SURFACE VEHICLE RECOMMENDED PRACTICE

J2878™ JUN2022

Issued 2010-01
Revised 2016-06
Reaffirmed 2022-06

Superseding J2878 JUN2016

Low Speed Thorax Impact Test Procedure for the HIII5F Dummy

RATIONALE

Section 2.1.1 SAE EA-25 was replaced by SAE J2862.

Section 2.2.1 Company name and link replaced with text indicating working link where documents can be obtained.

Section 3.3 Change upper limit of hysteresis corridor from 72 to 79.

SAE J2878 has been reaffirmed to comply with the SAE Five-Year Review policy.

TABLE OF CONTENTS

SAENORM.COM : Click to view the full PDF of j2878_202206

SAE Executive Standards Committee Rules provide that: "This report is published by SAE to advance the state of technical and engineering sciences. The use of this report is entirely voluntary, and its applicability and suitability for any particular use, including any patent infringement arising therefrom, is the sole responsibility of the user."

SAE reviews each technical report at least every five years at which time it may be revised, reaffirmed, stabilized, or cancelled. SAE invites your written comments and suggestions.

Copyright © 2022 SAE International

All rights reserved. No part of this publication may be reproduced, stored in a retrieval system or transmitted, in any form or by any means, electronic, mechanical, photocopying, recording, or otherwise, without the prior written permission of SAE.

TO PLACE A DOCUMENT ORDER: **Tel: 877-606-7323 (inside USA and Canada)**
Tel: +1 724-776-4970 (outside USA)
Fax: 724-776-0790
Email: CustomerService@sae.org
SAE WEB ADDRESS: **http://www.sae.org**

For more information on this standard, visit
https://www.sae.org/standards/content/J2878_202206/

1. SCOPE AND PURPOSE

This procedure establishes a recommended practice for performing a Low Speed Thorax Impact Test to the Hybrid III Small Female Anthropomorphic Test Device (ATD or crash dummy). This test was created to satisfy the demand by the industry to have a certification test which results in peak chest deflection similar to current full vehicle, frontal impact tests. An inherent problem exists with the current certification procedure because the normal (6.7 m/s) thorax impact test has test results for peak chest deflection that are greater than those currently seen in full vehicle, frontal tests.

The intent of this document is to develop a low speed thorax certification procedure for the H-III5F dummy with a 3.0 m/s impact similar to the SAE J2779 procedure for the H-III50M dummy.

2. REFERENCES

2.1 Applicable Documents

The following publications form a part of this specification to the extent specified herein. Unless otherwise indicated, the latest issue of SAE publications shall apply.

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 J211/1 Instrumentation for Impact Test - Part 1 - Electronic Instrumentation

SAE J2517 Hybrid III Family Chest Potentiometer Calibration Procedure

SAE J2779 Low Speed Thorax Impact Test Procedure for the HIII 50th Male Dummy

SAE J2862 User's Manual for the Small Adult Female Hybrid III Test Dummy

2.2 Related Publication

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

2.2.1 Federal Publication

Copies of these documents are available online at http://www.ecfr.gov.

Motor Vehicle Regulation No. 572 Test Dummies Specifications - Anthropomorphic Test Dummy for Applicable Test Procedures

SAENORM.COM : Click to view the full PDF of j2878_202206

3. CERTIFICATION PROCEDURE

3.1 Preparation

a. The complete dummy assembly (880105-000) is required, including the clothing (t-shirt and pants), but without the shoes (880105-630).

b. The fixture consists of a smooth, clean, dry, steel seating surface and a test probe. The test probe is a 152.4 ± 0.25 mm (6.0 ± 0.01 inch) diameter rigid cylinder with a mass of 13.97 ± 0.023 kg (30.80 ± 0.05 pound), including instrumentation, rigid attachments, and the lower 1/3 of the suspension cable mass. The impacting surface has a flat, right angle face with an edge radius of 12.7 ± 0.3 mm (0.5 ± 0.01 inch). Mount an accelerometer to the probe with its sensitive axis in line with the longitudinal centerline of the test probe.

c. The data acquisition system, including transducers, must conform to the specifications of the latest revision of SAE Recommended Practice J211/1. Filter pendulum force using a Channel Class 180 phaseless filter and chest deflection using a Channel Class 600 phaseless filter. Calibrate the chest deflection transducer using SAE J2517 Revision September 2006 or later.

3.2 Test Procedure

a. Remove the chest flesh and visually inspect the thorax assembly for cracks, cuts, abrasions, etc. Pay particular attention to the rib damping material (880105-358-1 through 880105-358-6), chest displacement transducer assembly (880105-1080), and the rear rib supports (880105-320). Torque the spine cables to 1.13-1.36 N·m (10-12 in-lbf).

b. Soak the test dummy in a controlled environment with a temperature of 20.6 to 22.2 °C (69 to 72 °F) and a relative humidity from 10 to 70 percent for at least four hours prior to the test, until the rib temperature has reached the soak temperature. The test environment should have the same temperature and humidity requirements as the soak environment.

c. Check that all transducers are properly installed, oriented, and calibrated.

d. Seat the dummy (without the chest flesh but with the pants) on the test fixture surface. The surface must be long enough to support the pelvis and outstretched legs.

e. Align the upper and lower neck bracket index marks to the zero position.

f. Place the arm assemblies horizontal (± 2°) and parallel to the midsagittal plane. Secure the arms by tightening the adjustment nut which holds the arm yoke to the clavicle assembly (880105-336, 337). If necessary, prop the arms up with a rod that will fall away during the test.

Level the ribs both longitudinally and laterally ± 0.5° (the reference is the number 3 rib as shown in Figure 1) and adjust the pelvis angle to 7 ± 2°. (Use the special tool which inserts into the pelvic structure and extends outward beyond the pelvic skin surface. The tool permits the use of an angle measurement device to determine the pelvis angle.)

The midsagittal plane of the dummy is vertical ± 1° and within 2° of being parallel to the centerline of the test probe. The longitudinal centerline of the test probe is centered on the midsagittal plane of the dummy within ± 3 mm. Align the test probe so its longitudinal centerline is 12.7 ± 1 mm below the horizontal centerline of the No. 3 rib and is within 0.5° of a horizontal line in the dummy's midsagittal plane.

After completing the initial setup, record reference measurements from locations such as the rear surfaces of the thoracic spine and the lower neck bracket. These reference measurements are necessary to ensure that the dummy remains in the same position after installing the chest flesh. When using a cable-supported test probe, the dummy must be moved rearward from the test probe to account for the thickness of the chest flesh, so the probe will impact at the lowest point on its arc of travel. The test setup appears in Figure 1.

SAENORM.COM : Click to view the full PDF of j2878_202206

g. Install the chest flesh and shirt and reposition the dummy as described in the preceding paragraph using the recorded reference measurements. The reference locations must be accessible after installation of the chest flesh, so it may be necessary to leave the chest flesh unzipped until the references are checked, and then fasten it just prior to the test.

h. Impact the thorax with the test probe so the probe's longitudinal centerline is within 2° of a horizontal line in the dummy's midsagittal plane at the moment of impact.

Guide the probe so no significant lateral, vertical or rotational motion takes place during the impact.

The test probe velocity at the time of impact is 3.00 m/s ± 0.05 m/s.

Time-zero is defined as the time of initial contact between the test probe and the chest flesh. All data channels should be at the zero level at this time (after processing to Engineering Units).

Wait at least 30 minutes between successive tests on the same thorax.

3.3 Performance Specifications

The maximum sternum-to-spine deflection, as measured by the chest displacement transducer should lie between -21.8 and -17.4 mm.

The maximum force applied to the thorax by the test probe should measure between -2.07 and -1.78 kN.

The internal hysteresis ratio should be greater than 65 percent but less than 79 percent. The hysteresis ratio, determined from the force vs. deflection curve, is the ratio of the area between the loading and unloading portions of the curve to the area under the loading portion of the curve. See Figure 2 for details.

SAENORM.COM : Click to view the full PDF of j2878_202206