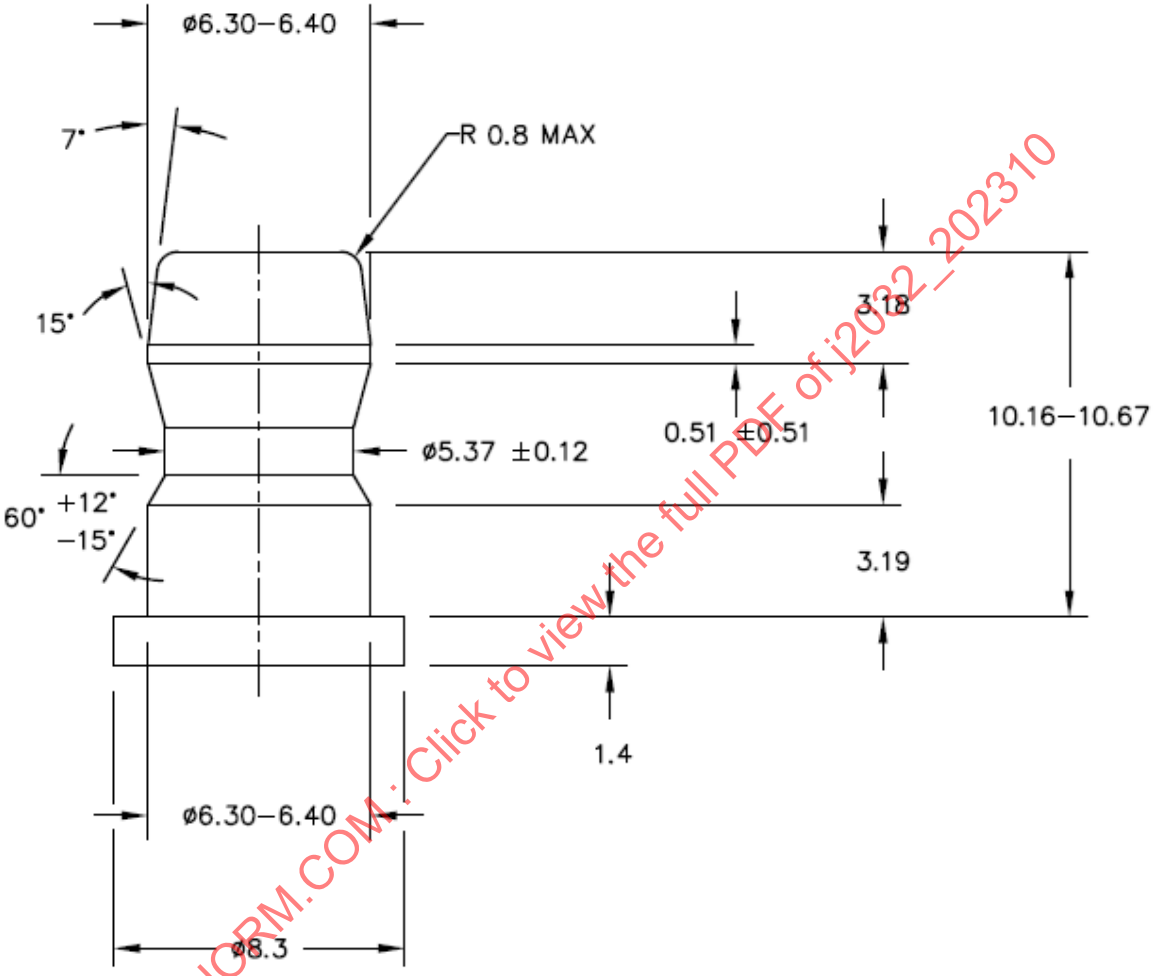

Figure 1 - Gage for measurement of insertion and removal forces of high-voltage connectors for spark plugs with post type terminals and for ignition coil and distributors with plug type high-voltage connections

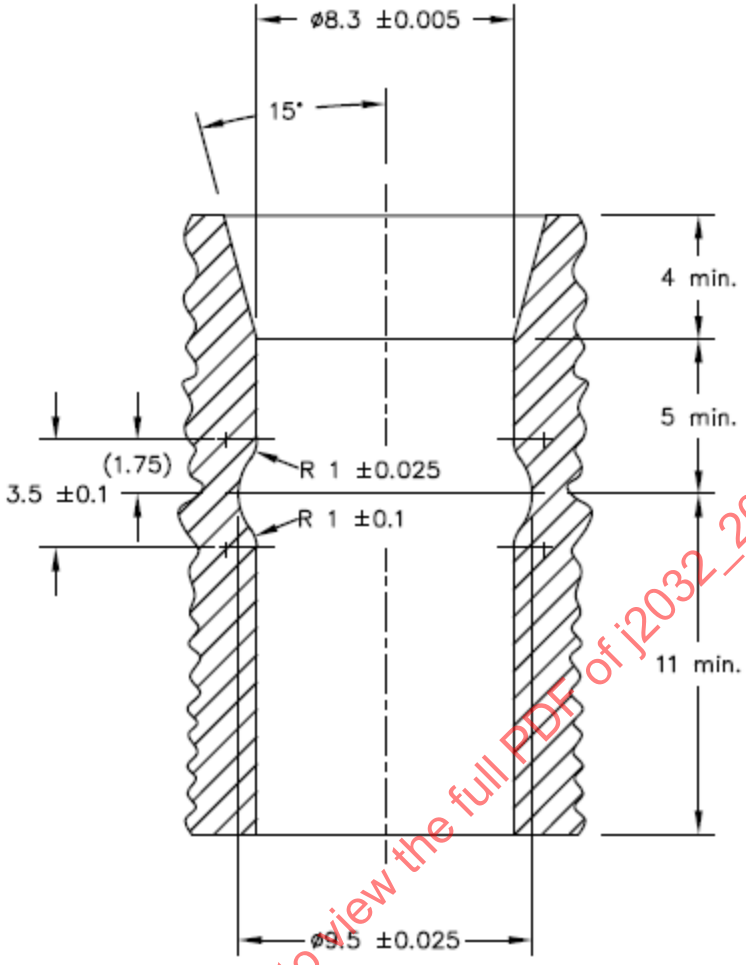

Figure 2 - Gage for measurement of insertion and removal forces of high-voltage connectors for socket type high-voltage connection for ignition coils and distributors

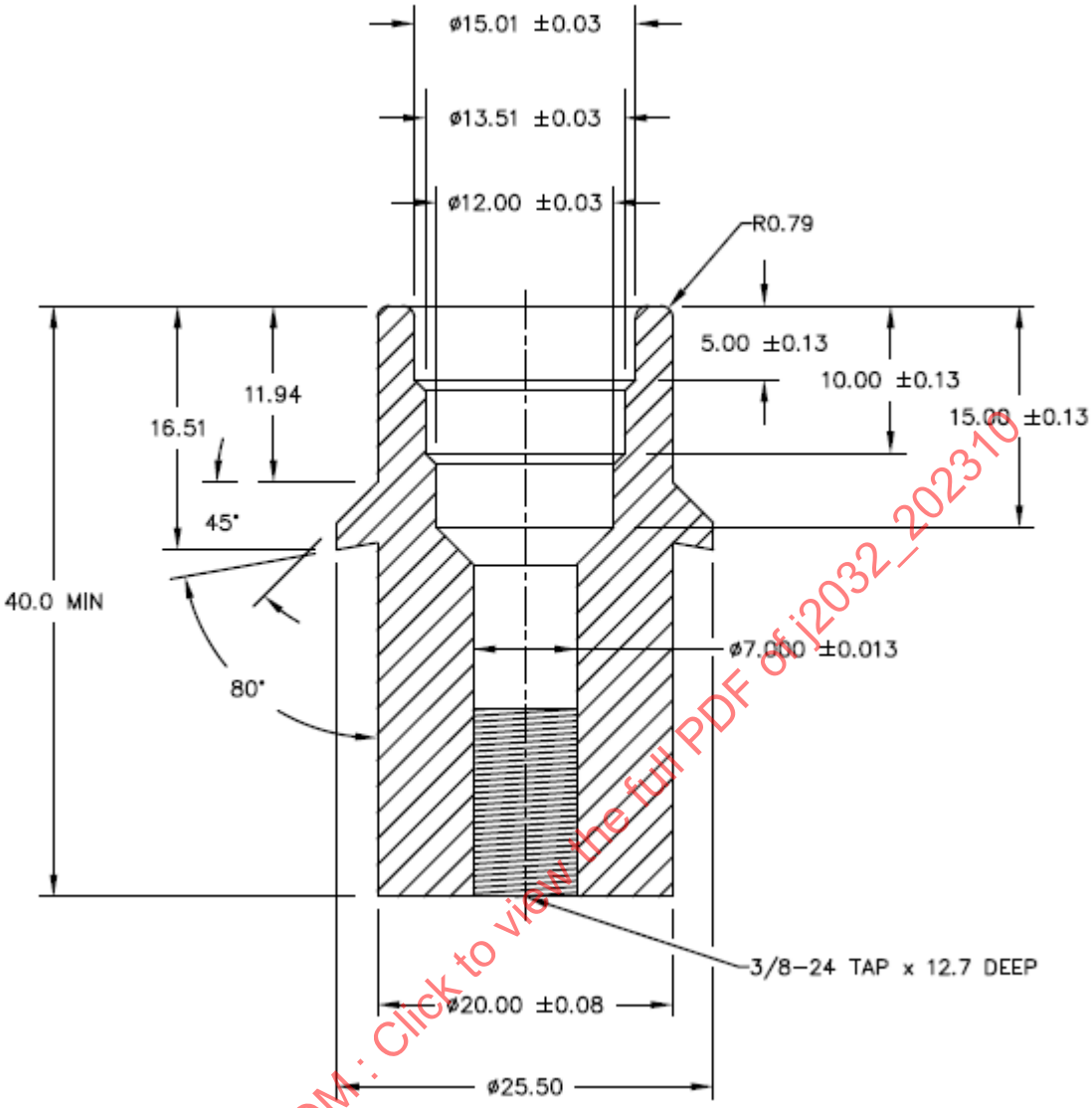

Figure 3 - Gage for measurement of insertion and removal forces of high-voltage connectors for high-voltage connection for distributor-less ignition coils

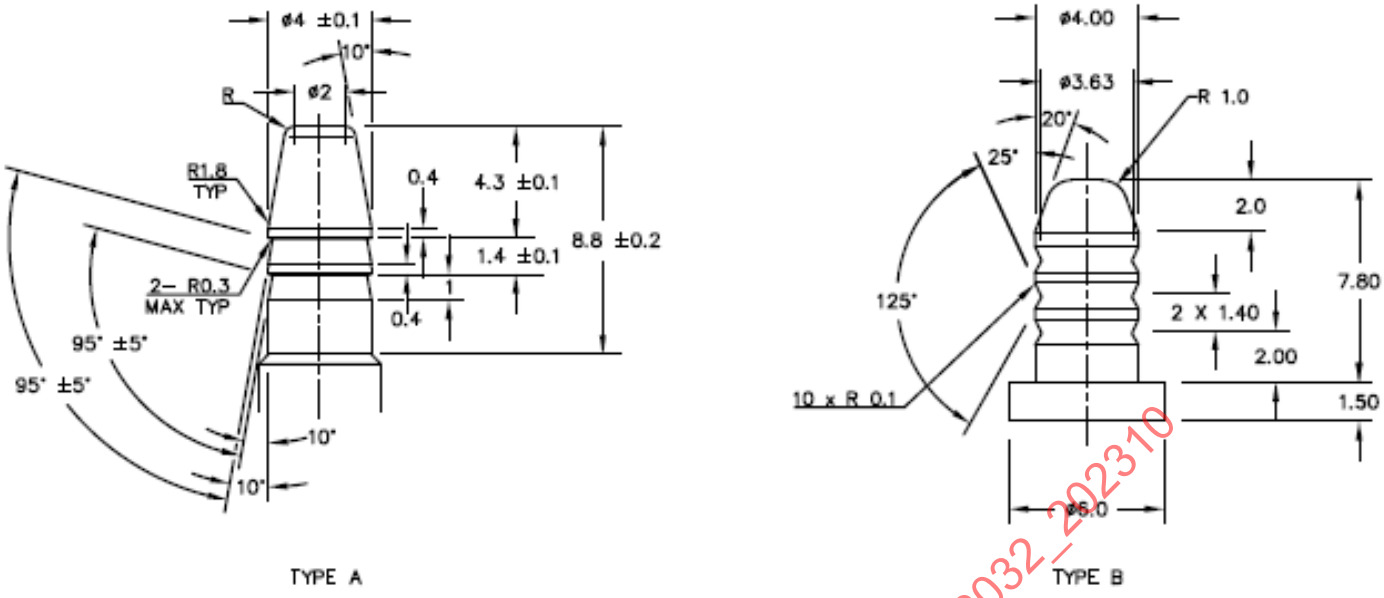

Figure 4 - Gage for measurement of insertion and removal forces of high-voltage connectors for 4 mm stud high-voltage connection for ignition coils and distributors

The insertion-removal force measurement shall be carried out using a suitable test fixture having a constant speed of 200 mm/min, aligned parallel to mating parts. Record the value obtained for initial insertion and record value on 5th removal.

3.4 Terminal Retention to Cable

3.4.1 Requirement

Forces other than shown in Table 2 are acceptable based upon agreement of the manufacturer and the customer.

Table 2 - Terminal retention forces

	Cold (23 °C ± 5 °C)	Hot (see 3.3.2)
Spark Plug Terminal	100 N min	92 N min
Distributor/Coil Terminal	75 N min	55 N min

NOTE: The termination shall not lose continuity at a force below the suggested minimum value, as monitored by an ohm-meter or continuity tester.

3.4.2 Procedure

Tests at room temperature (23 °C ± 5 °C) shall use an accurate force gage. Hot tests are to be conducted while samples are in an air circulating oven at 90 °C ± 2 °C for spark plug terminals or 70 °C ± 2 °C for distributor terminals. After a 1 hour soak a pull force shall be applied by means of an accurate force gage. Both tests shall be co-axial with the assembly being tested with a pull rate of 200 mm/min. Record the highest value obtained.

3.5 Room Temperature Insulator Seal Test

3.5.1 Requirement

The insulator shall not fail dielectrically or track through the cable, tower, or plug seals when subjected to the voltage levels listed in Table 3.

Table 3 - Sparkplug distributor and coil insulators

Cable/Wire Diameter	RMS	Peak
5 mm	15 kV	21.21 kV
7 mm	15 kV	21.21 kV
7 mm High Energy	23 kV	32.522 kV
8 mm	23 kV	32.522 kV
>8 mm	23 kV	32.522 kV

3.5.2 Procedure

Insulator seal test shall be conducted with the test sample submerged in 3% saline water and the voltage applied between the cable conductor and the saline water (Figure 5 or equal) using an AC 60 Hz high voltage unit capable of a minimum of 35 kV with variable adjustment. Beginning at 0 V, the voltage shall be increased to the requirement at a rate of 0.5 kV/s and held for 5 minutes.

1. At testing area, check all equipment for operability and safety concerns.
2. Prepare an insulated spark plug fixture (either the specific application spark plug or an artificial “dummy” plug).
3. A thin film of silicone grease, or alternate non-stick aid may be used to seal the boot to a blank spark plug, distributor cap, or coil tower. Grease should not be used on assemblies where the design intent calls for no grease or if the test is to look for possible dielectric tracking failures between the boot and the plug/coil tower assembly.
4. Insert the plug mating end into the sample test lead with a strong connection.
5. Immerse sample test lead into tank of room temperature water. Clamp in place if necessary with non-conductive clamp to locate sample at a specific level of immersion.
6. Attach other end of lead to the voltage line of the testing apparatus.
7. Check ground line is in place in tank.
8. Engage safety measures.
9. Turn on voltage controller and set test parameters in accordance with wire type being tested as laid out in Table 3.
10. Set timer for 300 seconds (5 minutes).
11. Activate testing apparatus. Testing commences with buildup of 0.5 kV/s from 0 kV to testing level and held for 300 seconds (5 minutes) as timer counts.
12. Record performance of test sample and noting voltage level reached, dwell time achieved, and if failure has occurred. In case of failure, note where said failure was located.
13. After test, remove test sample and prepare new sample.