Automotive parts – Test methods and general performance requirements for wiring harness connector operation

Introduction

This standard was originally established for adoption in 2010. It should be noted that there is currently no equivalent international standard covering the content of this standard.

1. Scope

This standard specifies the measurement methods of characteristics of automotive electrical connector engagement/disengagement operation. This standard applies to all automotive connectors that are removable for repair and/or maintenance after wiring harnesses have been installed in the vehicle.

2. Normative references

The following standards, when referred to in this standard, constitute a part of the specifications of this standard. These references standard (including any amendments) applies the latest edition.

JASO D611	Automotive parts – Unscreened low-voltage cables
JASO D616	Automotive parts – Test methods and general performance requirements for wiring harness connectors
JIS C1509-1	Electroacoustics -- Sound level meters -- Part 1: Specifications
JIS C3406	Low-voltage cables for automobiles
ISO 6722	Road vehicles – 60V and 600V single core cables – Dimensions, test methods and requirements
IEC 60050-581	International Electrotechnical Vocabulary – Electromechanical components for electronic equipment

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3. Terms and definitions

Main terms and definitions used in this standard are specified in **JASO D616** and **IEC 60050-581**, and additionally specified as follows.

3.1 Male connector

A connector having a male terminal attached to a housing.

3.2 Female connector

A connector having a female terminal attached to a housing.

3.3 Terminal

A connector contact connected with a corresponding element of the same purpose, used to form an electric circuit (including wiring parts).

3.4 Inertia lock

A connector locking mechanism designed so that the lock peak comes before current flows through the terminal and becomes higher than the terminal connection peak in the connector engagement process. (Refer to **Figure 1**.)

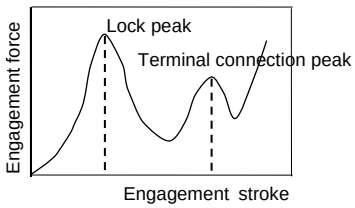

Figure 1 Inertia lock

4. Type

Measurement types are shown in **Table 1**.

Table 1 Measurement type

Type	Section
Engagement force measurement	5.2
Engagement sound measurement	5.3
Unlock force measurement	5.4
Disengagement force measurement	5.5
Twisting durability measurement	5.6
Mis-engagement measurement	5.7

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5. Measurement method

5.1 General

5.1.1 Pre-measurement condition

As pre-measurement conditions, all measurement samples must be stored for 24 hours at a temperature of (23±5)°C and a relative humidity of 45 to 75% before any continuous measurement.

5.1.2 Measurement condition

All measurement shall be performed with unused samples at a temperature of (23±5)°C unless otherwise specified. Terminals shall be inserted into all cavities to ensure contact with every pin.

Cables shall be prepared conforming to **JASO D611**, **JIS C3406**, or **ISO 6722**, and the cables used shall be recorded on the measurement report.

Wiring for terminals must be performed according to the recommendation of the terminal manufacturer.

5.2 Engagement force measurement

5.2.1 Sample preparation

For the samples, prepare 5 sets each of the male connector and female connector.

5.2.2 Measurement method

The measurement method is as follows.

a) Pay attention to prevent the connector from being engaged obliquely and to prevent a jig from interfering with cables or moving parts such as lock part. Engage the male and female connectors at a constant velocity of 25 to 100 mm/min, and then record the engagement force waveform. (Refer to **Figures 2 to 4**.)

b) Write the applied engagement velocity on the measurement report.

c) Measure the engagement force for each connector of 5 sets.

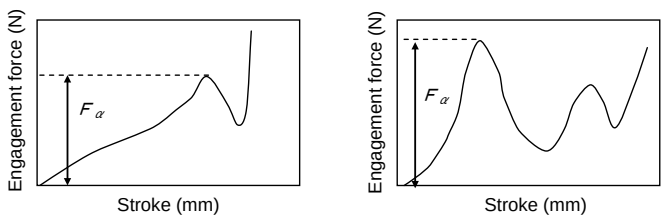
5.2.3 Required performance

a) Classify the engagement force in accordance with **Table 2** using the maximum engagement force (F_a) shown in **Figure 2a)** or **b)**.

Table 2 Engagement force

Unit: N

Classification	Value of F_a
1	$F_a \leq 45$
2	$45 < F_a \leq 70$
3	$70 < F_a$



a) Normal lock **b) Inertia lock**

Figure 2 Maximum engagement force (F_a)

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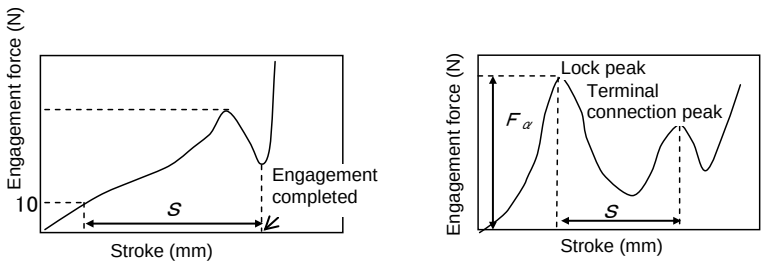
b) Classify the engagement stroke in accordance with **Table 3** using stroke *S* shown in **Figure 3a)** or **b)**.

Table 3 Engagement stroke

Unit: mm

Classification	Engagement stroke
1	$S < 4.5$
2	$4.5 \leq S < 5.5$
3	$5.5 \leq S < 6.5$
4	$6.5 \leq S$



a) Normal lock **b) Inertia lock**

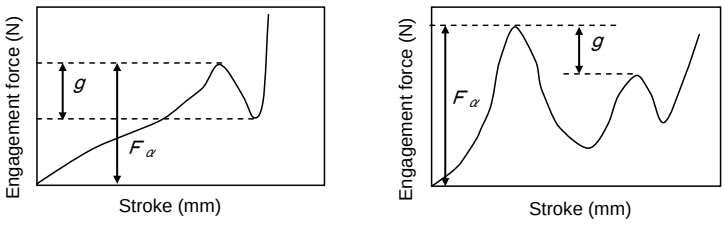
Figure 3 Engagement stroke (*S*)

c) Classify the engagement drop in accordance with **Table 4** [$R=(g/F_a)\times 100$] by calculating the percentage of the engagement completion drop (*g*) with respect to the maximum engagement force (F_a) using **Figure 4a)** or **b)**.

Table 4 Engagement drop

Unit: %

Classification	Value of R
1	$20 \leq R$
2	$10 \leq R < 20$
3	$5 \leq R < 10$
4	$R < 5$



a) Normal lock **b) Inertia lock**

Figure 4 Relationship of engagement drop

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