

SURFACE VEHICLE INFORMATION REPORT

SAE, **J2856 SEP2009**Issued 2009-09

EA-23 APR2005

Superseding

User's Manual for the 50th Percentile Male Hybrid III Dummy

RATIONALE

The 1986 version of Engineering Aid 23 focused on differences between the Hybrid III and its predecessor, the Hybrid II dummy.

The 1998 revision of EA-23 removed the differences between the Hybrid II and Hybrid III, as most users had experience in using the Hybrid III. Instead of presenting two variations on the calibration procedures that were included in the 1986 version, only the currently accepted practice is listed. It included modifications which are based on many years' experience with the Hybrid III, and addresses changes incorporated into the dummy. The most significant differences result from some changes in the Hybrid III dummy. One change now calls for using feet with a 45 degree range of motion rather than 30 degrees; the feet also have a prescribed force-deflection characteristic. The other major change is a redesigned upper femur, which makes the hip joint range of motion more symmetric and biofidelic, and also prevents metal-to-metal contact between the hip bone and the femur. These part changes require additional procedures to ensure the proper range of motion at the hip joint.

SAE J2856 replaced EA-23 in 2009. In addition to the format change and the correction of typographical errors, the following corrections were made to this Information Report:

References to SAE J211 were changed to SAE J211-1 throughout the report

Section 2 REFERENCES was added

Section 3.1 – corrected the reference to the drawing package from "the updated 1997 engineering drawing package" in EA-23 to "the engineering drawing package dated August 30, 1998"

Section 3.1 – corrected the reference to the drawing package from "The latest drawing package for the Hybrid III dummy was issued in 1997" in EA-23 to "The latest drawing package for the Hybrid III dummy was issued in 1998"

Section 3.2 – added title "HYBRID III 50th PERCENTILE MALE DUMMY INSTRUMENTATION" to Table 1

Section 3.7 – corrected inconsistency in terminology from "chest jacket" in EA-23 to "chest flesh"

Section 3.7 – Figure 12 was replaced to more clearly show the correct orientation of the nodding blocks

Section 3.9 – changed the disassembly instructions for the sternum from "Detach the bib assembly after loosening the set screw (Figure 27) on the chest displacement slider arm at the displacement pot" to "Detach the bib assembly. Do not loosen the set screw (Figure 27) because this will invalidate the chest pot calibration of SAE Recommended Practice J2517."

Section 3.13 – corrected the inspection of buttock compression from "apply a 335 N (75 lbf) force to the bottom of the pelvis, parallel to the ground" to "apply a 334 N (75 lbf) force to the bottom of the pelvis, perpendicular to the ground"

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Section 3.16 – changed the assembly instructions for the pin that holds the optional displacement potentiometer displacement rod to the slider from "tightened reasonably" to "tight"

Section 3.17 – corrected an error in lumbar cable torque from "1.2 to 1.4 N·m" in EA-23 to "1.1 to 1.4 N·m"

Section 3.17 – corrected inconsistency in terminology from "chest jacket" in EA-23 to "chest flesh"

Section 3.18 – added title "CENTERS OF GRAVITY" to Table 2

Section 3.18 – revised headers of Table 2 consistent with SAE format guidelines

Section 3.18 – corrected Center of Gravity Location for the foot in Table 2 from "2.30" inches along the X-axis in EA-23 to "2.20" inches. The metric dimension was correct

Section 3.18 – corrected Center of Gravity Location for the foot in Table 2 from "-52.7" mm and "-2.20" inches along the Z-axis in EA-23 to "-53.3" mm and "-2.10" inches

Section 4.1 (A) – corrected inconsistency in terminology from "chest skin" in EA-23 to "chest flesh"

Section 4.1 (C) – changed from "Torque the two spine cables to 1.1 N·m (10 in·lbf)" in EA-23 to "Torque the two lumbar cables to 1.1 to 1.4 N·m (10 to 12 in·lbf)" to be consistent with Section 3.17

Section 4.1 (L) – corrected inconsistency in terminology from "chest skin" in EA-23 to "chest flesh"

Section 4.2 (A) – corrected inconsistency in terminology in Table 4 from "Upper Torso Assembly with Torso Jacket" in EA-23 to "Upper Torso Assembly with Chest Flesh"

Section 4.2 (A) – corrected description of Lower Torso Assembly in Table 4 from "(includes femurs and their lower lumbar adapting plate)" in EA-23 to "(includes femurs and lower lumbar adapting plate)"

Section 4.2 (A) - corrected mass of Upper Arm Assembly, Left and Upper Arm Assembly, Right in Table 4 from "4.4 \pm 0.1" lb and "2.00 \pm 0.05" kg in EA-23 to "4.4 \pm 0.2" lb and "2.00 \pm 0.09" kg in SAE J2856

Section 4.2 (A) - corrected terminology in Table 4 from "Total Dummy Weight" in EA-23 to "Total Dummy Mass"

Section 4.3 (E) 1 – changed torque specification for skull cap screws from "18 N·m (160 in·lbf)" to "18 N·m minimum (160 in·lbf minimum)"

Section 4.3 (E) 2 – changed environment temperature for head drop test from "18.9 to 25.6 °C (66 to 78 °F)" to "20.6 to 22.2 °C (69 to 72 °F)"

Section 4.4 (E) 3 – added title "PENDULUM IMPULSE FOR THE NECK FLEXION TEST" to Table 5

Section 4.4 (F) 3 - added title "PENDULUM IMPULSE FOR THE NECK EXTENSION TEST" to Table 6

Section 4.5 (A) – corrected inconsistency in terminology from "vest and panty" in EA-23 to "shirt and pants"

Section 4.5 (B) – updated the test probe description to include "the mass of rigid attachments and the lower 1/3 of the suspension cable mass"

Section 4.5 (C) – changed the filter channel class for the thorax impact test from "Filter all data channels using Channel Class 180 phaseless filters" in EA-23 to "Filter pendulum force using a Channel Class 180 phaseless filter and chest deflection using a Channel Class 600 phaseless filter" for consistency with SAE J211-1

Section 4.5 (D) 1 – corrected inconsistency in terminology from "chest skin" in EA-23 to "chest flesh"

Section 4.5 (D) 1 – changed from "Torque the spine cables to 1.2 to 1.4 N·m (10 to 12 in·lbf)" in EA-23 to "Torque the two lumbar cables to 1.1 to 1.4 N·m (10 to 12 in·lbf)" to be consistent with Section 3.17

Section 4.5 (D) 6 – corrected inconsistency in terminology from "chest skin" in EA-23 to "chest flesh" in two places

Section 4.5 (D) 7 – corrected inconsistency in terminology from "chest skin" in EA-23 to "chest flesh" in three places

Section 4.5 (D) 11 – corrected inconsistency in terminology from "chest skin" in EA-23 to "chest flesh"

Section 4.5 (E) 3 – added "as shown in Figure 72." Inserted a new figure and the figure title "FIGURE 72 – HYSTERESIS REGIONS." Indexed the figure numbers of Figures 72 through 78 from EA-23

Section 4.6 (B) – updated the test probe description to include "the mass of rigid attachments and the lower 1/3 of the suspension cable mass"

Section 4.6 (D) 2 – changed environment temperature for knee impact test from "between 18.9 to 25.6 °C (66 to 78 °F)" to "of 20.6 to 22.2 °C (69 to 72 °F)"

Section 4.6 (D) 3 – changed "Torque the load cell simulator bolts to 40.7 N·m (30 ft·lbf)" to "Torque the mounting bolts to 40.7 N·m minimum (30 ft·lbf minimum)"

Section 4.7 (B) – corrected and tightened the specification on the knee slider test probe mass from "12.0 kg \pm 0.14 kg (26.5 lb \pm 0.3 lb)" to "12.00 kg \pm 0.02 kg (26.46 lb \pm 0.04 lb)"

Section 4.7 (B) – updated the probe description to include "the mass of rigid attachments and the lower 1/3 of the suspension cable mass"

Section 4.7 (B) – corrected an error in the diameter of the impacting face of the knee slider test probe from "75 mm \pm 0.2 mm" in EA-23 to "76.2 mm \pm 0.3 mm"

Section 4.7 (C) – replaced Figure 74 with corrected probe mass and hole diameters. The figure was Figure 73 in EA-23.

Section 4.7 (D) 2 – changed environment temperature for knee slider test from "between 18.9 to 25.6 °C (66 to 78 °F)" to "of 20.6 to 22.2 °C (69 to 72 °F)"

Section 4.7 (D) 4 – changed the torque specification for the femur load cell mounting bolts from "40.7 N·m (30 ft·lbf)" to "40.7 N·m minimum (30 ft·lbf minimum)"

Section 4.7 (E) 1 - added title "FORCE VERSUS DISPLACEMENT FOR THE KNEE SLIDER TEST" to Table 7

Section 4.7 (E) 1 – corrected errors in Table 7, by changing knee slider displacements from "10.0 mm" and "18.0 mm" to "10.2 mm" and "17.8 mm" respectively

Section 4.8 (C) – replaced Figure 75 to remove incorrect loading rate from EA-23. The figure was Figure 74 in EA-23

Section 4.8 – deleted the reference "NOTE: For details of the procedure development, reference the Final Report of the SAE Hip Calibration Task Group (August 1995)."

Section 4.9 – corrected source information for EC Directive 96/79/EC

Section 5.1 – Inserted new section "Low-speed Thorax Impact Test," referring to SAE Recommended Practice J2779 as an additional inspection test. Contents of EA-23 Section 5.1 were moved to Section 5.3 in SAE J2856

Section 5.2 – Inserted new section "Low-speed Knee Slider Test," referring to SAE Recommended Practice J2876 as an additional inspection test. Contents of EA-23 Section 5.2 were moved to Section 5.4 in SAE J2856