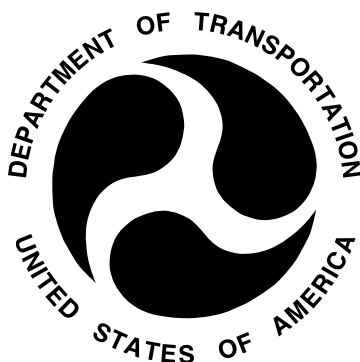


REPORT NO. 208-MGA-2014-DC001

**DUMMY PERFORMANCE CALIBRATIONS
FMVSS 208**

**NISSAN MOTOR CO. , LTD.
2014 NISSAN VERSA NOTE PASSENGER CAR
NHTSA NO.: C20145201**

**PREPARED BY:
MGA RESEARCH CORPORATION
5000 WARREN ROAD
BURLINGTON, WI 53105**



TEST DATES: JANUARY 20, 2014 – FEBRUARY 12, 2014

FINAL REPORT DATE: MARCH 31, 2014

FINAL REPORT

**PREPARED FOR:
U.S. DEPARTMENT OF TRANSPORTATION
NATIONAL HIGHWAY TRAFFIC SAFETY ADMINISTRATION
OFFICE OF ENFORCEMENT
OFFICE OF VEHICLE SAFETY COMPLIANCE
1200 NEW JERSEY AVENUE, S.E., NVS-220
WASHINGTON, D.C. 20590**

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EXTERNAL DIMENSIONS

HYBRID III 5 th SN #124, PART 572, SUBPART O EXTERNAL DIMENSIONS				
DIMENSION	DESCRIPTION	DETAILS	ASSEMBLY DIMENSION (mm)	ACTUAL MEASUREMENT
A	TOTAL SITTING HEIGHT	Seat surface to highest point on top of the head.	774.7-800.1	785.0
B	SHOULDER PIVOT HEIGHT	Centerline of shoulder pivot bolt to the seat surface.	431.8-457.2	455.1
C	H-POINT HEIGHT	Reference	81.3-86.3	85.2
D	H-POINT LOCATION FROM BACKLINE	Reference	144.8-149.8	145.6
E	SHOULDER PIVOT FROM BACKLINE	Center of the shoulder clevis to the rear vertical surface of the fixture.	68.6-83.8	83.0
F	THIGH CLEARANCE	Measured at the highest point on the upper femur segment.	119.4-134.6	125.6
G	BACK OF ELBOW TO WRIST PIVOT	Back of the elbow flesh to the wrist pivot in line with the elbow and wrist pivots	243.9-259.1	245.9
H	HEAD BACK TO BACKLINE	Back of skull cap skin to seat rear vertical surface (Reference)	43.2-48.2	45.0
I	SHOULDER TO ELBOW LENGTH	Measure from the highest point on top of the shoulder clevis to the lowest part of the flesh on the elbow in line with the elbow pivot bolt.	276.8-297.2	296.1
J	ELBOW REST HEIGHT	Measure from the flesh below the elbow pivot bolt to the seat surface.	182.8-203.2	192.3
K	BUTTOCK TO KNEE LENGTH	The forward most part of the knee flesh to the rear vertical surface of the fixture.	520.7-546.1	540.2
L	POPLITEAL HEIGHT	Seat surface to the plane of the horizontal plane of the bottom of the feet.	355.6-376.0	365.6
M	KNEE PIVOT HEIGHT	Centerline of knee pivot bolt to the horizontal plane of the bottom of the feet.	393.7-419.1	395.8
N	BUTTOCK POPLITEAL LENGTH	The rearmost surface of the lower leg to the same point on the rear surface of the buttocks used for dim. "K".	414.0-439.4	434.5

HYBRID III 5 th SN #124, PART 572, SUBPART O EXTERNAL DIMENSIONS, continued				
DIMENSION	DESCRIPTION	DETAILS	ASSEMBLY DIMENSION (mm)	ACTUAL MEASUREMENT
O	CHEST DEPTH WITHOUT JACKET	Measured 304.8 ± 5.1 mm above seat surface	175.3-190.5	176.0
P	FOOT LENGTH	Tip of toe to rear of heel	218.5-233.7	219.4
Q	STANDING HEIGHT	(THEORETICAL)	1501.1	N/A
R	BUTTOCK TO KNEE PIVOT LENGTH	The rear surface of the buttocks to the knee pivot bolt	457.2-482.6	481.0
S	HEAD BREADTH	The widest part of the head	137.1-147.3	138.6
T	HEAD DEPTH	Back of the head to the forehead	177.8-188.0	186.2
U	HIP BREADTH	The widest part of the hip	299.7-314.9	310.7
V	SHOULDER BREADTH	Outside edges of right and left shoulder clevises	350.5-365.7	354.9
W	FOOT BREADTH	The widest part of the foot	78.8-94.0	82.0
X	HEAD CIRCUMFERENCE	Measured at the point as in dim. "T"	528.3-548.7	547.1
Y	CHEST CIRCUMFERENCE (WITH CHEST JACKET)	Measured 345.4 ± 12.7 mm above seat surface	850.9-881.3	881.0
Z	WAIST CIRCUMFERENCE	Measured 165.1 ± 5.1 mm above seat surface	759.5-789.9	786.3
AA	REFERENCE LOCATION FOR MEASUREMENT OF CHEST CIRCUMFERENCE	Reference	332.7-358.1	357.4
BB	REFERENCE LOCATION FOR MEASUREMENT OF WAIST CIRCUMFERENCE	Reference	160.1-170.2	169.8

DATA SHEET B3
HEAD DROP TEST (572.132) (5th Female)

Dummy Serial Number: 124

Test Date: 02/04/2014

Technician: David Schoedel

- X Pre test calibration
 Post test calibration verification

Test attempt no. 1 (when successive head drops are necessary)

- X 1. It has been at least 2 hours since the last head drop. (572.132(c)(5))
 X N/A, ONLY one head drop performed
- X 2. The head assembly consists of the complete head (880105-100X), the six-axis neck transducer (SA572-S11) or neck transducer structural replacement (78051-383X), and three (3) accelerometers (SA572-S4). (572.132(a))
- X 3. The head accelerometer mounting plate screws (10-24 x 3/8 SHCS) are torqued to 9.0 Nm.
- X 4. Accelerometers and their respective mounts are smooth and clean.
- X 5. Torque the skull cap screws (10-24 x 1/2 SHCS) to 9.0 Nm.
- X 6. The data acquisition system, including transducers, conforms to the requirements of SAE Recommended Practice J211/1 MAR95. (572.136(m))
- X 7. The head assembly soaked at a temperature between 18.9°C (66°F) and 25.6°C (78°F) and at a relative humidity from 10% to 70% for a period of at least four (4) hours prior to a test. (572.132(c)(1))
- | | |
|---------------------------------|---------------|
| Record the maximum temperature: | <u>21.2°C</u> |
| Record the minimum temperature: | <u>21.0°C</u> |
| Record the maximum humidity: | <u>17%</u> |
| Record the minimum humidity: | <u>12%</u> |
- X 8. Visually inspect the head skin for cracks, cuts, abrasions, etc. Repair or replace the head skin if the damaged area is more than superficial. Note: If the damage resulted from the vehicle crash test in which the dummy was an occupant, the damaged area is to be documented with photography and the post test calibration verification testing completed before any replacement or repairs are made.
- Record findings and actions: No Damage

- X 9. Clean the impact surface of the skin and the impact surface of the fixture with isopropyl alcohol, trichloroethane or equivalent prior to the test. (572.132(c)(2))
- X 10. Suspend and orient the head assembly as shown in Figure 5B. The lowest point on the forehead is 376.0 ± 1.0 mm (14.8 ± 0.04 inch) from the impact surface. (572.132(c)(3))
Record the actual distance: 376 mm
- NOTE:** The masses of the suspension device and the accelerometer cables are to be kept as lightweight as possible to minimize their effect on the test results.
- X 11. The 1.57 mm (0.062 inch) diameter holes located on either side of the dummy's head are equidistance within 2 mm from the impact surface. A typical test setup is shown in Figure 6B. (572.132(c)(3))
Record the right side distance: 501 mm
Record the left side distance: 501 mm
- X 12. The impact surface is clean and dry and has a micro finish in the range of 203.2×10^{-6} mm (8 micro inches) to 2032.0×10^{-6} mm (80 micro inches) (RMS). (572.132(c)(4))
Record actual micro finish: 24.8 micro inches
- X 13. The impact surface is rigidly supported. (572.132(c)(4))
- X 14. The impact surface is a flat horizontal steel plate 50.8 mm (2 inches) thick and 610 mm (24 inches) square. (572.132(c)(4))
Record thickness: 50.9 mm
Record width: 604 mm
Record length: 595 mm
- X 15. Drop the head assembly from a height of 376.0 ± 1.0 mm (14.8 inches $\pm$ 0.04 inches) by a means that ensures a smooth, instant release onto the impact surface. (572.132(b) & (572.132(c)(4))
- X 16. Complete the following table using channel class 1000 data. (572.132(b)):

Parameter	Specification	Result
Peak resultant acceleration	$250 \text{ g} \leq x \leq 300 \text{ g}$	262 g
Resultant versus time history curve	Unimodal	Yes
Oscillations after the main pulse	Less than 10% of the peak resultant acceleration	Yes
Lateral acceleration	y-axis acceleration $\leq 15 \text{ g}$	-9.2 g

- X 17. Plots of the x, y, z, and resultant acceleration data follow this sheet.

David Schoedel
Signature

02/04/2014
Date

MGA RESEARCH CORPORATION
HEAD DROP TEST
HYBRID III 5TH PERCENTILE

ATD Serial No: 124

Test ID: D14391

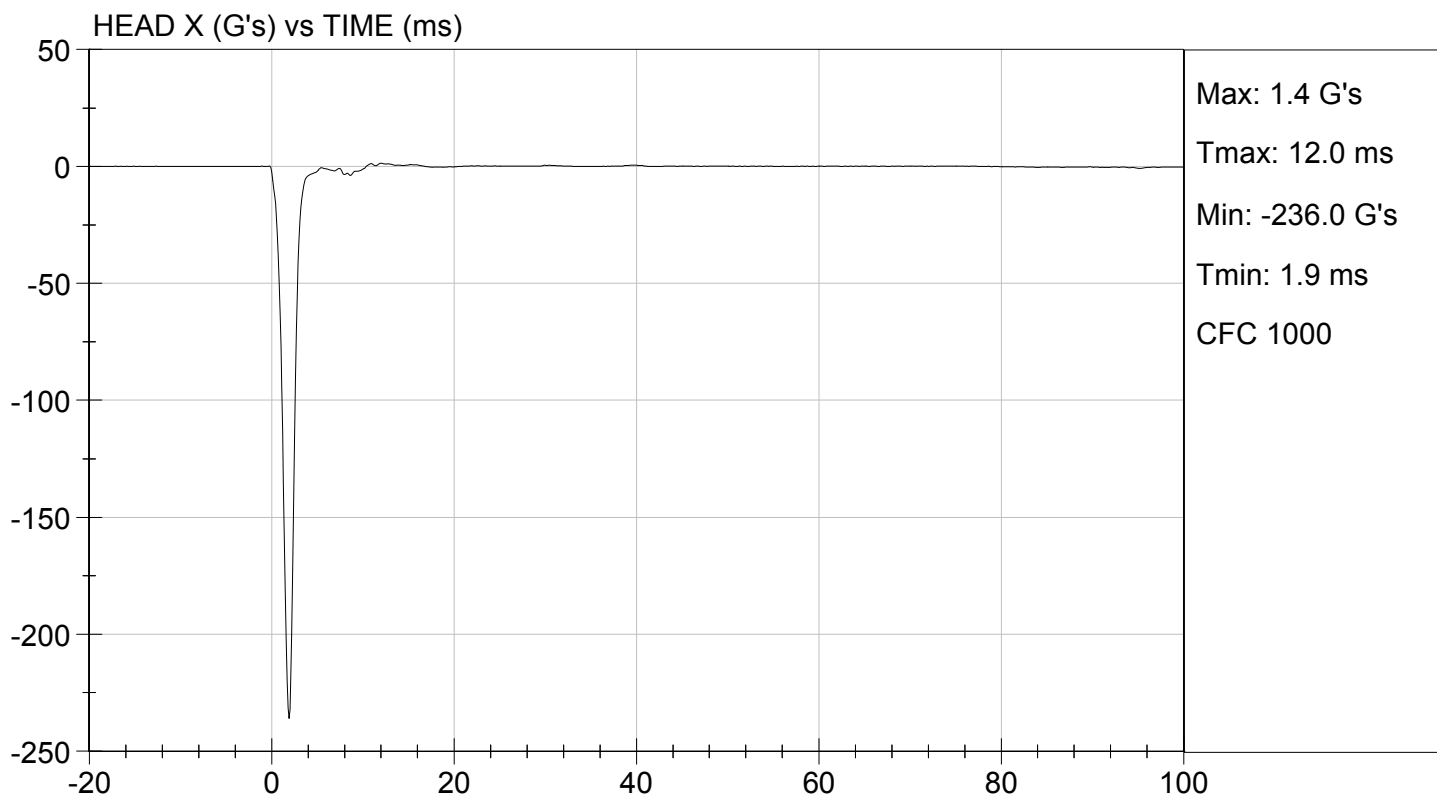
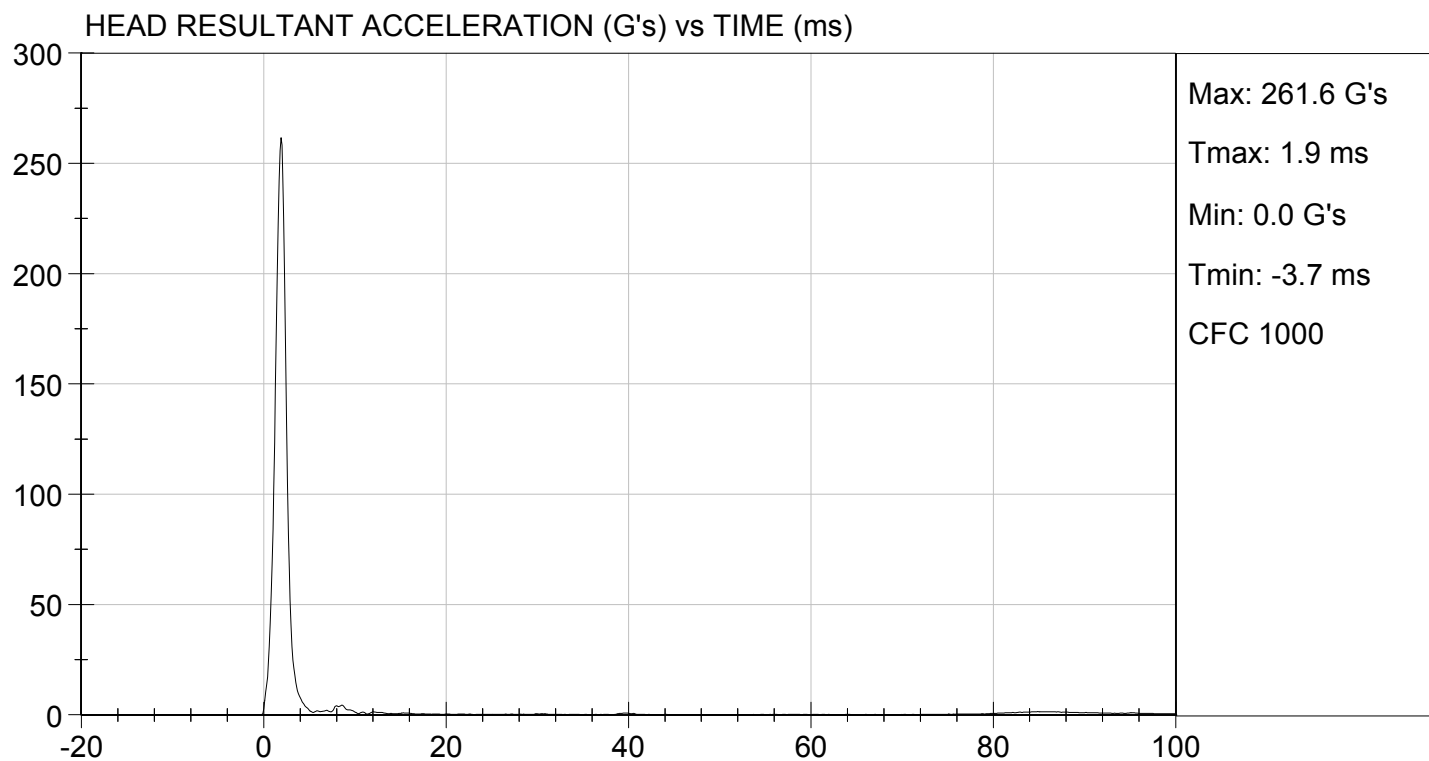
Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 to 25.6	21.2	Pass
Laboratory Relative Humidity	%	10 to 70	12	Pass
Peak Resultant Acceleration	G's	250 to 300	262	Pass
Peak Lateral Acceleration	G's	<= +/- 15.0	-9.2	Pass
Unimodal	N/A	Yes	Yes	Pass
Oscillations	N/A	within 10% of peak	Yes	Pass
Overall Test Results				Pass

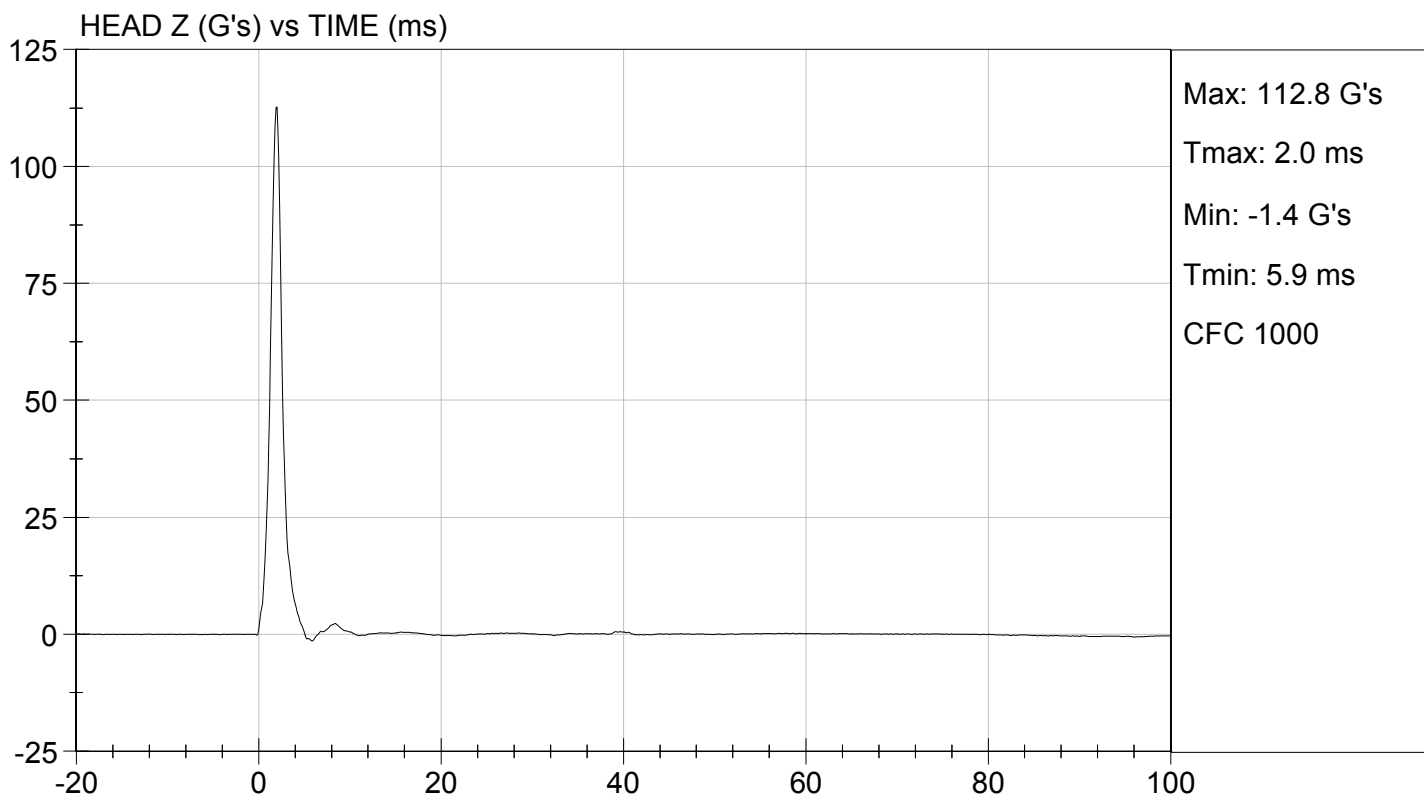
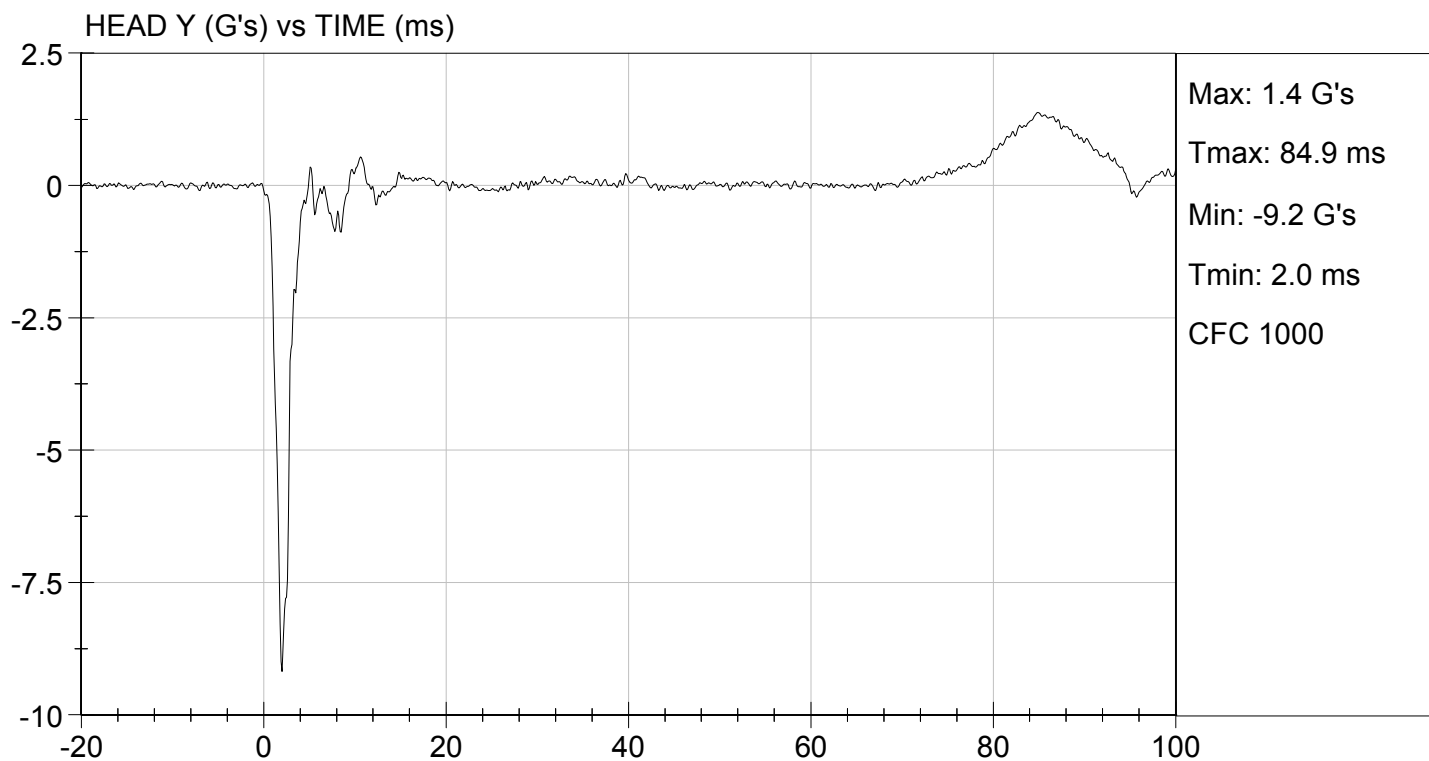
David Schoedel
Laboratory Technician

02/04/2014

Test Date

Jeff Leonard
Approved By





DATA SHEET B4
NECK FLEXION TEST (572.132) (5th Female)

Dummy Serial Number: 124

Test Date: 02/04/2014

Technician: David Schoedel

- X Pre test calibration
 Post test calibration verification

Test attempt no. 1 (when successive flexion tests are necessary)

- X 1. It has been at least 30 minutes since the last flexion test. (572.137(q))
X N/A, ONLY one neck test performed
- X 2. The components required for the neck tests include the head assembly (880105-100X), neck (880105-250), bib simulator (880105-371), upper neck adjusting bracket (880105-207), lower neck adjusting bracket (880105-208), six axis neck transducer (SA572-S11) and either three accelerometers (SA572-S4) or their mass equivalent installed in the head assembly as specified in drawing 880105-100X. Data from the accelerometers are not required. (572.133(b))
- X 3. The assembly soaked at a temperature between 20.6°C (69°F) and 22.2°C (72°F) and at a relative humidity from 10% to 70% for a period of at least four (4) hours prior to a test. (572.133(c)(1))
- | | |
|---------------------------------|---------------|
| Record the maximum temperature: | <u>21.2°C</u> |
| Record the minimum temperature: | <u>21.0°C</u> |
| Record the maximum humidity: | <u>17%</u> |
| Record the minimum humidity: | <u>12%</u> |
- X 4. Visually inspect neck assembly for cracks, cuts and separation of the rubber from the metal segments. Note: If the damage resulted from the vehicle crash test in which the dummy was an occupant, the damaged area is to be documented with photography and the post test calibration verification testing completed before any replacement or repairs are made.
- Record findings and actions: No damage
- X 5. Inspect the nodding blocks (78051-351) for any deterioration, but when replacement is necessary, ONLY replace during pre-test calibration. Using a Shore "A" type Durometer, verify the hardness of the nodding blocks is between 80 and 90. Ensure the nodding blocks are installed correctly. (880105-250 and PADI page17).
- Record findings and actions: No Deterioration; Hardness: Front 89; Back 90.
- X 6. Torque the jam nut (9000018) on the neck cable (880105-206) to 1.4 ± 0.2 Nm (12.0 ± 2.0 in-lb). (572.133(c)(2))

- X 7. The data acquisition system, including transducers, conforms to the requirements of SAE Recommended Practice J211/1 MAR95. (572.137(m))
- X 8. The test fixture pendulum conforms to the specifications in Figure 7B. (572.133(c)(3))
- X 9. The head-neck assembly is mounted on the pendulum so the midsagittal plane of the head is vertical and coincides with the plane of motion of the pendulum longitudinal centerline as shown in Figure 8B for the flexion test. (572.133(c)(3))
- X 10. Install the transducers or other devices for measuring the "D" plane rotation with respect to the pendulum longitudinal centerline. Note: Plane "D" is the bottom horizontal surface of the skull. These measurement devices should be designed to minimize their influence upon the performance of the head-neck assembly. An example of a measurement device is shown in Figure 10B.
- X 11. With the pendulum resting against the honeycomb material, the neck bracket was adjusted until the longitudinal centerline of the pendulum was perpendicular ± 1 degree to plane "D" on the dummy's head.
- X 12. Release the pendulum and allow it to fall freely from a height to achieve an impact speed of 6.89 m/s to 7.13 m/s as measured at the center of the pendulum accelerometer. (572.133(c)(4)(i))
- X 13. Complete the following table:

Neck Flexion Test Results (572.133(b)(1) & 572.133(c)(4)(i & ii))

Parameter		Specification	Results
Pendulum impact speed		6.89 m/s $\leq$ speed $\leq$ 7.13 m/s	6.96 m/s
Pendulum ΔV with respect to impact speed	@ 10 ms	2.1 m/s $\leq \Delta V \leq$ 2.5 m/s	2.4 m/s
	@ 20 ms	4.0 m/s $\leq \Delta V \leq$ 5.0 m/s	4.8 m/s
	@ 30 ms	5.8 m/s $\leq \Delta V \leq$ 7.0 m/s	6.7 m/s
Plane D Rotation		Peak moment* 69 Nm $\leq$ moment $\leq$ 83 Nm during the following rotation range 77° $\leq$ angle $\leq$ 91°	77 Nm @ 83 degrees
Positive Moment Decay** (Flexion)		Time to decay to 10 Nm 80 ms $\leq$ time $\leq$ 100 ms	81 ms

*Moment about the occipital condyle = $M_y - (0.01778 \text{ m} \times F_x)$ (572.133(b)(1)(ii))

M_y = Moment in Nm measured by the transducer

F_x = Force, in N measured by the transducer

**Time zero is defined as the time of initial contact between the pendulum striker plate and the honeycomb material. (572.133(b)(3))

- X 14. Plots of acceleration, velocity, y-axis moment, and x-axis force and y-axis moment about the occipital condyle follows this sheet.

David Schoedel
Signature

02/04/2014
Date

MGA RESEARCH CORPORATION

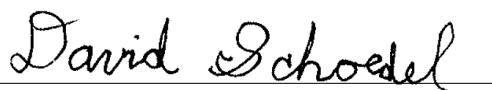
NECK FLEXION TEST

HYBRID III 5TH PERCENTILE

ATD Serial No: 124

Test I.D: D14392

Tested Parameter		Units	Specification	Result	Pass/Fail
Laboratory Temperature		deg C	20.6 to 22.2	21.2	Pass
Laboratory Relative Humidity		%	10 to 70	17	Pass
Pendulum Speed		m/s	6.89 to 7.13	6.96	Pass
Pendulum Velocity	10 ms	m/s	2.1 to 2.5	2.4	Pass
	20 ms	m/s	4.0 to 5.0	4.8	Pass
	30 ms	m/s	5.8 to 7.0	6.7	Pass
D Plane Rotation	Max	deg	77 to 91	83	Pass
Occipital Condyle Moment within Rotation Corridor		Nm	69 to 83	77	Pass
Positive Moment Time Curve Decay to 10 Nm		ms	80 to 100	81	Pass
Overall Results					Pass



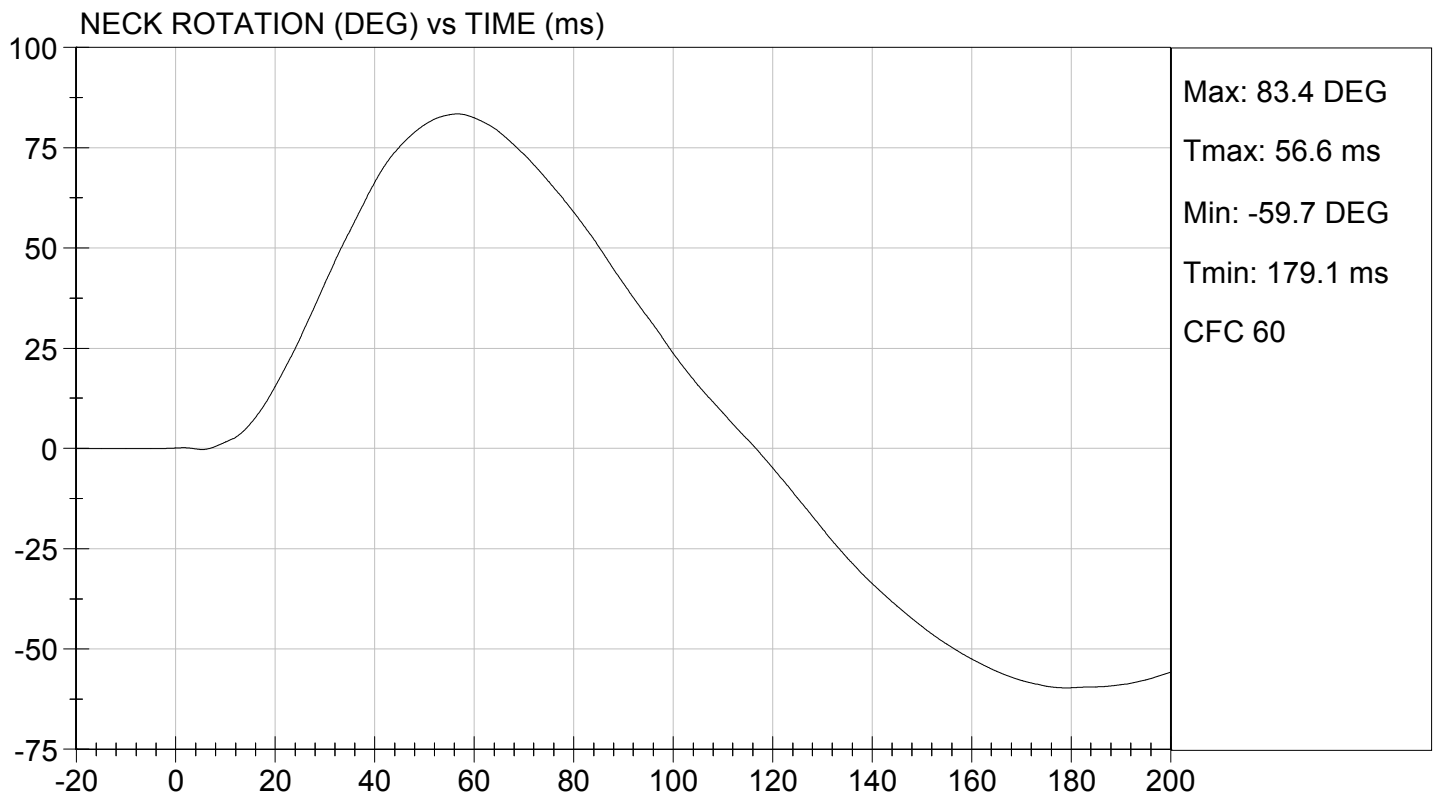
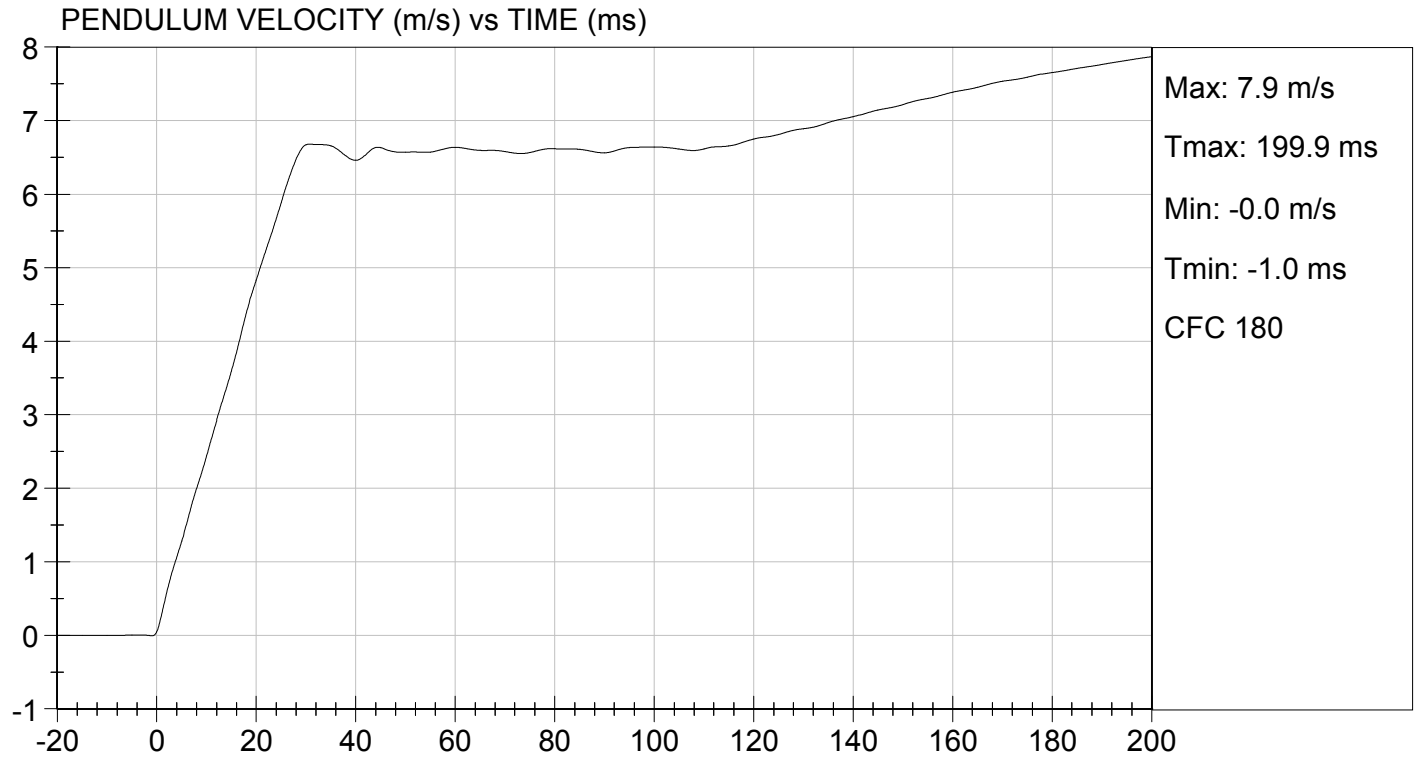
Laboratory Technician

02/04/2014

Test Date



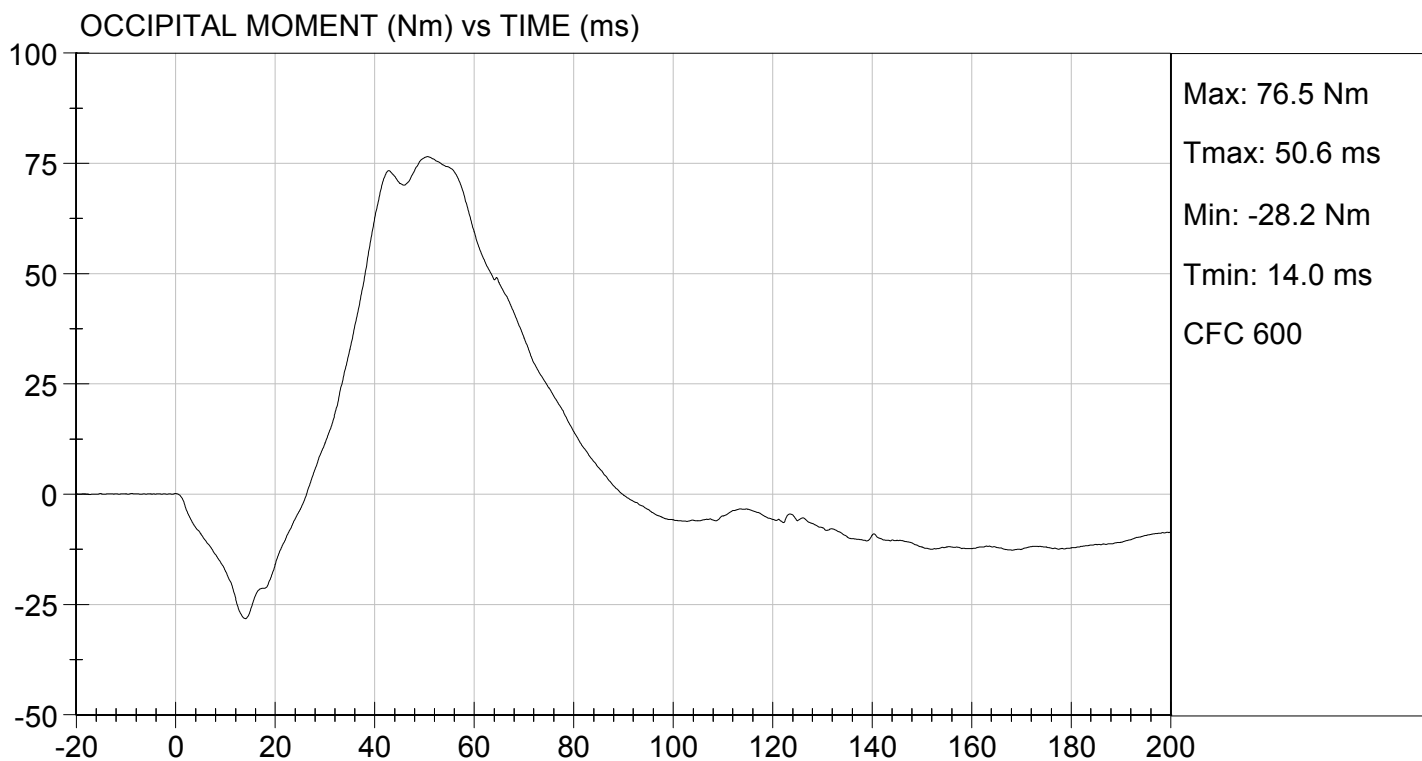
Approved By





TEST DESC: NECK FLEXION
VELOCITY: 22.83 ft/s, 6.96 m/s

TEST DATE: 02/04/2014
TEST #: D14392



DATA SHEET B5
NECK EXTENSION TEST (572.133) (5th Female)

Dummy Serial Number: 124

Test Date: 02/04/2014

Technician: David Schoedel

- ☒ Pre test calibration
☐ Post test calibration verification

Test attempt no. 1 (when successive extension tests are necessary)

- ☒ 1. It has been at least 30 minutes since the last extension test. (572.137(q))
☒ N/A, ONLY one neck test performed
- ☒ 2. The components required for the neck tests include the head assembly (880105-100X), neck (880105-250), bib simulator (880105-371), upper neck adjusting bracket (880105-207), lower neck adjusting bracket (880105-208), six axis neck transducer (SA572-S11) and either three accelerometers (SA572-S4) or their mass equivalent installed in the head assembly as specified in drawing 880105-100X. Data from the accelerometers are not required. (572.133(b))
- ☒ 3. The assembly soaked at a temperature between 20.6°C (69°F) and 22.2°C (72°F) and at a relative humidity from 10% to 70% for a period of at least four (4) hours prior to a test. (572.133(c)(1))
- | | |
|---------------------------------|---------------|
| Record the maximum temperature: | <u>21.2°C</u> |
| Record the minimum temperature: | <u>21.0°C</u> |
| Record the maximum humidity: | <u>17%</u> |
| Record the minimum humidity: | <u>12%</u> |
- ☒ 4. Visually inspect neck assembly for cracks, cuts and separation of the rubber from the metal segments. Note: If the damage resulted from the vehicle crash test in which the dummy was an occupant, the damaged area is to be documented with photography and the post test calibration verification testing completed before any replacement or repairs are made.
- Record findings and actions: No damage
- ☒ 5. Inspect the nodding blocks (78051-351) for any deterioration, but when replacement is necessary, ONLY replace during pre-test calibration. Using a Shore "A" type Durometer, verify the hardness of the nodding blocks is between 80 and 90. Ensure the nodding blocks are installed correctly. (880105-250 and PADI page17).
- Record findings and actions: No Deterioration; Hardness: Front 89; Back 90.
- ☒ 6. Torque the jam nut (9000018) on the neck cable (880105-206) to 1.4 ± 0.2 Nm (12.0 ± 2.0 in-lb). (572.133(c)(2))

- X 7. The data acquisition system, including transducers, conforms to the requirements of SAE Recommended Practice J211/1 MAR95. (572.137(m))
- X 8. The test fixture pendulum conforms to the specifications in Figure 7B. (572.133(c)(3))
- X 9. The head-neck assembly is mounted on the pendulum so the midsagittal plane of the head is vertical and coincides with the plane of motion of the pendulum longitudinal centerline as shown in Figure 9B for the extension test. (572.133(c)(3))
- X 10. Install the transducers or other devices for measuring the "D" plane rotation with respect to the pendulum longitudinal centerline. Note: Plane "D" is the bottom horizontal surface of the skull. These measurement devices should be designed to minimize their influence upon the performance of the head-neck assembly. An example of a measurement device is shown in Figure 10B.
- X 11. With the pendulum resting against the honeycomb material, the neck bracket was adjusted until the longitudinal centerline of the pendulum was perpendicular ± 1 degree to plane "D" on the dummy's head.
- X 12. Release the pendulum and allow it to fall freely from a height to achieve an impact speed of 5.95 m/s to 6.19 m/s as measured at the center of the pendulum accelerometer. (572.133(c)(4)(i))
- X 13. Complete the following table:
Neck Extension Test Results (572.133(b)(2) & 572.133(c)(4)(I & ii))

Parameter		Specification	Results
Pendulum impact speed		$5.95 \text{ m/s} \leq \text{speed} \leq 6.19 \text{ m/s}$	6.05 m/s
Pendulum ΔV with respect to impact speed	@ 10 ms	$1.5 \text{ m/s} \leq \Delta V \leq 1.9 \text{ m/s}$	1.9 m/s
	@ 20 ms	$3.1 \text{ m/s} \leq \Delta V \leq 3.9 \text{ m/s}$	3.8 m/s
	@ 30 ms	$4.6 \text{ m/s} \leq \Delta V \leq 5.6 \text{ m/s}$	5.4 m/s
Plane D Rotation		Peak moment* $-65 \text{ Nm} \leq \text{moment} \leq -53 \text{ Nm}$ during the following rotation range $99^\circ \leq \text{angle} \leq 114^\circ$	-57 Nm @ 107 degrees
Positive Moment Decay** (Extension)		Time to decay to -10 Nm $94 \text{ ms} \leq \text{time} \leq 114 \text{ ms}$	101 ms

*Moment about the occipital condyle = $M_y - (0.01778 \text{ m} \times F_x)$ (572.133(b)(1)(ii))

M_y = Moment in Nm measured by the transducer

F_x = Force, in N measured by the transducer

**Time zero is defined as the time of initial contact between the pendulum striker plate and the honeycomb material. (572.133(b)(3))

- X 14. Plots of acceleration, velocity, y-axis moment, and x-axis force and y-axis moment about the occipital condyle follow this sheet.

David Schoedel
Signature

02/04/2014
Date

MGA RESEARCH CORPORATION
NECK EXTENSION TEST
HYBRID III 5TH PERCENTILE

ATD Serial No: 124

Test I.D: D14393

Tested Parameter		Units	Specification	Result	Pass/Fail
Laboratory Temperature		deg C	20.6 to 22.2	21.2	Pass
Laboratory Relative Humidity		%	10 to 70	17	Pass
Pendulum Speed		m/s	5.95 to 6.19	6.05	Pass
Pendulum Velocity	10 ms	m/s	1.5 to 1.9	1.9	Pass
	20 ms	m/s	3.1 to 3.9	3.8	Pass
	30 ms	m/s	4.6 to 5.6	5.4	Pass
D Plane Rotation	Max	deg	99 to 114	107	Pass
Occipital Condyle Moment within Rotation Corridor		Nm	-65 to -53	-57	Pass
Negative Moment Time Curve Decay to -10 Nm		ms	94 to 114	101	Pass
Overall Results					Pass

David Schoedel
Laboratory Technician

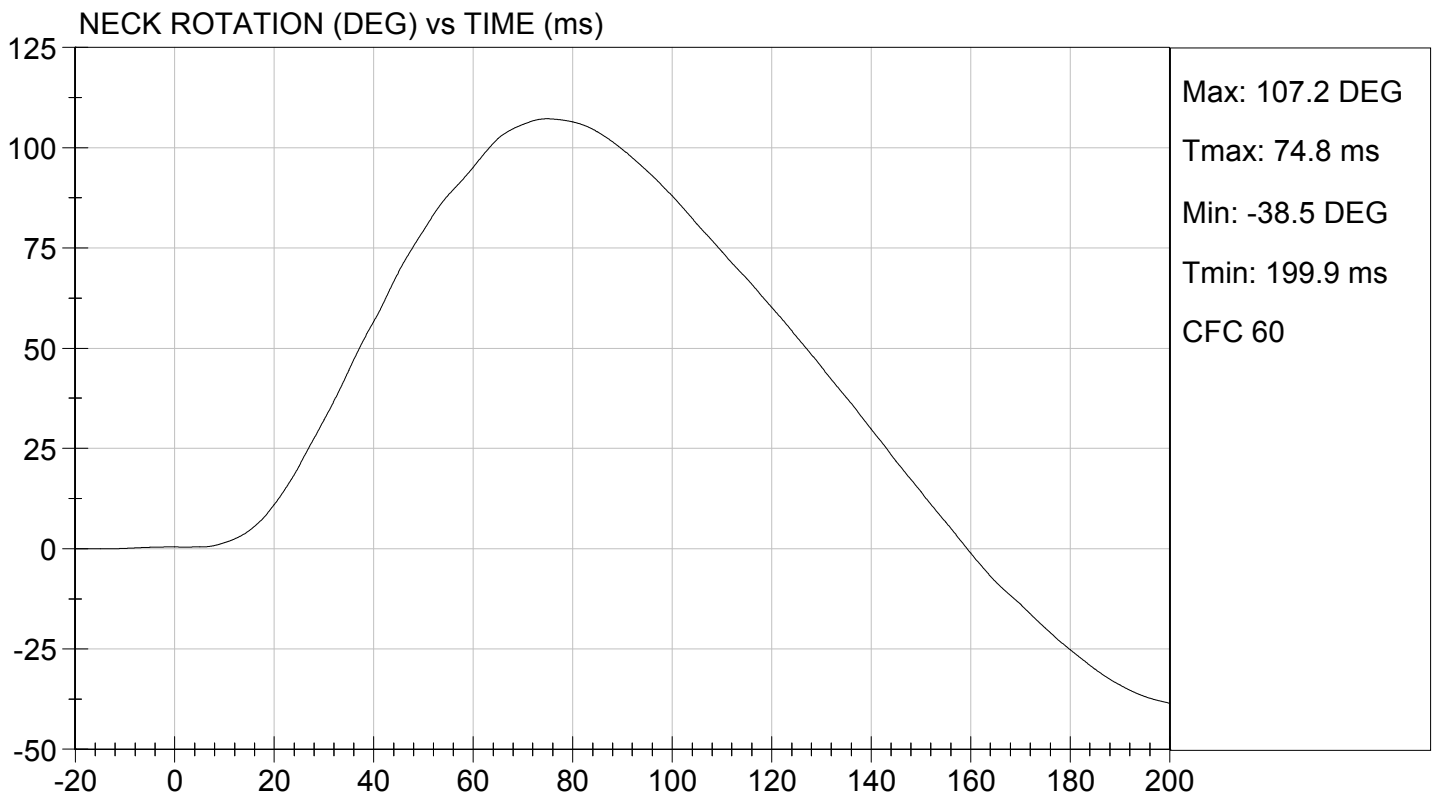
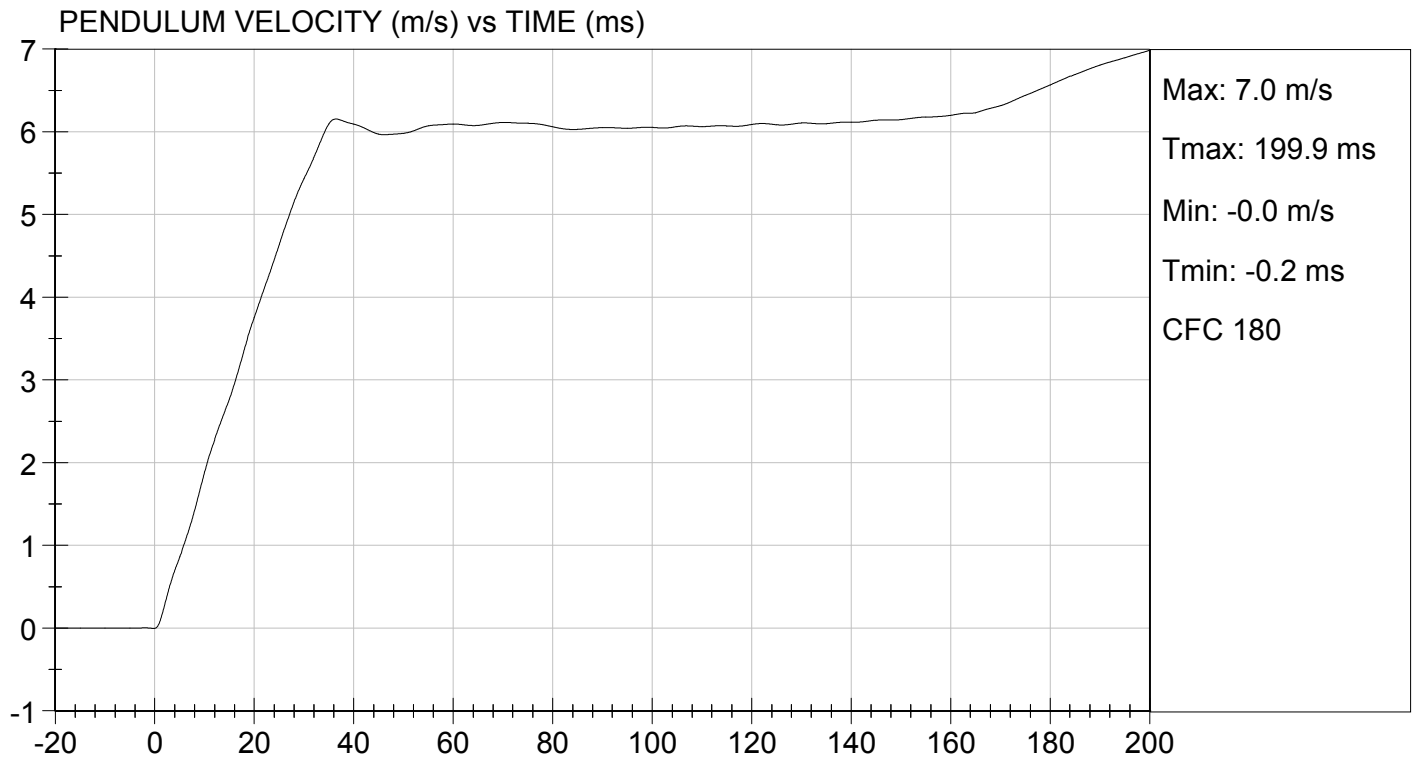
02/04/2014
Test Date

Jeff Leonard
Approved By



TEST DESC: NECK EXTENSION
VELOCITY: 19.84 ft/s, 6.05 m/s

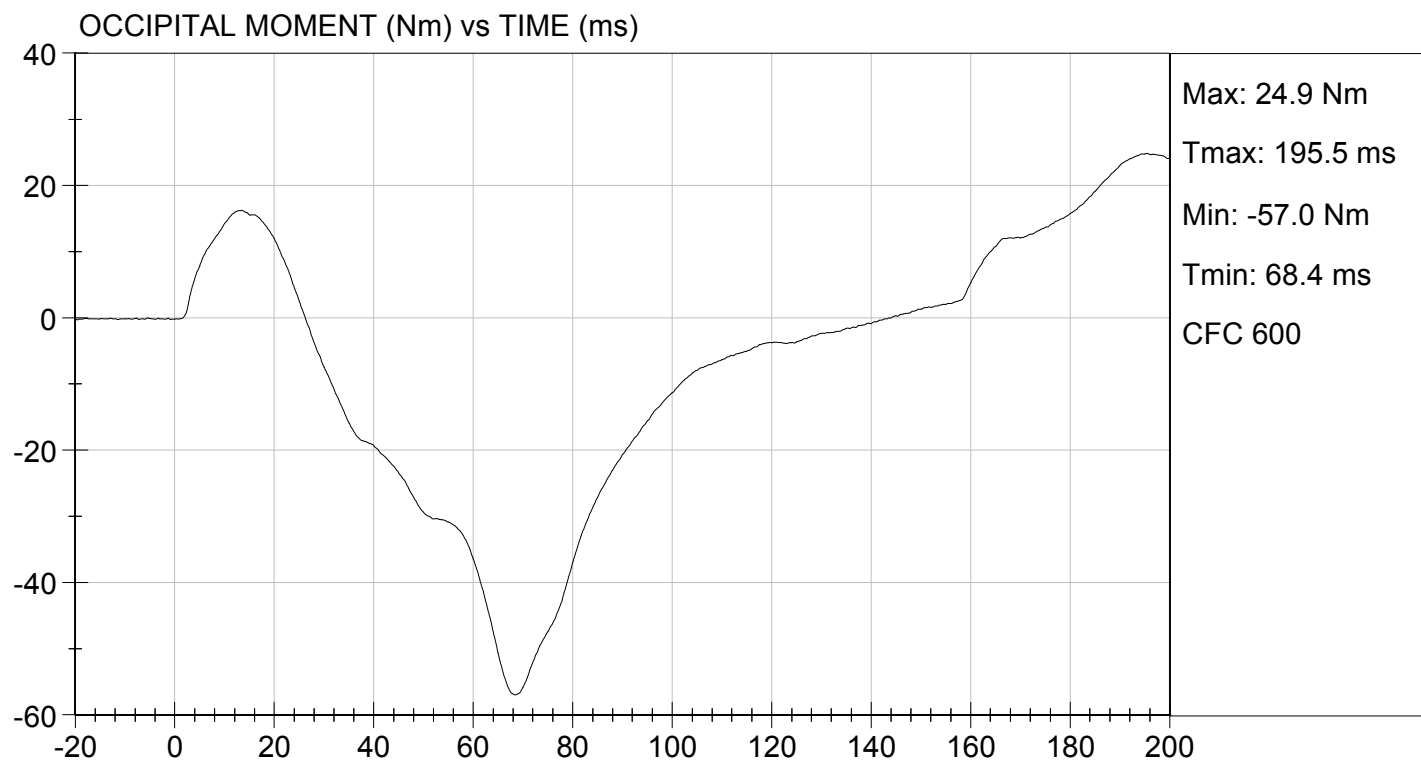
TEST DATE: 02/04/2014
TEST #: D14393





TEST DESC: NECK EXTENSION
VELOCITY: 19.84 ft/s, 6.05 m/s

TEST DATE: 02/04/2014
TEST #: D14393



DATA SHEET B6
THORAX IMPACT TEST (572.134) (5th Female)

Dummy Serial Number: 124

Test Date: 02/04/2014

Technician: David Schoedel

- ☒ Pre test calibration
☐ Post test calibration verification

Test attempt no. 1 (when successive thorax impact tests are necessary)

- ☒ 1. It has been at least 30 minutes since the last thorax impact test. (572.137(q))
☒ N/A, ONLY one thorax impact test performed
- ☒ 2. The test fixture conforms to the specifications in Figure 11B.
- ☒ 3. The complete assembled dummy (880105-000) is used (572.134(b)) and is dressed in a form fitting cotton stretch above-the-elbow sleeved shirt and above-the-knee pants. The weight of the shirt and pants shall not exceed 0.14 kg. (572.134(c)(1))
- ☒ 4. The dummy assembly soaked at a temperature between 20.6°C (69°F) and 22.2°C (72°F) and at a relative humidity from 10% to 70% for a period of at least four (4) hours prior to this test. (572.134(c)(2))

Record the maximum temperature:	<u>21.2°C</u>
Record the minimum temperature:	<u>21.0°C</u>
Record the maximum humidity:	<u>17%</u>
Record the minimum humidity:	<u>12%</u>

- ☒ 5. Remove the chest skin and visually inspect the thorax assembly for cracks, cuts, abrasions, etc. Particular attention should be given to the rib damping material, chest displacement transducer assembly and the rear rib supports. Inspect for rib deformation using the chest depth gage. If any damage is noted repair and/or replace the damaged components unless the damage resulted from the vehicle crash test in which the dummy was an occupant in which case the damage must be documented and post test calibration verification testing completed before any repairs or replacements are made.

☒ - No Damage

☐ - Damage from crash test, no repairs or replacement because this is a post test calibration verification. Record damage:

☐ - The following repairs or replacement was performed. Record:

- X 6. Seat the dummy, (chest skin still removed) without back and arm supports on the test fixture surface as shown in Figure 11B. The surface must be long enough to support the pelvis and outstretched legs. (572.134(c)(3))
- X 7. Level the ribs both longitudinally and laterally $\pm 0.5^\circ$ and adjust the pelvis angle to $7^\circ \pm 2^\circ$. The angle may be measured using the special H-point tool (TE-2504) that inserts into the pelvic structure and extends outward beyond the pelvic skin surface or by using the surface of the pelvic adaptor block.
- X 8. The midsagittal plane of the dummy is vertical within $\pm 1^\circ$. (572.134(c)(3))
- X 9. The longitudinal centerline of the test probe is centered within ± 2.5 mm of the midsagittal plane of the dummy and is $12.7 \text{ mm} \pm 1 \text{ mm}$ below the horizontal peripheral centerline of the No. 3 rib and is within 0.5° of a horizontal line in the dummy's midsagittal plane. (572.134(c)(4))
- X 10. Align the adjustable neck bracket index marks to the "zero" position.
- X 11. Record locations such as the rear surfaces of the thoracic spine and the lower neck bracket reference with respect to the laboratory coordinate system. These reference measurements are necessary to ensure the dummy is in the same position after the chest skin is installed. The reference locations must be accessible after installation of the chest skin. It may be necessary to leave the chest skin zipper unfastened until the references are checked and fasten it just prior to the test.
- X 12. Install the chest skin and reposition the dummy as described in the preceding paragraph using the reference measurements recorded.
- X 13. Place the arm assemblies horizontal $\pm 2^\circ$ and parallel to the midsagittal plane. The arms are held in place by tightening the adjustment nut that holds the arm yoke to the clavicle assembly.
- X 14. The data acquisition system, including transducers, must conform to the requirements of SAE Recommended Practice J211/1 MAR95 (572.136(m)) Class 180.
- X 15. Impact the anterior surface of the thorax with the test probe so the longitudinal centerline of the probe is within 2° of a horizontal line in the dummy's midsagittal plane at the moment of impact. (572.134(c)(5)) The velocity of the test probe at the time of impact is $6.71 \text{ m/s} \pm 0.12 \text{ m/s}$. (572.134(b)) The probe is guided so there is no significant lateral, vertical or rotational movement during the impact. (572.134(c)(6)) Neither the suspension hardware, suspension cables, nor other attachments to the probe, including the velocity vane, make contact with the dummy. (572.134(c)(7))

- X 16. Complete the following table:
Thorax Impact Results (572.134(b) and 572.134(b)(1)&(2))

Parameter*	Specification	Result
Test Probe Speed	$6.59 \text{ m/s} \leq \text{speed} \leq 6.83 \text{ m/s}$	6.77 m/s
Chest Compression	$50.0 \text{ mm} \leq \text{compression} \leq 58.0 \text{ mm}$	52 mm
Peak force** between 50.0 and 58.0 mm chest compression	$3900\text{N} \leq \text{peak force} \leq 4400\text{N}$	4372 N
Peak Force** between 18.0 and 50.0 mm chest compression	Peak Force $\leq 4600 \text{ N}$	4377 N
Internal Hysteresis***	$69\% \leq \text{hysteresis} \leq 85\%$	73%

*Time zero is defined as the time of initial contact between the test probe and the chest skin.

**Force = impactor mass x acceleration (572.134(b)(3))

***Area under loading curve minus the area under the unloading curve divided by the area under the loading curve. (Figure 12B)

- X 17. Plots of chest compression, acceleration, force, force versus deflection follow this sheet.

David Schoedel

Signature

02/04/2014

Date

MGA RESEARCH CORPORATION
THORAX IMPACT
HYBRID III 5TH PERCENTILE

ATD Serial No: 124

Test I.D: D14394

Tested Parameter	Units	Specification	Result	Pass/Fail
Temperature	deg C	20.6 to 22.2	21.2	Pass
Relative Humidity	%	10 to 70	12	Pass
Probe Speed	m/s	6.59 to 6.83	6.77	Pass
Peak Deflection	mm	50 to 58	52	Pass
Peak Resistive Force w/in Deflection Corridor	N	3900 to 4400	4372	Pass
Internal Hysteresis	%	69 to 85	73	Pass
Peak Force 18 mm - 50 mm	N	<= 4600	4377	Pass
Overall Test Results				Pass

David Schoedel
Laboratory Technician

02/04/2014

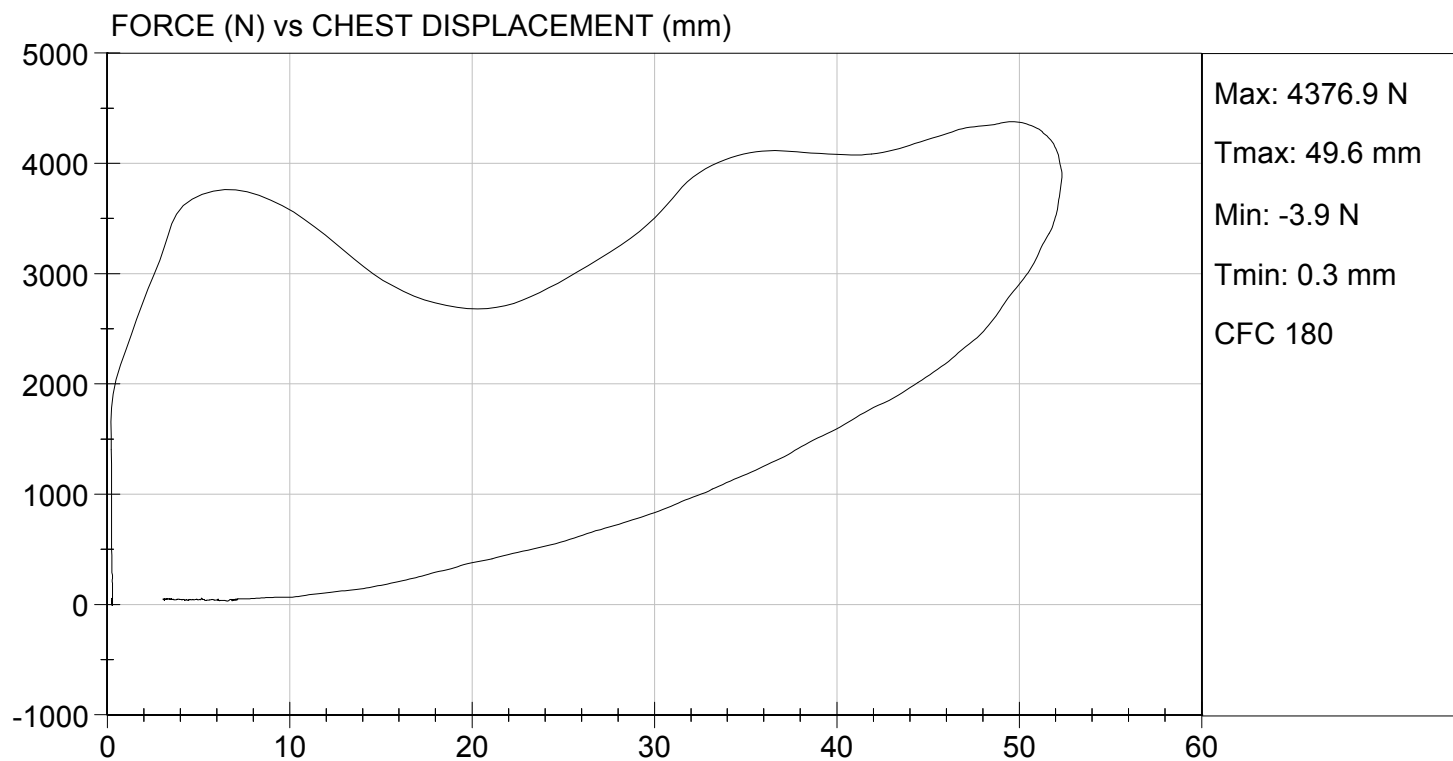
Test Date

Jeff Leonard
Approved By



TEST DESC: THORAX IMPACT
VELOCITY: 22.22 ft/s, 6.77 m/s

TEST DATE: 02/04/2014
TEST #: D14394



DATA SHEET B7
TORSO FLEXION TEST (572.135) (5th Female)

Dummy Serial Number: 124

Test Date: 02/04/2014

Technician: Tim Grochowske

X Pre test calibration
 Post test calibration verification

Test attempt no. 1 (when successive torso flexion tests are necessary)

- X 1. It has been at least 30 minutes since the last torso flexion test. (572.137(q))
 X N/A, ONLY one torso flexion test performed
- X 2. The test fixture conforms to the specifications in Figure 13B.
- X 3. The complete assembled dummy (880105-000) is used (572.135(c)(2)).
 With legs below femurs.
 X Without legs below femurs.
- X 4. The dummy assembly soaked at a temperature between 18.9°C (66°F) and 25.6°C (78°F) and at a relative humidity from 10% to 70% for a period of at least four (4) hours prior to this test. (572.135(c)(1))
- | | |
|---------------------------------|---------------|
| Record the maximum temperature: | <u>21.2°C</u> |
| Record the minimum temperature: | <u>21.0°C</u> |
| Record the maximum humidity: | <u>17%</u> |
| Record the minimum humidity: | <u>12%</u> |
- X 5. Secure the pelvis to the fixture at the pelvis instrument cavity rear face by threading four ¼ cap screws into the available threaded attachment holes. Tighten the mountings so that the test material is rigidly affixed to the test fixture and the pelvic lumbar joining surface is horizontal. (572.135(c)(3))
- X 6. Attach the loading adapter bracket to the spine of the dummy as shown in Figure 13B. (572.135(c)(4))
- X 7. Inspect and adjust, if necessary, the seating of the abdominal insert within the pelvis cavity and with respect to the torso flesh, assuring that the torso flesh provides uniform fit and overlap with respect to the outside surface of the pelvis flesh. (572.135(c)(5))
- X 8. Flex the dummy forward and back 3 times such that the angle reference plane moves between 0° and 30° with respect to the vertical transverse plane. (572.135(c)(6))

- X 9. Support the dummy such that the angle reference plane is at or near 0° (vertical with respect to the vertical transverse plane). Wait at least 30 minutes before continuing. (572.135(c)(6))
- X 10. Remove all external support that was implemented in 9 above. (572.135(c)(7))
- X 11. Measure the initial orientation angle of the torso reference plane of the seated, unsupported dummy. (572.135(c)(7))
 Record reference plane angle (max. allowed 20°): See Result Table
- X 12. Attach the pull cable and the load cell. (572.135(c)(8))
- X 13. Apply a tension force in the midsagittal plane to the pull cable at any upper torso deflection rate between 0.5° and 1.5° per second, until the angle reference plane is at 45° ± 0.5° of flexion relative to the vertical transverse plane. (572.135(c)(9))
- X 14. Maintain angle reference plane at 45° ± 0.5° of flexion for 10 seconds. (572.135(c)(10))
- X 15. As quickly as possible release the force applied to the attachment bracket. (572.135(c)(11))
- X 16. 3 minutes after the release of the force, measure the reference plane angle. (572.135(c)(11))
- X 17. Complete the following table:
 Torso Flexion Results (572.135(b), 572.135(c)(7), 572.135(c)(9))

Parameter	Specification	Result
Initial ref. plane angle	Angle ≤ 20°	16 deg
Torso rotation rate	0.5°/s ≤ rate ≤ 1.5°/s	0.9 deg/sec
Force at 45° ± 0.5°	320 N ≤ force ≤ 390 N	370 N
Final ref. plane angle	Initial ref. plane angle ± 8°	20 deg

Tim Anshutz
 Signature

02/04/2014
 Date

MGA RESEARCH CORPORATION

**TORSO FLEXION TEST
HYBRID III 5TH PERCENTILE**

ATD Serial No: 124

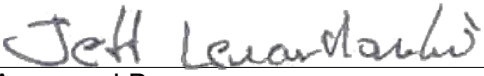
Test I.D: D14397

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 to 25.6	21.2	Pass
Laboratory Relative Humidity	%	10 to 70	12	Pass
Initial Angle	deg	0 to 20	16	Pass
Return Angle	deg	+/- 8	20	Pass
Force at 45 deg	N	320 to 390	370	Pass
Upper Torso Deflection Rate	deg/s	0.5 to 1.5	0.9	Pass
Overall Result				Pass


Laboratory Technician

02/04/2014

Test Date


Approved By

DATA SHEET B8
LEFT KNEE IMPACT TEST (572.136) (5th Female)

Dummy Serial Number: 124

Test Date: 02/04/2014

Technician: David Schoedel

X Pre test calibration
 Post test calibration verification

Test attempt no. 1 (when successive knee impact tests are necessary)

- X 1. It has been at least 30 minutes since the last knee impact test. (572.137(q))
X N/A, ONLY one knee impact test performed
- X 2. The test fixture conforms to the specifications in Figure 14B.
- X 3. The knee assembly (880105-528L), lower leg structural replacement (880105-603), lower leg flesh (880105-601), ankle assembly (880105-660), foot assembly (880105-650), and femur load transducer (SA572-S14) (may use the load cell structural replacement (78051-319)) were used. (572.136(b)(1))
- X 4. The knee assembly soaked at a temperature between 18.9°C (66°F) and 25.6°C (78°F) and at a relative humidity from 10% to 70% for a period of at least four (4) hours prior to this test. (572.136(c)(1))
- | | |
|---------------------------------|---------------|
| Record the maximum temperature: | <u>21.2°C</u> |
| Record the minimum temperature: | <u>21.0°C</u> |
| Record the maximum humidity: | <u>17%</u> |
| Record the minimum humidity: | <u>12%</u> |
- X 5. Mount the test specimen and secure it to the rigid test fixture. (572.136(c)(2))
- X 6. No parts of the foot or tibia contact any exterior surface. (572.136(c)(2))
- X 7. Align the test probe so that throughout its stroke and at contact with the knee it is within 2 degrees of horizontal and collinear with the longitudinal centerline of the femur. (572.136(c)(3))
- X 8. The probe is guided so there is no significant lateral, vertical or rotational movement during the impact with the knee. (572.136(c)(4))
- X 9. The data acquisition system, including transducers, must conform to the requirements of SAE Recommended Practice J211/1 MAR95 (572.136(m)) Class 600.

X 10. Contact the knee with the test probe at a speed between 2.07 m/s and 2.13 m/s.
(572.136(c)(5)) Neither the suspension hardware, suspension cables, nor other
attachments to the probe, including the velocity vane, make contact with the dummy.
(572.136(c)(6))

 X 11. Complete the following table:
Knee Impact Results (572.136(b)(1) and 572.136(c)(5))

Parameter	Specification	Result
Probe speed	$2.07 \text{ m/s} \leq \text{speed} \leq 2.13 \text{ m/s}$	2.12 m/s
Peak resistance force*	$3450 \text{ N} \leq \text{force} \leq 4060 \text{ N}$	3556 N

*Force = impactor mass x deceleration (572.136(b)(2))

 X 12. Plots of acceleration versus time and force versus time follow this sheet.

David Schoedel
Signature

02/04/2014
Date

MGA RESEARCH CORPORATION

**LEFT KNEE IMPACT TEST
HYBRID III 5TH PERCENTILE**

ATD Serial No: 124

Test I.D: D14396

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 to 25.6	21.2	Pass
Laboratory Relative Humidity	%	10 to 70	13	Pass
Probe Speed	m/s	2.07 to 2.13	2.12	Pass
Maximum Force	N	3450 to 4060	3556	Pass
Overall Test Results				Pass

David Schoedel
Laboratory Technician

02/04/2014

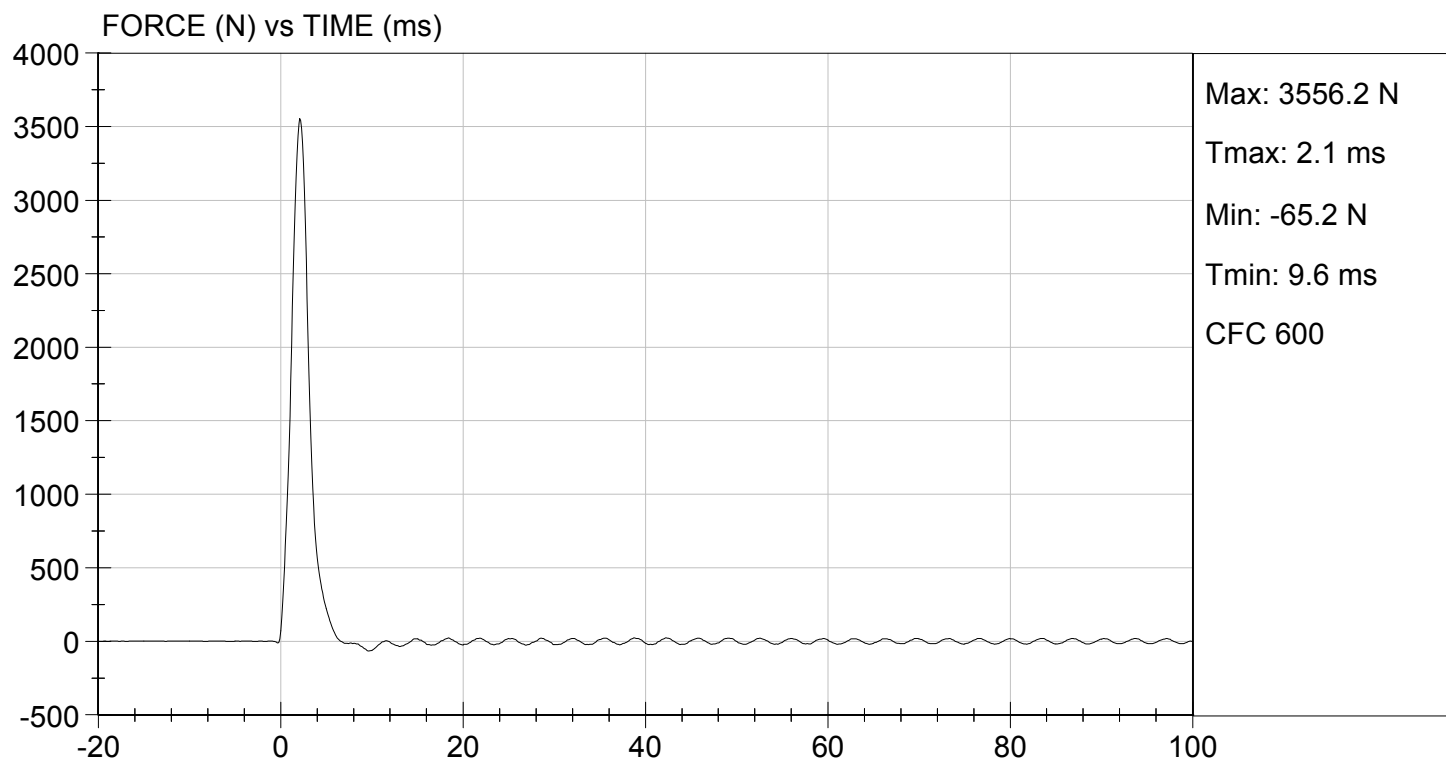
Test Date

Jeff Leonard
Approved By



TEST DESC: LEFT KNEE
VELOCITY: 6.94 ft/s, 2.12 m/s

TEST DATE: 02/04/2014
TEST #: D14396



DATA SHEET B9
RIGHT KNEE IMPACT TEST (572.136) (5th Female)

Dummy Serial Number: 124

Test Date: 02/04/2014

Technician: David Schoedel

- ☒ Pre test calibration
☐ Post test calibration verification

Test attempt no. 1 (when successive knee impact tests are necessary)

- ☒ 1. It has been at least 30 minutes since the last knee impact test. (572.137(q))
☒ N/A, ONLY one knee impact test performed
- ☒ 2. The test fixture conforms to the specifications in Figure 14B.
- ☒ 3. The knee assembly (880105-528R), lower leg structural replacement (880105- 603), lower leg flesh (880105-601), ankle assembly (880105-660), foot assembly (880105-651), and femur load transducer (SA572-S14) (may use the load cell structural replacement (78051-319)) were used. (572.136(b)(1))
- ☒ 4. The knee assembly soaked at a temperature between 18.9°C (66°F) and 25.6°C (78°F) and at a relative humidity from 10% to 70% for a period of at least four (4) hours prior to this test. (572.136(c)(1))

Record the maximum temperature:	<u>21.2°C</u>
Record the minimum temperature:	<u>21.0°C</u>
Record the maximum humidity:	<u>17%</u>
Record the minimum humidity:	<u>12%</u>

- ☒ 5. Mount the test specimen and secure it to the rigid test fixture. (572.136(c)(2))
- ☒ 6. No parts of the foot or tibia contact any exterior surface. (572.136(c)(2))
- ☒ 7. Align the test probe so that throughout its stroke and at contact with the knee it is within 2 degrees of horizontal and collinear with the longitudinal centerline of the femur. (572.136(c)(3))
- ☒ 8. The probe is guided so there is no significant lateral, vertical or rotational movement during the impact with the knee. (572.136(c)(4))
- ☒ 9. The data acquisition system, including transducers, must conform to the requirements of SAE Recommended Practice J211/1 MAR95 (572.136(m)) Class 600.

X 10. Contact the knee with the test probe at a speed between 2.07 m/s and 2.13 m/s.
(572.136(c)(5)) Neither the suspension hardware, suspension cables, nor other
attachments to the probe, including the velocity vane, make contact with the dummy.
(572.136(c)(6))

 X 11. Complete the following table:
Knee Impact Results (572.136(b)(1) and 572.136(c)(5))

Parameter	Specification	Result
Probe speed	$2.07 \text{ m/s} \leq \text{speed} \leq 2.13 \text{ m/s}$	2.07 m/s
Peak resistance force*	$3450 \text{ N} \leq \text{force} \leq 4060 \text{ N}$	3476 N

*Force = impactor mass x deceleration (572.136(b)(2))

 X 12. Plots of acceleration versus time and force versus time follow this sheet.

David Schoedel
Signature

02/04/2014
Date

MGA RESEARCH CORPORATION

RIGHT KNEE IMPACT TEST

HYBRID III 5TH PERCENTILE

ATD Serial No: 124

Test I.D: D14395

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 to 25.6	21.2	Pass
Laboratory Relative Humidity	%	10 to 70	13	Pass
Probe Speed	m/s	2.07 to 2.13	2.07	Pass
Maximum Force	N	3450 to 4060	3476	Pass
Overall Test Results				Pass

David Schoedel
Laboratory Technician

02/04/2014

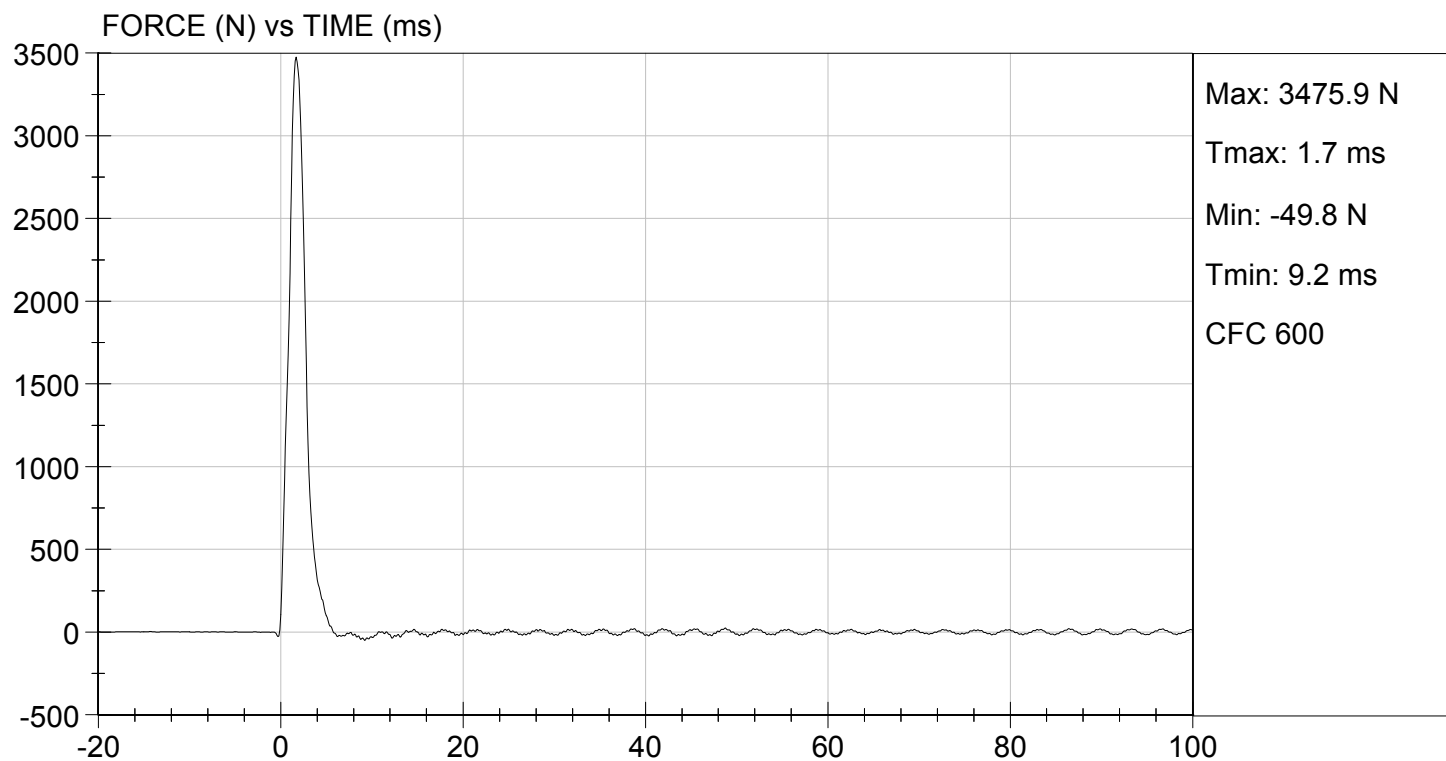
Test Date

Jeff Leonard
Approved By



TEST DESC: RIGHT KNEE
VELOCITY: 6.80 ft/s, 2.07 m/s

TEST DATE: 02/04/2014
TEST #: D14395



DATA SHEET B10

PART 572 INSTRUMENTATION CALIBRATION INFORMATION

I.D. NO.	MANUFACTURER	MODEL NO.	SERIAL NO.	DATE OF LAST CALIBRATION	DATE OF NEXT CALIBRATION
DUMMY INSTRUMENTATION					
HEAD ACCELEROMETERS					
(1) LONGITUDINAL	Endevco	7264C-2KTZ-2-360M17	P77650	01/16/2014	07/16/2014
(2) LATERAL	Endevco	7264C-2KTZ-2-360M17	P77651	01/16/2014	07/16/2014
(3) VERTICAL	Endevco	7264C-2KTZ-2-360M17	P77653	01/16/2014	07/16/2014
NECK TRANSDUCER	Denton	1716	1673	11/20/2013	05/20/2014
CHEST ACCELEROMETERS					
(1) LONGITUDINAL	Endevco	7264C-2KTZ-2-360M17	P78817	01/16/2014	07/16/2014
(2) LATERAL	Endevco	7264C-2KTZ-2-360M17	P78822	01/16/2014	07/16/2014
(3) VERTICAL	Endevco	7264C-2KTZ-2-360M17	P8825	01/16/2014	07/16/2014
CHEST POTENTIOMETER	Servo	14CBI-2897	124	01/20/2014	07/20/2014
FEMUR LOAD CELLS					
(1) RIGHT FEMUR	GSE	2430	1361	10/31/2013	05/01/2014
(2) LEFT FEMUR	GSE	2430	1362	10/31/2013	05/01/2014
LABORATORY INSTRUMENTATION					
NECK PENDULUM ACCELEROMETER	Endevco	7231C-750	AGH70	08/27/2013	02/27/2014
THORAX PENDULUM ACCELEROMETER	Endevco	7264C-2KTZ-2-240	P82319	11/01/2013	05/01/2014
KNEE PENDULUM ACCELEROMETER	Endevco	7264C-2KTZ-2-240	P77579	01/10/2014	07/10/2014
NECK ROTATION TRANSDUCER 1 (OPTIONAL)	Spectrol	132-0-0-102	18	08/13/2013	02/13/2014
NECK ROTATION TRANSDUCER 2 (OPTIONAL)	Spectrol	132-0-0-102	29	08/13/2013	02/13/2014

LABORATORY TECHNICIAN: Jessica Hall

DATA SHEET B3
HEAD DROP TEST (572.132) (5th Female)

Dummy Serial Number: 124

Test Date: 02/12/2014

Technician: David Schoedel

 Pre test calibration
 X Post test calibration verification

Test attempt no. 1 (when successive head drops are necessary)

- X 1. It has been at least 2 hours since the last head drop. (572.132(c)(5))
 X N/A, ONLY one head drop performed
- X 2. The head assembly consists of the complete head (880105-100X), the six-axis neck transducer (SA572-S11) or neck transducer structural replacement (78051-383X), and three (3) accelerometers (SA572-S4). (572.132(a))
- X 3. The head accelerometer mounting plate screws (10-24 x 3/8 SHCS) are torqued to 9.0 Nm.
- X 4. Accelerometers and their respective mounts are smooth and clean.
- X 5. Torque the skull cap screws (10-24 x 1/2 SHCS) to 9.0 Nm.
- X 6. The data acquisition system, including transducers, conforms to the requirements of SAE Recommended Practice J211/1 MAR95. (572.136(m))
- X 7. The head assembly soaked at a temperature between 18.9°C (66°F) and 25.6°C (78°F) and at a relative humidity from 10% to 70% for a period of at least four (4) hours prior to a test. (572.132(c)(1))
- | | |
|---------------------------------|---------------|
| Record the maximum temperature: | <u>20.9°C</u> |
| Record the minimum temperature: | <u>20.8°C</u> |
| Record the maximum humidity: | <u>14%</u> |
| Record the minimum humidity: | <u>12%</u> |
- X 8. Visually inspect the head skin for cracks, cuts, abrasions, etc. Repair or replace the head skin if the damaged area is more than superficial. Note: If the damage resulted from the vehicle crash test in which the dummy was an occupant, the damaged area is to be documented with photography and the post test calibration verification testing completed before any replacement or repairs are made.
- | | |
|------------------------------|------------------|
| Record findings and actions: | <u>No Damage</u> |
|------------------------------|------------------|

- X 9. Clean the impact surface of the skin and the impact surface of the fixture with isopropyl alcohol, trichloroethane or equivalent prior to the test. (572.132(c)(2))
- X 10. Suspend and orient the head assembly as shown in Figure 5B. The lowest point on the forehead is 376.0 ± 1.0 mm (14.8 ± 0.04 inch) from the impact surface. (572.132(c)(3))
Record the actual distance: 376 mm
- NOTE:** The masses of the suspension device and the accelerometer cables are to be kept as lightweight as possible to minimize their effect on the test results.
- X 11. The 1.57 mm (0.062 inch) diameter holes located on either side of the dummy's head are equidistance within 2 mm from the impact surface. A typical test setup is shown in Figure 6B. (572.132(c)(3))
Record the right side distance: 501 mm
Record the left side distance: 501 mm
- X 12. The impact surface is clean and dry and has a micro finish in the range of 203.2×10^{-6} mm (8 micro inches) to 2032.0×10^{-6} mm (80 micro inches) (RMS). (572.132(c)(4))
Record actual micro finish: 24.8 micro inches
- X 13. The impact surface is rigidly supported. (572.132(c)(4))
- X 14. The impact surface is a flat horizontal steel plate 50.8 mm (2 inches) thick and 610 mm (24 inches) square. (572.132(c)(4))
Record thickness: 50.9 mm
Record width: 604 mm
Record length: 595 mm
- X 15. Drop the head assembly from a height of 376.0 ± 1.0 mm (14.8 inches $\pm$ 0.04 inches) by a means that ensures a smooth, instant release onto the impact surface. (572.132(b) & (572.132(c)(4))
- X 16. Complete the following table using channel class 1000 data. (572.132(b)):

Parameter	Specification	Result
Peak resultant acceleration	$250 \text{ g} \leq x \leq 300 \text{ g}$	266 g
Resultant versus time history curve	Unimodal	Yes
Oscillations after the main pulse	Less than 10% of the peak resultant acceleration	Yes
Lateral acceleration	y-axis acceleration $\leq 15 \text{ g}$	-9.7 g

- X 17. Plots of the x, y, z, and resultant acceleration data follow this sheet.

David Schoedel
Signature

02/12/2014
Date

MGA RESEARCH CORPORATION
HEAD DROP TEST
HYBRID III 5TH PERCENTILE

ATD Serial No: 124

Test ID: D14551

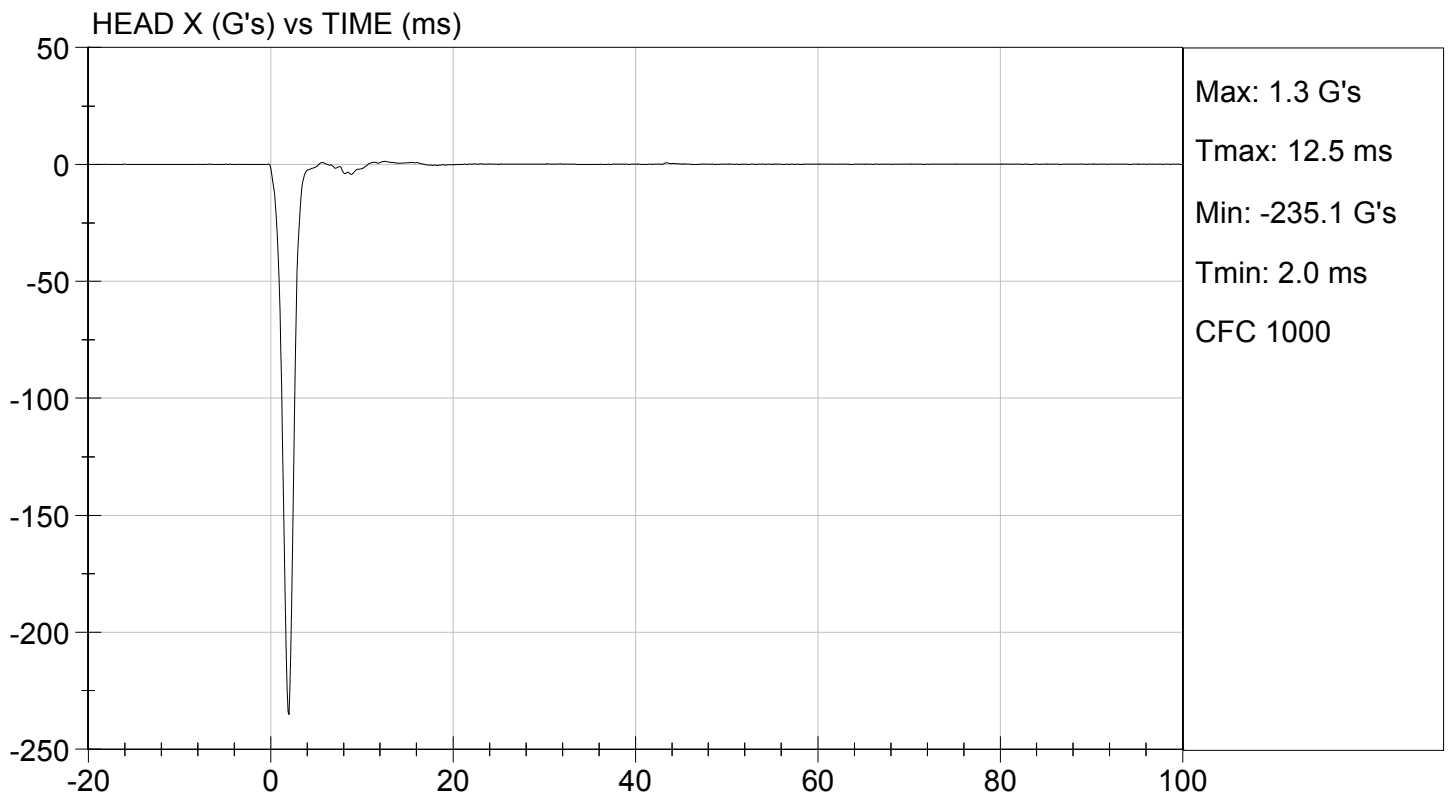
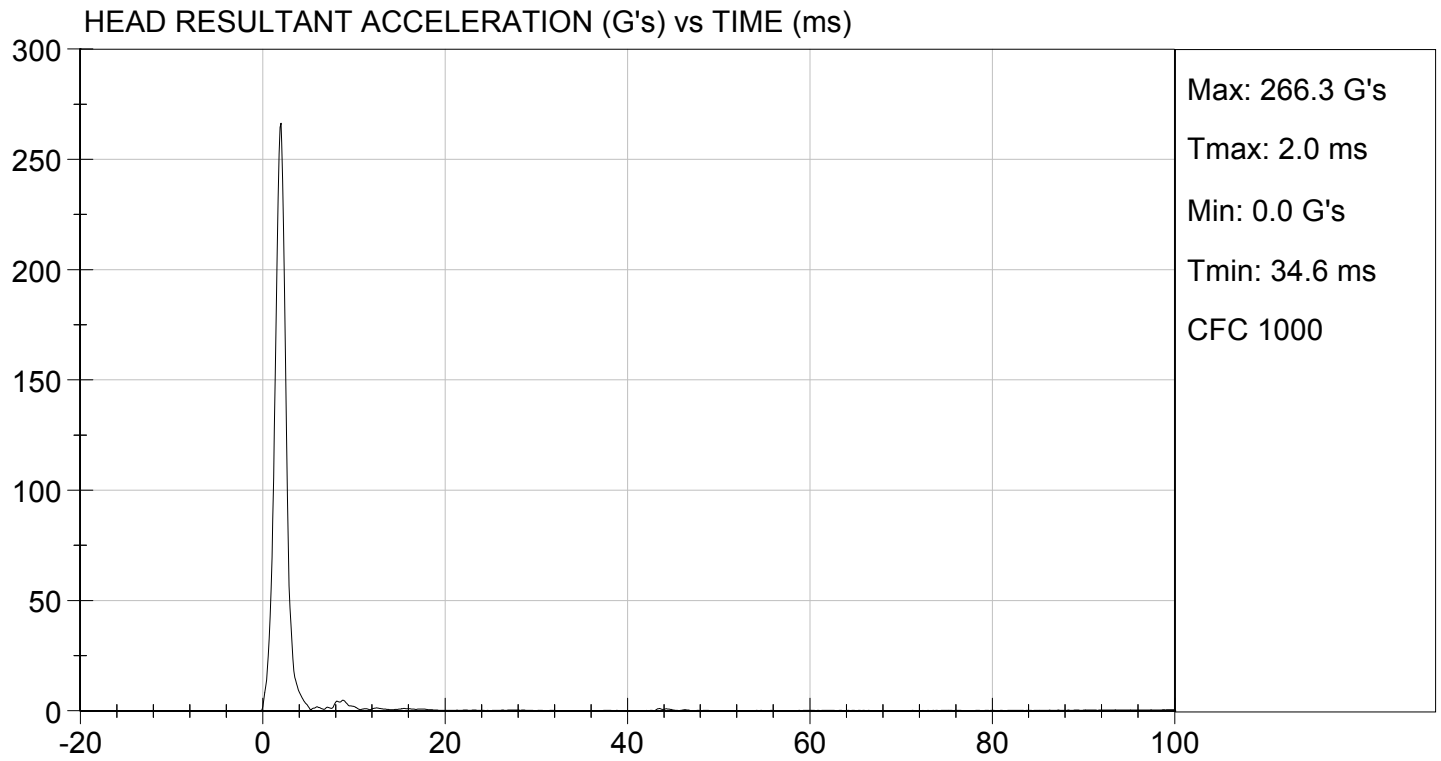
Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 to 25.6	20.8	Pass
Laboratory Relative Humidity	%	10 to 70	12	Pass
Peak Resultant Acceleration	G's	250 to 300	266	Pass
Peak Lateral Acceleration	G's	<= +/- 15.0	-9.7	Pass
Unimodal	N/A	Yes	Yes	Pass
Oscillations	N/A	within 10% of peak	Yes	Pass
Overall Test Results				Pass

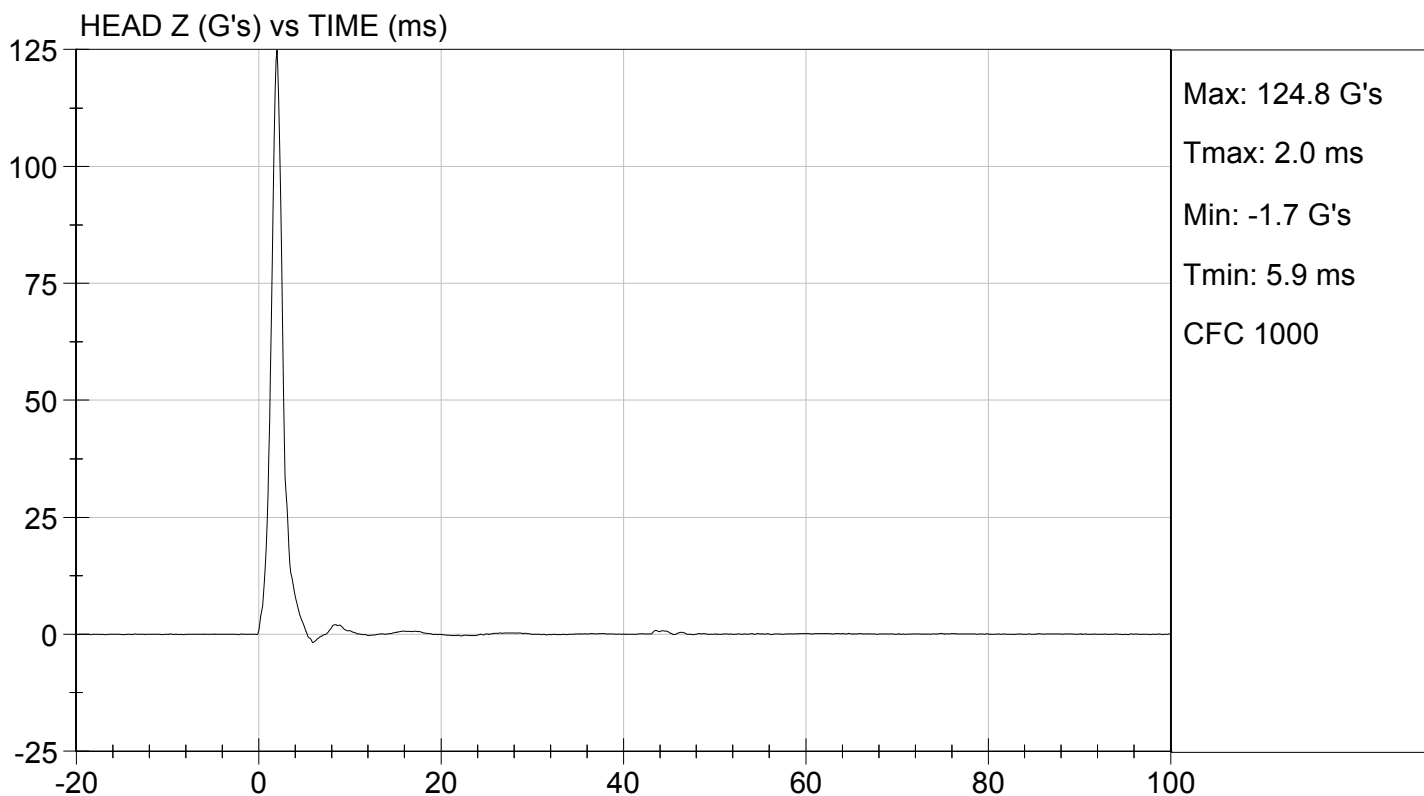
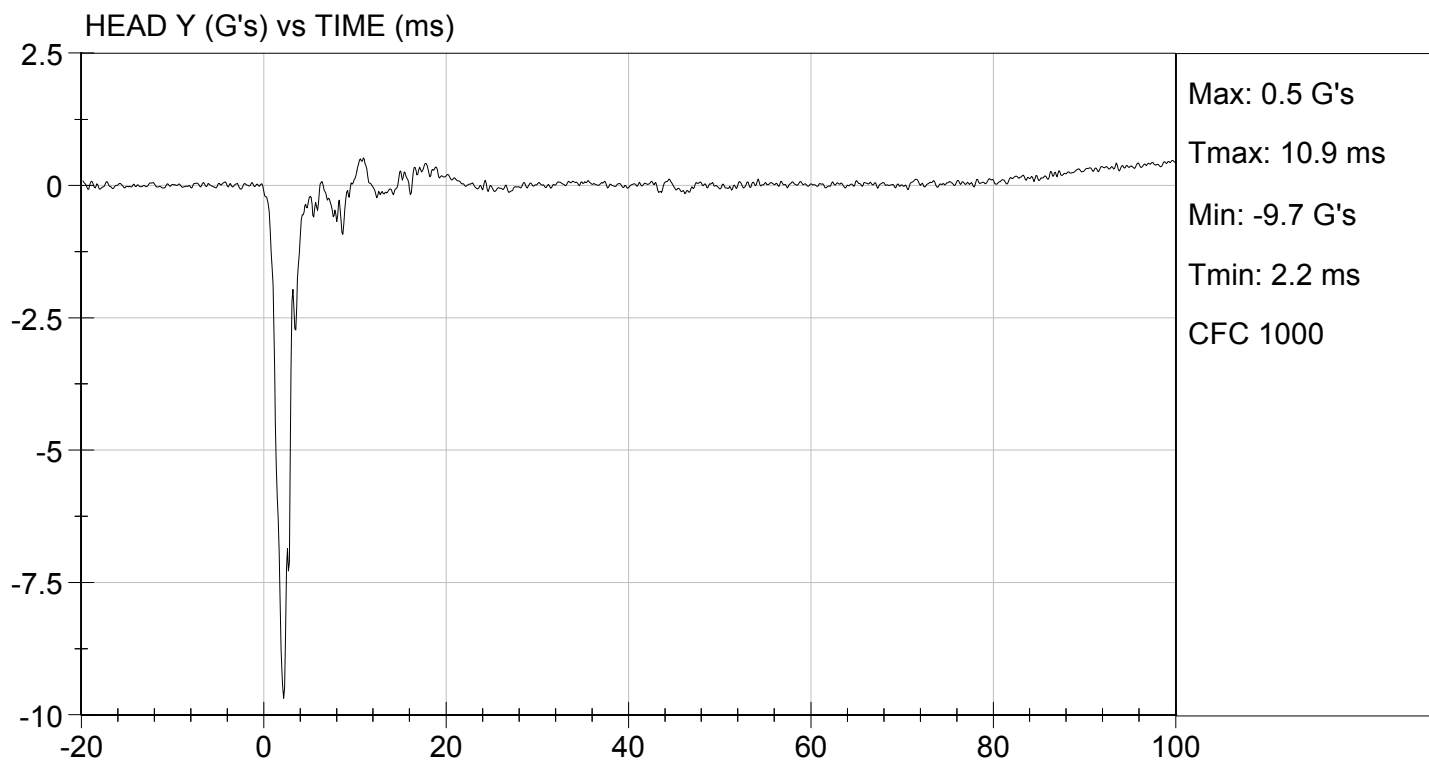
David Schoedel
Laboratory Technician

02/12/2014

Test Date

Jeff Leonard
Approved By





DATA SHEET B4
NECK FLEXION TEST (572.132) (5th Female)

Dummy Serial Number: 124

Test Date: 02/12/2014

Technician: Tim Grochowske

 Pre test calibration
 X Post test calibration verification

Test attempt no. 1 (when successive flexion tests are necessary)

- X 1. It has been at least 30 minutes since the last flexion test. (572.137(q))
 X N/A, ONLY one neck test performed
- X 2. The components required for the neck tests include the head assembly (880105-100X), neck (880105-250), bib simulator (880105-371), upper neck adjusting bracket (880105-207), lower neck adjusting bracket (880105-208), six axis neck transducer (SA572-S11) and either three accelerometers (SA572-S4) or their mass equivalent installed in the head assembly as specified in drawing 880105-100X. Data from the accelerometers are not required. (572.133(b))
- X 3. The assembly soaked at a temperature between 20.6°C (69°F) and 22.2°C (72°F) and at a relative humidity from 10% to 70% for a period of at least four (4) hours prior to a test. (572.133(c)(1))
- | | |
|---------------------------------|---------------|
| Record the maximum temperature: | <u>20.9°C</u> |
| Record the minimum temperature: | <u>20.8°C</u> |
| Record the maximum humidity: | <u>14%</u> |
| Record the minimum humidity: | <u>12%</u> |
- X 4. Visually inspect neck assembly for cracks, cuts and separation of the rubber from the metal segments. Note: If the damage resulted from the vehicle crash test in which the dummy was an occupant, the damaged area is to be documented with photography and the post test calibration verification testing completed before any replacement or repairs are made.
- Record findings and actions: No damage
- X 5. Inspect the nodding blocks (78051-351) for any deterioration, but when replacement is necessary, ONLY replace during pre-test calibration. Using a Shore "A" type Durometer, verify the hardness of the nodding blocks is between 80 and 90. Ensure the nodding blocks are installed correctly. (880105-250 and PADI page17).
- Record findings and actions: No Deterioration; Hardness: Front 89; Back 90.
- X 6. Torque the jam nut (9000018) on the neck cable (880105-206) to 1.4 ± 0.2 Nm (12.0 ± 2.0 in-lb). (572.133(c)(2))

- X 7. The data acquisition system, including transducers, conforms to the requirements of SAE Recommended Practice J211/1 MAR95. (572.137(m))
- X 8. The test fixture pendulum conforms to the specifications in Figure 7B. (572.133(c)(3))
- X 9. The head-neck assembly is mounted on the pendulum so the midsagittal plane of the head is vertical and coincides with the plane of motion of the pendulum longitudinal centerline as shown in Figure 8B for the flexion test. (572.133(c)(3))
- X 10. Install the transducers or other devices for measuring the "D" plane rotation with respect to the pendulum longitudinal centerline. Note: Plane "D" is the bottom horizontal surface of the skull. These measurement devices should be designed to minimize their influence upon the performance of the head-neck assembly. An example of a measurement device is shown in Figure 10B.
- X 11. With the pendulum resting against the honeycomb material, the neck bracket was adjusted until the longitudinal centerline of the pendulum was perpendicular ± 1 degree to plane "D" on the dummy's head.
- X 12. Release the pendulum and allow it to fall freely from a height to achieve an impact speed of 6.89 m/s to 7.13 m/s as measured at the center of the pendulum accelerometer. (572.133(c)(4)(i))
- X 13. Complete the following table:

Neck Flexion Test Results (572.133(b)(1) & 572.133(c)(4)(i & ii))

Parameter		Specification	Results
Pendulum impact speed		6.89 m/s $\leq$ speed $\leq$ 7.13 m/s	7.05 m/s
Pendulum ΔV with respect to impact speed	@ 10 ms	2.1 m/s $\leq \Delta V \leq$ 2.5 m/s	2.3 m/s
	@ 20 ms	4.0 m/s $\leq \Delta V \leq$ 5.0 m/s	4.4 m/s
	@ 30 ms	5.8 m/s $\leq \Delta V \leq$ 7.0 m/s	6.2 m/s
Plane D Rotation		Peak moment* 69 Nm $\leq$ moment $\leq$ 83 Nm during the following rotation range 77° $\leq$ angle $\leq$ 91°	72 Nm @ 82 degrees
Positive Moment Decay** (Flexion)		Time to decay to 10 Nm 80 ms $\leq$ time $\leq$ 100 ms	85 ms

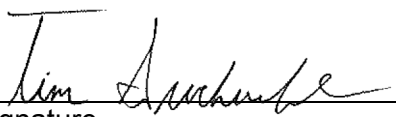
*Moment about the occipital condyle = $M_y - (0.01778 \text{ m} \times F_x)$ (572.133(b)(1)(ii))

M_y = Moment in Nm measured by the transducer

F_x = Force, in N measured by the transducer

**Time zero is defined as the time of initial contact between the pendulum striker plate and the honeycomb material. (572.133(b)(3))

- X 14. Plots of acceleration, velocity, y-axis moment, and x-axis force and y-axis moment about the occipital condyle follows this sheet.


Signature

02/12/2014
Date

MGA RESEARCH CORPORATION

NECK FLEXION TEST

HYBRID III 5TH PERCENTILE

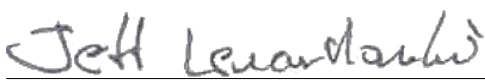
ATD Serial No: 125

Test I.D: D14552

Tested Parameter		Units	Specification	Result	Pass/Fail
Laboratory Temperature		deg C	20.6 to 22.2	20.9	Pass
Laboratory Relative Humidity		%	10 to 70	14	Pass
Pendulum Speed		m/s	6.89 to 7.13	7.05	Pass
Pendulum Velocity	10 ms	m/s	2.1 to 2.5	2.3	Pass
	20 ms	m/s	4.0 to 5.0	4.4	Pass
	30 ms	m/s	5.8 to 7.0	6.2	Pass
D Plane Rotation	Max	deg	77 to 91	82	Pass
Occipital Condyle Moment within Rotation Corridor		Nm	69 to 83	72	Pass
Positive Moment Time Curve Decay to 10 Nm		ms	80 to 100	85	Pass
Overall Results					Pass


 Laboratory Technician

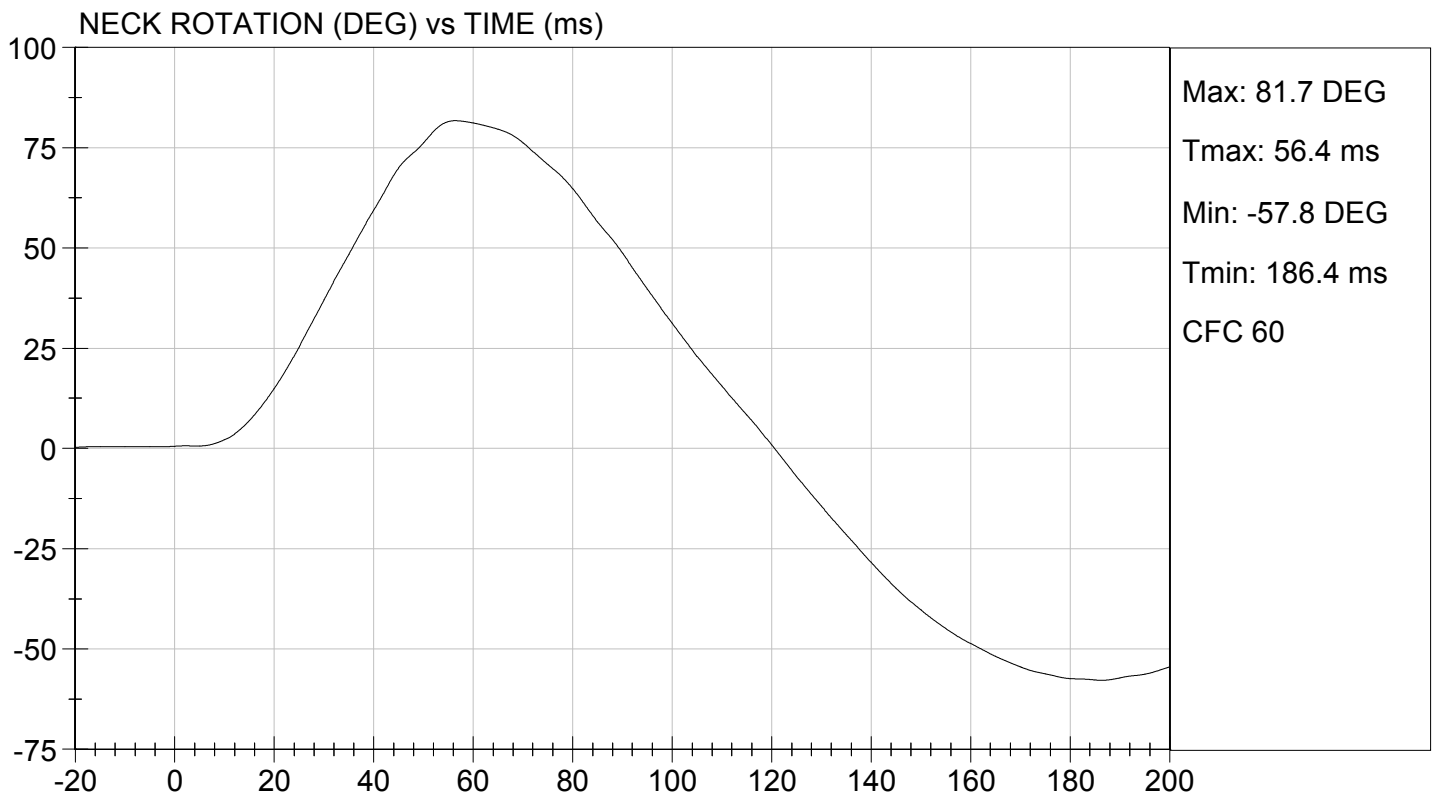
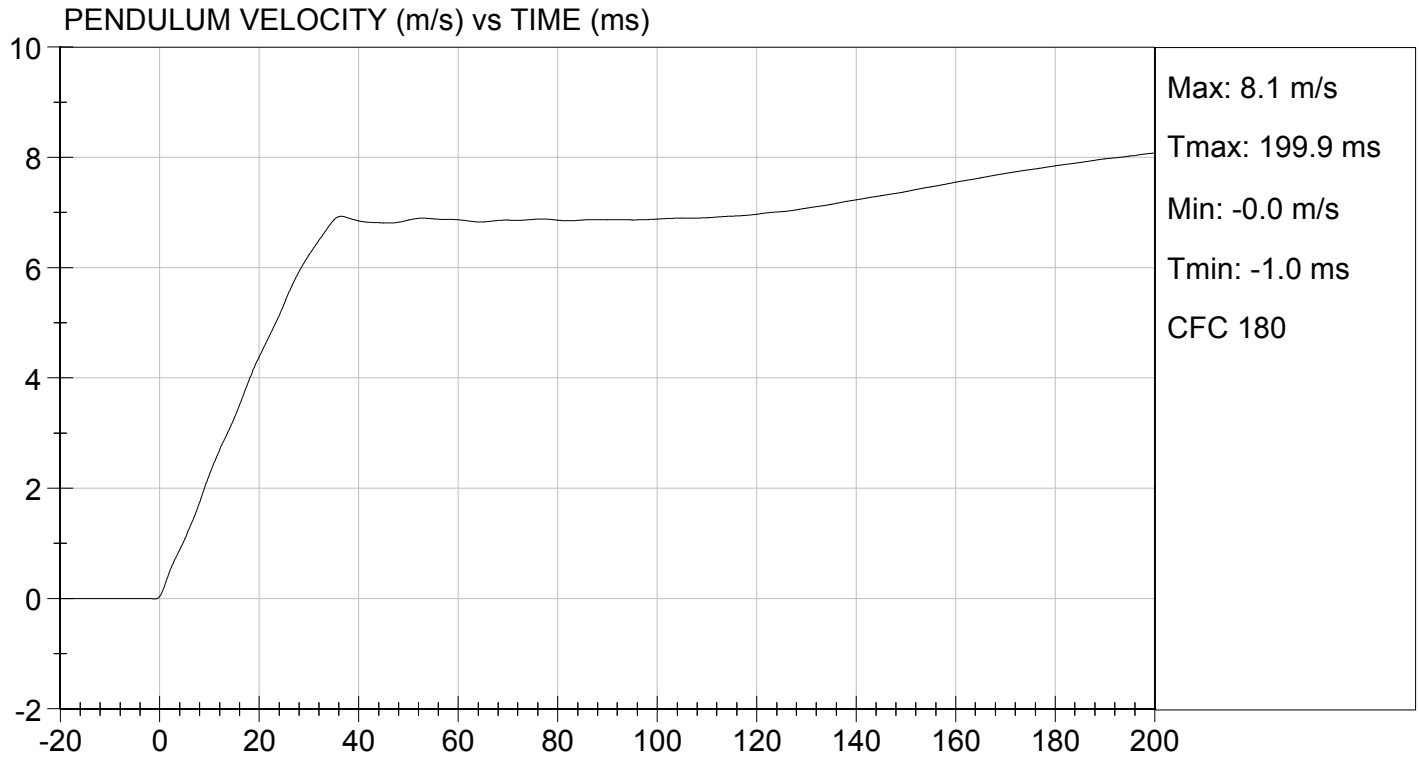
02/12/2014
 Test Date


 Approved By



TEST DESC: NECK FLEXION
VELOCITY: 23.14 ft/s, 7.05 m/s

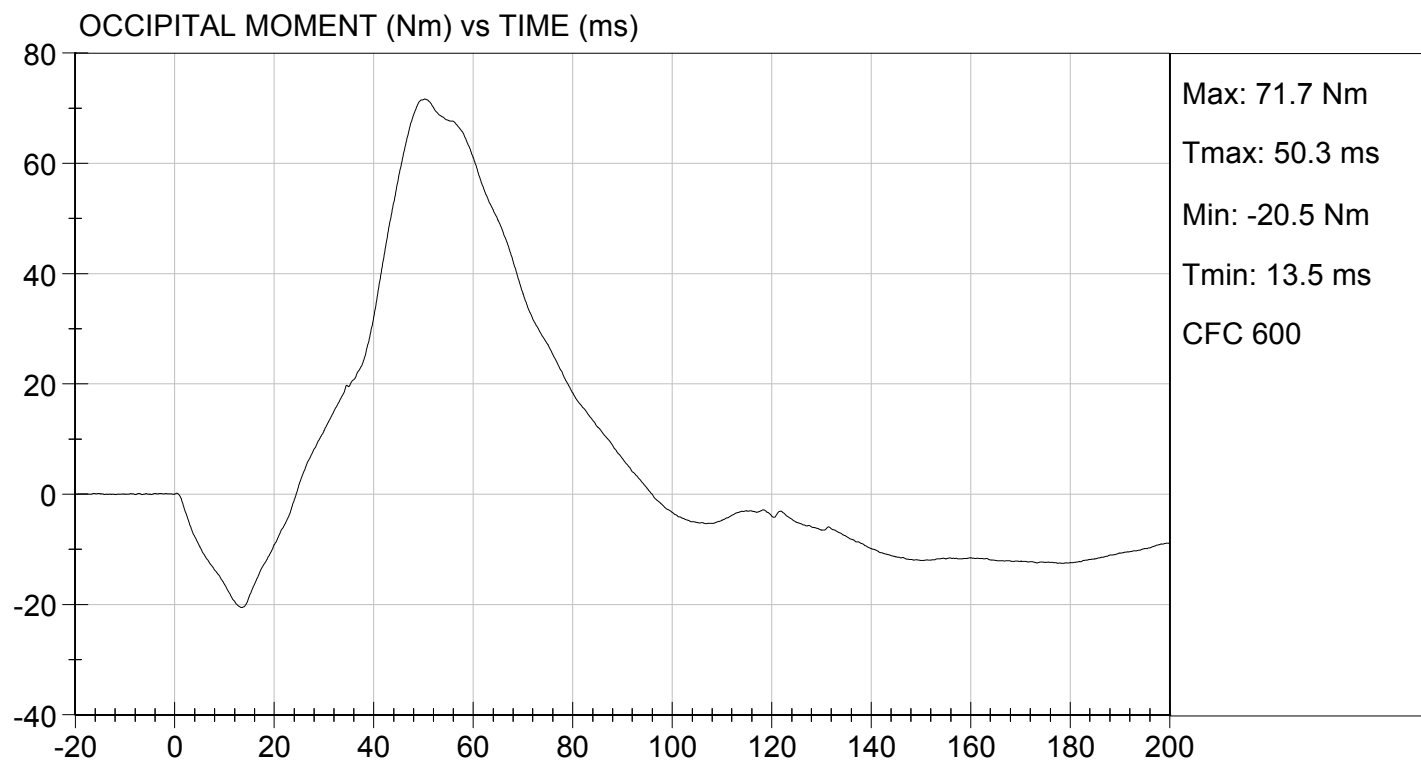
TEST DATE: 02/12/2014
TEST #: D14552





TEST DESC: NECK FLEXION
VELOCITY: 23.14 ft/s, 7.05 m/s

TEST DATE: 02/12/2014
TEST #: D14552



DATA SHEET B5
NECK EXTENSION TEST (572.133) (5th Female)

Dummy Serial Number: 124

Test Date: 02/12/2014

Technician: Tim Grochowske

- Pre test calibration
 X Post test calibration verification

Test attempt no. 1 (when successive extension tests are necessary)

- X 1. It has been at least 30 minutes since the last extension test. (572.137(q))
 X N/A, ONLY one neck test performed
- X 2. The components required for the neck tests include the head assembly (880105-100X), neck (880105-250), bib simulator (880105-371), upper neck adjusting bracket (880105-207), lower neck adjusting bracket (880105-208), six axis neck transducer (SA572-S11) and either three accelerometers (SA572-S4) or their mass equivalent installed in the head assembly as specified in drawing 880105-100X. Data from the accelerometers are not required. (572.133(b))
- X 3. The assembly soaked at a temperature between 20.6°C (69°F) and 22.2°C (72°F) and at a relative humidity from 10% to 70% for a period of at least four (4) hours prior to a test. (572.133(c)(1))
- | | |
|---------------------------------|---------------|
| Record the maximum temperature: | <u>20.9°C</u> |
| Record the minimum temperature: | <u>20.8°C</u> |
| Record the maximum humidity: | <u>14%</u> |
| Record the minimum humidity: | <u>12%</u> |
- X 4. Visually inspect neck assembly for cracks, cuts and separation of the rubber from the metal segments. Note: If the damage resulted from the vehicle crash test in which the dummy was an occupant, the damaged area is to be documented with photography and the post test calibration verification testing completed before any replacement or repairs are made.
- Record findings and actions: No damage
- X 5. Inspect the nodding blocks (78051-351) for any deterioration, but when replacement is necessary, ONLY replace during pre-test calibration. Using a Shore "A" type Durometer, verify the hardness of the nodding blocks is between 80 and 90. Ensure the nodding blocks are installed correctly. (880105-250 and PADI page17).
- Record findings and actions: No Deterioration; Hardness: Front 89; Back 90.
- X 6. Torque the jam nut (9000018) on the neck cable (880105-206) to 1.4 ± 0.2 Nm (12.0 ± 2.0 in-lb). (572.133(c)(2))

- X 7. The data acquisition system, including transducers, conforms to the requirements of SAE Recommended Practice J211/1 MAR95. (572.137(m))
- X 8. The test fixture pendulum conforms to the specifications in Figure 7B. (572.133(c)(3))
- X 9. The head-neck assembly is mounted on the pendulum so the midsagittal plane of the head is vertical and coincides with the plane of motion of the pendulum longitudinal centerline as shown in Figure 9B for the extension test. (572.133(c)(3))
- X 10. Install the transducers or other devices for measuring the "D" plane rotation with respect to the pendulum longitudinal centerline. Note: Plane "D" is the bottom horizontal surface of the skull. These measurement devices should be designed to minimize their influence upon the performance of the head-neck assembly. An example of a measurement device is shown in Figure 10B.
- X 11. With the pendulum resting against the honeycomb material, the neck bracket was adjusted until the longitudinal centerline of the pendulum was perpendicular ± 1 degree to plane "D" on the dummy's head.
- X 12. Release the pendulum and allow it to fall freely from a height to achieve an impact speed of 5.95 m/s to 6.19 m/s as measured at the center of the pendulum accelerometer. (572.133(c)(4)(i))
- X 13. Complete the following table:
Neck Extension Test Results (572.133(b)(2) & 572.133(c)(4)(I & ii))

Parameter		Specification	Results
Pendulum impact speed		$5.95 \text{ m/s} \leq \text{speed} \leq 6.19 \text{ m/s}$	6.12 m/s
Pendulum ΔV with respect to impact speed	@ 10 ms	$1.5 \text{ m/s} \leq \Delta V \leq 1.9 \text{ m/s}$	1.7 m/s
	@ 20 ms	$3.1 \text{ m/s} \leq \Delta V \leq 3.9 \text{ m/s}$	3.5 m/s
	@ 30 ms	$4.6 \text{ m/s} \leq \Delta V \leq 5.6 \text{ m/s}$	5.2 m/s
Plane D Rotation		Peak moment* $-65 \text{ Nm} \leq \text{moment} \leq -53 \text{ Nm}$ during the following rotation range $99^\circ \leq \text{angle} \leq 114^\circ$	-57 Nm @ 108 degrees
Positive Moment Decay** (Extension)		Time to decay to -10 Nm $94 \text{ ms} \leq \text{time} \leq 114 \text{ ms}$	101 ms

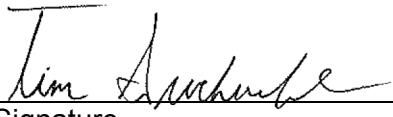
*Moment about the occipital condyle = $M_y - (0.01778 \text{ m} \times F_x)$ (572.133(b)(1)(ii))

M_y = Moment in Nm measured by the transducer

F_x = Force, in N measured by the transducer

**Time zero is defined as the time of initial contact between the pendulum striker plate and the honeycomb material. (572.133(b)(3))

- X 14. Plots of acceleration, velocity, y-axis moment, and x-axis force and y-axis moment about the occipital condyle follow this sheet.


Signature

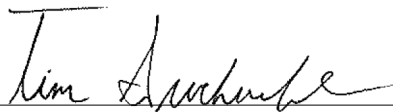
02/12/2014
Date

MGA RESEARCH CORPORATION
NECK EXTENSION TEST
HYBRID III 5TH PERCENTILE

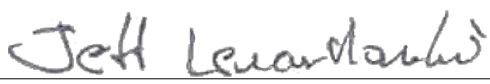
ATD Serial No: 125

Test I.D: D14553

Tested Parameter		Units	Specification	Result	Pass/Fail
Laboratory Temperature		deg C	20.6 to 22.2	20.9	Pass
Laboratory Relative Humidity		%	10 to 70	14	Pass
Pendulum Speed		m/s	5.95 to 6.19	6.12	Pass
Pendulum Velocity	10 ms	m/s	1.5 to 1.9	1.7	Pass
	20 ms	m/s	3.1 to 3.9	3.5	Pass
	30 ms	m/s	4.6 to 5.6	5.2	Pass
D Plane Rotation	Max	deg	99 to 114	108	Pass
Occipital Condyle Moment within Rotation Corridor		Nm	-65 to -53	-57	Pass
Negative Moment Time Curve Decay to -10 Nm		ms	94 to 114	101	Pass
Overall Results					Pass


 Laboratory Technician

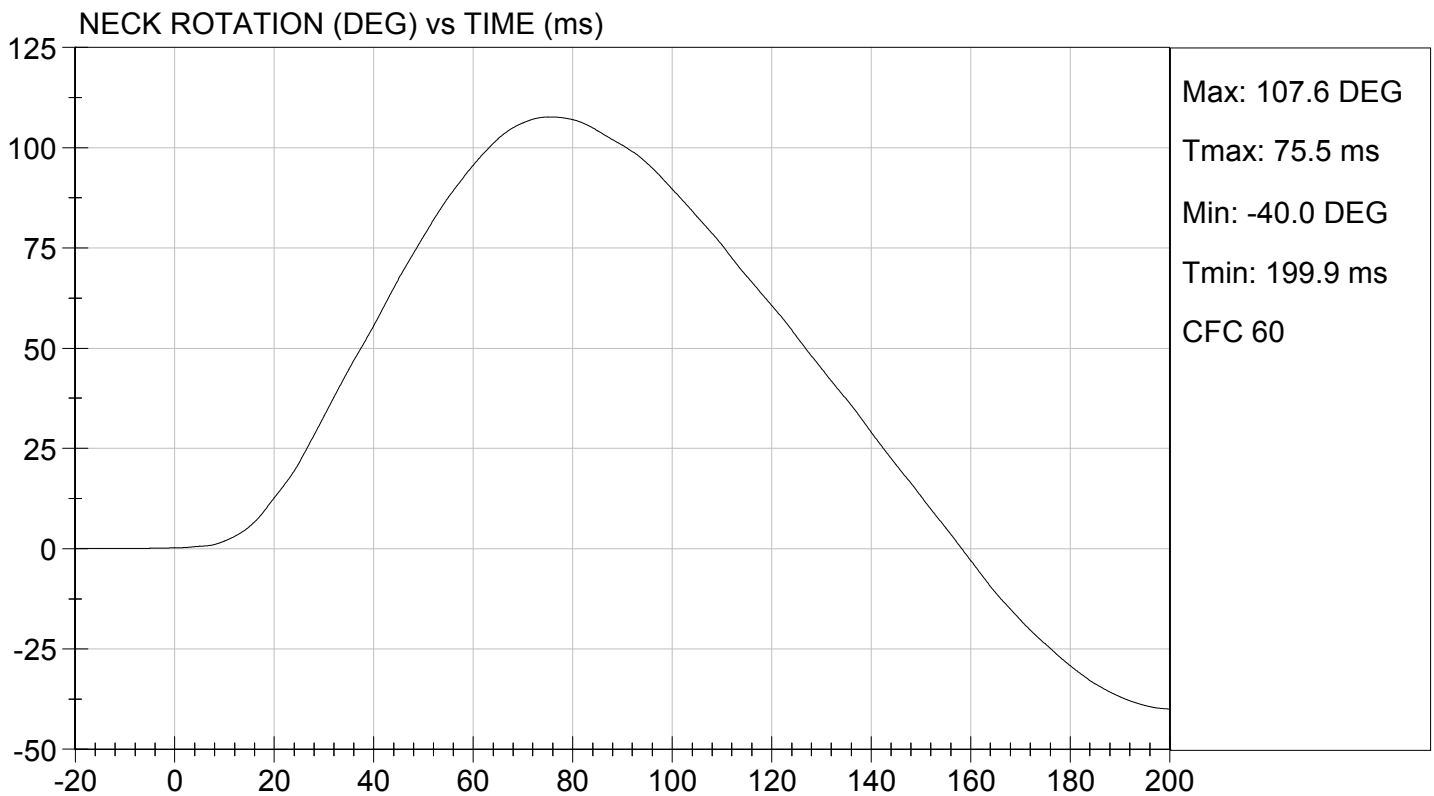
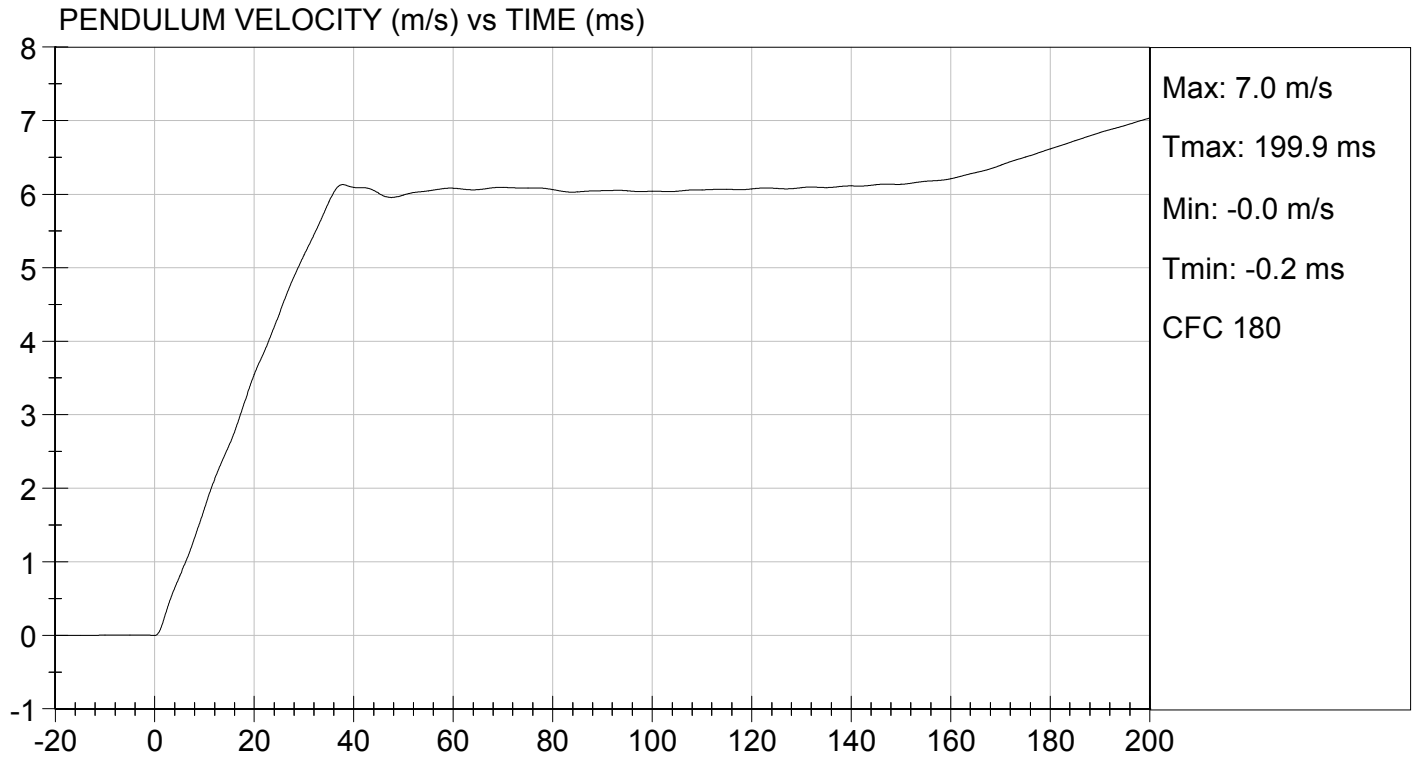
02/12/2014
 Test Date


 Approved By



TEST DESC: NECK EXTENSION
VELOCITY: 20.08 ft/s, 6.12 m/s

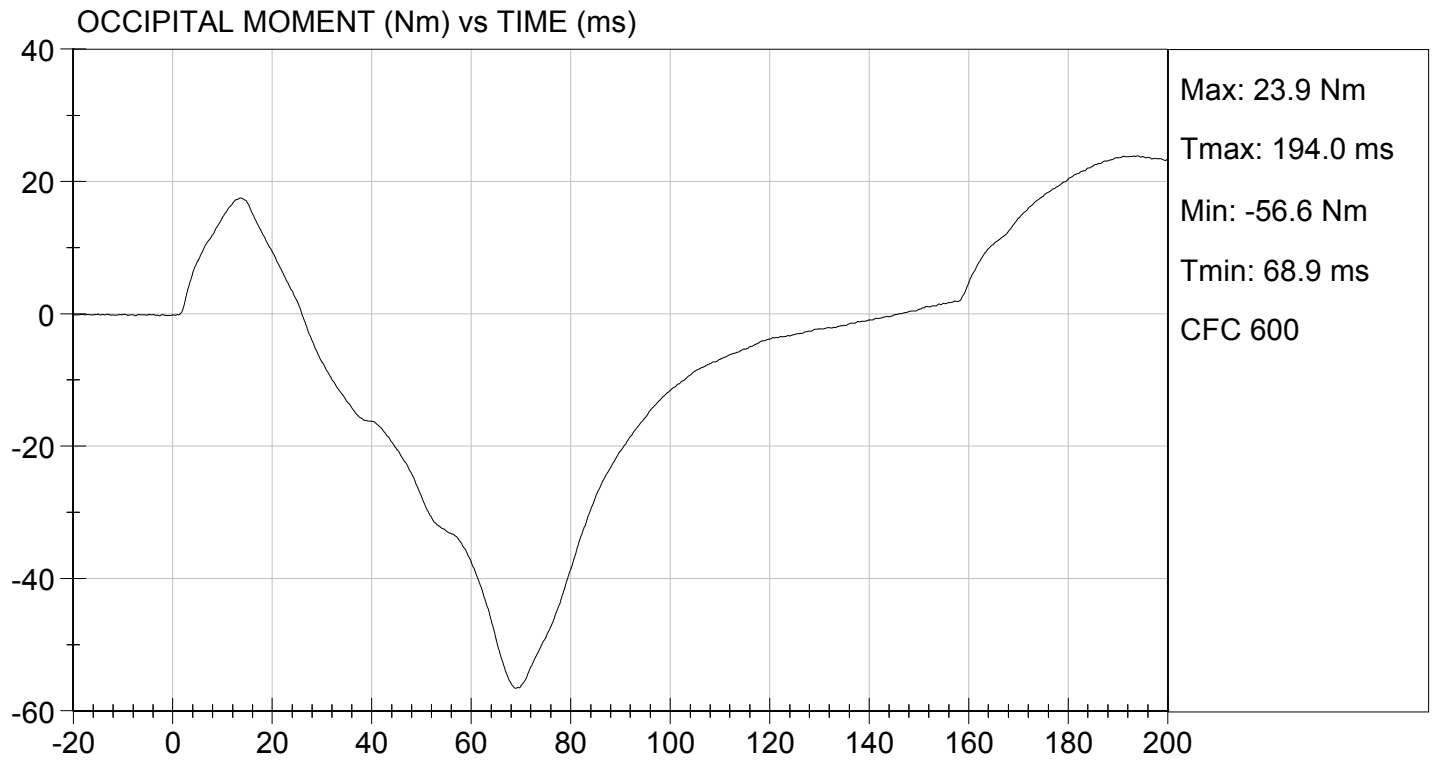
TEST DATE: 02/12/2014
TEST #: D14553





TEST DESC: NECK EXTENSION
VELOCITY: 20.08 ft/s, 6.12 m/s

TEST DATE: 02/12/2014
TEST #: D14553



DATA SHEET B6
THORAX IMPACT TEST (572.134) (5th Female)

Dummy Serial Number: 124

Test Date: 02/12/2014

Technician: David Schoedel

 Pre test calibration
X Post test calibration verification

Test attempt no. 1 (when successive thorax impact tests are necessary)

- X 1. It has been at least 30 minutes since the last thorax impact test. (572.137(q))
 X N/A, ONLY one thorax impact test performed
- X 2. The test fixture conforms to the specifications in Figure 11B.
- X 3. The complete assembled dummy (880105-000) is used (572.134(b)) and is dressed in a form fitting cotton stretch above-the-elbow sleeved shirt and above-the-knee pants. The weight of the shirt and pants shall not exceed 0.14 kg. (572.134(c)(1))
- X 4. The dummy assembly soaked at a temperature between 20.6°C (69°F) and 22.2°C (72°F) and at a relative humidity from 10% to 70% for a period of at least four (4) hours prior to this test. (572.134(c)(2))

Record the maximum temperature:	<u>20.9°C</u>
Record the minimum temperature:	<u>20.8°C</u>
Record the maximum humidity:	<u>14%</u>
Record the minimum humidity:	<u>12%</u>

- X 5. Remove the chest skin and visually inspect the thorax assembly for cracks, cuts, abrasions, etc. Particular attention should be given to the rib damping material, chest displacement transducer assembly and the rear rib supports. Inspect for rib deformation using the chest depth gage. If any damage is noted repair and/or replace the damaged components unless the damage resulted from the vehicle crash test in which the dummy was an occupant in which case the damage must be documented and post test calibration verification testing completed before any repairs or replacements are made.

X - No Damage

 - Damage from crash test, no repairs or replacement because this is a post test calibration verification. Record damage:

 - The following repairs or replacement was performed. Record:

- X 6. Seat the dummy, (chest skin still removed) without back and arm supports on the test fixture surface as shown in Figure 11B. The surface must be long enough to support the pelvis and outstretched legs. (572.134(c)(3))
- X 7. Level the ribs both longitudinally and laterally $\pm 0.5^\circ$ and adjust the pelvis angle to $7^\circ \pm 2^\circ$. The angle may be measured using the special H-point tool (TE-2504) that inserts into the pelvic structure and extends outward beyond the pelvic skin surface or by using the surface of the pelvic adaptor block.
- X 8. The midsagittal plane of the dummy is vertical within $\pm 1^\circ$. (572.134(c)(3))
- X 9. The longitudinal centerline of the test probe is centered within ± 2.5 mm of the midsagittal plane of the dummy and is $12.7 \text{ mm} \pm 1 \text{ mm}$ below the horizontal peripheral centerline of the No. 3 rib and is within 0.5° of a horizontal line in the dummy's midsagittal plane. (572.134(c)(4))
- X 10. Align the adjustable neck bracket index marks to the "zero" position.
- X 11. Record locations such as the rear surfaces of the thoracic spine and the lower neck bracket reference with respect to the laboratory coordinate system. These reference measurements are necessary to ensure the dummy is in the same position after the chest skin is installed. The reference locations must be accessible after installation of the chest skin. It may be necessary to leave the chest skin zipper unfastened until the references are checked and fasten it just prior to the test.
- X 12. Install the chest skin and reposition the dummy as described in the preceding paragraph using the reference measurements recorded.
- X 13. Place the arm assemblies horizontal $\pm 2^\circ$ and parallel to the midsagittal plane. The arms are held in place by tightening the adjustment nut that holds the arm yoke to the clavicle assembly.
- X 14. The data acquisition system, including transducers, must conform to the requirements of SAE Recommended Practice J211/1 MAR95 (572.136(m)) Class 180.
- X 15. Impact the anterior surface of the thorax with the test probe so the longitudinal centerline of the probe is within 2° of a horizontal line in the dummy's midsagittal plane at the moment of impact. (572.134(c)(5)) The velocity of the test probe at the time of impact is $6.71 \text{ m/s} \pm 0.12 \text{ m/s}$. (572.134(b)) The probe is guided so there is no significant lateral, vertical or rotational movement during the impact. (572.134(c)(6)) Neither the suspension hardware, suspension cables, nor other attachments to the probe, including the velocity vane, make contact with the dummy. (572.134(c)(7))

- X 16. Complete the following table:
Thorax Impact Results (572.134(b) and 572.134(b)(1)&(2))

Parameter*	Specification	Result
Test Probe Speed	$6.59 \text{ m/s} \leq \text{speed} \leq 6.83 \text{ m/s}$	6.77 m/s
Chest Compression	$50.0 \text{ mm} \leq \text{compression} \leq 58.0 \text{ mm}$	51 mm
Peak force** between 50.0 and 58.0 mm chest compression	$3900\text{N} \leq \text{peak force} \leq 4400\text{N}$	4349 N
Peak Force** between 18.0 and 50.0 mm chest compression	Peak Force $\leq 4600 \text{ N}$	4407 N
Internal Hysteresis***	$69\% \leq \text{hysteresis} \leq 85\%$	71%

*Time zero is defined as the time of initial contact between the test probe and the chest skin.

**Force = impactor mass x acceleration (572.134(b)(3))

***Area under loading curve minus the area under the unloading curve divided by the area under the loading curve. (Figure 12B)

- X 17. Plots of chest compression, acceleration, force, force versus deflection follow this sheet.

David Schoedel
Signature

02/12/2014
Date

MGA RESEARCH CORPORATION
THORAX IMPACT
HYBRID III 5TH PERCENTILE

ATD Serial No: 124

Test I.D: D14554

Tested Parameter	Units	Specification	Result	Pass/Fail
Temperature	deg C	20.6 to 22.2	20.9	Pass
Relative Humidity	%	10 to 70	13	Pass
Probe Speed	m/s	6.59 to 6.83	6.77	Pass
Peak Deflection	mm	50 to 58	51	Pass
Peak Resistive Force w/in Deflection Corridor	N	3900 to 4400	4349	Pass
Internal Hysteresis	%	69 to 85	71	Pass
Peak Force 18 mm - 50 mm	N	<= 4600	4407	Pass
Overall Test Results				Pass

David Schoedel
Laboratory Technician

02/12/2014

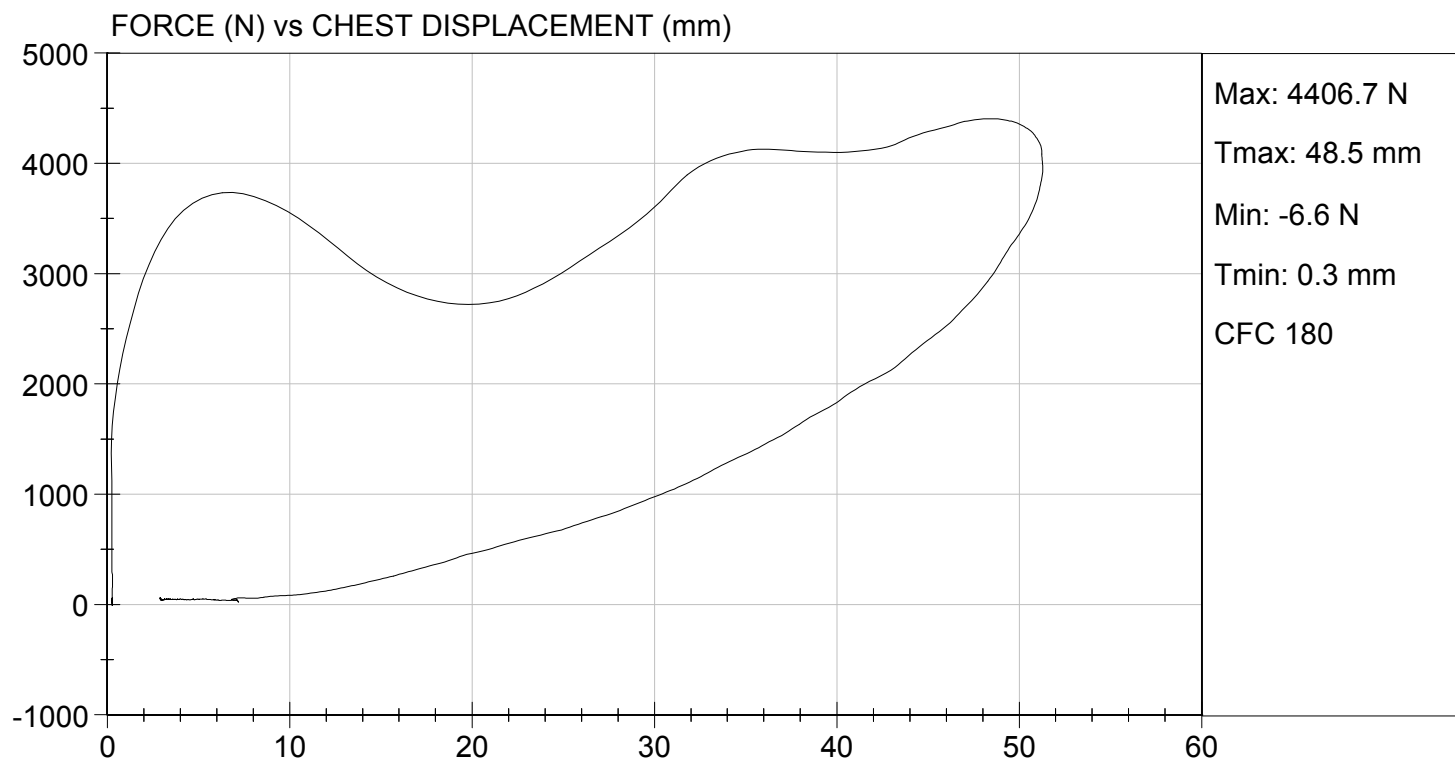
Test Date

Jeff Leonard
Approved By



TEST DESC: THORAX IMPACT
VELOCITY: 22.22 ft/s, 6.77 m/s

TEST DATE: 02/12/2014
TEST #: D14554



DATA SHEET B7
TORSO FLEXION TEST (572.135) (5th Female)

Dummy Serial Number: 124

Test Date: 02/12/2014

Technician: David Schoedel

 Pre test calibration
 X Post test calibration verification

Test attempt no. 1 (when successive torso flexion tests are necessary)

- X 1. It has been at least 30 minutes since the last torso flexion test. (572.137(q))
 X N/A, ONLY one torso flexion test performed
- X 2. The test fixture conforms to the specifications in Figure 13B.
- X 3. The complete assembled dummy (880105-000) is used (572.135(c)(2)).
 With legs below femurs.
 X Without legs below femurs.
- X 4. The dummy assembly soaked at a temperature between 18.9°C (66°F) and 25.6°C (78°F) and at a relative humidity from 10% to 70% for a period of at least four (4) hours prior to this test. (572.135(c)(1))
- | | |
|---------------------------------|---------------|
| Record the maximum temperature: | <u>20.9°C</u> |
| Record the minimum temperature: | <u>20.8°C</u> |
| Record the maximum humidity: | <u>14%</u> |
| Record the minimum humidity: | <u>12%</u> |
- X 5. Secure the pelvis to the fixture at the pelvis instrument cavity rear face by threading four ¼ cap screws into the available threaded attachment holes. Tighten the mountings so that the test material is rigidly affixed to the test fixture and the pelvic lumbar joining surface is horizontal. (572.135(c)(3))
- X 6. Attach the loading adapter bracket to the spine of the dummy as shown in Figure 13B. (572.135(c)(4))
- X 7. Inspect and adjust, if necessary, the seating of the abdominal insert within the pelvis cavity and with respect to the torso flesh, assuring that the torso flesh provides uniform fit and overlap with respect to the outside surface of the pelvis flesh. (572.135(c)(5))
- X 8. Flex the dummy forward and back 3 times such that the angle reference plane moves between 0° and 30° with respect to the vertical transverse plane. (572.135(c)(6))

- X 9. Support the dummy such that the angle reference plane is at or near 0° (vertical with respect to the vertical transverse plane). Wait at least 30 minutes before continuing. (572.135(c)(6))
- X 10. Remove all external support that was implemented in 9 above. (572.135(c)(7))
- X 11. Measure the initial orientation angle of the torso reference plane of the seated, unsupported dummy. (572.135(c)(7))
 Record reference plane angle (max. allowed 20°): See Result Table
- X 12. Attach the pull cable and the load cell. (572.135(c)(8))
- X 13. Apply a tension force in the midsagittal plane to the pull cable at any upper torso deflection rate between 0.5° and 1.5° per second, until the angle reference plane is at 45° ± 0.5° of flexion relative to the vertical transverse plane. (572.135(c)(9))
- X 14. Maintain angle reference plane at 45° ± 0.5° of flexion for 10 seconds. (572.135(c)(10))
- X 15. As quickly as possible release the force applied to the attachment bracket. (572.135(c)(11))
- X 16. 3 minutes after the release of the force, measure the reference plane angle. (572.135(c)(11))
- X 17. Complete the following table:
 Torso Flexion Results (572.135(b), 572.135(c)(7), 572.135(c)(9))

Parameter	Specification	Result
Initial ref. plane angle	Angle ≤ 20°	18 deg
Torso rotation rate	0.5°/s ≤ rate ≤ 1.5°/s	0.9 deg/sec
Force at 45° ± 0.5°	320 N ≤ force ≤ 390 N	349 N
Final ref. plane angle	Initial ref. plane angle ± 8°	19 deg

David Schoedel
 Signature

02/12/2014
 Date

MGA RESEARCH CORPORATION

TORSO FLEXION TEST

HYBRID III 5TH PERCENTILE

ATD Serial No: 124

Test I.D: D14557

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 to 25.6	20.8	Pass
Laboratory Relative Humidity	%	10 to 70	12	Pass
Initial Angle	deg	0 to 20	18	Pass
Return Angle	deg	+/- 8	19	Pass
Force at 45 deg	N	320 to 390	349	Pass
Upper Torso Deflection Rate	deg/s	0.5 to 1.5	1.0	Pass
Overall Result				Pass

David Schoedel
Laboratory Technician

02/12/2014

Test Date

Jeff Leonard
Approved By

DATA SHEET B8
LEFT KNEE IMPACT TEST (572.136) (5th Female)

Dummy Serial Number: 124

Test Date: 02/12/2014

Technician: David Schoedel

 Pre test calibration
 X Post test calibration verification

Test attempt no. 1 (when successive knee impact tests are necessary)

- X 1. It has been at least 30 minutes since the last knee impact test. (572.137(q))
 X N/A, ONLY one knee impact test performed
- X 2. The test fixture conforms to the specifications in Figure 14B.
- X 3. The knee assembly (880105-528L), lower leg structural replacement (880105- 603), lower leg flesh (880105-601), ankle assembly (880105-660), foot assembly (880105-650), and femur load transducer (SA572-S14) (may use the load cell structural replacement (78051-319)) were used. (572.136(b)(1))
- X 4. The knee assembly soaked at a temperature between 18.9°C (66°F) and 25.6°C (78°F) and at a relative humidity from 10% to 70% for a period of at least four (4) hours prior to this test. (572.136(c)(1))
- | | |
|---------------------------------|---------------|
| Record the maximum temperature: | <u>20.9°C</u> |
| Record the minimum temperature: | <u>20.8°C</u> |
| Record the maximum humidity: | <u>14%</u> |
| Record the minimum humidity: | <u>12%</u> |
- X 5. Mount the test specimen and secure it to the rigid test fixture. (572.136(c)(2))
- X 6. No parts of the foot or tibia contact any exterior surface. (572.136(c)(2))
- X 7. Align the test probe so that throughout its stroke and at contact with the knee it is within 2 degrees of horizontal and collinear with the longitudinal centerline of the femur. (572.136(c)(3))
- X 8. The probe is guided so there is no significant lateral, vertical or rotational movement during the impact with the knee. (572.136(c)(4))
- X 9. The data acquisition system, including transducers, must conform to the requirements of SAE Recommended Practice J211/1 MAR95 (572.136(m)) Class 600.

X 10. Contact the knee with the test probe at a speed between 2.07 m/s and 2.13 m/s.
(572.136(c)(5)) Neither the suspension hardware, suspension cables, nor other
attachments to the probe, including the velocity vane, make contact with the dummy.
(572.136(c)(6))

 X 11. Complete the following table:
Knee Impact Results (572.136(b)(1) and 572.136(c)(5))

Parameter	Specification	Result
Probe speed	$2.07 \text{ m/s} \leq \text{speed} \leq 2.13 \text{ m/s}$	2.13 m/s
Peak resistance force*	$3450 \text{ N} \leq \text{force} \leq 4060 \text{ N}$	3721 N

*Force = impactor mass x deceleration (572.136(b)(2))

 X 12. Plots of acceleration versus time and force versus time follow this sheet.

David Schoedel
Signature

02/12/2014
Date

MGA RESEARCH CORPORATION

**LEFT KNEE IMPACT TEST
HYBRID III 5TH PERCENTILE**

ATD Serial No: 124

Test I.D: D14556

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 to 25.6	20.9	Pass
Laboratory Relative Humidity	%	10 to 70	14	Pass
Probe Speed	m/s	2.07 to 2.13	2.13	Pass
Maximum Force	N	3450 to 4060	3721	Pass
Overall Test Results				Pass

David Schoedel
Laboratory Technician

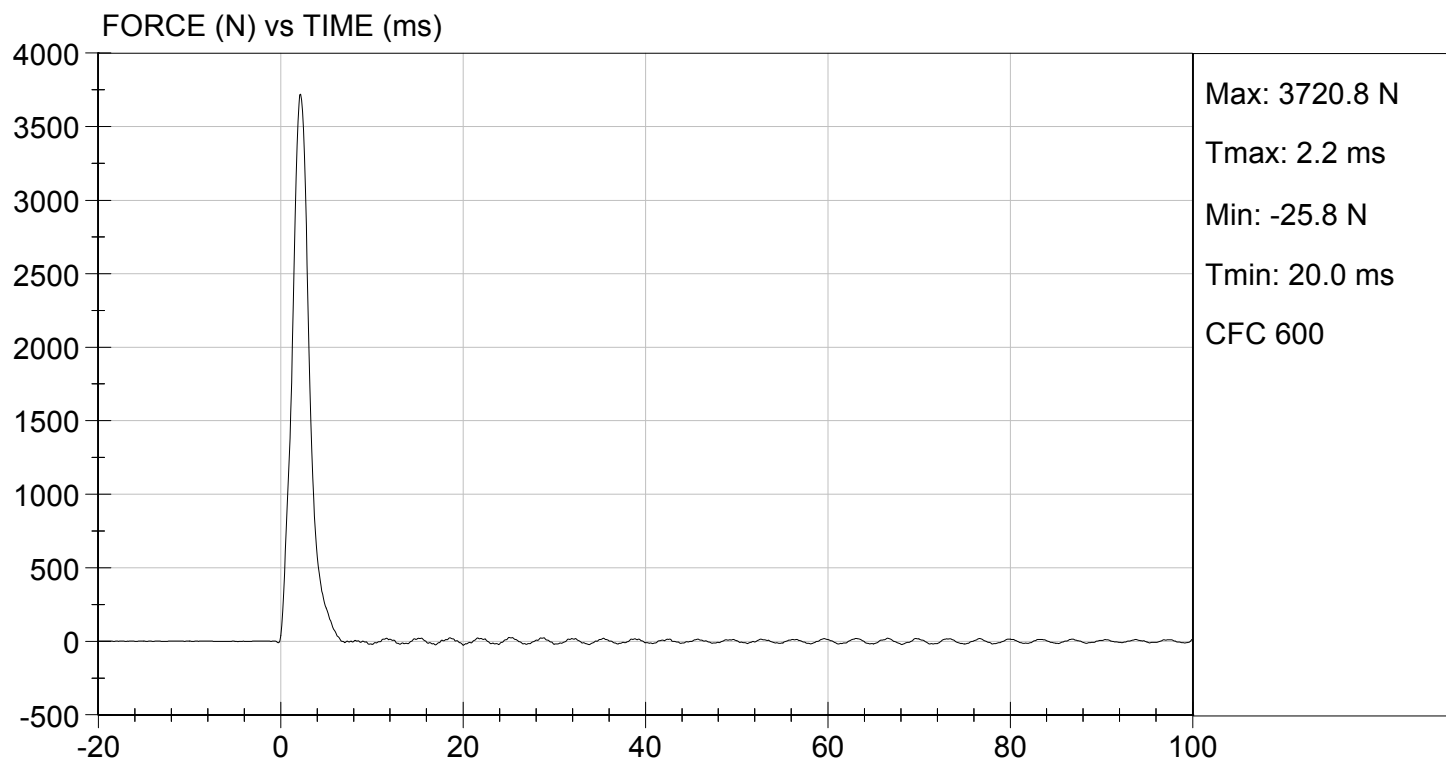
02/12/2014
Test Date

Jeff Leonard
Approved By



TEST DESC: LEFT KNEE
VELOCITY: 7.00 ft/s, 2.13 m/s

TEST DATE: 02/12/2014
TEST #: D14556



DATA SHEET B9
RIGHT KNEE IMPACT TEST (572.136) (5th Female)

Dummy Serial Number: 124

Test Date: 02/12/2014

Technician: David Schoedel

 Pre test calibration
X Post test calibration verification

Test attempt no. 1 (when successive knee impact tests are necessary)

- X 1. It has been at least 30 minutes since the last knee impact test. (572.137(q))
X N/A, ONLY one knee impact test performed
- X 2. The test fixture conforms to the specifications in Figure 14B.
- X 3. The knee assembly (880105-528R), lower leg structural replacement (880105- 603), lower leg flesh (880105-601), ankle assembly (880105-660), foot assembly (880105-651), and femur load transducer (SA572-S14) (may use the load cell structural replacement (78051-319)) were used. (572.136(b)(1))
- X 4. The knee assembly soaked at a temperature between 18.9°C (66°F) and 25.6°C (78°F) and at a relative humidity from 10% to 70% for a period of at least four (4) hours prior to this test. (572.136(c)(1))

Record the maximum temperature:	<u>20.9°C</u>
Record the minimum temperature:	<u>20.8°C</u>
Record the maximum humidity:	<u>14%</u>
Record the minimum humidity:	<u>12%</u>

- X 5. Mount the test specimen and secure it to the rigid test fixture. (572.136(c)(2))
- X 6. No parts of the foot or tibia contact any exterior surface. (572.136(c)(2))
- X 7. Align the test probe so that throughout its stroke and at contact with the knee it is within 2 degrees of horizontal and collinear with the longitudinal centerline of the femur. (572.136(c)(3))
- X 8. The probe is guided so there is no significant lateral, vertical or rotational movement during the impact with the knee. (572.136(c)(4))
- X 9. The data acquisition system, including transducers, must conform to the requirements of SAE Recommended Practice J211/1 MAR95 (572.136(m)) Class 600.

X 10. Contact the knee with the test probe at a speed between 2.07 m/s and 2.13 m/s.
(572.136(c)(5)) Neither the suspension hardware, suspension cables, nor other
attachments to the probe, including the velocity vane, make contact with the dummy.
(572.136(c)(6))

 X 11. Complete the following table:
Knee Impact Results (572.136(b)(1) and 572.136(c)(5))

Parameter	Specification	Result
Probe speed	$2.07 \text{ m/s} \leq \text{speed} \leq 2.13 \text{ m/s}$	2.13 m/s
Peak resistance force*	$3450 \text{ N} \leq \text{force} \leq 4060 \text{ N}$	3927 N

*Force = impactor mass x deceleration (572.136(b)(2))

 X 12. Plots of acceleration versus time and force versus time follow this sheet.

David Schoedel
Signature

02/12/2014
Date

MGA RESEARCH CORPORATION

RIGHT KNEE IMPACT TEST

HYBRID III 5TH PERCENTILE

ATD Serial No: 124

Test I.D: D14555

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 to 25.6	20.9	Pass
Laboratory Relative Humidity	%	10 to 70	14	Pass
Probe Speed	m/s	2.07 to 2.13	2.13	Pass
Maximum Force	N	3450 to 4060	3927	Pass
Overall Test Results				Pass

David Schoedel
Laboratory Technician

02/12/2014

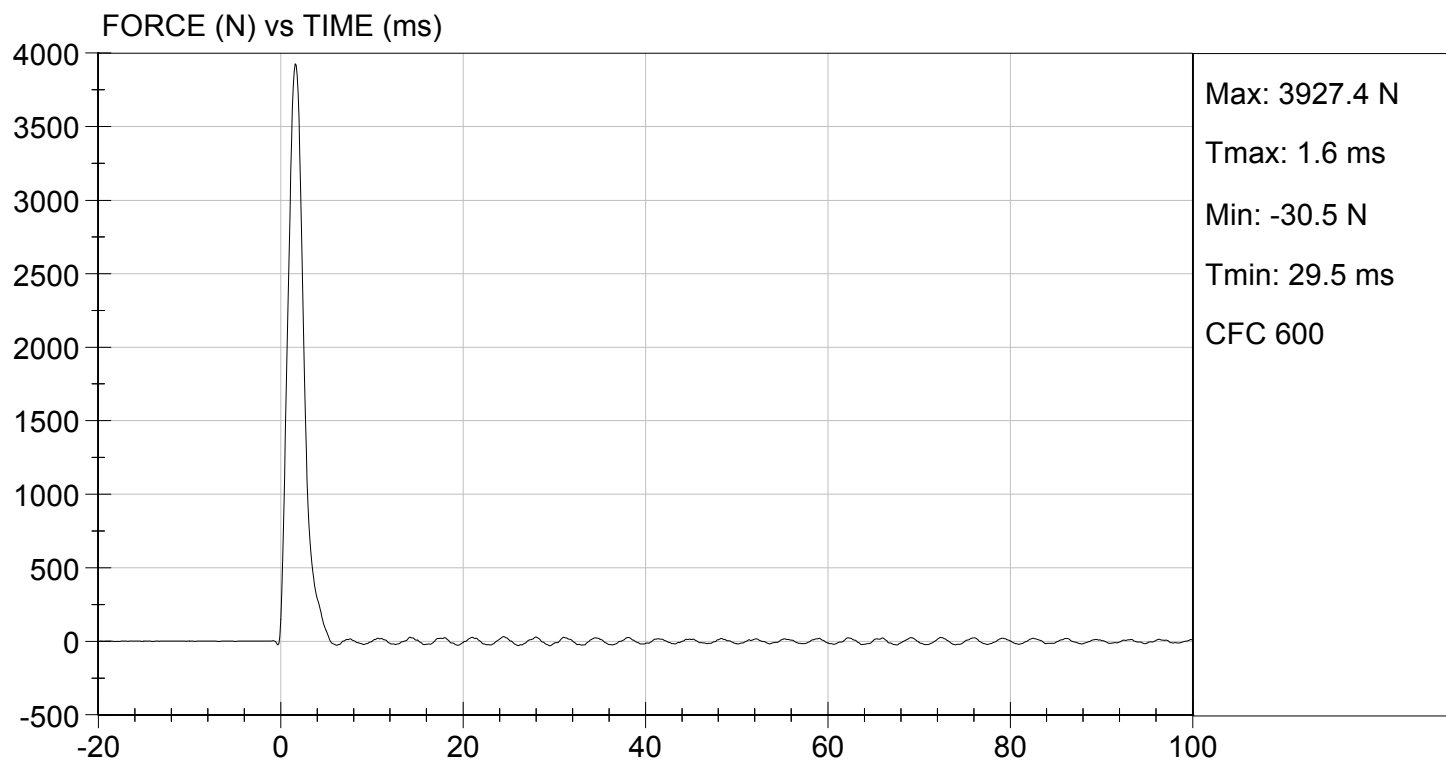
Test Date

Jeff Leonard
Approved By



TEST DESC: RIGHT KNEE
VELOCITY: 7.00 ft/s, 2.13 m/s

TEST DATE: 02/12/2014
TEST #: D14555



DATA SHEET B10

PART 572 INSTRUMENTATION CALIBRATION INFORMATION

I.D. NO.	MANUFACTURER	MODEL NO.	SERIAL NO.	DATE OF LAST CALIBRATION	DATE OF NEXT CALIBRATION
DUMMY INSTRUMENTATION					
HEAD ACCELEROMETERS					
(1) LONGITUDINAL	Endevco	7264C-2KTZ-2-360M17	P77650	01/16/2014	07/16/2014
(2) LATERAL	Endevco	7264C-2KTZ-2-360M17	P77651	01/16/2014	07/16/2014
(3) VERTICAL	Endevco	7264C-2KTZ-2-360M17	P77653	01/16/2014	07/16/2014
NECK TRANSDUCER	Denton	1716	1673	11/20/2013	05/20/2014
CHEST ACCELEROMETERS					
(1) LONGITUDINAL	Endevco	7264C-2KTZ-2-360M17	P78817	01/16/2014	07/16/2014
(2) LATERAL	Endevco	7264C-2KTZ-2-360M17	P78822	01/16/2014	07/16/2014
(3) VERTICAL	Endevco	7264C-2KTZ-2-360M17	P78825	01/16/2014	07/16/2014
CHEST POTENTIOMETER	Servo	14CBI-2897	124	01/20/2014	07/20/2014
FEMUR LOAD CELLS					
(1) RIGHT FEMUR	GSE	2430	1361	10/31/2013	05/01/2014
(2) LEFT FEMUR	GSE	2430	1362	10/31/2013	05/01/2014
LABORATORY INSTRUMENTATION					
NECK PENDULUM ACCELEROMETER	Endevco	7231C-750	AGH70	08/27/2013	02/27/2014
THORAX PENDULUM ACCELEROMETER	Endevco	7264C-2KTZ-2-240	P82319	11/01/2013	05/01/2014
KNEE PENDULUM ACCELEROMETER	Endevco	7264C-2KTZ-2-240	P77579	01/10/2014	07/10/2014
NECK ROTATION TRANSDUCER 1 (OPTIONAL)	Spectrol	132-0-0-102	18	08/13/2013	02/13/2014
NECK ROTATION TRANSDUCER 2 (OPTIONAL)	Spectrol	132-0-0-102	29	08/13/2013	02/13/2014

LABORATORY TECHNICIAN: Jessica Hall

DATA SHEET B1
DUMMY DAMAGE CHECKLIST

Dummy Serial Number: 124

Test Date: 02/12/2014

Technician: Jessica Gall

This check sheet is completed as part of the post test calibration verification.

X Perform general cleaning.

Dummy Item	Inspect for	Comments	Damage	OK
Outer skin	Gashes, rips, cracks			X
Head	Ballast secure			X
	General appearance			X
Neck	Broken or cracked rubber			X
	Upper neck bracket firmly attached to the lower neck bracket			X
	Looseness at the condyle joint			X
	Nodding blocks cracked or out of position			X
Spine	Broken or cracks in rubber			X
Ribs	Broken or bent ribs			X
	Broken or bent rib supports			X
	Damping material separated or cracked			X
	Rubber bumpers in place			X
Chest Displacement Assembly	Bent shaft			X
	Slider arm riding in track			X
Transducer leads	Torn cables			X
Accelerometer Mountings	Head mounting secure			X
	Chest mounting secure			X
Knees	Skin condition			X
	Insert (do not remove)			X
	Casting			X
Limbs	Normal movement and adjustment			X
Knee Sliders	Wires intact			X
	Rubber returned to "at rest" position			X
Pelvis	Broken			X
Other				X

If upon visual examination, damage is apparent in any of these areas, the appropriate engineer or engineering technician is to be consulted for a decision on repair or replacement of parts.

Repair or Replacement approved by:

Jessica Hall
Signature

02/12/2014
Date

Describe the repair or replacement of parts:

Checked by:

Jeff Leonard
Signature

02/12/2014
Date

EXTERNAL DIMENSIONS

HYBRID III 5 th SN #125, PART 572, SUBPART O EXTERNAL DIMENSIONS				
DIMENSION	DESCRIPTION	DETAILS	ASSEMBLY DIMENSION (mm)	ACTUAL MEASUREMENT
A	TOTAL SITTING HEIGHT	Seat surface to highest point on top of the head.	774.7-800.1	785.2
B	SHOULDER PIVOT HEIGHT	Centerline of shoulder pivot bolt to the seat surface.	431.8-457.2	448.6
C	H-POINT HEIGHT	Reference	81.3-86.3	86.0
D	H-POINT LOCATION FROM BACKLINE	Reference	144.8-149.8	146.7
E	SHOULDER PIVOT FROM BACKLINE	Center of the shoulder clevis to the rear vertical surface of the fixture.	68.6-83.8	83.5
F	THIGH CLEARANCE	Measured at the highest point on the upper femur segment.	119.4-134.6	127.5
G	BACK OF ELBOW TO WRIST PIVOT	Back of the elbow flesh to the wrist pivot in line with the elbow and wrist pivots	243.9-259.1	248.3
H	HEAD BACK TO BACKLINE	Back of skull cap skin to seat rear vertical surface (Reference)	43.2-48.2	43.4
I	SHOULDER TO ELBOW LENGTH	Measure from the highest point on top of the shoulder clevis to the lowest part of the flesh on the elbow in line with the elbow pivot bolt.	276.8-297.2	285.4
J	ELBOW REST HEIGHT	Measure from the flesh below the elbow pivot bolt to the seat surface.	182.8-203.2	192.9
K	BUTTOCK TO KNEE LENGTH	The forward most part of the knee flesh to the rear vertical surface of the fixture.	520.7-546.1	542.7
L	POPLITEAL HEIGHT	Seat surface to the plane of the horizontal plane of the bottom of the feet.	355.6-376.0	356.8
M	KNEE PIVOT HEIGHT	Centerline of knee pivot bolt to the horizontal plane of the bottom of the feet.	393.7-419.1	394.2
N	BUTTOCK POPLITEAL LENGTH	The rearmost surface of the lower leg to the same point on the rear surface of the buttocks used for dim. "K".	414.0-439.4	428.5

HYBRID III 5 th SN #125, PART 572, SUBPART O EXTERNAL DIMENSIONS, continued				
DIMENSION	DESCRIPTION	DETAILS	ASSEMBLY DIMENSION (mm)	ACTUAL MEASUREMENT
O	CHEST DEPTH WITHOUT JACKET	Measured 304.8 ± 5.1 mm above seat surface	175.3-190.5	185.2
P	FOOT LENGTH	Tip of toe to rear of heel	218.5-233.7	219.0
Q	STANDING HEIGHT	(THEORETICAL)	1501.1	N/A
R	BUTTOCK TO KNEE PIVOT LENGTH	The rear surface of the buttocks to the knee pivot bolt	457.2-482.6	471.8
S	HEAD BREADTH	The widest part of the head	137.1-147.3	141.2
T	HEAD DEPTH	Back of the head to the forehead	177.8-188.0	182.5
U	HIP BREADTH	The widest part of the hip	299.7-314.9	301.6
V	SHOULDER BREADTH	Outside edges of right and left shoulder clevises	350.5-365.7	360.0
W	FOOT BREADTH	The widest part of the foot	78.8-94.0	93.9
X	HEAD CIRCUMFERENCE	Measured at the point as in dim. "T"	528.3-548.7	547.1
Y	CHEST CIRCUMFERENCE (WITH CHEST JACKET)	Measured 345.4 ± 12.7 mm above seat surface	850.9-881.3	852.6
Z	WAIST CIRCUMFERENCE	Measured 165.1 ± 5.1 mm above seat surface	759.5-789.9	789.1
AA	REFERENCE LOCATION FOR MEASUREMENT OF CHEST CIRCUMFERENCE	Reference	332.7-358.1	345.0
BB	REFERENCE LOCATION FOR MEASUREMENT OF WAIST CIRCUMFERENCE	Reference	160.1-170.2	165.0

DATA SHEET B3
HEAD DROP TEST (572.132) (5th Female)

Dummy Serial Number: 125

Test Date: 02/10/2014

Technician: David Schoedel

- X Pre test calibration
 Post test calibration verification

Test attempt no. 1 (when successive head drops are necessary)

- X 1. It has been at least 2 hours since the last head drop. (572.132(c)(5))
 X N/A, ONLY one head drop performed
- X 2. The head assembly consists of the complete head (880105-100X), the six-axis neck transducer (SA572-S11) or neck transducer structural replacement (78051-383X), and three (3) accelerometers (SA572-S4). (572.132(a))
- X 3. The head accelerometer mounting plate screws (10-24 x 3/8 SHCS) are torqued to 9.0 Nm.
- X 4. Accelerometers and their respective mounts are smooth and clean.
- X 5. Torque the skull cap screws (10-24 x 1/2 SHCS) to 9.0 Nm.
- X 6. The data acquisition system, including transducers, conforms to the requirements of SAE Recommended Practice J211/1 MAR95. (572.136(m))
- X 7. The head assembly soaked at a temperature between 18.9°C (66°F) and 25.6°C (78°F) and at a relative humidity from 10% to 70% for a period of at least four (4) hours prior to a test. (572.132(c)(1))
- | | |
|---------------------------------|---------------|
| Record the maximum temperature: | <u>21.3°C</u> |
| Record the minimum temperature: | <u>20.7°C</u> |
| Record the maximum humidity: | <u>12%</u> |
| Record the minimum humidity: | <u>10%</u> |
- X 8. Visually inspect the head skin for cracks, cuts, abrasions, etc. Repair or replace the head skin if the damaged area is more than superficial. Note: If the damage resulted from the vehicle crash test in which the dummy was an occupant, the damaged area is to be documented with photography and the post test calibration verification testing completed before any replacement or repairs are made.
- | | |
|------------------------------|------------------|
| Record findings and actions: | <u>No Damage</u> |
|------------------------------|------------------|

X 9. Clean the impact surface of the skin and the impact surface of the fixture with isopropyl alcohol, trichloroethane or equivalent prior to the test. (572.132(c)(2))

X 10. Suspend and orient the head assembly as shown in Figure 5B. The lowest point on the forehead is 376.0 ± 1.0 mm (14.8 ± 0.04 inch) from the impact surface. (572.132(c)(3))
Record the actual distance: 376 mm

NOTE: The masses of the suspension device and the accelerometer cables are to be kept as lightweight as possible to minimize their effect on the test results.

X 11. The 1.57 mm (0.062 inch) diameter holes located on either side of the dummy's head are equidistance within 2 mm from the impact surface. A typical test setup is shown in Figure 6B. (572.132(c)(3))

Record the right side distance: 501 mm

Record the left side distance: 501 mm

X 12. The impact surface is clean and dry and has a micro finish in the range of 203.2×10^{-6} mm (8 micro inches) to 2032.0×10^{-6} mm (80 micro inches) (RMS). (572.132(c)(4))

Record actual micro finish: 24.8 micro inches

X 13. The impact surface is rigidly supported. (572.132(c)(4))

X 14. The impact surface is a flat horizontal steel plate 50.8 mm (2 inches) thick and 610 mm (24 inches) square. (572.132(c)(4))

Record thickness: 50.9 mm

Record width: 604 mm

Record length: 595 mm

X 15. Drop the head assembly from a height of 376.0 ± 1.0 mm (14.8 inches $\pm$ 0.04 inches) by a means that ensures a smooth, instant release onto the impact surface. (572.132(b) & (572.132(c)(4))

X 16. Complete the following table using channel class 1000 data. (572.132(b)):

Parameter	Specification	Result
Peak resultant acceleration	$250 \text{ g} \leq x \leq 300 \text{ g}$	276 g
Resultant versus time history curve	Unimodal	Yes
Oscillations after the main pulse	Less than 10% of the peak resultant acceleration	Yes
Lateral acceleration	y-axis acceleration $\leq 15 \text{ g}$	-10.3 g

X 17. Plots of the x, y, z, and resultant acceleration data follow this sheet.

David Schoedel
Signature

02/10/2014
Date

MGA RESEARCH CORPORATION
HEAD DROP TEST
HYBRID III 5TH PERCENTILE

ATD Serial No: 125

Test ID: D14501

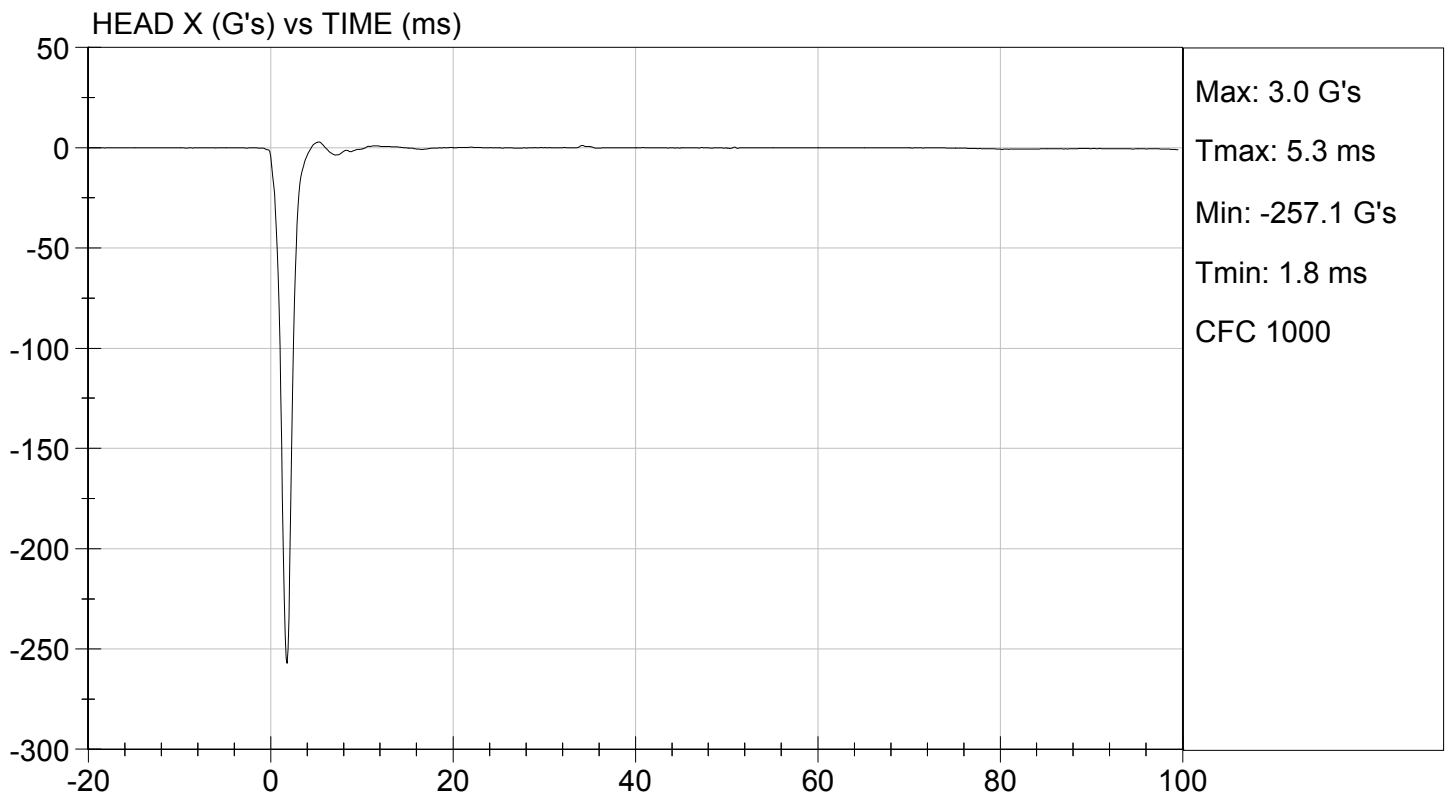
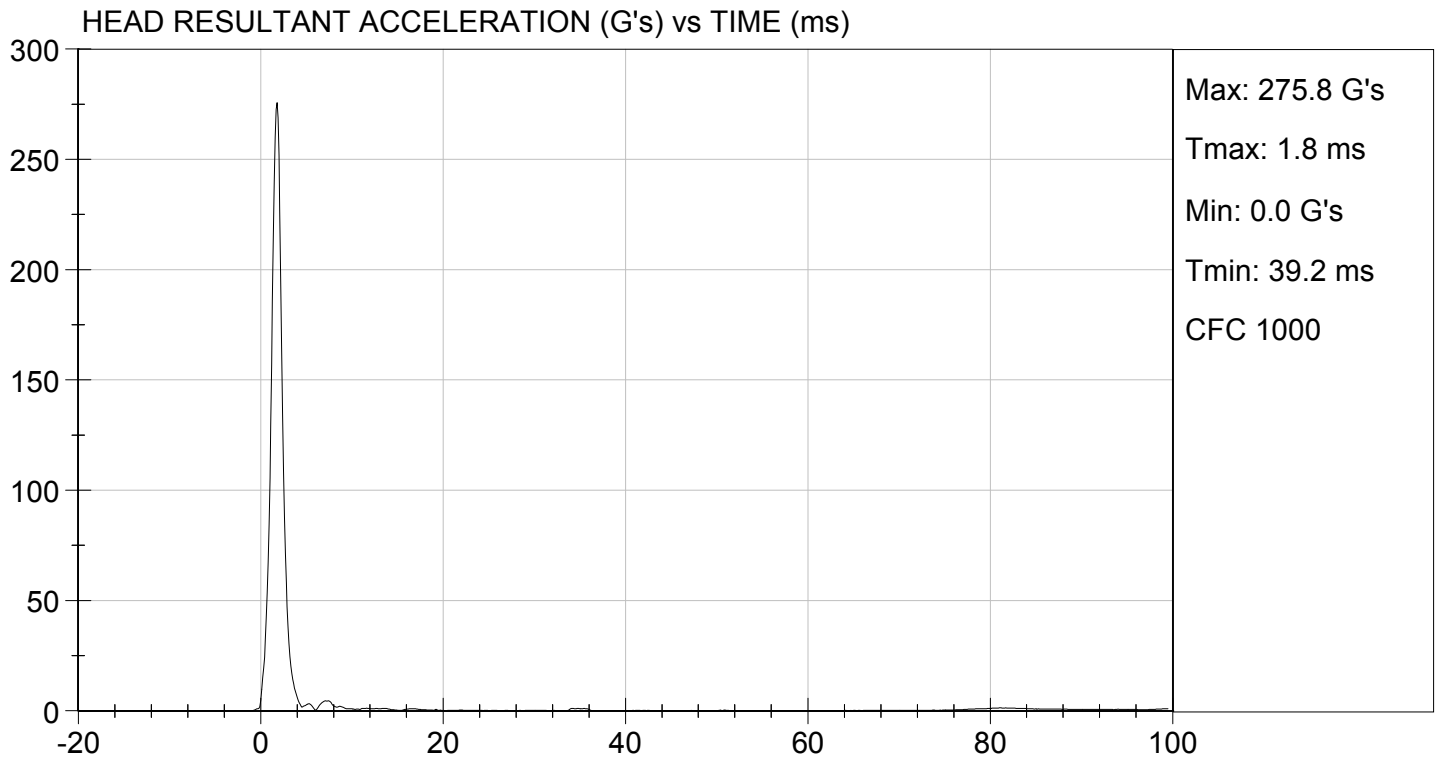
Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 to 25.6	20.7	Pass
Laboratory Relative Humidity	%	10 to 70	10	Pass
Peak Resultant Acceleration	G's	250 to 300	276	Pass
Peak Lateral Acceleration	G's	<= +/- 15.0	-10.3	Pass
Unimodal	N/A	Yes	Yes	Pass
Oscillations	N/A	within 10% of peak	Yes	Pass
			Overall Test Results	Pass

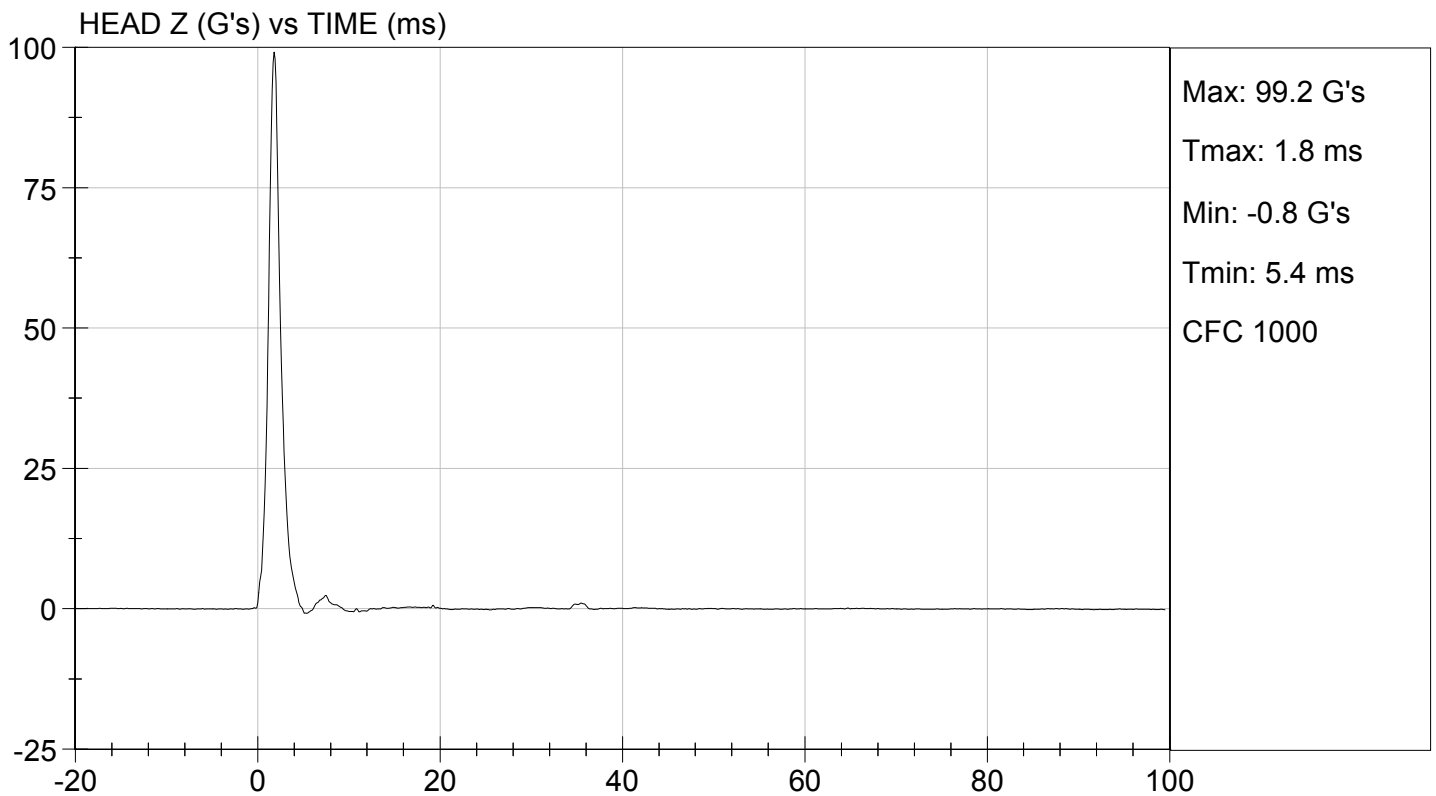
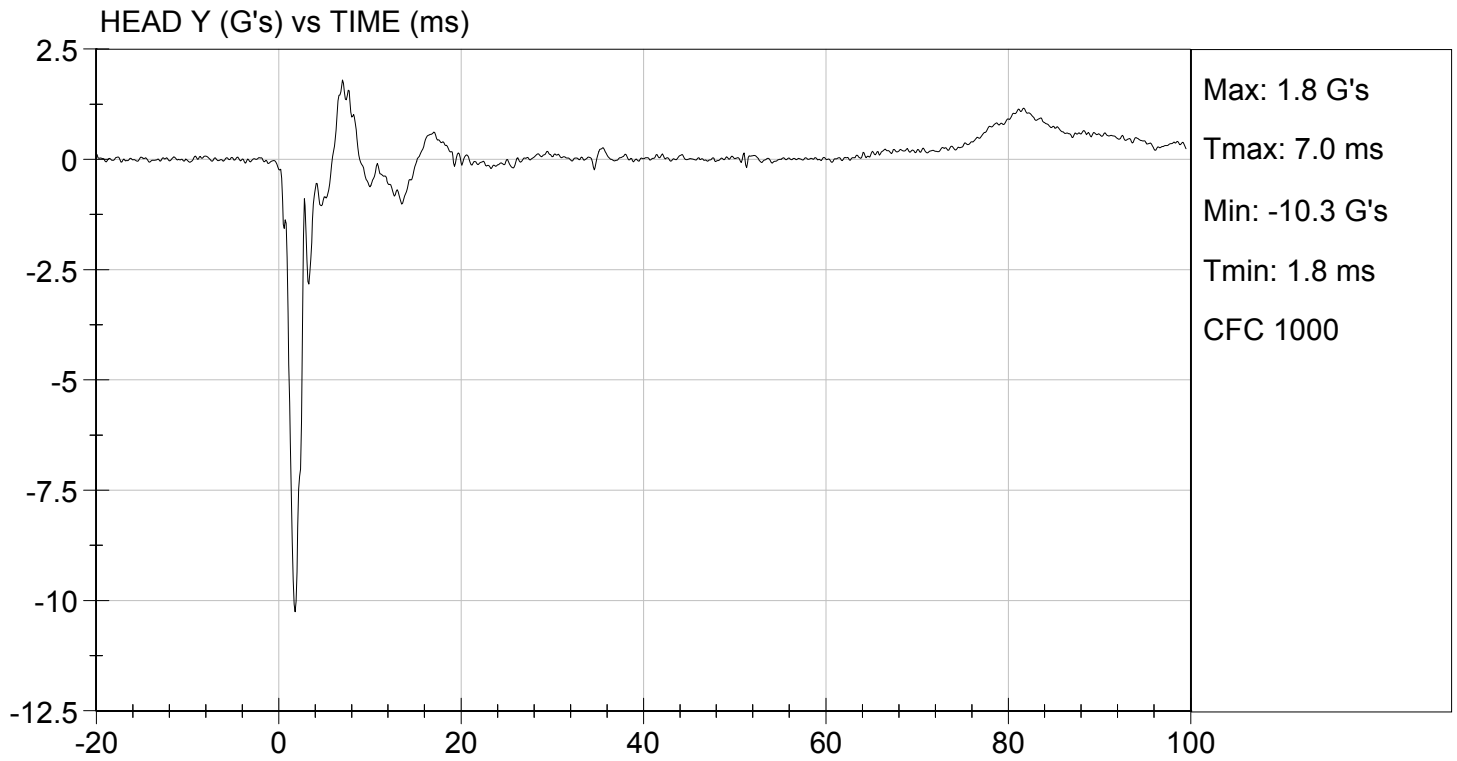
David Schoedel
Laboratory Technician

02/10/2014

Test Date

Jeff Leonard
Approved By





DATA SHEET B4
NECK FLEXION TEST (572.132) (5th Female)

Dummy Serial Number: 125

Test Date: 02/10/2014

Technician: David Schoedel

- X Pre test calibration
 Post test calibration verification

Test attempt no. 1 (when successive flexion tests are necessary)

- X 1. It has been at least 30 minutes since the last flexion test. (572.137(q))
X N/A, ONLY one neck test performed
- X 2. The components required for the neck tests include the head assembly (880105-100X), neck (880105-250), bib simulator (880105-371), upper neck adjusting bracket (880105-207), lower neck adjusting bracket (880105-208), six axis neck transducer (SA572-S11) and either three accelerometers (SA572-S4) or their mass equivalent installed in the head assembly as specified in drawing 880105-100X. Data from the accelerometers are not required. (572.133(b))
- X 3. The assembly soaked at a temperature between 20.6°C (69°F) and 22.2°C (72°F) and at a relative humidity from 10% to 70% for a period of at least four (4) hours prior to a test. (572.133(c)(1))
- | | |
|---------------------------------|---------------|
| Record the maximum temperature: | <u>21.3°C</u> |
| Record the minimum temperature: | <u>20.7°C</u> |
| Record the maximum humidity: | <u>12%</u> |
| Record the minimum humidity: | <u>10%</u> |
- X 4. Visually inspect neck assembly for cracks, cuts and separation of the rubber from the metal segments. Note: If the damage resulted from the vehicle crash test in which the dummy was an occupant, the damaged area is to be documented with photography and the post test calibration verification testing completed before any replacement or repairs are made.
- Record findings and actions: No damage
- X 5. Inspect the nodding blocks (78051-351) for any deterioration, but when replacement is necessary, ONLY replace during pre-test calibration. Using a Shore "A" type Durometer, verify the hardness of the nodding blocks is between 80 and 90. Ensure the nodding blocks are installed correctly. (880105-250 and PADI page17).
- Record findings and actions: No Deterioration; Hardness: Front 89; Back 90.
- X 6. Torque the jam nut (9000018) on the neck cable (880105-206) to 1.4 ± 0.2 Nm (12.0 ± 2.0 in-lb). (572.133(c)(2))

- X 7. The data acquisition system, including transducers, conforms to the requirements of SAE Recommended Practice J211/1 MAR95. (572.137(m))
- X 8. The test fixture pendulum conforms to the specifications in Figure 7B. (572.133(c)(3))
- X 9. The head-neck assembly is mounted on the pendulum so the midsagittal plane of the head is vertical and coincides with the plane of motion of the pendulum longitudinal centerline as shown in Figure 8B for the flexion test. (572.133(c)(3))
- X 10. Install the transducers or other devices for measuring the "D" plane rotation with respect to the pendulum longitudinal centerline. Note: Plane "D" is the bottom horizontal surface of the skull. These measurement devices should be designed to minimize their influence upon the performance of the head-neck assembly. An example of a measurement device is shown in Figure 10B.
- X 11. With the pendulum resting against the honeycomb material, the neck bracket was adjusted until the longitudinal centerline of the pendulum was perpendicular ± 1 degree to plane "D" on the dummy's head.
- X 12. Release the pendulum and allow it to fall freely from a height to achieve an impact speed of 6.89 m/s to 7.13 m/s as measured at the center of the pendulum accelerometer. (572.133(c)(4)(i))
- X 13. Complete the following table:

Neck Flexion Test Results (572.133(b)(1) & 572.133(c)(4)(i & ii))

Parameter		Specification	Results
Pendulum impact speed		6.89 m/s $\leq$ speed $\leq$ 7.13 m/s	7.06 m/s
Pendulum ΔV with respect to impact speed	@ 10 ms	2.1 m/s $\leq \Delta V \leq$ 2.5 m/s	2.5 m/s
	@ 20 ms	4.0 m/s $\leq \Delta V \leq$ 5.0 m/s	4.6 m/s
	@ 30 ms	5.8 m/s $\leq \Delta V \leq$ 7.0 m/s	6.4 m/s
Plane D Rotation		Peak moment* 69 Nm $\leq$ moment $\leq$ 83 Nm during the following rotation range 77° $\leq$ angle $\leq$ 91°	76 Nm @ 83 degrees
Positive Moment Decay** (Flexion)		Time to decay to 10 Nm 80 ms $\leq$ time $\leq$ 100 ms	82 ms

*Moment about the occipital condyle = $M_y - (0.01778 \text{ m} \times F_x)$ (572.133(b)(1)(ii))

M_y = Moment in Nm measured by the transducer

F_x = Force, in N measured by the transducer

**Time zero is defined as the time of initial contact between the pendulum striker plate and the honeycomb material. (572.133(b)(3))

- X 14. Plots of acceleration, velocity, y-axis moment, and x-axis force and y-axis moment about the occipital condyle follows this sheet.

David Schoedel
Signature

02/10/2014
Date

MGA RESEARCH CORPORATION

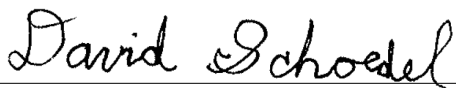
NECK FLEXION TEST

HYBRID III 5TH PERCENTILE

ATD Serial No: 125

Test I.D: D14502

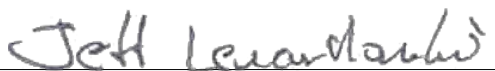
Tested Parameter		Units	Specification	Result	Pass/Fail
Laboratory Temperature		deg C	20.6 to 22.2	20.8	Pass
Laboratory Relative Humidity		%	10 to 70	12	Pass
Pendulum Speed		m/s	6.89 to 7.13	7.06	Pass
Pendulum Velocity	10 ms	m/s	2.1 to 2.5	2.5	Pass
	20 ms	m/s	4.0 to 5.0	4.6	Pass
	30 ms	m/s	5.8 to 7.0	6.4	Pass
D Plane Rotation	Max	deg	77 to 91	83	Pass
Occipital Condyle Moment within Rotation Corridor		Nm	69 to 83	76	Pass
Positive Moment Time Curve Decay to 10 Nm		ms	80 to 100	82	Pass
Overall Results					Pass



Laboratory Technician

02/10/2014

Test Date

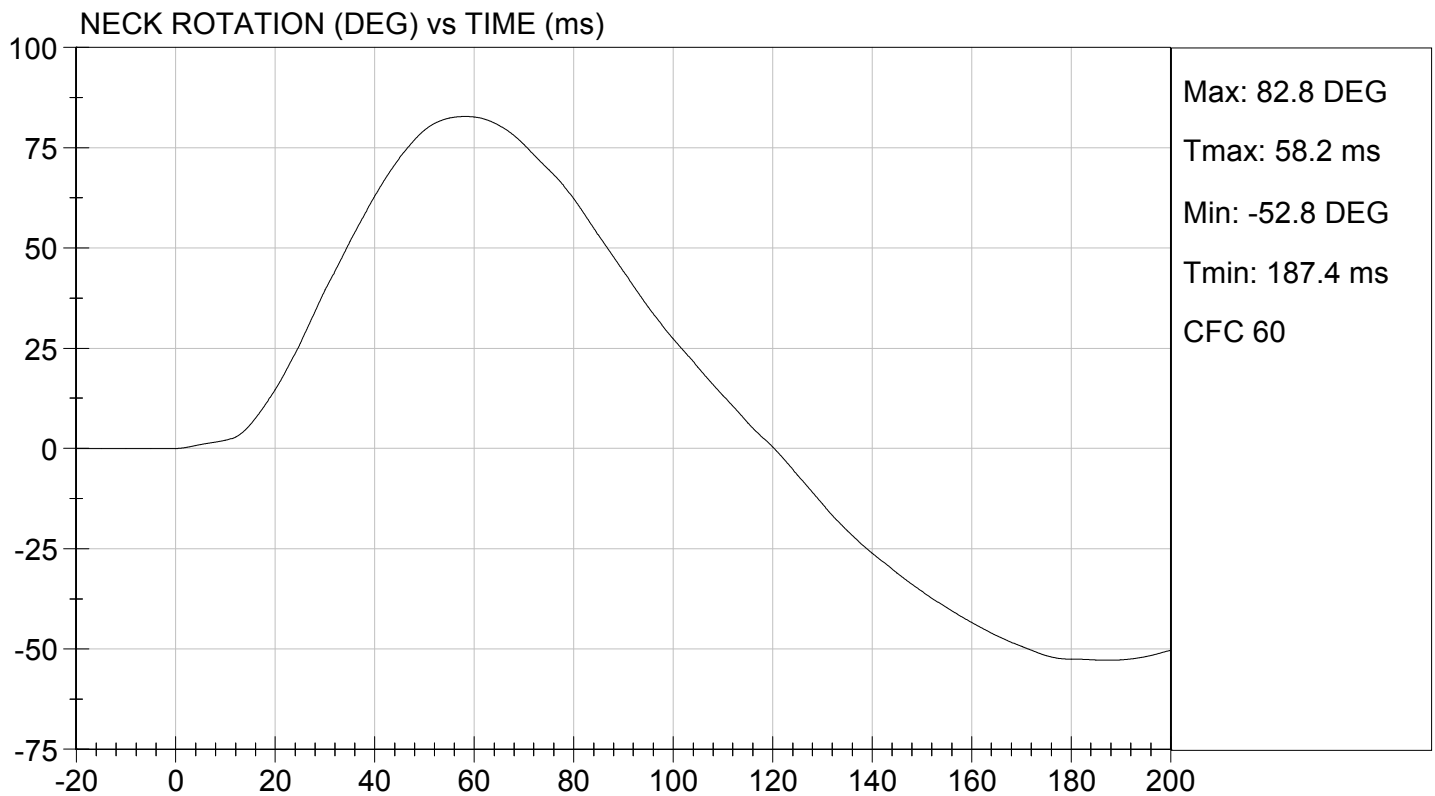
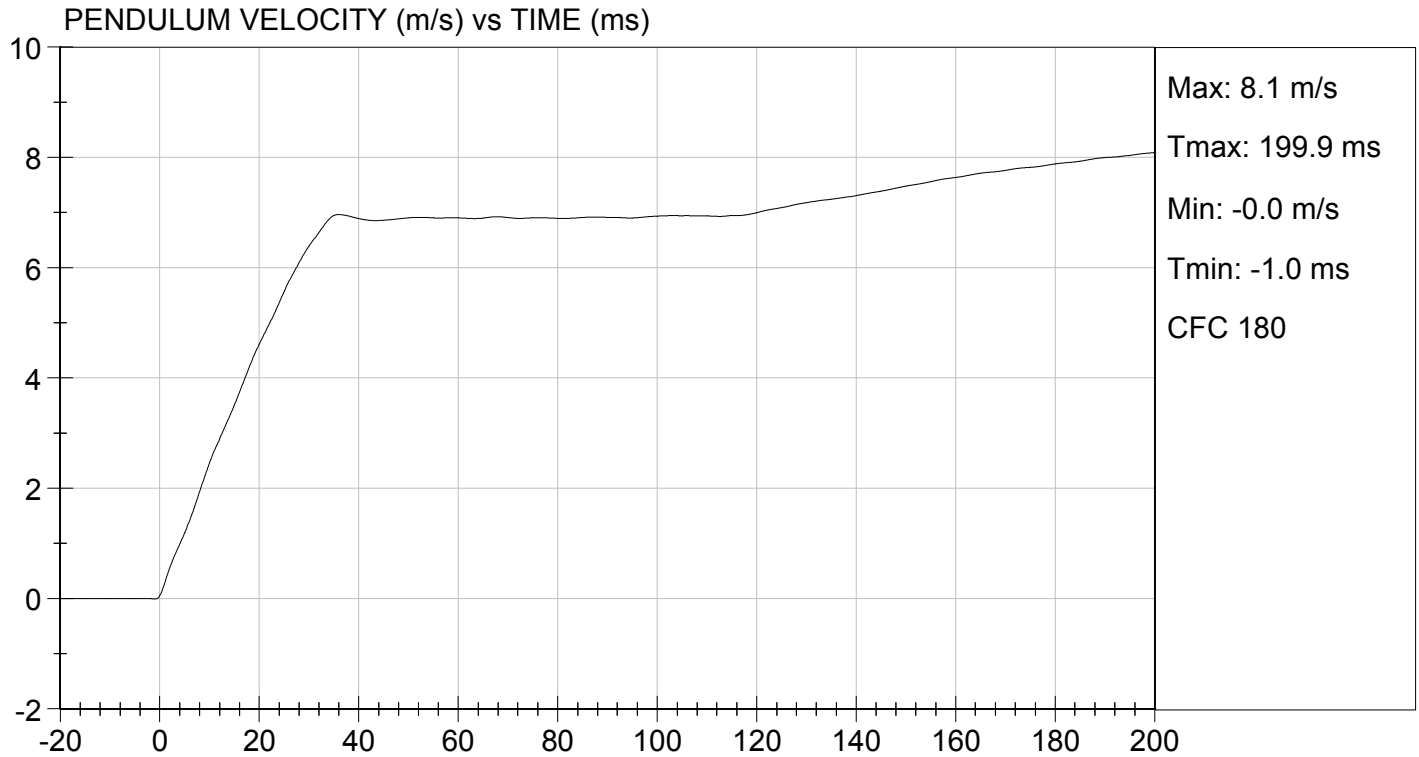


Approved By



TEST DESC: NECK FLEXION
VELOCITY: 23.15 ft/s, 7.06 m/s

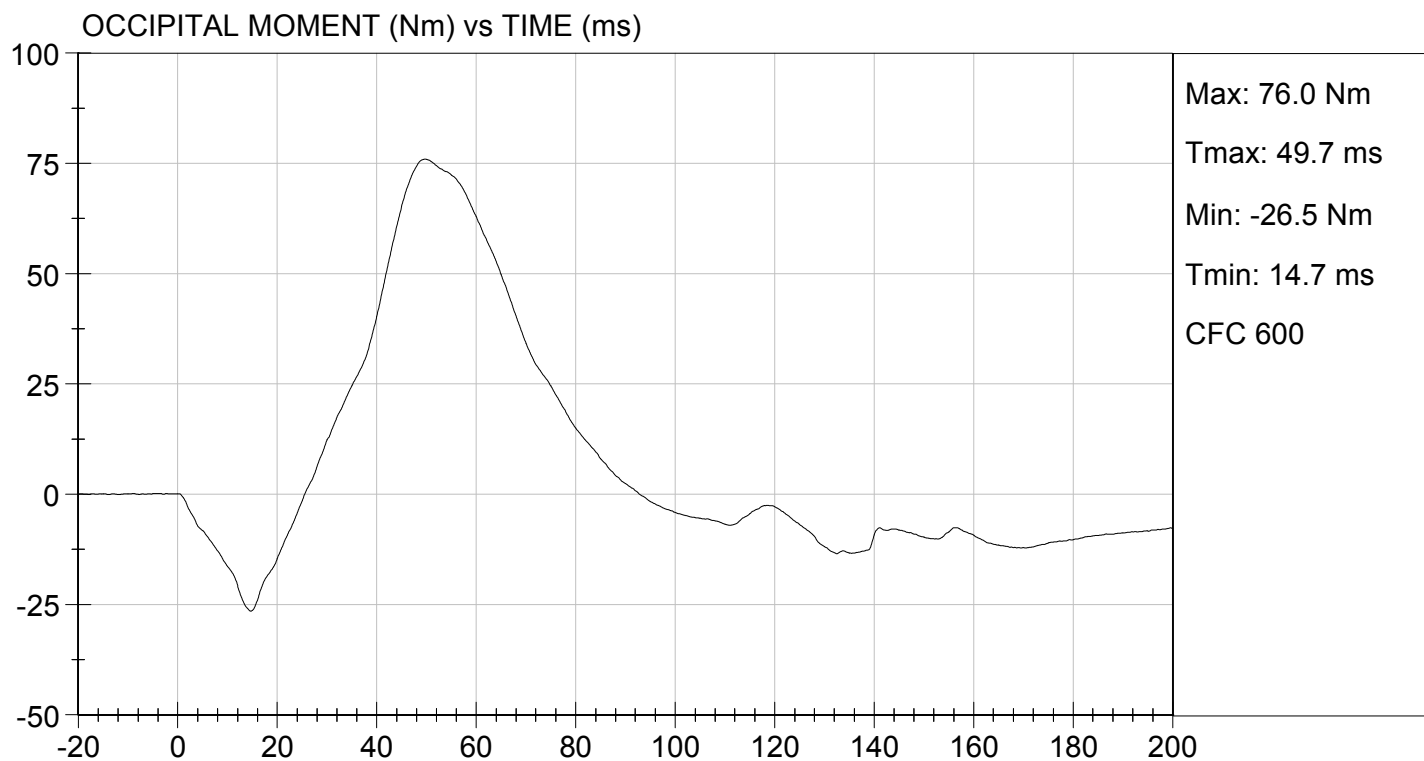
TEST DATE: 02/10/2014
TEST #: D14502





TEST DESC: NECK FLEXION
VELOCITY: 23.15 ft/s, 7.06 m/s

TEST DATE: 02/10/2014
TEST #: D14502



DATA SHEET B5
NECK EXTENSION TEST (572.133) (5th Female)

Dummy Serial Number: 125

Test Date: 02/10/2014

Technician: David Schoedel

- ☒ Pre test calibration
☐ Post test calibration verification

Test attempt no. 1 (when successive extension tests are necessary)

- ☒ 1. It has been at least 30 minutes since the last extension test. (572.137(q))
☒ N/A, ONLY one neck test performed
- ☒ 2. The components required for the neck tests include the head assembly (880105-100X), neck (880105-250), bib simulator (880105-371), upper neck adjusting bracket (880105-207), lower neck adjusting bracket (880105-208), six axis neck transducer (SA572-S11) and either three accelerometers (SA572-S4) or their mass equivalent installed in the head assembly as specified in drawing 880105-100X. Data from the accelerometers are not required. (572.133(b))
- ☒ 3. The assembly soaked at a temperature between 20.6°C (69°F) and 22.2°C (72°F) and at a relative humidity from 10% to 70% for a period of at least four (4) hours prior to a test. (572.133(c)(1))
- | | |
|---------------------------------|---------------|
| Record the maximum temperature: | <u>21.3°C</u> |
| Record the minimum temperature: | <u>20.7°C</u> |
| Record the maximum humidity: | <u>12%</u> |
| Record the minimum humidity: | <u>10%</u> |
- ☒ 4. Visually inspect neck assembly for cracks, cuts and separation of the rubber from the metal segments. Note: If the damage resulted from the vehicle crash test in which the dummy was an occupant, the damaged area is to be documented with photography and the post test calibration verification testing completed before any replacement or repairs are made.
- Record findings and actions: No damage
- ☒ 5. Inspect the nodding blocks (78051-351) for any deterioration, but when replacement is necessary, ONLY replace during pre-test calibration. Using a Shore "A" type Durometer, verify the hardness of the nodding blocks is between 80 and 90. Ensure the nodding blocks are installed correctly. (880105-250 and PADI page17).
- Record findings and actions: No Deterioration; Hardness: Front 89; Back 90.
- ☒ 6. Torque the jam nut (9000018) on the neck cable (880105-206) to 1.4 ± 0.2 Nm (12.0 ± 2.0 in-lb). (572.133(c)(2))

- X 7. The data acquisition system, including transducers, conforms to the requirements of SAE Recommended Practice J211/1 MAR95. (572.137(m))
- X 8. The test fixture pendulum conforms to the specifications in Figure 7B. (572.133(c)(3))
- X 9. The head-neck assembly is mounted on the pendulum so the midsagittal plane of the head is vertical and coincides with the plane of motion of the pendulum longitudinal centerline as shown in Figure 9B for the extension test. (572.133(c)(3))
- X 10. Install the transducers or other devices for measuring the "D" plane rotation with respect to the pendulum longitudinal centerline. Note: Plane "D" is the bottom horizontal surface of the skull. These measurement devices should be designed to minimize their influence upon the performance of the head-neck assembly. An example of a measurement device is shown in Figure 10B.
- X 11. With the pendulum resting against the honeycomb material, the neck bracket was adjusted until the longitudinal centerline of the pendulum was perpendicular ± 1 degree to plane "D" on the dummy's head.
- X 12. Release the pendulum and allow it to fall freely from a height to achieve an impact speed of 5.95 m/s to 6.19 m/s as measured at the center of the pendulum accelerometer. (572.133(c)(4)(i))
- X 13. Complete the following table:
Neck Extension Test Results (572.133(b)(2) & 572.133(c)(4)(I & ii))

Parameter		Specification	Results
Pendulum impact speed		$5.95 \text{ m/s} \leq \text{speed} \leq 6.19 \text{ m/s}$	6.12 m/s
Pendulum ΔV with respect to impact speed	@ 10 ms	$1.5 \text{ m/s} \leq \Delta V \leq 1.9 \text{ m/s}$	1.6 m/s
	@ 20 ms	$3.1 \text{ m/s} \leq \Delta V \leq 3.9 \text{ m/s}$	3.5 m/s
	@ 30 ms	$4.6 \text{ m/s} \leq \Delta V \leq 5.6 \text{ m/s}$	5.1 m/s
Plane D Rotation		Peak moment* $-65 \text{ Nm} \leq \text{moment} \leq -53 \text{ Nm}$ during the following rotation range $99^\circ \leq \text{angle} \leq 114^\circ$	-56 Nm @ 106 degrees
Positive Moment Decay** (Extension)		Time to decay to -10 Nm $94 \text{ ms} \leq \text{time} \leq 114 \text{ ms}$	101 ms

*Moment about the occipital condyle = $M_y - (0.01778 \text{ m} \times F_x)$ (572.133(b)(1)(ii))

M_y = Moment in Nm measured by the transducer

F_x = Force, in N measured by the transducer

**Time zero is defined as the time of initial contact between the pendulum striker plate and the honeycomb material. (572.133(b)(3))

- X 14. Plots of acceleration, velocity, y-axis moment, and x-axis force and y-axis moment about the occipital condyle follow this sheet.

David Schoedel
Signature

02/10/2014
Date

MGA RESEARCH CORPORATION
NECK EXTENSION TEST
HYBRID III 5TH PERCENTILE

ATD Serial No: 125

Test I.D: D14503

Tested Parameter		Units	Specification	Result	Pass/Fail
Laboratory Temperature		deg C	20.6 to 22.2	20.8	Pass
Laboratory Relative Humidity		%	10 to 70	12	Pass
Pendulum Speed		m/s	5.95 to 6.19	6.12	Pass
Pendulum Velocity	10 ms	m/s	1.5 to 1.9	1.6	Pass
	20 ms	m/s	3.1 to 3.9	3.5	Pass
	30 ms	m/s	4.6 to 5.6	5.1	Pass
D Plane Rotation	Max	deg	99 to 114	106	Pass
Occipital Condyle Moment within Rotation Corridor		Nm	-65 to -53	-56	Pass
Negative Moment Time Curve Decay to -10 Nm		ms	94 to 114	101	Pass
Overall Results					Pass

David Schoedel
Laboratory Technician

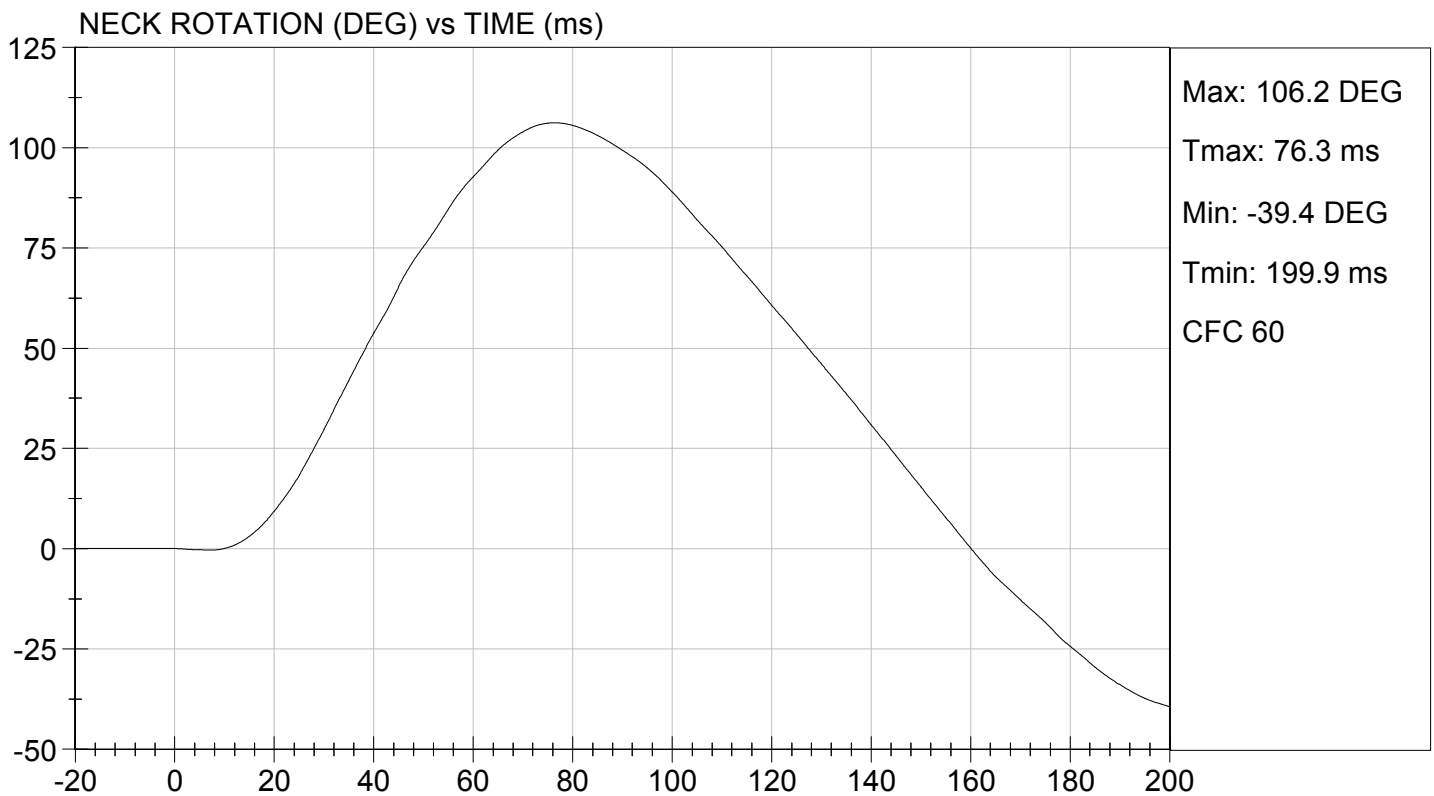
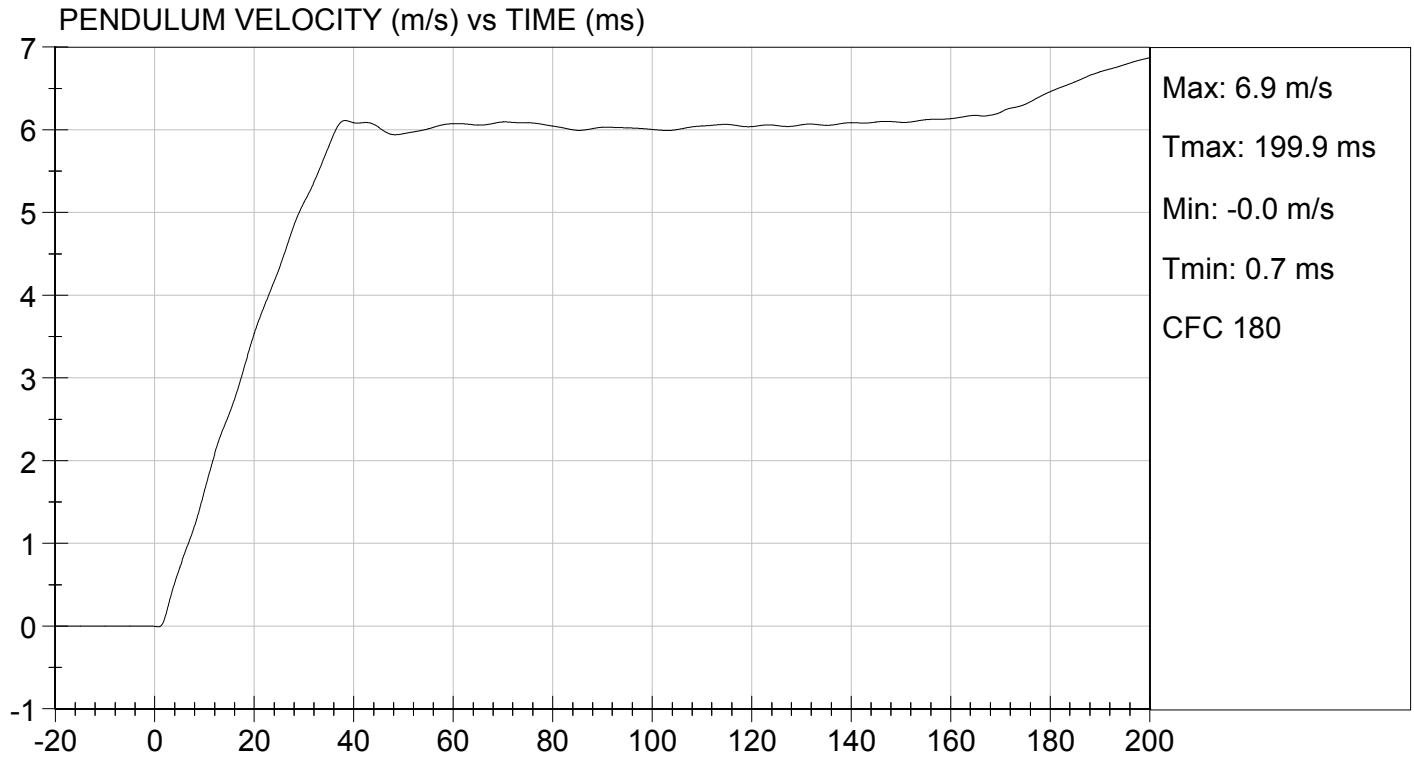
02/10/2014
Test Date

Jeff Leonard
Approved By



TEST DESC: NECK EXTENSION
VELOCITY: 20.08 ft/s, 6.12 m/s

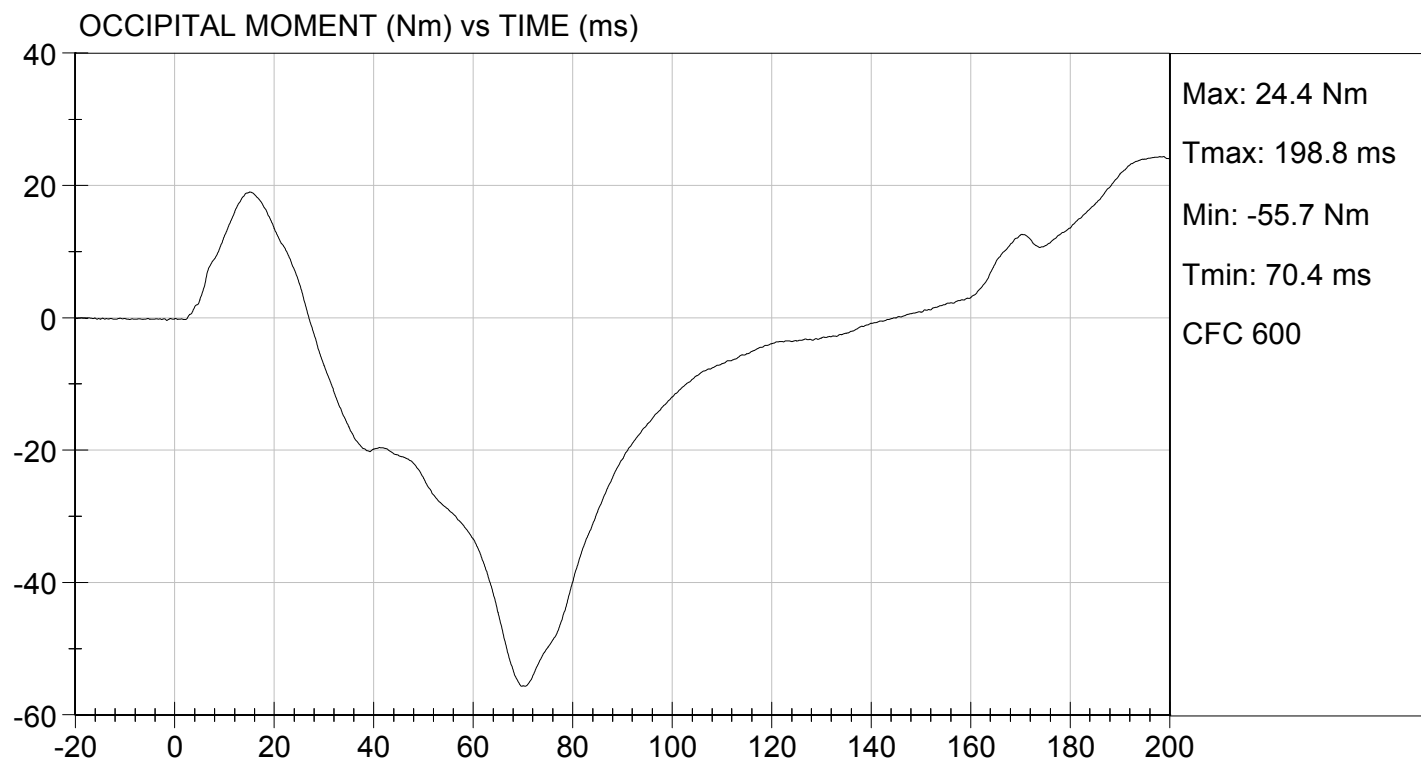
TEST DATE: 02/10/2014
TEST #: D14503





TEST DESC: NECK EXTENSION
VELOCITY: 20.08 ft/s, 6.12 m/s

TEST DATE: 02/10/2014
TEST #: D14503



DATA SHEET B6
THORAX IMPACT TEST (572.134) (5th Female)

Dummy Serial Number: 125

Test Date: 02/11/2014

Technician: David Schoedel

- ☒ Pre test calibration
☐ Post test calibration verification

Test attempt no. 1 (when successive thorax impact tests are necessary)

- ☒ 1. It has been at least 30 minutes since the last thorax impact test. (572.137(q))
☒ N/A, ONLY one thorax impact test performed
- ☒ 2. The test fixture conforms to the specifications in Figure 11B.
- ☒ 3. The complete assembled dummy (880105-000) is used (572.134(b)) and is dressed in a form fitting cotton stretch above-the-elbow sleeved shirt and above-the-knee pants. The weight of the shirt and pants shall not exceed 0.14 kg. (572.134(c)(1))
- ☒ 4. The dummy assembly soaked at a temperature between 20.6°C (69°F) and 22.2°C (72°F) and at a relative humidity from 10% to 70% for a period of at least four (4) hours prior to this test. (572.134(c)(2))

Record the maximum temperature:	<u>21.3°C</u>
Record the minimum temperature:	<u>20.7°C</u>
Record the maximum humidity:	<u>12%</u>
Record the minimum humidity:	<u>10%</u>

- ☒ 5. Remove the chest skin and visually inspect the thorax assembly for cracks, cuts, abrasions, etc. Particular attention should be given to the rib damping material, chest displacement transducer assembly and the rear rib supports. Inspect for rib deformation using the chest depth gage. If any damage is noted repair and/or replace the damaged components unless the damage resulted from the vehicle crash test in which the dummy was an occupant in which case the damage must be documented and post test calibration verification testing completed before any repairs or replacements are made.

☒ - No Damage

☐ - Damage from crash test, no repairs or replacement because this is a post test calibration verification. Record damage:

☐ - The following repairs or replacement was performed. Record:

- X 6. Seat the dummy, (chest skin still removed) without back and arm supports on the test fixture surface as shown in Figure 11B. The surface must be long enough to support the pelvis and outstretched legs. (572.134(c)(3))
- X 7. Level the ribs both longitudinally and laterally $\pm 0.5^\circ$ and adjust the pelvis angle to $7^\circ \pm 2^\circ$. The angle may be measured using the special H-point tool (TE-2504) that inserts into the pelvic structure and extends outward beyond the pelvic skin surface or by using the surface of the pelvic adaptor block.
- X 8. The midsagittal plane of the dummy is vertical within $\pm 1^\circ$. (572.134(c)(3))
- X 9. The longitudinal centerline of the test probe is centered within ± 2.5 mm of the midsagittal plane of the dummy and is $12.7 \text{ mm} \pm 1 \text{ mm}$ below the horizontal peripheral centerline of the No. 3 rib and is within 0.5° of a horizontal line in the dummy's midsagittal plane. (572.134(c)(4))
- X 10. Align the adjustable neck bracket index marks to the "zero" position.
- X 11. Record locations such as the rear surfaces of the thoracic spine and the lower neck bracket reference with respect to the laboratory coordinate system. These reference measurements are necessary to ensure the dummy is in the same position after the chest skin is installed. The reference locations must be accessible after installation of the chest skin. It may be necessary to leave the chest skin zipper unfastened until the references are checked and fasten it just prior to the test.
- X 12. Install the chest skin and reposition the dummy as described in the preceding paragraph using the reference measurements recorded.
- X 13. Place the arm assemblies horizontal $\pm 2^\circ$ and parallel to the midsagittal plane. The arms are held in place by tightening the adjustment nut that holds the arm yoke to the clavicle assembly.
- X 14. The data acquisition system, including transducers, must conform to the requirements of SAE Recommended Practice J211/1 MAR95 (572.136(m)) Class 180.
- X 15. Impact the anterior surface of the thorax with the test probe so the longitudinal centerline of the probe is within 2° of a horizontal line in the dummy's midsagittal plane at the moment of impact. (572.134(c)(5)) The velocity of the test probe at the time of impact is $6.71 \text{ m/s} \pm 0.12 \text{ m/s}$. (572.134(b)) The probe is guided so there is no significant lateral, vertical or rotational movement during the impact. (572.134(c)(6)) Neither the suspension hardware, suspension cables, nor other attachments to the probe, including the velocity vane, make contact with the dummy. (572.134(c)(7))

- X 16. Complete the following table:
Thorax Impact Results (572.134(b) and 572.134(b)(1)&(2))

Parameter*	Specification	Result
Test Probe Speed	$6.59 \text{ m/s} \leq \text{speed} \leq 6.83 \text{ m/s}$	6.77 m/s
Chest Compression	$50.0 \text{ mm} \leq \text{compression} \leq 58.0 \text{ mm}$	52 mm
Peak force** between 50.0 and 58.0 mm chest compression	$3900\text{N} \leq \text{peak force} \leq 4400\text{N}$	4128 N
Peak Force** between 18.0 and 50.0 mm chest compression	$\text{Peak Force} \leq 4600 \text{ N}$	4134 N
Internal Hysteresis***	$69\% \leq \text{hysteresis} \leq 85\%$	70%

*Time zero is defined as the time of initial contact between the test probe and the chest skin.

**Force = impactor mass x acceleration (572.134(b)(3))

***Area under loading curve minus the area under the unloading curve divided by the area under the loading curve. (Figure 12B)

- X 17. Plots of chest compression, acceleration, force, force versus deflection follow this sheet.

David Schoedel
Signature

02/11/2014
Date

MGA RESEARCH CORPORATION
THORAX IMPACT
HYBRID III 5TH PERCENTILE

ATD Serial No: 125

Test I.D: D14504

Tested Parameter	Units	Specification	Result	Pass/Fail
Temperature	deg C	20.6 to 22.2	21.3	Pass
Relative Humidity	%	10 to 70	10	Pass
Probe Speed	m/s	6.59 to 6.83	6.77	Pass
Peak Deflection	mm	50 to 58	52	Pass
Peak Resistive Force w/in Deflection Corridor	N	3900 to 4400	4128	Pass
Internal Hysteresis	%	69 to 85	70	Pass
Peak Force 18 mm - 50 mm	N	<= 4600	4134	Pass
Overall Test Results				Pass

David Schoedel
Laboratory Technician

02/11/2014

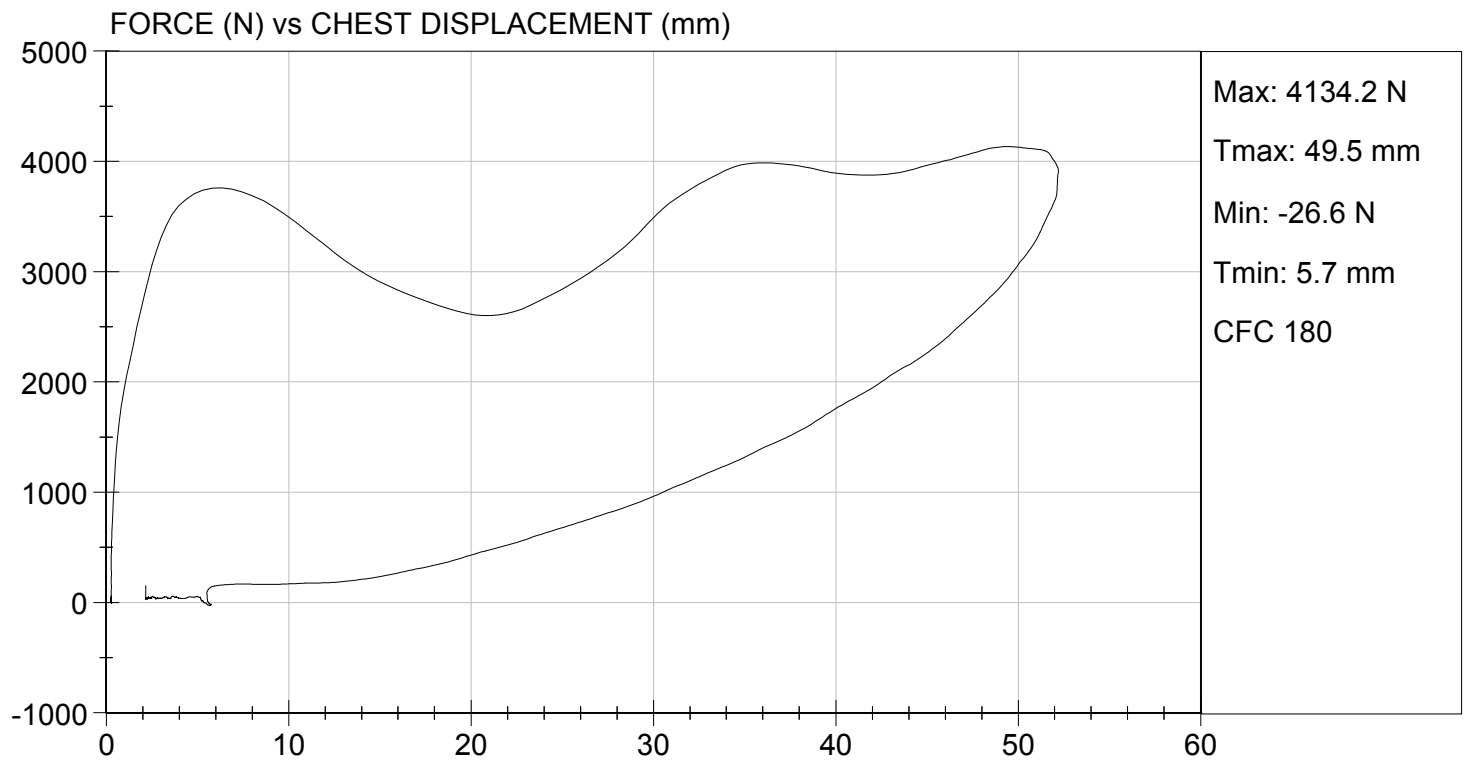
Test Date

Jeff Leonard
Approved By



TEST DESC: THORAX IMPACT
VELOCITY: 22.22 ft/s, 6.77 m/s

TEST DATE: 02/11/2014
TEST #: D14504



DATA SHEET B7
TORSO FLEXION TEST (572.135) (5th Female)

Dummy Serial Number: 125

Test Date: 02/10/2014

Technician: David Schoedel

- ☒ Pre test calibration
☐ Post test calibration verification

Test attempt no. 1 (when successive torso flexion tests are necessary)

- ☒ 1. It has been at least 30 minutes since the last torso flexion test. (572.137(q))
☒ N/A, ONLY one torso flexion test performed
- ☒ 2. The test fixture conforms to the specifications in Figure 13B.
- ☒ 3. The complete assembled dummy (880105-000) is used (572.135(c)(2)).
☐ With legs below femurs.
☒ Without legs below femurs.
- ☒ 4. The dummy assembly soaked at a temperature between 18.9°C (66°F) and 25.6°C (78°F) and at a relative humidity from 10% to 70% for a period of at least four (4) hours prior to this test. (572.135(c)(1))
- | | |
|---------------------------------|---------------|
| Record the maximum temperature: | <u>21.3°C</u> |
| Record the minimum temperature: | <u>20.7°C</u> |
| Record the maximum humidity: | <u>12%</u> |
| Record the minimum humidity: | <u>10%</u> |
- ☒ 5. Secure the pelvis to the fixture at the pelvis instrument cavity rear face by threading four ¼ cap screws into the available threaded attachment holes. Tighten the mountings so that the test material is rigidly affixed to the test fixture and the pelvic lumbar joining surface is horizontal. (572.135(c)(3))
- ☒ 6. Attach the loading adapter bracket to the spine of the dummy as shown in Figure 13B. (572.135(c)(4))
- ☒ 7. Inspect and adjust, if necessary, the seating of the abdominal insert within the pelvis cavity and with respect to the torso flesh, assuring that the torso flesh provides uniform fit and overlap with respect to the outside surface of the pelvis flesh. (572.135(c)(5))
- ☒ 8. Flex the dummy forward and back 3 times such that the angle reference plane moves between 0° and 30° with respect to the vertical transverse plane. (572.135(c)(6))

- X 9. Support the dummy such that the angle reference plane is at or near 0° (vertical with respect to the vertical transverse plane). Wait at least 30 minutes before continuing. (572.135(c)(6))
- X 10. Remove all external support that was implemented in 9 above. (572.135(c)(7))
- X 11. Measure the initial orientation angle of the torso reference plane of the seated, unsupported dummy. (572.135(c)(7))
 Record reference plane angle (max. allowed 20°): See Result Table
- X 12. Attach the pull cable and the load cell. (572.135(c)(8))
- X 13. Apply a tension force in the midsagittal plane to the pull cable at any upper torso deflection rate between 0.5° and 1.5° per second, until the angle reference plane is at 45° ± 0.5° of flexion relative to the vertical transverse plane. (572.135(c)(9))
- X 14. Maintain angle reference plane at 45° ± 0.5° of flexion for 10 seconds. (572.135(c)(10))
- X 15. As quickly as possible release the force applied to the attachment bracket. (572.135(c)(11))
- X 16. 3 minutes after the release of the force, measure the reference plane angle. (572.135(c)(11))
- X 17. Complete the following table:
 Torso Flexion Results (572.135(b), 572.135(c)(7), 572.135(c)(9))

Parameter	Specification	Result
Initial ref. plane angle	Angle ≤ 20°	19 deg
Torso rotation rate	0.5°/s ≤ rate ≤ 1.5°/s	0.9 deg/sec
Force at 45° ± 0.5°	320 N ≤ force ≤ 390 N	384 N
Final ref. plane angle	Initial ref. plane angle ± 8°	23 deg

David Schoedel
 Signature

02/10/2014
 Date

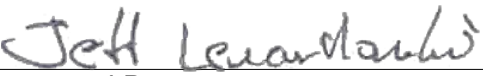
MGA RESEARCH CORPORATION**TORSO FLEXION TEST****HYBRID III 5TH PERCENTILE****ATD Serial No:** 125**Test I.D:** D14507

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 to 25.6	20.7	Pass
Laboratory Relative Humidity	%	10 to 70	10	Pass
Initial Angle	deg	0 to 20	19	Pass
Return Angle	deg	+/- 8	23	Pass
Force at 45 deg	N	320 to 390	384	Pass
Upper Torso Deflection Rate	deg/s	0.5 to 1.5	0.9	Pass
Overall Result				Pass

Laboratory Technician

02/10/2014

Test Date


Approved By

DATA SHEET B8
LEFT KNEE IMPACT TEST (572.136) (5th Female)

Dummy Serial Number: 125

Test Date: 02/10/2014

Technician: Jessica Gall

X Pre test calibration
 Post test calibration verification

Test attempt no. 1 (when successive knee impact tests are necessary)

- X 1. It has been at least 30 minutes since the last knee impact test. (572.137(q))
X N/A, ONLY one knee impact test performed
- X 2. The test fixture conforms to the specifications in Figure 14B.
- X 3. The knee assembly (880105-528L), lower leg structural replacement (880105-603), lower leg flesh (880105-601), ankle assembly (880105-660), foot assembly (880105-650), and femur load transducer (SA572-S14) (may use the load cell structural replacement (78051-319)) were used. (572.136(b)(1))
- X 4. The knee assembly soaked at a temperature between 18.9°C (66°F) and 25.6°C (78°F) and at a relative humidity from 10% to 70% for a period of at least four (4) hours prior to this test. (572.136(c)(1))
- | | |
|---------------------------------|---------------|
| Record the maximum temperature: | <u>21.3°C</u> |
| Record the minimum temperature: | <u>20.7°C</u> |
| Record the maximum humidity: | <u>12%</u> |
| Record the minimum humidity: | <u>10%</u> |
- X 5. Mount the test specimen and secure it to the rigid test fixture. (572.136(c)(2))
- X 6. No parts of the foot or tibia contact any exterior surface. (572.136(c)(2))
- X 7. Align the test probe so that throughout its stroke and at contact with the knee it is within 2 degrees of horizontal and collinear with the longitudinal centerline of the femur. (572.136(c)(3))
- X 8. The probe is guided so there is no significant lateral, vertical or rotational movement during the impact with the knee. (572.136(c)(4))
- X 9. The data acquisition system, including transducers, must conform to the requirements of SAE Recommended Practice J211/1 MAR95 (572.136(m)) Class 600.

X 10. Contact the knee with the test probe at a speed between 2.07 m/s and 2.13 m/s.
(572.136(c)(5)) Neither the suspension hardware, suspension cables, nor other
attachments to the probe, including the velocity vane, make contact with the dummy.
(572.136(c)(6))

 X 11. Complete the following table:
Knee Impact Results (572.136(b)(1) and 572.136(c)(5))

Parameter	Specification	Result
Probe speed	$2.07 \text{ m/s} \leq \text{speed} \leq 2.13 \text{ m/s}$	2.12 m/s
Peak resistance force*	$3450 \text{ N} \leq \text{force} \leq 4060 \text{ N}$	3561 N

*Force = impactor mass x deceleration (572.136(b)(2))

 X 12. Plots of acceleration versus time and force versus time follow this sheet.

 Jessica Hall
Signature

 02/10/2014
Date

MGA RESEARCH CORPORATION

**LEFT KNEE IMPACT TEST
HYBRID III 5TH PERCENTILE**

ATD Serial No: 125

Test I.D: D14506

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 to 25.6	20.7	Pass
Laboratory Relative Humidity	%	10 to 70	12	Pass
Probe Speed	m/s	2.07 to 2.13	2.12	Pass
Maximum Force	N	3450 to 4060	3561	Pass
Overall Test Results				Pass

Jessica Hall
Laboratory Technician

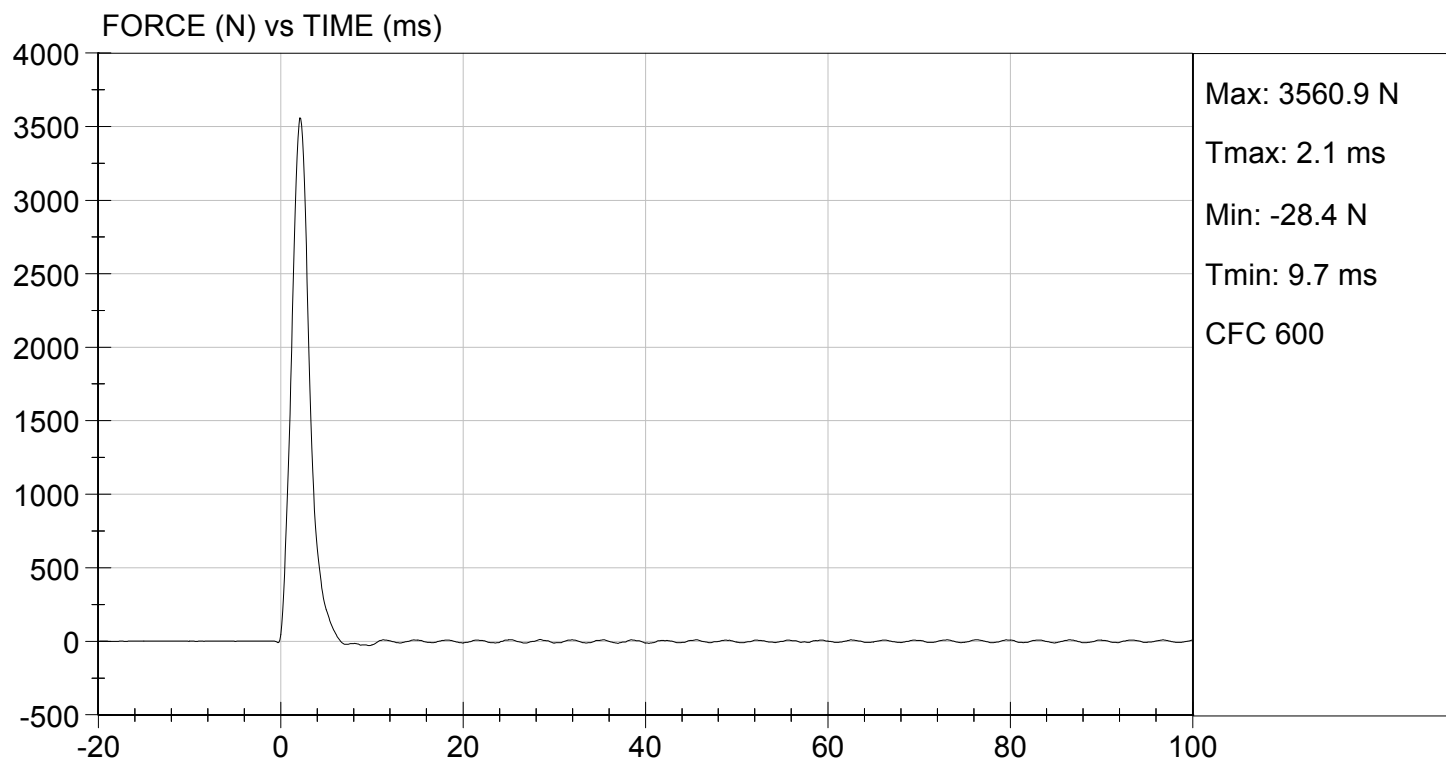
02/10/2014
Test Date

Jeff Leonard
Approved By



TEST DESC: LEFT KNEE
VELOCITY: 6.97 ft/s, 2.12 m/s

TEST DATE: 02/10/2014
TEST #: D14506



DATA SHEET B9
RIGHT KNEE IMPACT TEST (572.136) (5th Female)

Dummy Serial Number: 125

Test Date: 02/10/2014

Technician: Jessica Gall

- ☒ Pre test calibration
☐ Post test calibration verification

Test attempt no. 1 (when successive knee impact tests are necessary)

- ☒ 1. It has been at least 30 minutes since the last knee impact test. (572.137(q))
☒ N/A, ONLY one knee impact test performed
- ☒ 2. The test fixture conforms to the specifications in Figure 14B.
- ☒ 3. The knee assembly (880105-528R), lower leg structural replacement (880105- 603), lower leg flesh (880105-601), ankle assembly (880105-660), foot assembly (880105-651), and femur load transducer (SA572-S14) (may use the load cell structural replacement (78051-319)) were used. (572.136(b)(1))
- ☒ 4. The knee assembly soaked at a temperature between 18.9°C (66°F) and 25.6°C (78°F) and at a relative humidity from 10% to 70% for a period of at least four (4) hours prior to this test. (572.136(c)(1))

Record the maximum temperature:	<u>21.3°C</u>
Record the minimum temperature:	<u>20.7°C</u>
Record the maximum humidity:	<u>12%</u>
Record the minimum humidity:	<u>10%</u>

- ☒ 5. Mount the test specimen and secure it to the rigid test fixture. (572.136(c)(2))
- ☒ 6. No parts of the foot or tibia contact any exterior surface. (572.136(c)(2))
- ☒ 7. Align the test probe so that throughout its stroke and at contact with the knee it is within 2 degrees of horizontal and collinear with the longitudinal centerline of the femur. (572.136(c)(3))
- ☒ 8. The probe is guided so there is no significant lateral, vertical or rotational movement during the impact with the knee. (572.136(c)(4))
- ☒ 9. The data acquisition system, including transducers, must conform to the requirements of SAE Recommended Practice J211/1 MAR95 (572.136(m)) Class 600.

- X 11. Complete the following table:

Parameter	Specification	Result
Probe speed	$2.07 \text{ m/s} \leq \text{speed} \leq 2.13 \text{ m/s}$	2.12 m/s
Peak resistance force*	$3450 \text{ N} \leq \text{force} \leq 4060 \text{ N}$	3497 N

X 12. Plots of acceleration versus time and force versus time follow this sheet.

Jessica Hall
Signature

02/10/2014

Date

MGA RESEARCH CORPORATION

RIGHT KNEE IMPACT TEST

HYBRID III 5TH PERCENTILE

ATD Serial No: 125

Test I.D: D14505

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 to 25.6	20.7	Pass
Laboratory Relative Humidity	%	10 to 70	12	Pass
Probe Speed	m/s	2.07 to 2.13	2.12	Pass
Maximum Force	N	3450 to 4060	3497	Pass
Overall Test Results				Pass

Jessica Hall
Laboratory Technician

02/10/2014

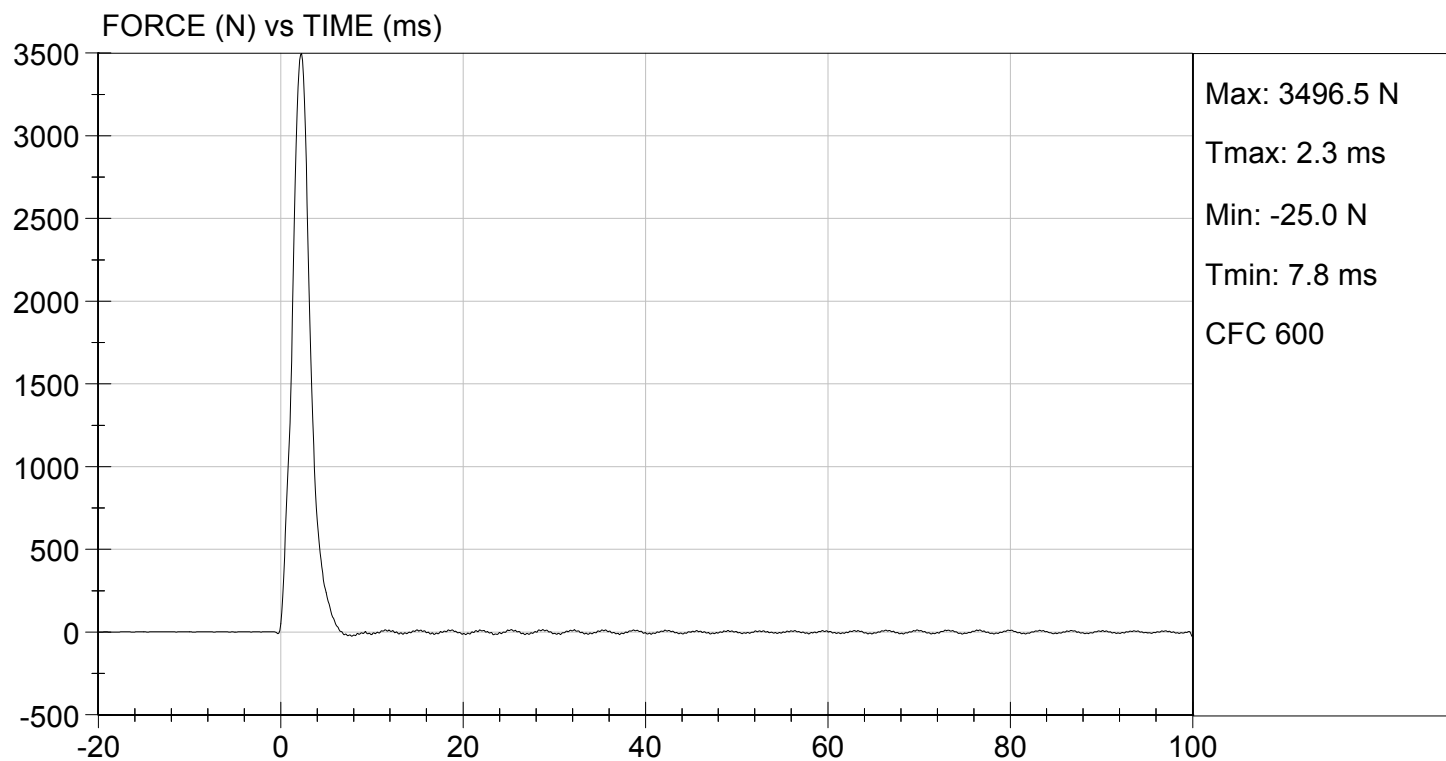
Test Date

Jeff Leonard
Approved By



TEST DESC: RIGHT KNEE
VELOCITY: 6.97 ft/s, 2.12 m/s

TEST DATE: 02/10/2014
TEST #: D14505



DATA SHEET B10

PART 572 INSTRUMENTATION CALIBRATION INFORMATION

I.D. NO.	MANUFACTURER	MODEL NO.	SERIAL NO.	DATE OF LAST CALIBRATION	DATE OF NEXT CALIBRATION
DUMMY INSTRUMENTATION					
HEAD ACCELEROMETERS					
(1) LONGITUDINAL	Endevco	7264C-2KTZ-2-360M17	P82603	02/04/2014	08/04/2014
(2) LATERAL	Endevco	7264C-2KTZ-2-360M17	P82604	02/04/2014	08/04/2014
(3) VERTICAL	Endevco	7264C-2KTZ-2-360M17	P82605	02/04/2014	08/04/2014
NECK TRANSDUCER	Denton	1716	1496	01/16/2014	07/16/2014
CHEST ACCELEROMETERS					
(1) LONGITUDINAL	Endevco	7264C-2KTZ-2-360M17	P82607	02/04/2014	08/04/2014
(2) LATERAL	Endevco	7264C-2KTZ-2-360M17	P82609	02/04/2014	08/04/2014
(3) VERTICAL	Endevco	7264C-2KTZ-2-360M17	P82610	02/04/2014	08/04/2014
CHEST POTENTIOMETER	Servo	14CBI-2897	125	02/10/2014	08/10/2014
FEMUR LOAD CELLS					
(1) RIGHT FEMUR	GSE	2430	2024	01/20/2014	07/20/2014
(2) LEFT FEMUR	GSE	2430	2025	01/20/2014	07/20/2014
LABORATORY INSTRUMENTATION					
NECK PENDULUM ACCELEROMETER	Endevco	7231C-750	AGH70	08/27/2013	02/27/2014
THORAX PENDULUM ACCELEROMETER	Endevco	7264C-2KTZ-2-240	P82319	11/01/2013	05/01/2014
KNEE PENDULUM ACCELEROMETER	Endevco	7264C-2KTZ-2-240	P77579	01/10/2014	07/10/2014
NECK ROTATION TRANSDUCER 1 (OPTIONAL)	Spectrol	132-0-0-102	18	08/13/2013	02/13/2014
NECK ROTATION TRANSDUCER 2 (OPTIONAL)	Spectrol	132-0-0-102	29	08/13/2013	02/13/2014

LABORATORY TECHNICIAN:

Jessica Hall

DATA SHEET B3
HEAD DROP TEST (572.132) (5th Female)

Dummy Serial Number: 125

Test Date: 02/12/2014

Technician: David Schoedel

 Pre test calibration
 X Post test calibration verification

Test attempt no. 1 (when successive head drops are necessary)

- X 1. It has been at least 2 hours since the last head drop. (572.132(c)(5))
 X N/A, ONLY one head drop performed
- X 2. The head assembly consists of the complete head (880105-100X), the six-axis neck transducer (SA572-S11) or neck transducer structural replacement (78051-383X), and three (3) accelerometers (SA572-S4). (572.132(a))
- X 3. The head accelerometer mounting plate screws (10-24 x 3/8 SHCS) are torqued to 9.0 Nm.
- X 4. Accelerometers and their respective mounts are smooth and clean.
- X 5. Torque the skull cap screws (10-24 x 1/2 SHCS) to 9.0 Nm.
- X 6. The data acquisition system, including transducers, conforms to the requirements of SAE Recommended Practice J211/1 MAR95. (572.136(m))
- X 7. The head assembly soaked at a temperature between 18.9°C (66°F) and 25.6°C (78°F) and at a relative humidity from 10% to 70% for a period of at least four (4) hours prior to a test. (572.132(c)(1))
- | | |
|---------------------------------|---------------|
| Record the maximum temperature: | <u>20.9°C</u> |
| Record the minimum temperature: | <u>20.8°C</u> |
| Record the maximum humidity: | <u>14%</u> |
| Record the minimum humidity: | <u>12%</u> |
- X 8. Visually inspect the head skin for cracks, cuts, abrasions, etc. Repair or replace the head skin if the damaged area is more than superficial. Note: If the damage resulted from the vehicle crash test in which the dummy was an occupant, the damaged area is to be documented with photography and the post test calibration verification testing completed before any replacement or repairs are made.
- Record findings and actions: No Damage

X 9. Clean the impact surface of the skin and the impact surface of the fixture with isopropyl alcohol, trichloroethane or equivalent prior to the test. (572.132(c)(2))

X 10. Suspend and orient the head assembly as shown in Figure 5B. The lowest point on the forehead is 376.0 ± 1.0 mm (14.8 ± 0.04 inch) from the impact surface. (572.132(c)(3))
Record the actual distance: 376 mm

NOTE: The masses of the suspension device and the accelerometer cables are to be kept as lightweight as possible to minimize their effect on the test results.

X 11. The 1.57 mm (0.062 inch) diameter holes located on either side of the dummy's head are equidistance within 2 mm from the impact surface. A typical test setup is shown in Figure 6B. (572.132(c)(3))

Record the right side distance: 501 mm

Record the left side distance: 501 mm

X 12. The impact surface is clean and dry and has a micro finish in the range of 203.2×10^{-6} mm (8 micro inches) to 2032.0×10^{-6} mm (80 micro inches) (RMS). (572.132(c)(4))

Record actual micro finish: 24.8 micro inches

X 13. The impact surface is rigidly supported. (572.132(c)(4))

X 14. The impact surface is a flat horizontal steel plate 50.8 mm (2 inches) thick and 610 mm (24 inches) square. (572.132(c)(4))

Record thickness: 50.9 mm

Record width: 604 mm

Record length: 595 mm

X 15. Drop the head assembly from a height of 376.0 ± 1.0 mm (14.8 inches $\pm$ 0.04 inches) by a means that ensures a smooth, instant release onto the impact surface. (572.132(b) & (572.132(c)(4))

X 16. Complete the following table using channel class 1000 data. (572.132(b)):

Parameter	Specification	Result
Peak resultant acceleration	$250 \text{ g} \leq x \leq 300 \text{ g}$	265 g
Resultant versus time history curve	Unimodal	Yes
Oscillations after the main pulse	Less than 10% of the peak resultant acceleration	Yes
Lateral acceleration	y-axis acceleration $\leq 15 \text{ g}$	-9.5 g

X 17. Plots of the x, y, z, and resultant acceleration data follow this sheet.

David Schoedel
Signature

02/12/2014
Date

MGA RESEARCH CORPORATION
HEAD DROP TEST
HYBRID III 5TH PERCENTILE

ATD Serial No: 125

Test ID: D14561

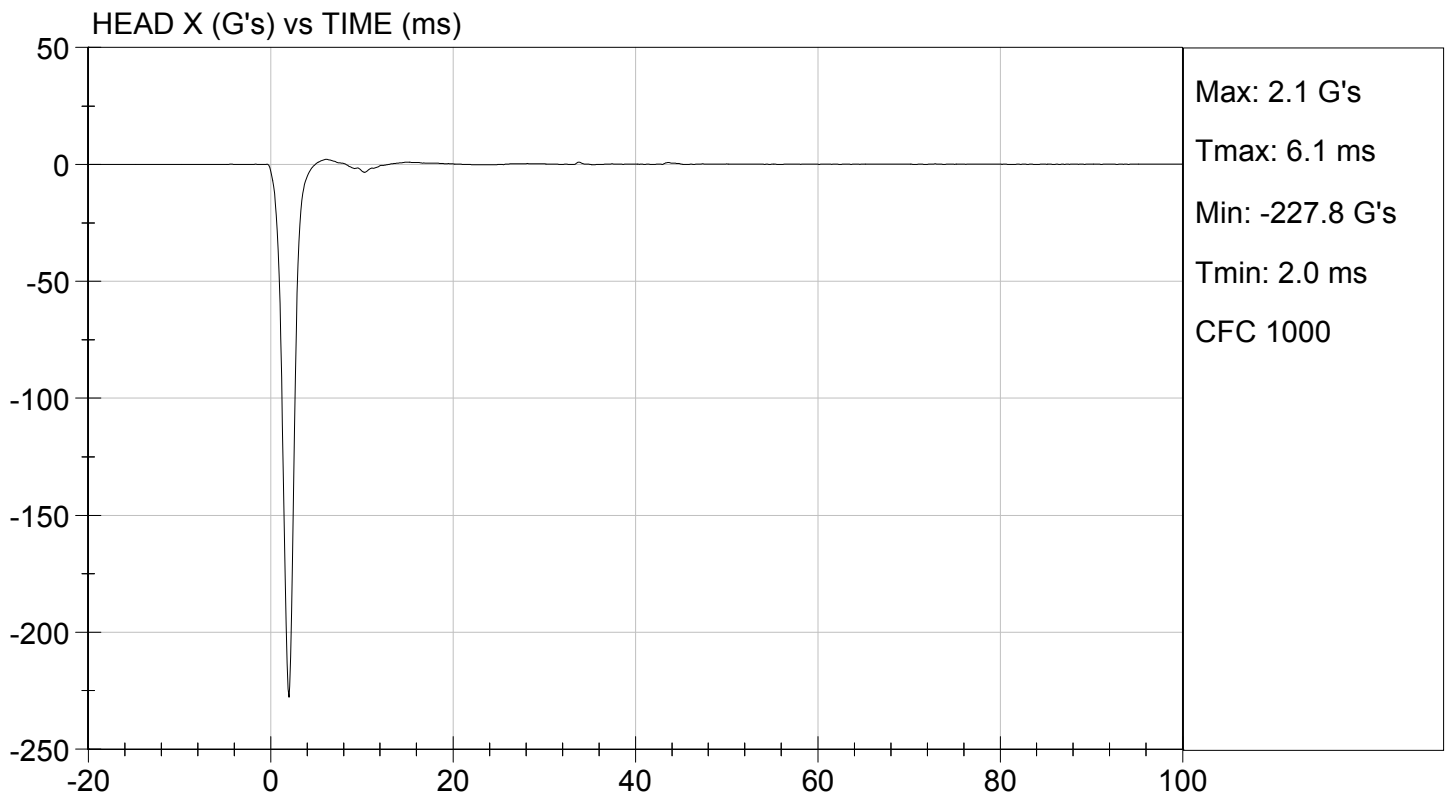
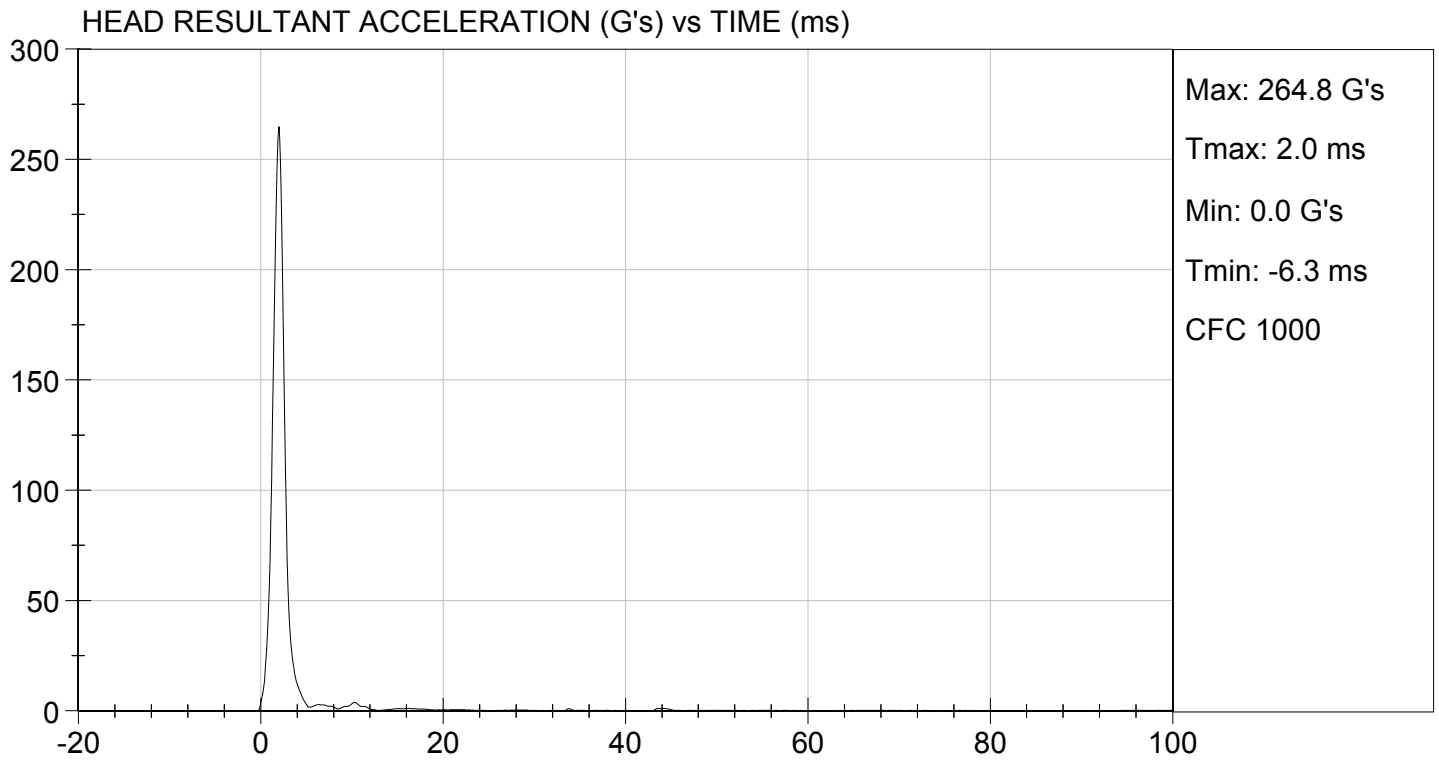
Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 to 25.6	20.8	Pass
Laboratory Relative Humidity	%	10 to 70	12	Pass
Peak Resultant Acceleration	G's	250 to 300	265	Pass
Peak Lateral Acceleration	G's	<= +/- 15.0	-9.5	Pass
Unimodal	N/A	Yes	Yes	Pass
Oscillations	N/A	within 10% of peak	Yes	Pass
Overall Test Results				Pass

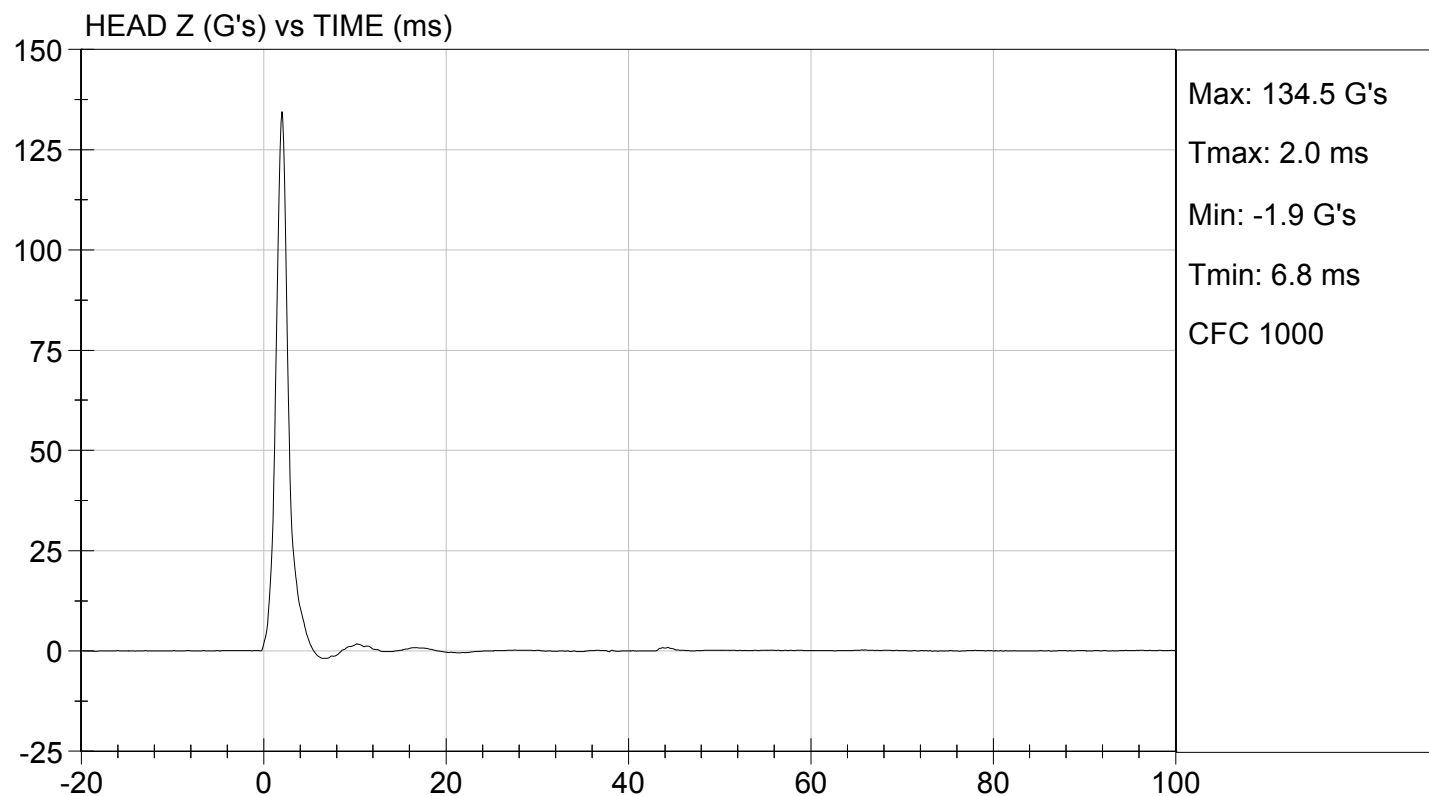
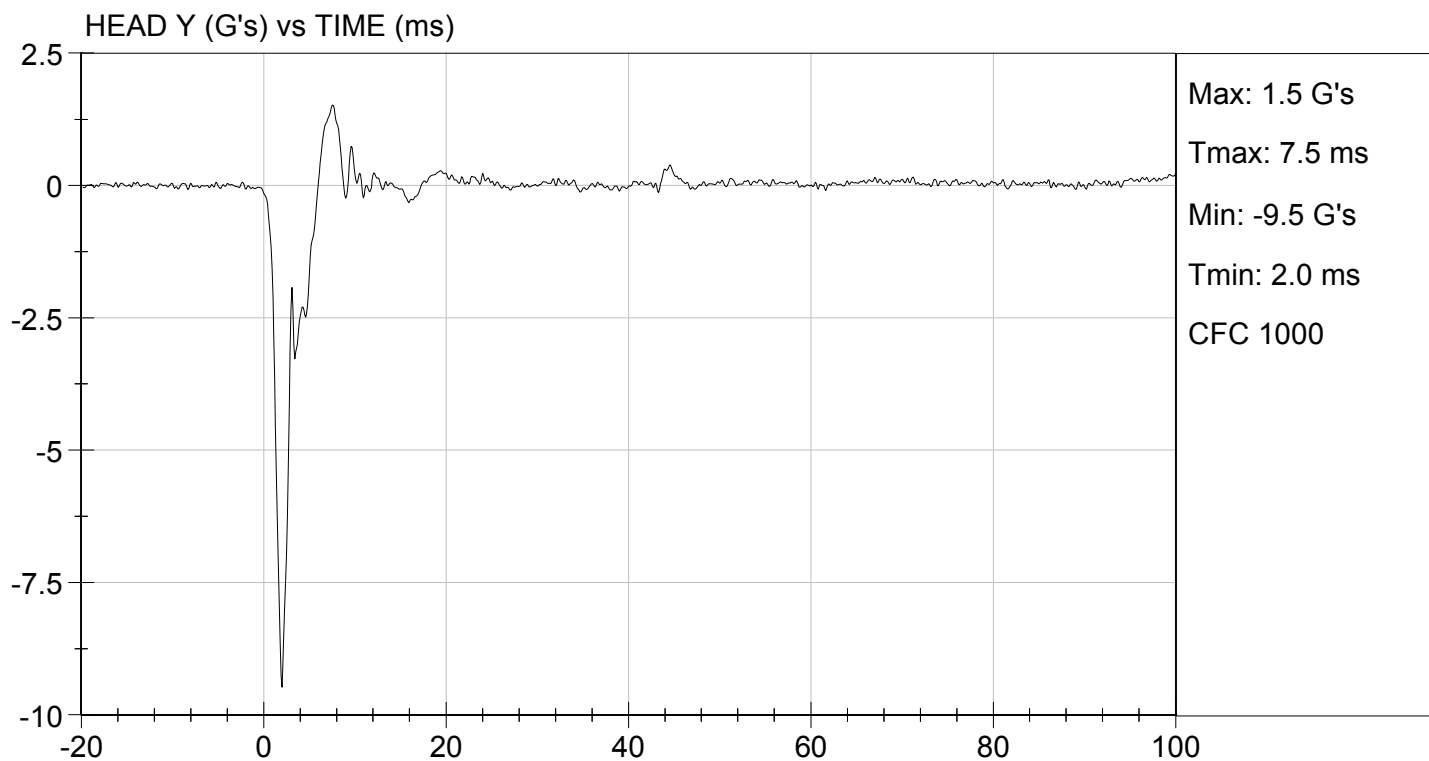
David Schoedel
Laboratory Technician

02/12/2014

Test Date

Jeff Leonard
Approved By





DATA SHEET B4
NECK FLEXION TEST (572.132) (5th Female)

Dummy Serial Number: 125

Test Date: 02/12/2014

Technician: Tim Grochowske

 Pre test calibration
 X Post test calibration verification

Test attempt no. 1 (when successive flexion tests are necessary)

- X 1. It has been at least 30 minutes since the last flexion test. (572.137(q))
 X N/A, ONLY one neck test performed
- X 2. The components required for the neck tests include the head assembly (880105-100X), neck (880105-250), bib simulator (880105-371), upper neck adjusting bracket (880105-207), lower neck adjusting bracket (880105-208), six axis neck transducer (SA572-S11) and either three accelerometers (SA572-S4) or their mass equivalent installed in the head assembly as specified in drawing 880105-100X. Data from the accelerometers are not required. (572.133(b))
- X 3. The assembly soaked at a temperature between 20.6°C (69°F) and 22.2°C (72°F) and at a relative humidity from 10% to 70% for a period of at least four (4) hours prior to a test. (572.133(c)(1))
- | | |
|---------------------------------|---------------|
| Record the maximum temperature: | <u>20.9°C</u> |
| Record the minimum temperature: | <u>20.8°C</u> |
| Record the maximum humidity: | <u>14%</u> |
| Record the minimum humidity: | <u>12%</u> |
- X 4. Visually inspect neck assembly for cracks, cuts and separation of the rubber from the metal segments. Note: If the damage resulted from the vehicle crash test in which the dummy was an occupant, the damaged area is to be documented with photography and the post test calibration verification testing completed before any replacement or repairs are made.
- Record findings and actions: No damage
- X 5. Inspect the nodding blocks (78051-351) for any deterioration, but when replacement is necessary, ONLY replace during pre-test calibration. Using a Shore "A" type Durometer, verify the hardness of the nodding blocks is between 80 and 90. Ensure the nodding blocks are installed correctly. (880105-250 and PADI page17).
- Record findings and actions: No Deterioration; Hardness: Front 89; Back 90.
- X 6. Torque the jam nut (9000018) on the neck cable (880105-206) to 1.4 ± 0.2 Nm (12.0 ± 2.0 in-lb). (572.133(c)(2))

- X 7. The data acquisition system, including transducers, conforms to the requirements of SAE Recommended Practice J211/1 MAR95. (572.137(m))
- X 8. The test fixture pendulum conforms to the specifications in Figure 7B. (572.133(c)(3))
- X 9. The head-neck assembly is mounted on the pendulum so the midsagittal plane of the head is vertical and coincides with the plane of motion of the pendulum longitudinal centerline as shown in Figure 8B for the flexion test. (572.133(c)(3))
- X 10. Install the transducers or other devices for measuring the "D" plane rotation with respect to the pendulum longitudinal centerline. Note: Plane "D" is the bottom horizontal surface of the skull. These measurement devices should be designed to minimize their influence upon the performance of the head-neck assembly. An example of a measurement device is shown in Figure 10B.
- X 11. With the pendulum resting against the honeycomb material, the neck bracket was adjusted until the longitudinal centerline of the pendulum was perpendicular ± 1 degree to plane "D" on the dummy's head.
- X 12. Release the pendulum and allow it to fall freely from a height to achieve an impact speed of 6.89 m/s to 7.13 m/s as measured at the center of the pendulum accelerometer. (572.133(c)(4)(i))
- X 13. Complete the following table:

Neck Flexion Test Results (572.133(b)(1) & 572.133(c)(4)(i & ii))

Parameter		Specification	Results
Pendulum impact speed		6.89 m/s $\leq$ speed $\leq$ 7.13 m/s	7.05 m/s
Pendulum ΔV with respect to impact speed	@ 10 ms	2.1 m/s $\leq \Delta V \leq$ 2.5 m/s	2.2 m/s
	@ 20 ms	4.0 m/s $\leq \Delta V \leq$ 5.0 m/s	4.3 m/s
	@ 30 ms	5.8 m/s $\leq \Delta V \leq$ 7.0 m/s	6.1 m/s
Plane D Rotation		Peak moment* 69 Nm $\leq$ moment $\leq$ 83 Nm during the following rotation range 77° $\leq$ angle $\leq$ 91°	71 Nm @ 80 degrees
Positive Moment Decay** (Flexion)		Time to decay to 10 Nm 80 ms $\leq$ time $\leq$ 100 ms	88 ms

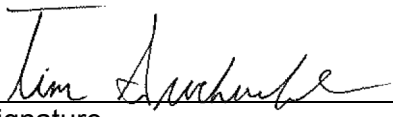
*Moment about the occipital condyle = $M_y - (0.01778 \text{ m} \times F_x)$ (572.133(b)(1)(ii))

M_y = Moment in Nm measured by the transducer

F_x = Force, in N measured by the transducer

**Time zero is defined as the time of initial contact between the pendulum striker plate and the honeycomb material. (572.133(b)(3))

- X 14. Plots of acceleration, velocity, y-axis moment, and x-axis force and y-axis moment about the occipital condyle follows this sheet.


Signature

02/12/2014
Date

MGA RESEARCH CORPORATION

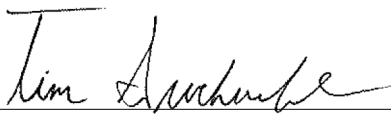
NECK FLEXION TEST

HYBRID III 5TH PERCENTILE

ATD Serial No: 125

Test I.D: D14562

Tested Parameter		Units	Specification	Result	Pass/Fail
Laboratory Temperature		deg C	20.6 to 22.2	20.9	Pass
Laboratory Relative Humidity		%	10 to 70	14	Pass
Pendulum Speed		m/s	6.89 to 7.13	7.05	Pass
Pendulum Velocity	10 ms	m/s	2.1 to 2.5	2.2	Pass
	20 ms	m/s	4.0 to 5.0	4.3	Pass
	30 ms	m/s	5.8 to 7.0	6.1	Pass
D Plane Rotation	Max	deg	77 to 91	80	Pass
Occipital Condyle Moment within Rotation Corridor		Nm	69 to 83	71	Pass
Positive Moment Time Curve Decay to 10 Nm		ms	80 to 100	88	Pass
Overall Results					Pass



Laboratory Technician

02/12/2014

Test Date

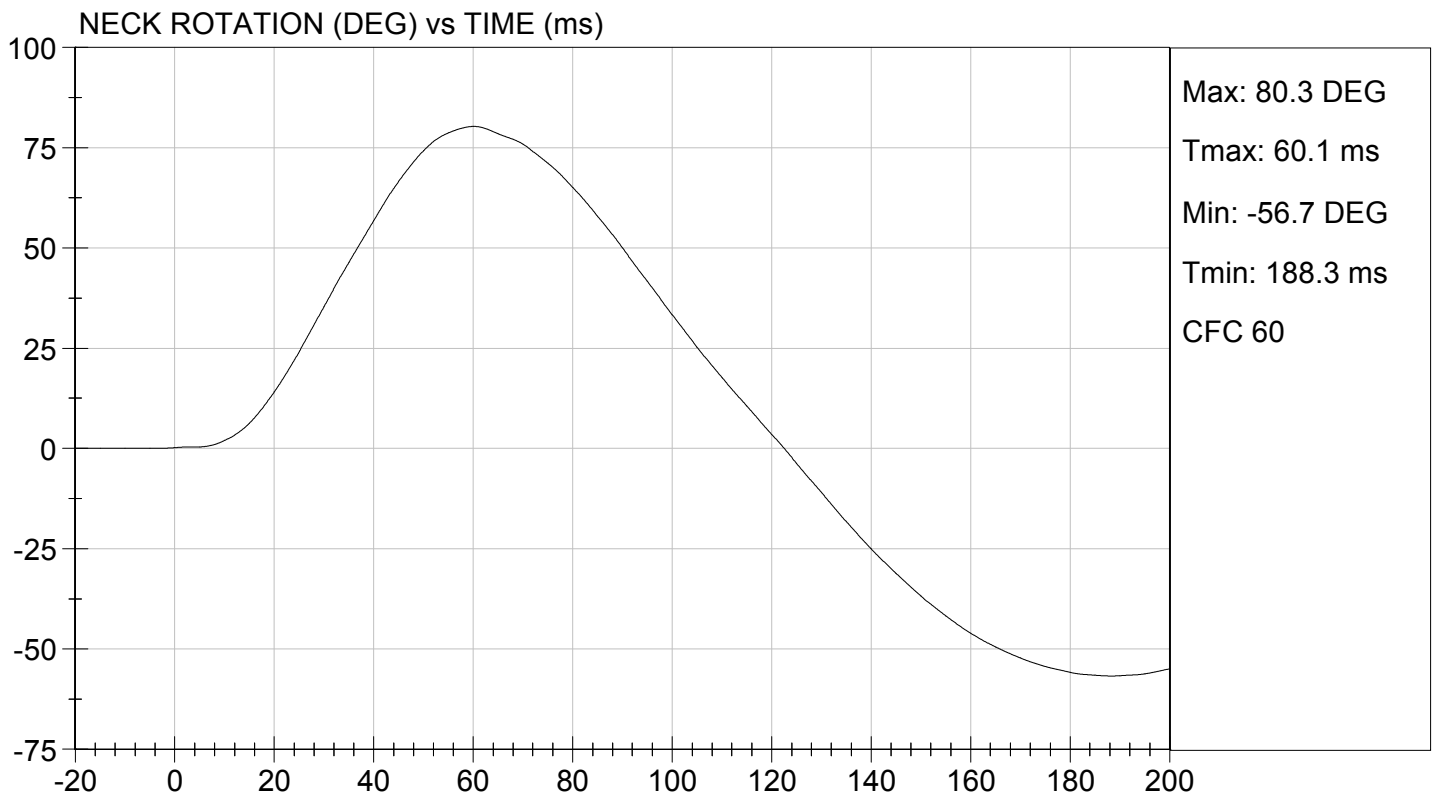
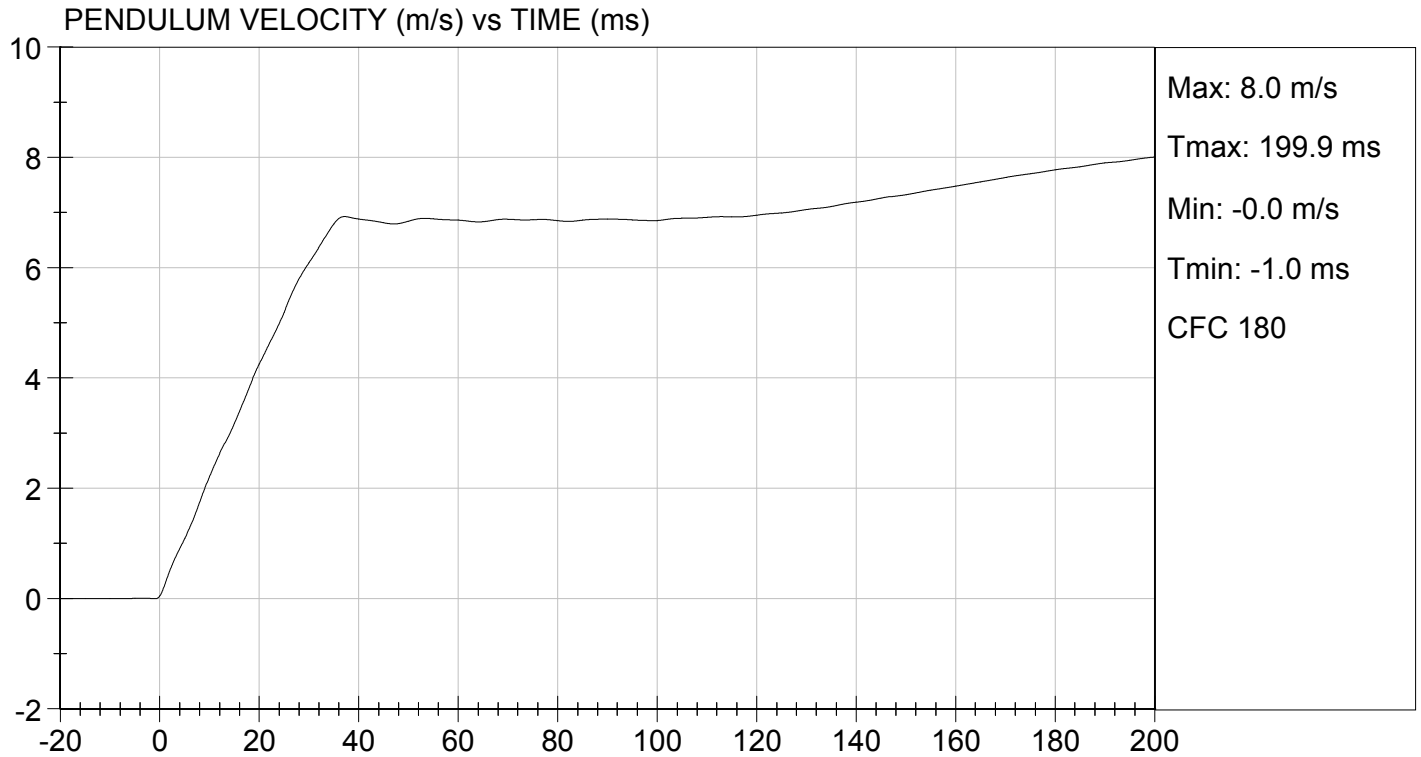


Approved By



TEST DESC: NECK FLEXION
VELOCITY: 23.14 ft/s, 7.05 m/s

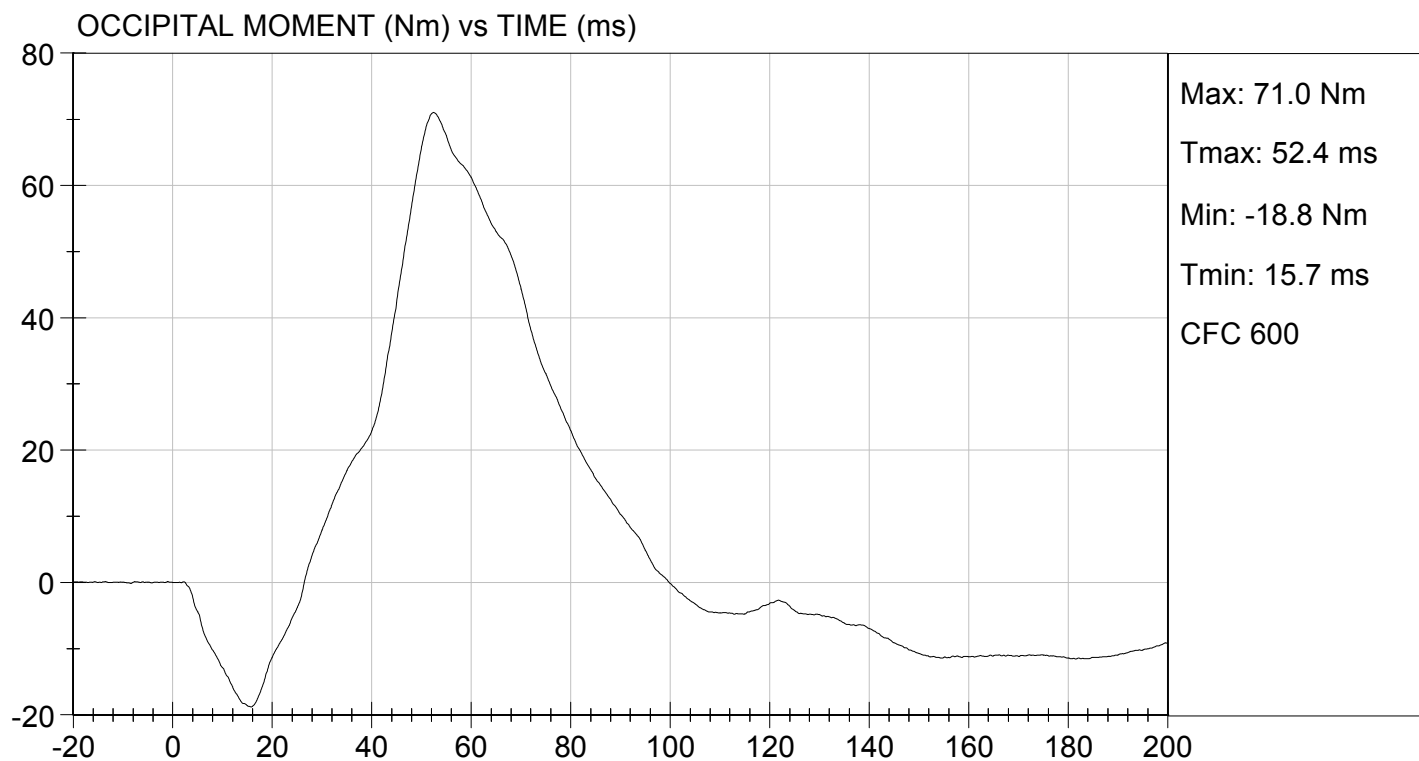
TEST DATE: 02/12/2014
TEST #: D14562





TEST DESC: NECK FLEXION
VELOCITY: 23.14 ft/s, 7.05 m/s

TEST DATE: 02/12/2014
TEST #: D14562



DATA SHEET B5
NECK EXTENSION TEST (572.133) (5th Female)

Dummy Serial Number: 125

Test Date: 02/12/2014

Technician: Tim Grochowske

- Pre test calibration
 X Post test calibration verification

Test attempt no. 1 (when successive extension tests are necessary)

- X 1. It has been at least 30 minutes since the last extension test. (572.137(q))
 X N/A, ONLY one neck test performed
- X 2. The components required for the neck tests include the head assembly (880105-100X), neck (880105-250), bib simulator (880105-371), upper neck adjusting bracket (880105-207), lower neck adjusting bracket (880105-208), six axis neck transducer (SA572-S11) and either three accelerometers (SA572-S4) or their mass equivalent installed in the head assembly as specified in drawing 880105-100X. Data from the accelerometers are not required. (572.133(b))
- X 3. The assembly soaked at a temperature between 20.6°C (69°F) and 22.2°C (72°F) and at a relative humidity from 10% to 70% for a period of at least four (4) hours prior to a test. (572.133(c)(1))
- | | |
|---------------------------------|---------------|
| Record the maximum temperature: | <u>20.9°C</u> |
| Record the minimum temperature: | <u>20.8°C</u> |
| Record the maximum humidity: | <u>14%</u> |
| Record the minimum humidity: | <u>12%</u> |
- X 4. Visually inspect neck assembly for cracks, cuts and separation of the rubber from the metal segments. Note: If the damage resulted from the vehicle crash test in which the dummy was an occupant, the damaged area is to be documented with photography and the post test calibration verification testing completed before any replacement or repairs are made.
- Record findings and actions: No damage
- X 5. Inspect the nodding blocks (78051-351) for any deterioration, but when replacement is necessary, ONLY replace during pre-test calibration. Using a Shore "A" type Durometer, verify the hardness of the nodding blocks is between 80 and 90. Ensure the nodding blocks are installed correctly. (880105-250 and PADI page17).
- Record findings and actions: No Deterioration; Hardness: Front 89; Back 90.
- X 6. Torque the jam nut (9000018) on the neck cable (880105-206) to 1.4 ± 0.2 Nm (12.0 ± 2.0 in-lb). (572.133(c)(2))

- X 7. The data acquisition system, including transducers, conforms to the requirements of SAE Recommended Practice J211/1 MAR95. (572.137(m))
- X 8. The test fixture pendulum conforms to the specifications in Figure 7B. (572.133(c)(3))
- X 9. The head-neck assembly is mounted on the pendulum so the midsagittal plane of the head is vertical and coincides with the plane of motion of the pendulum longitudinal centerline as shown in Figure 9B for the extension test. (572.133(c)(3))
- X 10. Install the transducers or other devices for measuring the "D" plane rotation with respect to the pendulum longitudinal centerline. Note: Plane "D" is the bottom horizontal surface of the skull. These measurement devices should be designed to minimize their influence upon the performance of the head-neck assembly. An example of a measurement device is shown in Figure 10B.
- X 11. With the pendulum resting against the honeycomb material, the neck bracket was adjusted until the longitudinal centerline of the pendulum was perpendicular ± 1 degree to plane "D" on the dummy's head.
- X 12. Release the pendulum and allow it to fall freely from a height to achieve an impact speed of 5.95 m/s to 6.19 m/s as measured at the center of the pendulum accelerometer. (572.133(c)(4)(i))
- X 13. Complete the following table:
Neck Extension Test Results (572.133(b)(2) & 572.133(c)(4)(I & ii))

Parameter		Specification	Results
Pendulum impact speed		$5.95 \text{ m/s} \leq \text{speed} \leq 6.19 \text{ m/s}$	6.12 m/s
Pendulum ΔV with respect to impact speed	@ 10 ms	$1.5 \text{ m/s} \leq \Delta V \leq 1.9 \text{ m/s}$	1.8 m/s
	@ 20 ms	$3.1 \text{ m/s} \leq \Delta V \leq 3.9 \text{ m/s}$	3.6 m/s
	@ 30 ms	$4.6 \text{ m/s} \leq \Delta V \leq 5.6 \text{ m/s}$	5.2 m/s
Plane D Rotation		Peak moment* $-65 \text{ Nm} \leq \text{moment} \leq -53 \text{ Nm}$ during the following rotation range $99^\circ \leq \text{angle} \leq 114^\circ$	-57 Nm @ 109 degrees
Positive Moment Decay** (Extension)		Time to decay to -10 Nm $94 \text{ ms} \leq \text{time} \leq 114 \text{ ms}$	98 ms

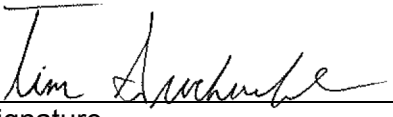
*Moment about the occipital condyle = $M_y - (0.01778 \text{ m} \times F_x)$ (572.133(b)(1)(ii))

M_y = Moment in Nm measured by the transducer

F_x = Force, in N measured by the transducer

**Time zero is defined as the time of initial contact between the pendulum striker plate and the honeycomb material. (572.133(b)(3))

- X 14. Plots of acceleration, velocity, y-axis moment, and x-axis force and y-axis moment about the occipital condyle follow this sheet.


Signature

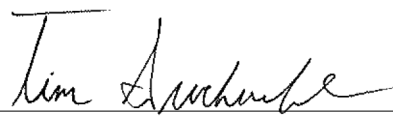
02/12/2014
Date

MGA RESEARCH CORPORATION
NECK EXTENSION TEST
HYBRID III 5TH PERCENTILE

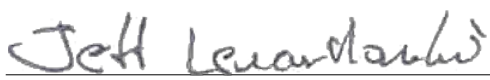
ATD Serial No: 125

Test I.D: D14563

Tested Parameter		Units	Specification	Result	Pass/Fail
Laboratory Temperature		deg C	20.6 to 22.2	20.9	Pass
Laboratory Relative Humidity		%	10 to 70	14	Pass
Pendulum Speed		m/s	5.95 to 6.19	6.12	Pass
Pendulum Velocity	10 ms	m/s	1.5 to 1.9	1.8	Pass
	20 ms	m/s	3.1 to 3.9	3.6	Pass
	30 ms	m/s	4.6 to 5.6	5.2	Pass
D Plane Rotation	Max	deg	99 to 114	109	Pass
Occipital Condyle Moment within Rotation Corridor		Nm	-65 to -53	-57	Pass
Negative Moment Time Curve Decay to -10 Nm		ms	94 to 114	98	Pass
Overall Results					Pass


 Laboratory Technician

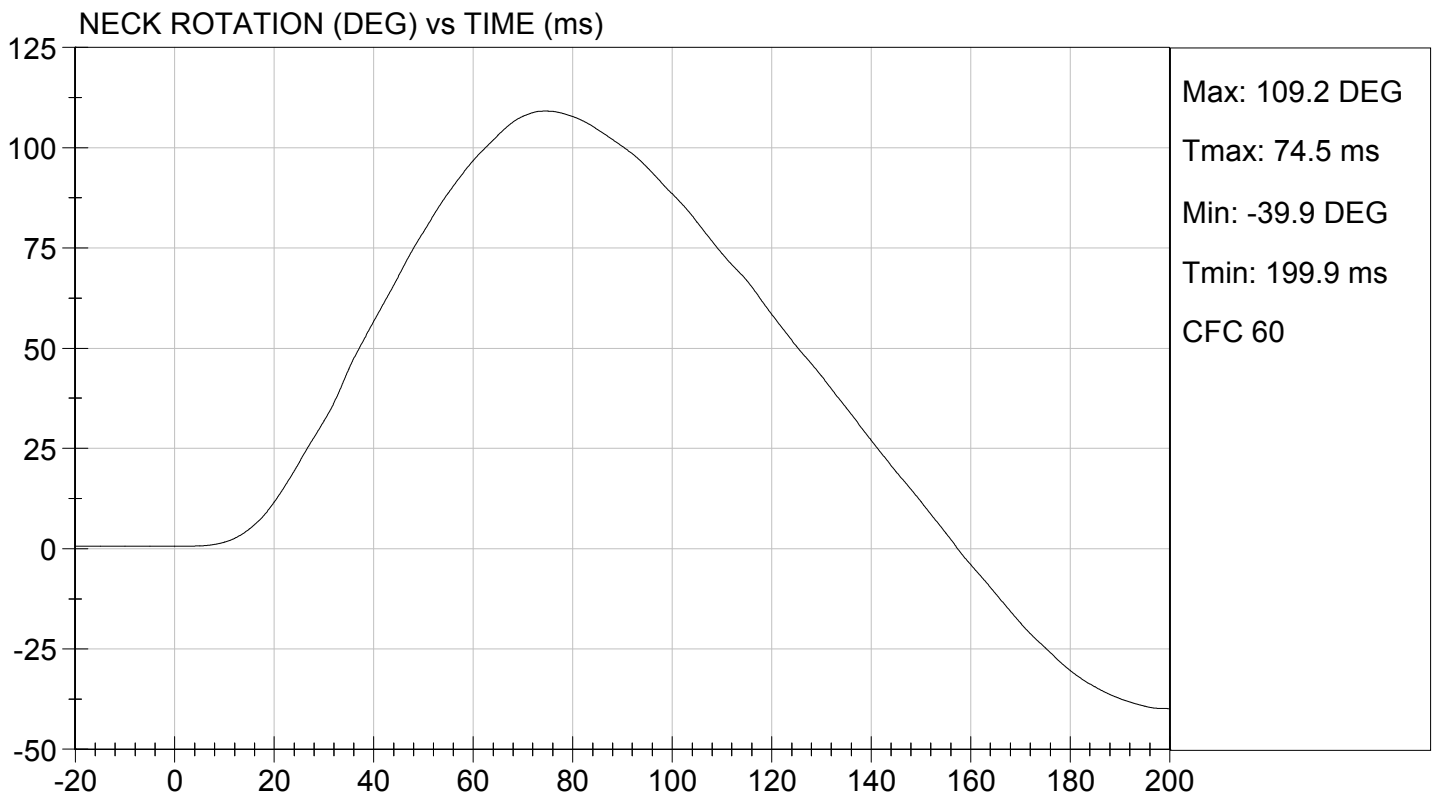
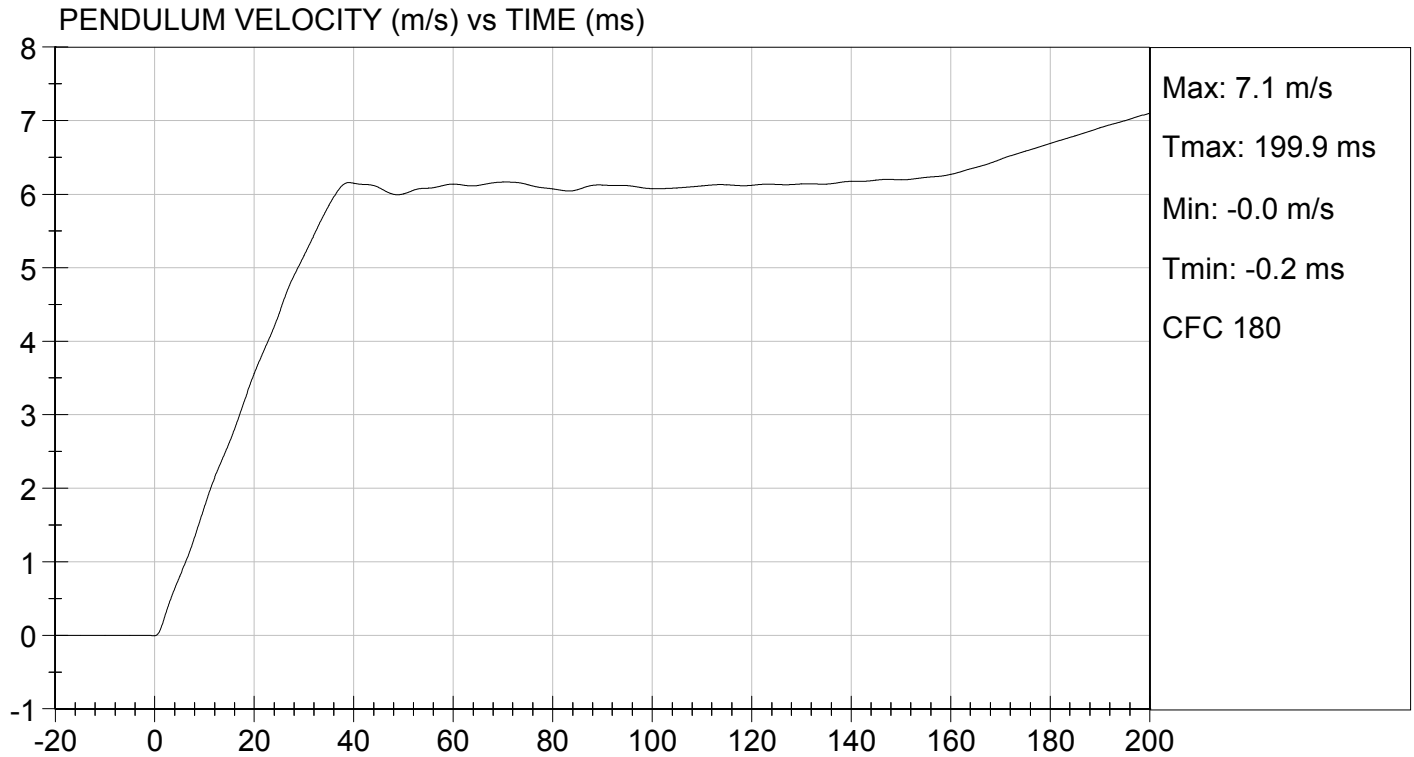
02/12/2014
 Test Date

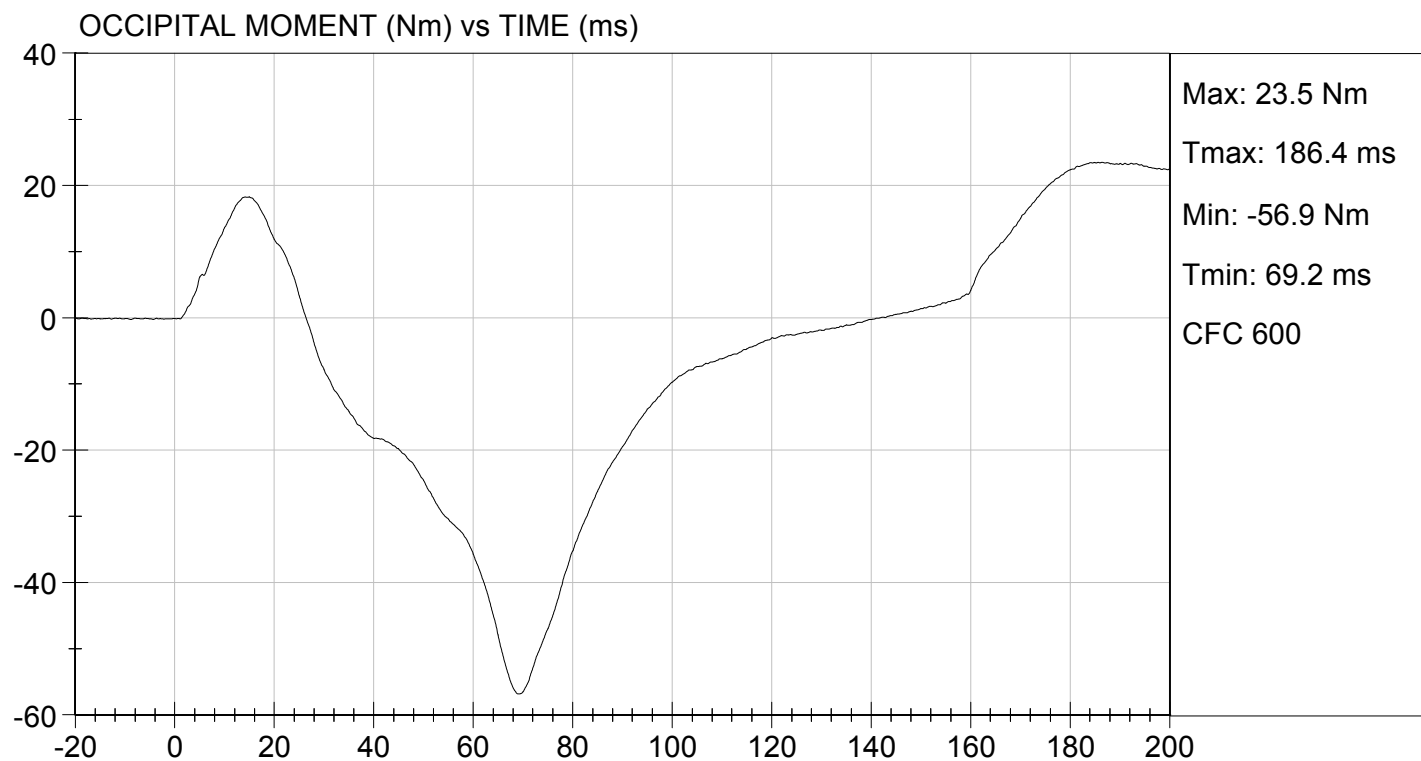

 Approved By



TEST DESC: NECK EXTENSION
VELOCITY: 20.08 ft/s, 6.12 m/s

TEST DATE: 02/12/2014
TEST #: D14563





DATA SHEET B6
THORAX IMPACT TEST (572.134) (5th Female)

Dummy Serial Number: 125

Test Date: 02/12/2014

Technician: David Schoedel

 Pre test calibration
X Post test calibration verification

Test attempt no. 1 (when successive thorax impact tests are necessary)

- X 1. It has been at least 30 minutes since the last thorax impact test. (572.137(q))
X N/A, ONLY one thorax impact test performed
- X 2. The test fixture conforms to the specifications in Figure 11B.
- X 3. The complete assembled dummy (880105-000) is used (572.134(b)) and is dressed in a form fitting cotton stretch above-the-elbow sleeved shirt and above-the-knee pants. The weight of the shirt and pants shall not exceed 0.14 kg. (572.134(c)(1))
- X 4. The dummy assembly soaked at a temperature between 20.6°C (69°F) and 22.2°C (72°F) and at a relative humidity from 10% to 70% for a period of at least four (4) hours prior to this test. (572.134(c)(2))

Record the maximum temperature:	<u>20.9°C</u>
Record the minimum temperature:	<u>20.8°C</u>
Record the maximum humidity:	<u>14%</u>
Record the minimum humidity:	<u>12%</u>

- X 5. Remove the chest skin and visually inspect the thorax assembly for cracks, cuts, abrasions, etc. Particular attention should be given to the rib damping material, chest displacement transducer assembly and the rear rib supports. Inspect for rib deformation using the chest depth gage. If any damage is noted repair and/or replace the damaged components unless the damage resulted from the vehicle crash test in which the dummy was an occupant in which case the damage must be documented and post test calibration verification testing completed before any repairs or replacements are made.

X - No Damage

 - Damage from crash test, no repairs or replacement because this is a post test calibration verification. Record damage:

 - The following repairs or replacement was performed. Record:

- X 6. Seat the dummy, (chest skin still removed) without back and arm supports on the test fixture surface as shown in Figure 11B. The surface must be long enough to support the pelvis and outstretched legs. (572.134(c)(3))
- X 7. Level the ribs both longitudinally and laterally $\pm 0.5^\circ$ and adjust the pelvis angle to $7^\circ \pm 2^\circ$. The angle may be measured using the special H-point tool (TE-2504) that inserts into the pelvic structure and extends outward beyond the pelvic skin surface or by using the surface of the pelvic adaptor block.
- X 8. The midsagittal plane of the dummy is vertical within $\pm 1^\circ$. (572.134(c)(3))
- X 9. The longitudinal centerline of the test probe is centered within ± 2.5 mm of the midsagittal plane of the dummy and is $12.7 \text{ mm} \pm 1 \text{ mm}$ below the horizontal peripheral centerline of the No. 3 rib and is within 0.5° of a horizontal line in the dummy's midsagittal plane. (572.134(c)(4))
- X 10. Align the adjustable neck bracket index marks to the "zero" position.
- X 11. Record locations such as the rear surfaces of the thoracic spine and the lower neck bracket reference with respect to the laboratory coordinate system. These reference measurements are necessary to ensure the dummy is in the same position after the chest skin is installed. The reference locations must be accessible after installation of the chest skin. It may be necessary to leave the chest skin zipper unfastened until the references are checked and fasten it just prior to the test.
- X 12. Install the chest skin and reposition the dummy as described in the preceding paragraph using the reference measurements recorded.
- X 13. Place the arm assemblies horizontal $\pm 2^\circ$ and parallel to the midsagittal plane. The arms are held in place by tightening the adjustment nut that holds the arm yoke to the clavicle assembly.
- X 14. The data acquisition system, including transducers, must conform to the requirements of SAE Recommended Practice J211/1 MAR95 (572.136(m)) Class 180.
- X 15. Impact the anterior surface of the thorax with the test probe so the longitudinal centerline of the probe is within 2° of a horizontal line in the dummy's midsagittal plane at the moment of impact. (572.134(c)(5)) The velocity of the test probe at the time of impact is $6.71 \text{ m/s} \pm 0.12 \text{ m/s}$. (572.134(b)) The probe is guided so there is no significant lateral, vertical or rotational movement during the impact. (572.134(c)(6)) Neither the suspension hardware, suspension cables, nor other attachments to the probe, including the velocity vane, make contact with the dummy. (572.134(c)(7))

- X 16. Complete the following table:
Thorax Impact Results (572.134(b) and 572.134(b)(1)&(2))

Parameter*	Specification	Result
Test Probe Speed	$6.59 \text{ m/s} \leq \text{speed} \leq 6.83 \text{ m/s}$	6.68 m/s
Chest Compression	$50.0 \text{ mm} \leq \text{compression} \leq 58.0 \text{ mm}$	53 mm
Peak force** between 50.0 and 58.0 mm chest compression	$3900\text{N} \leq \text{peak force} \leq 4400\text{N}$	4242 N
Peak Force** between 18.0 and 50.0 mm chest compression	Peak Force $\leq 4600 \text{ N}$	4253 N
Internal Hysteresis***	$69\% \leq \text{hysteresis} \leq 85\%$	69%

*Time zero is defined as the time of initial contact between the test probe and the chest skin.

**Force = impactor mass x acceleration (572.134(b)(3))

***Area under loading curve minus the area under the unloading curve divided by the area under the loading curve. (Figure 12B)

- X 17. Plots of chest compression, acceleration, force, force versus deflection follow this sheet.

David Schoedel
Signature

02/12/2014
Date

MGA RESEARCH CORPORATION
THORAX IMPACT
HYBRID III 5TH PERCENTILE

ATD Serial No: 125

Test I.D: D14564

Tested Parameter	Units	Specification	Result	Pass/Fail
Temperature	deg C	20.6 to 22.2	20.9	Pass
Relative Humidity	%	10 to 70	13	Pass
Probe Speed	m/s	6.59 to 6.83	6.68	Pass
Peak Deflection	mm	50 to 58	53	Pass
Peak Resistive Force w/in Deflection Corridor	N	3900 to 4400	4242	Pass
Internal Hysteresis	%	69 to 85	69	Pass
Peak Force 18 mm - 50 mm	N	<= 4600	4253	Pass
Overall Test Results				Pass

David Schoedel
Laboratory Technician

02/12/2014

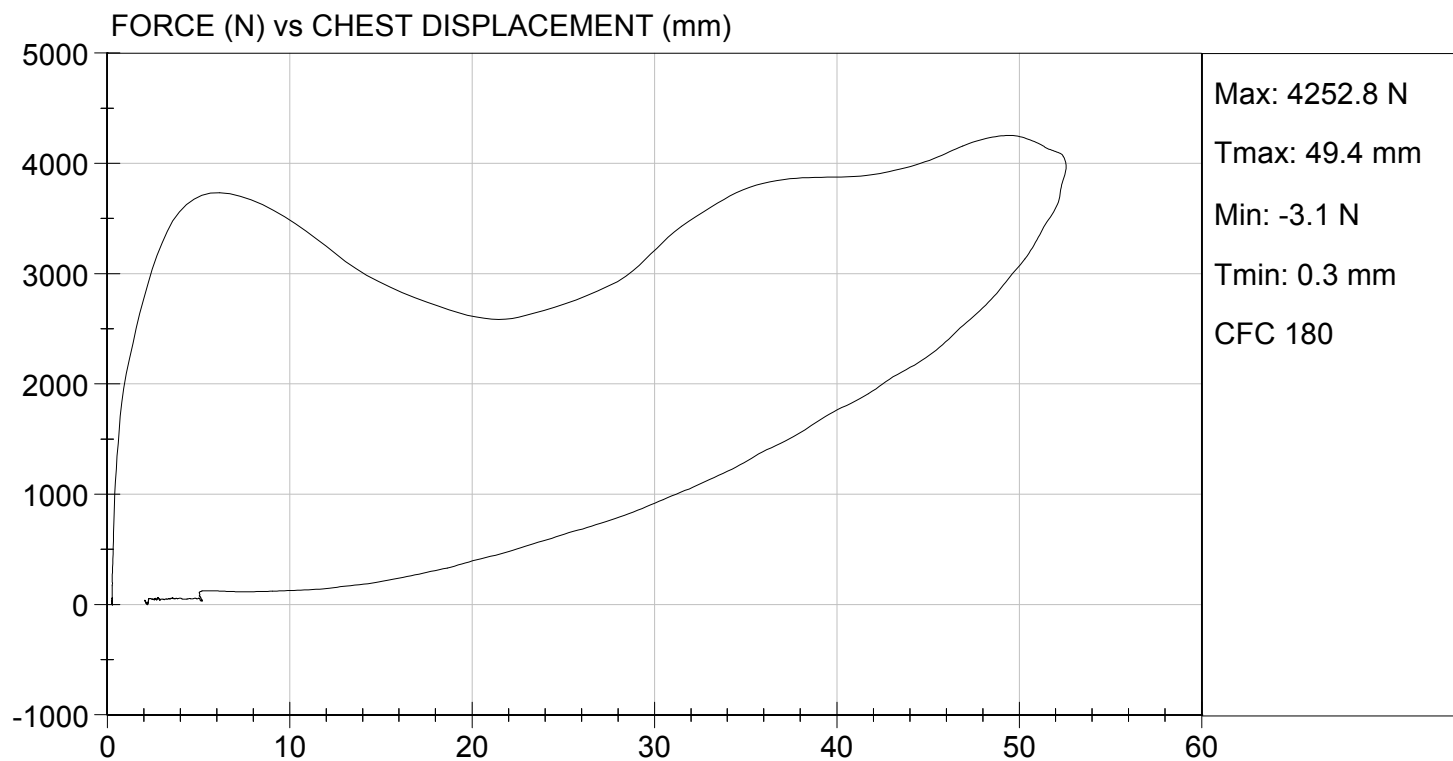
Test Date

Jeff Leonard
Approved By



TEST DESC: THORAX IMPACT
VELOCITY: 21.93 ft/s, 6.68 m/s

TEST DATE: 02/12/2014
TEST #: D14564



DATA SHEET B7
TORSO FLEXION TEST (572.135) (5th Female)

Dummy Serial Number: 125

Test Date: 02/12/2014

Technician: David Schoedel

 Pre test calibration
 X Post test calibration verification

Test attempt no. 1 (when successive torso flexion tests are necessary)

- X 1. It has been at least 30 minutes since the last torso flexion test. (572.137(q))
 X N/A, ONLY one torso flexion test performed
- X 2. The test fixture conforms to the specifications in Figure 13B.
- X 3. The complete assembled dummy (880105-000) is used (572.135(c)(2)).
 With legs below femurs.
 X Without legs below femurs.
- X 4. The dummy assembly soaked at a temperature between 18.9°C (66°F) and 25.6°C (78°F) and at a relative humidity from 10% to 70% for a period of at least four (4) hours prior to this test. (572.135(c)(1))
- | | |
|---------------------------------|---------------|
| Record the maximum temperature: | <u>20.9°C</u> |
| Record the minimum temperature: | <u>20.8°C</u> |
| Record the maximum humidity: | <u>14%</u> |
| Record the minimum humidity: | <u>12%</u> |
- X 5. Secure the pelvis to the fixture at the pelvis instrument cavity rear face by threading four ¼ cap screws into the available threaded attachment holes. Tighten the mountings so that the test material is rigidly affixed to the test fixture and the pelvic lumbar joining surface is horizontal. (572.135(c)(3))
- X 6. Attach the loading adapter bracket to the spine of the dummy as shown in Figure 13B. (572.135(c)(4))
- X 7. Inspect and adjust, if necessary, the seating of the abdominal insert within the pelvis cavity and with respect to the torso flesh, assuring that the torso flesh provides uniform fit and overlap with respect to the outside surface of the pelvis flesh. (572.135(c)(5))
- X 8. Flex the dummy forward and back 3 times such that the angle reference plane moves between 0° and 30° with respect to the vertical transverse plane. (572.135(c)(6))

- X 9. Support the dummy such that the angle reference plane is at or near 0° (vertical with respect to the vertical transverse plane). Wait at least 30 minutes before continuing. (572.135(c)(6))
- X 10. Remove all external support that was implemented in 9 above. (572.135(c)(7))
- X 11. Measure the initial orientation angle of the torso reference plane of the seated, unsupported dummy. (572.135(c)(7))
 Record reference plane angle (max. allowed 20°): See Result Table
- X 12. Attach the pull cable and the load cell. (572.135(c)(8))
- X 13. Apply a tension force in the midsagittal plane to the pull cable at any upper torso deflection rate between 0.5° and 1.5° per second, until the angle reference plane is at 45° ± 0.5° of flexion relative to the vertical transverse plane. (572.135(c)(9))
- X 14. Maintain angle reference plane at 45° ± 0.5° of flexion for 10 seconds. (572.135(c)(10))
- X 15. As quickly as possible release the force applied to the attachment bracket. (572.135(c)(11))
- X 16. 3 minutes after the release of the force, measure the reference plane angle. (572.135(c)(11))
- X 17. Complete the following table:
 Torso Flexion Results (572.135(b), 572.135(c)(7), 572.135(c)(9))

Parameter	Specification	Result
Initial ref. plane angle	Angle ≤ 20°	18 deg
Torso rotation rate	0.5°/s ≤ rate ≤ 1.5°/s	0.9 deg/sec
Force at 45° ± 0.5°	320 N ≤ force ≤ 390 N	341 N
Final ref. plane angle	Initial ref. plane angle ± 8°	21 deg

David Schoedel
 Signature

02/12/2014
 Date

MGA RESEARCH CORPORATION

TORSO FLEXION TEST

HYBRID III 5TH PERCENTILE

ATD Serial No: 125

Test I.D: D14567

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 to 25.6	20.8	Pass
Laboratory Relative Humidity	%	10 to 70	12	Pass
Initial Angle	deg	0 to 20	18	Pass
Return Angle	deg	+/- 8	21	Pass
Force at 45 deg	N	320 to 390	341	Pass
Upper Torso Deflection Rate	deg/s	0.5 to 1.5	0.9	Pass
Overall Result				Pass

David Schoedel
Laboratory Technician

02/12/2014

Test Date

Jeff Leonard
Approved By

DATA SHEET B8
LEFT KNEE IMPACT TEST (572.136) (5th Female)

Dummy Serial Number: 125

Test Date: 02/12/2014

Technician: David Schoedel

 Pre test calibration
 X Post test calibration verification

Test attempt no. 1 (when successive knee impact tests are necessary)

- X 1. It has been at least 30 minutes since the last knee impact test. (572.137(q))
 X N/A, ONLY one knee impact test performed
- X 2. The test fixture conforms to the specifications in Figure 14B.
- X 3. The knee assembly (880105-528L), lower leg structural replacement (880105- 603), lower leg flesh (880105-601), ankle assembly (880105-660), foot assembly (880105-650), and femur load transducer (SA572-S14) (may use the load cell structural replacement (78051-319)) were used. (572.136(b)(1))
- X 4. The knee assembly soaked at a temperature between 18.9°C (66°F) and 25.6°C (78°F) and at a relative humidity from 10% to 70% for a period of at least four (4) hours prior to this test. (572.136(c)(1))
- | | |
|---------------------------------|---------------|
| Record the maximum temperature: | <u>20.9°C</u> |
| Record the minimum temperature: | <u>20.8°C</u> |
| Record the maximum humidity: | <u>14%</u> |
| Record the minimum humidity: | <u>12%</u> |
- X 5. Mount the test specimen and secure it to the rigid test fixture. (572.136(c)(2))
- X 6. No parts of the foot or tibia contact any exterior surface. (572.136(c)(2))
- X 7. Align the test probe so that throughout its stroke and at contact with the knee it is within 2 degrees of horizontal and collinear with the longitudinal centerline of the femur. (572.136(c)(3))
- X 8. The probe is guided so there is no significant lateral, vertical or rotational movement during the impact with the knee. (572.136(c)(4))
- X 9. The data acquisition system, including transducers, must conform to the requirements of SAE Recommended Practice J211/1 MAR95 (572.136(m)) Class 600.

X 10. Contact the knee with the test probe at a speed between 2.07 m/s and 2.13 m/s.
(572.136(c)(5)) Neither the suspension hardware, suspension cables, nor other
attachments to the probe, including the velocity vane, make contact with the dummy.
(572.136(c)(6))

 X 11. Complete the following table:
Knee Impact Results (572.136(b)(1) and 572.136(c)(5))

Parameter	Specification	Result
Probe speed	$2.07 \text{ m/s} \leq \text{speed} \leq 2.13 \text{ m/s}$	2.13 m/s
Peak resistance force*	$3450 \text{ N} \leq \text{force} \leq 4060 \text{ N}$	3497 N

*Force = impactor mass x deceleration (572.136(b)(2))

 X 12. Plots of acceleration versus time and force versus time follow this sheet.

David Schoedel
Signature

02/12/2014
Date

MGA RESEARCH CORPORATION

**LEFT KNEE IMPACT TEST
HYBRID III 5TH PERCENTILE**

ATD Serial No: 125

Test I.D: D14566

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 to 25.6	20.9	Pass
Laboratory Relative Humidity	%	10 to 70	14	Pass
Probe Speed	m/s	2.07 to 2.13	2.13	Pass
Maximum Force	N	3450 to 4060	3497	Pass
Overall Test Results				Pass

David Schoedel

Laboratory Technician

02/12/2014

Test Date

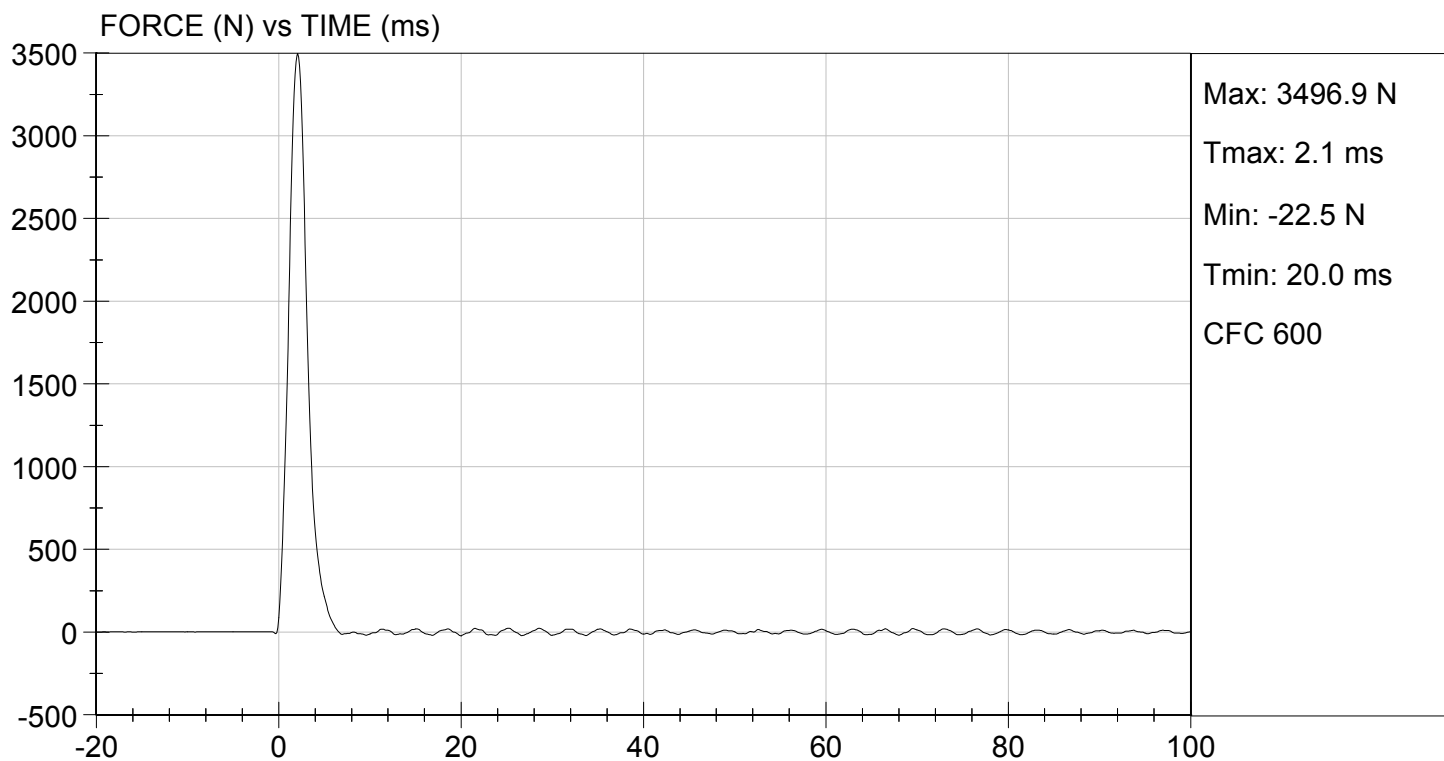
Jeff Leonard

Approved By



TEST DESC: LEFT KNEE
VELOCITY: 7.00 ft/s, 2.13 m/s

TEST DATE: 02/12/2014
TEST #: D14566



DATA SHEET B9
RIGHT KNEE IMPACT TEST (572.136) (5th Female)

Dummy Serial Number: 125

Test Date: 02/12/2014

Technician: David Schoedel

 Pre test calibration
 X Post test calibration verification

Test attempt no. 1 (when successive knee impact tests are necessary)

- X 1. It has been at least 30 minutes since the last knee impact test. (572.137(q))
 X N/A, ONLY one knee impact test performed
- X 2. The test fixture conforms to the specifications in Figure 14B.
- X 3. The knee assembly (880105-528R), lower leg structural replacement (880105- 603), lower leg flesh (880105-601), ankle assembly (880105-660), foot assembly (880105-651), and femur load transducer (SA572-S14) (may use the load cell structural replacement (78051-319)) were used. (572.136(b)(1))
- X 4. The knee assembly soaked at a temperature between 18.9°C (66°F) and 25.6°C (78°F) and at a relative humidity from 10% to 70% for a period of at least four (4) hours prior to this test. (572.136(c)(1))

Record the maximum temperature:	<u>20.9°C</u>
Record the minimum temperature:	<u>20.8°C</u>
Record the maximum humidity:	<u>14%</u>
Record the minimum humidity:	<u>12%</u>

- X 5. Mount the test specimen and secure it to the rigid test fixture. (572.136(c)(2))
- X 6. No parts of the foot or tibia contact any exterior surface. (572.136(c)(2))
- X 7. Align the test probe so that throughout its stroke and at contact with the knee it is within 2 degrees of horizontal and collinear with the longitudinal centerline of the femur. (572.136(c)(3))
- X 8. The probe is guided so there is no significant lateral, vertical or rotational movement during the impact with the knee. (572.136(c)(4))
- X 9. The data acquisition system, including transducers, must conform to the requirements of SAE Recommended Practice J211/1 MAR95 (572.136(m)) Class 600.

X 10. Contact the knee with the test probe at a speed between 2.07 m/s and 2.13 m/s.
(572.136(c)(5)) Neither the suspension hardware, suspension cables, nor other
attachments to the probe, including the velocity vane, make contact with the dummy.
(572.136(c)(6))

 X 11. Complete the following table:
Knee Impact Results (572.136(b)(1) and 572.136(c)(5))

Parameter	Specification	Result
Probe speed	$2.07 \text{ m/s} \leq \text{speed} \leq 2.13 \text{ m/s}$	2.13 m/s
Peak resistance force*	$3450 \text{ N} \leq \text{force} \leq 4060 \text{ N}$	3568 N

*Force = impactor mass x deceleration (572.136(b)(2))

 X 12. Plots of acceleration versus time and force versus time follow this sheet.

David Schoedel
Signature

02/12/2014
Date

MGA RESEARCH CORPORATION

RIGHT KNEE IMPACT TEST

HYBRID III 5TH PERCENTILE

ATD Serial No: 125

Test I.D: D14565

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 to 25.6	20.9	Pass
Laboratory Relative Humidity	%	10 to 70	14	Pass
Probe Speed	m/s	2.07 to 2.13	2.13	Pass
Maximum Force	N	3450 to 4060	3568	Pass
Overall Test Results				Pass

David Schoedel

Laboratory Technician

02/12/2014

Test Date

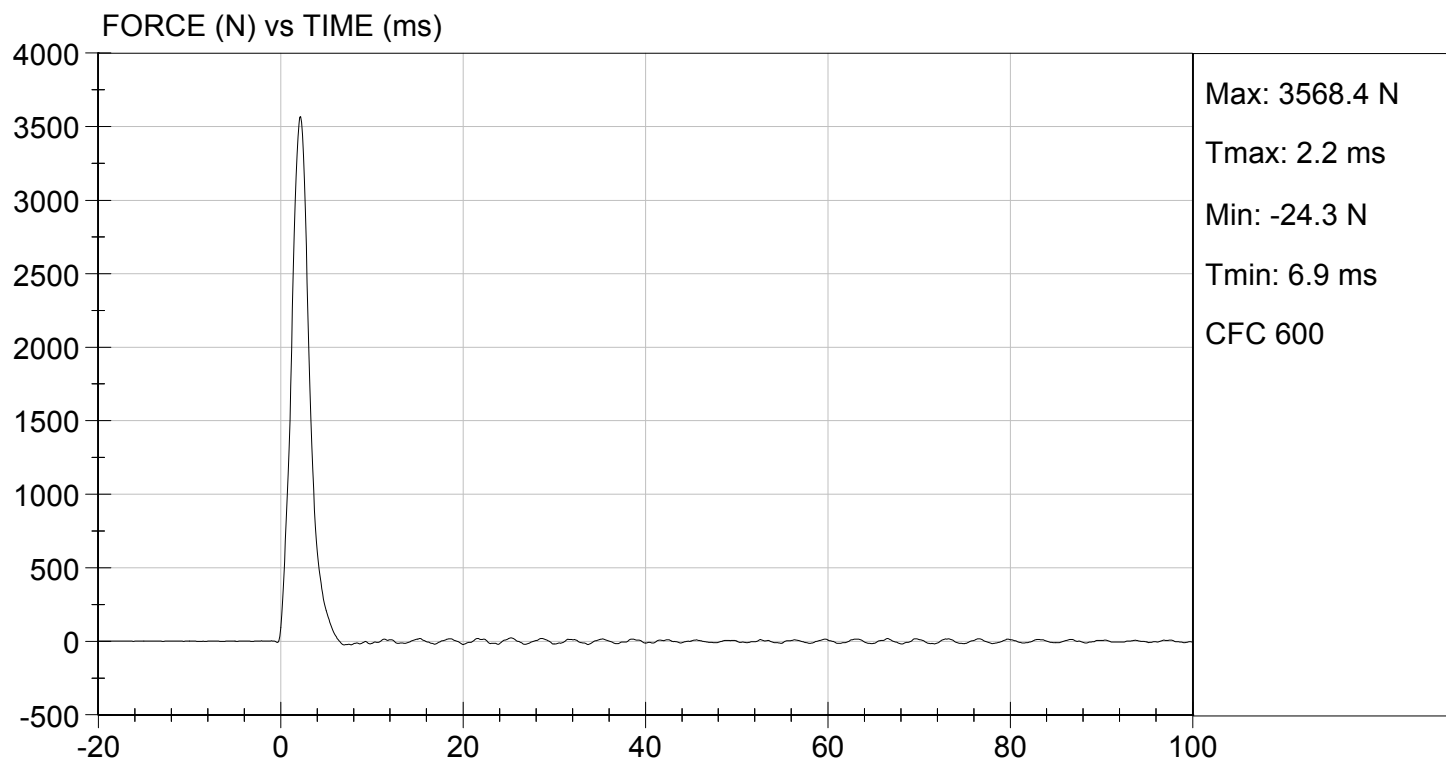
Jeff LevanMarini

Approved By



TEST DESC: RIGHT KNEE
VELOCITY: 7.00 ft/s, 2.13 m/s

TEST DATE: 02/12/2014
TEST #: D14565



DATA SHEET B10

PART 572 INSTRUMENTATION CALIBRATION INFORMATION

I.D. NO.	MANUFACTURER	MODEL NO.	SERIAL NO.	DATE OF LAST CALIBRATION	DATE OF NEXT CALIBRATION
DUMMY INSTRUMENTATION					
HEAD ACCELEROMETERS					
(1) LONGITUDINAL	Endevco	7264C-2KTZ-2-360M17	P82603	02/04/2014	08/04/2014
(2) LATERAL	Endevco	7264C-2KTZ-2-360M17	P82604	02/04/2014	08/04/2014
(3) VERTICAL	Endevco	7264C-2KTZ-2-360M17	P82605	02/04/2014	08/04/2014
NECK TRANSDUCER	Denton	1716	1496	01/16/2014	07/16/2014
CHEST ACCELEROMETERS					
(1) LONGITUDINAL	Endevco	7264C-2KTZ-2-360M17	P82607	02/04/2014	08/04/2014
(2) LATERAL	Endevco	7264C-2KTZ-2-360M17	P82609	02/04/2014	08/04/2014
(3) VERTICAL	Endevco	7264C-2KTZ-2-360M17	P82610	02/04/2014	08/04/2014
CHEST POTENTIOMETER	Servo	14CBI-2897	125	02/10/2014	08/10/2014
FEMUR LOAD CELLS					
(1) RIGHT FEMUR	GSE	2430	2024	01/20/2014	07/20/2014
(2) LEFT FEMUR	GSE	2430	2025	01/20/2014	07/20/2014
LABORATORY INSTRUMENTATION					
NECK PENDULUM ACCELEROMETER	Endevco	7231C-750	AGH70	08/27/2013	02/27/2014
THORAX PENDULUM ACCELEROMETER	Endevco	7264C-2KTZ-2-240	P82319	11/01/2013	05/01/2014
KNEE PENDULUM ACCELEROMETER	Endevco	7264C-2KTZ-2-240	P77579	01/10/2014	07/10/2014
NECK ROTATION TRANSDUCER 1 (OPTIONAL)	Spectrol	132-0-0-102	18	08/13/2013	02/13/2014
NECK ROTATION TRANSDUCER 2 (OPTIONAL)	Spectrol	132-0-0-102	29	08/13/2013	02/13/2014

LABORATORY TECHNICIAN: Jessica Hall

DATA SHEET B1
DUMMY DAMAGE CHECKLIST

Dummy Serial Number: 125

Test Date: 02/12/2014

Technician: Jessica Gall

This check sheet is completed as part of the post test calibration verification.

X Perform general cleaning.

Dummy Item	Inspect for	Comments	Damage	OK
Outer skin	Gashes, rips, cracks			X
Head	Ballast secure			X
	General appearance			X
Neck	Broken or cracked rubber			X
	Upper neck bracket firmly attached to the lower neck bracket			X
	Looseness at the condyle joint			X
	Nodding blocks cracked or out of position			X
Spine	Broken or cracks in rubber			X
Ribs	Broken or bent ribs			X
	Broken or bent rib supports			X
	Damping material separated or cracked			X
	Rubber bumpers in place			X
Chest Displacement Assembly	Bent shaft			X
	Slider arm riding in track			X
Transducer leads	Torn cables			X
Accelerometer Mountings	Head mounting secure			X
	Chest mounting secure			X
Knees	Skin condition			X
	Insert (do not remove)			X
	Casting			X
Limbs	Normal movement and adjustment			X
Knee Sliders	Wires intact			X
	Rubber returned to "at rest" position			X
Pelvis	Broken			X
Other				X

If upon visual examination, damage is apparent in any of these areas, the appropriate engineer or engineering technician is to be consulted for a decision on repair or replacement of parts.

Repair or Replacement approved by:

Jessica Hall
Signature

02/12/2014
Date

Describe the repair or replacement of parts:

Checked by:

Jeff Leonard
Signature

02/12/2014
Date

EXTERNAL DIMENSIONS

HYBRID III 5 th SN #124, PART 572, SUBPART O EXTERNAL DIMENSIONS				
DIMENSION	DESCRIPTION	DETAILS	ASSEMBLY DIMENSION (mm)	ACTUAL MEASUREMENT
A	TOTAL SITTING HEIGHT	Seat surface to highest point on top of the head.	774.7-800.1	785.0
B	SHOULDER PIVOT HEIGHT	Centerline of shoulder pivot bolt to the seat surface.	431.8-457.2	455.1
C	H-POINT HEIGHT	Reference	81.3-86.3	85.2
D	H-POINT LOCATION FROM BACKLINE	Reference	144.8-149.8	145.6
E	SHOULDER PIVOT FROM BACKLINE	Center of the shoulder clevis to the rear vertical surface of the fixture.	68.6-83.8	83.0
F	THIGH CLEARANCE	Measured at the highest point on the upper femur segment.	119.4-134.6	125.6
G	BACK OF ELBOW TO WRIST PIVOT	Back of the elbow flesh to the wrist pivot in line with the elbow and wrist pivots	243.9-259.1	245.9
H	HEAD BACK TO BACKLINE	Back of skull cap skin to seat rear vertical surface (Reference)	43.2-48.2	45.0
I	SHOULDER TO ELBOW LENGTH	Measure from the highest point on top of the shoulder clevis to the lowest part of the flesh on the elbow in line with the elbow pivot bolt.	276.8-297.2	296.1
J	ELBOW REST HEIGHT	Measure from the flesh below the elbow pivot bolt to the seat surface.	182.8-203.2	192.3
K	BUTTOCK TO KNEE LENGTH	The forward most part of the knee flesh to the rear vertical surface of the fixture.	520.7-546.1	540.2
L	POPLITEAL HEIGHT	Seat surface to the plane of the horizontal plane of the bottom of the feet.	355.6-376.0	365.6
M	KNEE PIVOT HEIGHT	Centerline of knee pivot bolt to the horizontal plane of the bottom of the feet.	393.7-419.1	395.8
N	BUTTOCK POPLITEAL LENGTH	The rearmost surface of the lower leg to the same point on the rear surface of the buttocks used for dim. "K".	414.0-439.4	434.5

HYBRID III 5 th SN #124, PART 572, SUBPART O EXTERNAL DIMENSIONS, continued				
DIMENSION	DESCRIPTION	DETAILS	ASSEMBLY DIMENSION (mm)	ACTUAL MEASUREMENT
O	CHEST DEPTH WITHOUT JACKET	Measured 304.8 ± 5.1 mm above seat surface	175.3-190.5	176.0
P	FOOT LENGTH	Tip of toe to rear of heel	218.5-233.7	219.4
Q	STANDING HEIGHT	(THEORETICAL)	1501.1	N/A
R	BUTTOCK TO KNEE PIVOT LENGTH	The rear surface of the buttocks to the knee pivot bolt	457.2-482.6	481.0
S	HEAD BREADTH	The widest part of the head	137.1-147.3	138.6
T	HEAD DEPTH	Back of the head to the forehead	177.8-188.0	186.2
U	HIP BREADTH	The widest part of the hip	299.7-314.9	310.7
V	SHOULDER BREADTH	Outside edges of right and left shoulder clevises	350.5-365.7	354.9
W	FOOT BREADTH	The widest part of the foot	78.8-94.0	82.0
X	HEAD CIRCUMFERENCE	Measured at the point as in dim. "T"	528.3-548.7	547.1
Y	CHEST CIRCUMFERENCE (WITH CHEST JACKET)	Measured 345.4 ± 12.7 mm above seat surface	850.9-881.3	881.0
Z	WAIST CIRCUMFERENCE	Measured 165.1 ± 5.1 mm above seat surface	759.5-789.9	786.3
AA	REFERENCE LOCATION FOR MEASUREMENT OF CHEST CIRCUMFERENCE	Reference	332.7-358.1	357.4
BB	REFERENCE LOCATION FOR MEASUREMENT OF WAIST CIRCUMFERENCE	Reference	160.1-170.2	169.8

DATA SHEET B3
HEAD DROP TEST (572.132) (5th Female)

Dummy Serial Number: 124

Test Date: 01/20/2014

Technician: David Schoedel

- X Pre test calibration
 Post test calibration verification

Test attempt no. 1 (when successive head drops are necessary)

- X 1. It has been at least 2 hours since the last head drop. (572.132(c)(5))
 X N/A, ONLY one head drop performed
- X 2. The head assembly consists of the complete head (880105-100X), the six-axis neck transducer (SA572-S11) or neck transducer structural replacement (78051-383X), and three (3) accelerometers (SA572-S4). (572.132(a))
- X 3. The head accelerometer mounting plate screws (10-24 x 3/8 SHCS) are torqued to 9.0 Nm.
- X 4. Accelerometers and their respective mounts are smooth and clean.
- X 5. Torque the skull cap screws (10-24 x 1/2 SHCS) to 9.0 Nm.
- X 6. The data acquisition system, including transducers, conforms to the requirements of SAE Recommended Practice J211/1 MAR95. (572.136(m))
- X 7. The head assembly soaked at a temperature between 18.9°C (66°F) and 25.6°C (78°F) and at a relative humidity from 10% to 70% for a period of at least four (4) hours prior to a test. (572.132(c)(1))
- | | |
|---------------------------------|---------------|
| Record the maximum temperature: | <u>20.9°C</u> |
| Record the minimum temperature: | <u>20.8°C</u> |
| Record the maximum humidity: | <u>20%</u> |
| Record the minimum humidity: | <u>18%</u> |
- X 8. Visually inspect the head skin for cracks, cuts, abrasions, etc. Repair or replace the head skin if the damaged area is more than superficial. Note: If the damage resulted from the vehicle crash test in which the dummy was an occupant, the damaged area is to be documented with photography and the post test calibration verification testing completed before any replacement or repairs are made.
- Record findings and actions: No Damage

- X 9. Clean the impact surface of the skin and the impact surface of the fixture with isopropyl alcohol, trichloroethane or equivalent prior to the test. (572.132(c)(2))
- X 10. Suspend and orient the head assembly as shown in Figure 5B. The lowest point on the forehead is 376.0 ± 1.0 mm (14.8 ± 0.04 inch) from the impact surface. (572.132(c)(3))
Record the actual distance: 376 mm
- NOTE:** The masses of the suspension device and the accelerometer cables are to be kept as lightweight as possible to minimize their effect on the test results.
- X 11. The 1.57 mm (0.062 inch) diameter holes located on either side of the dummy's head are equidistance within 2 mm from the impact surface. A typical test setup is shown in Figure 6B. (572.132(c)(3))
Record the right side distance: 501 mm
Record the left side distance: 501 mm
- X 12. The impact surface is clean and dry and has a micro finish in the range of 203.2×10^{-6} mm (8 micro inches) to 2032.0×10^{-6} mm (80 micro inches) (RMS). (572.132(c)(4))
Record actual micro finish: 24.8 micro inches
- X 13. The impact surface is rigidly supported. (572.132(c)(4))
- X 14. The impact surface is a flat horizontal steel plate 50.8 mm (2 inches) thick and 610 mm (24 inches) square. (572.132(c)(4))
Record thickness: 50.9 mm
Record width: 604 mm
Record length: 595 mm
- X 15. Drop the head assembly from a height of 376.0 ± 1.0 mm (14.8 inches $\pm$ 0.04 inches) by a means that ensures a smooth, instant release onto the impact surface. (572.132(b) & (572.132(c)(4))
- X 16. Complete the following table using channel class 1000 data. (572.132(b)):

Parameter	Specification	Result
Peak resultant acceleration	$250 \text{ g} \leq x \leq 300 \text{ g}$	270 g
Resultant versus time history curve	Unimodal	Yes
Oscillations after the main pulse	Less than 10% of the peak resultant acceleration	Yes
Lateral acceleration	y-axis acceleration $\leq 15 \text{ g}$	10.6 g

- X 17. Plots of the x, y, z, and resultant acceleration data follow this sheet.

David Schoedel
Signature

01/20/2014
Date

MGA RESEARCH CORPORATION
HEAD DROP TEST
HYBRID III 5TH PERCENTILE

ATD Serial No: 124

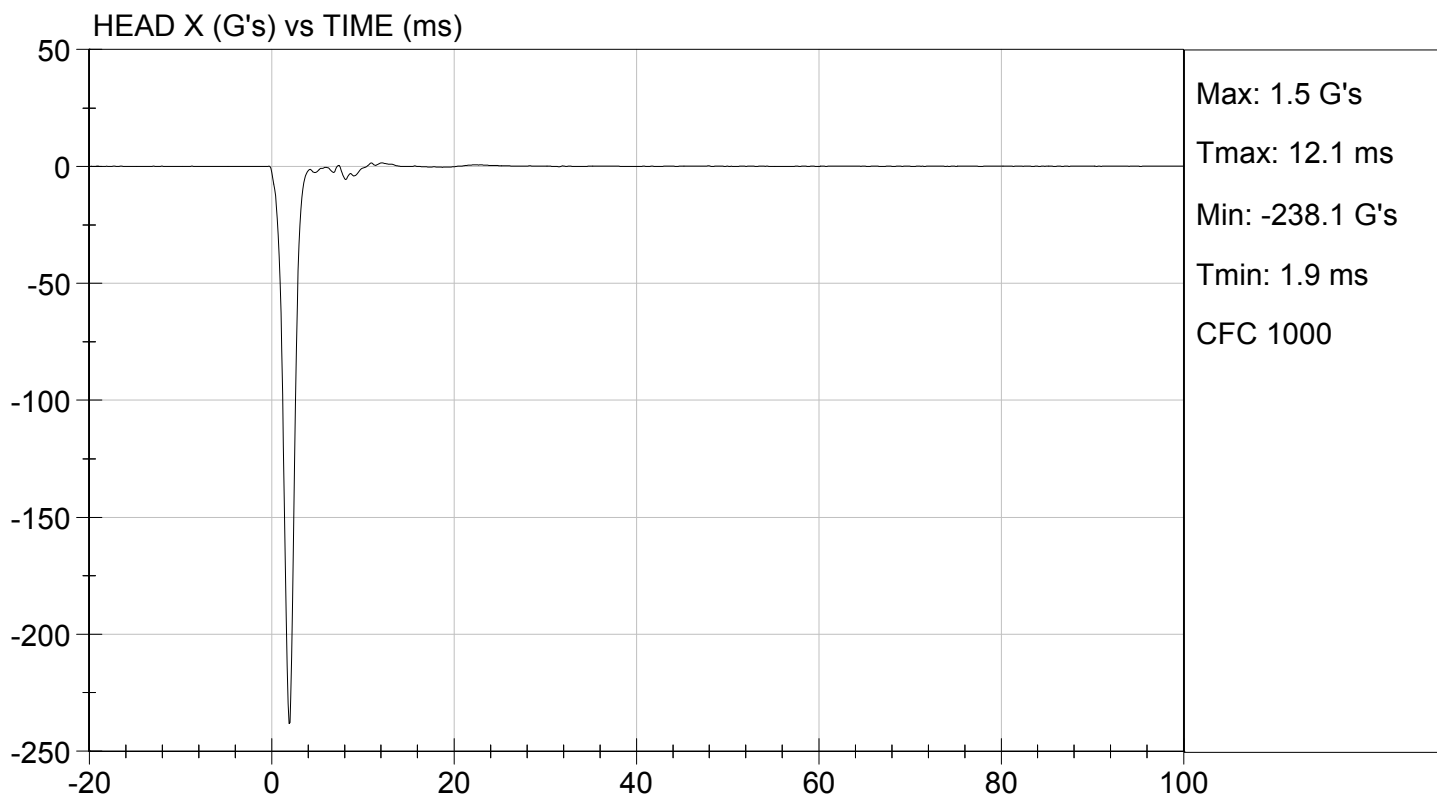
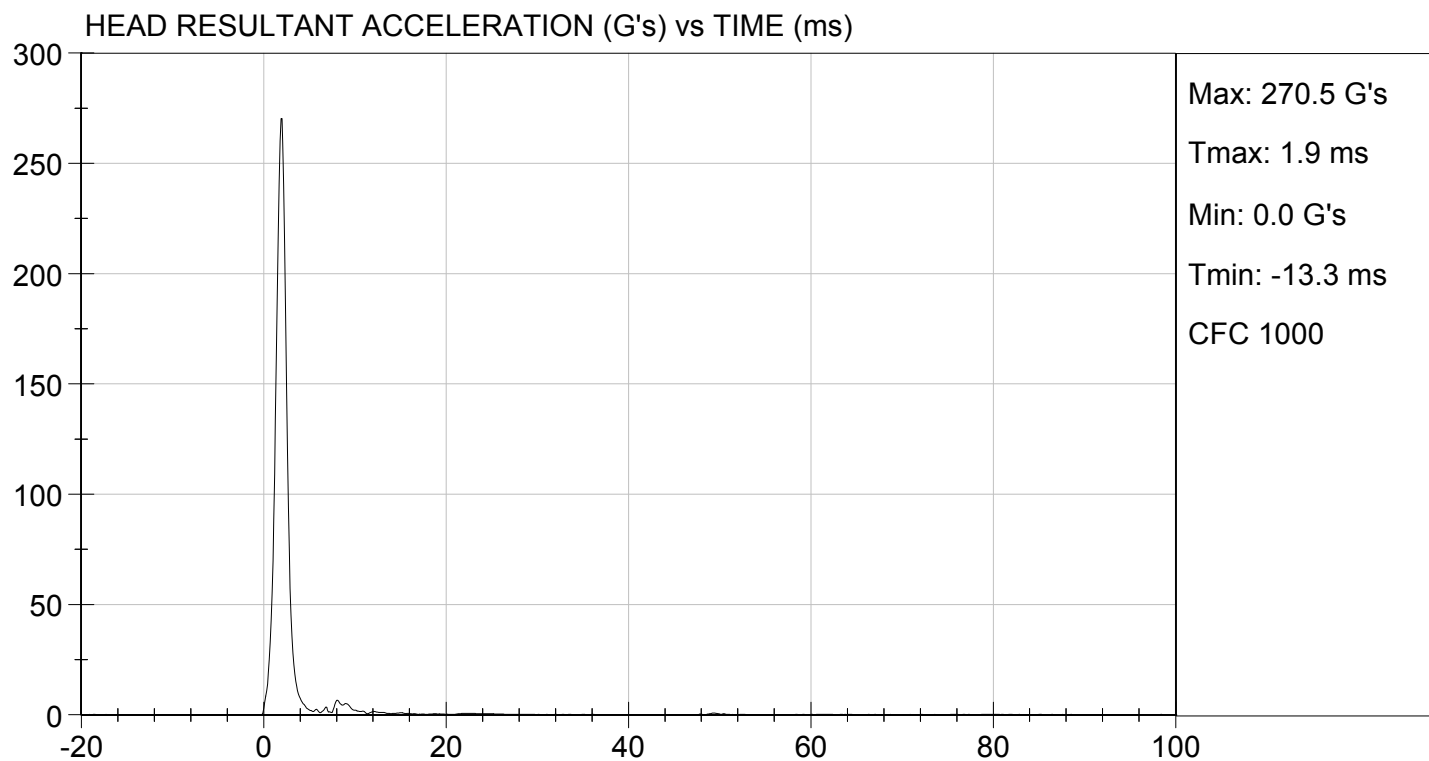
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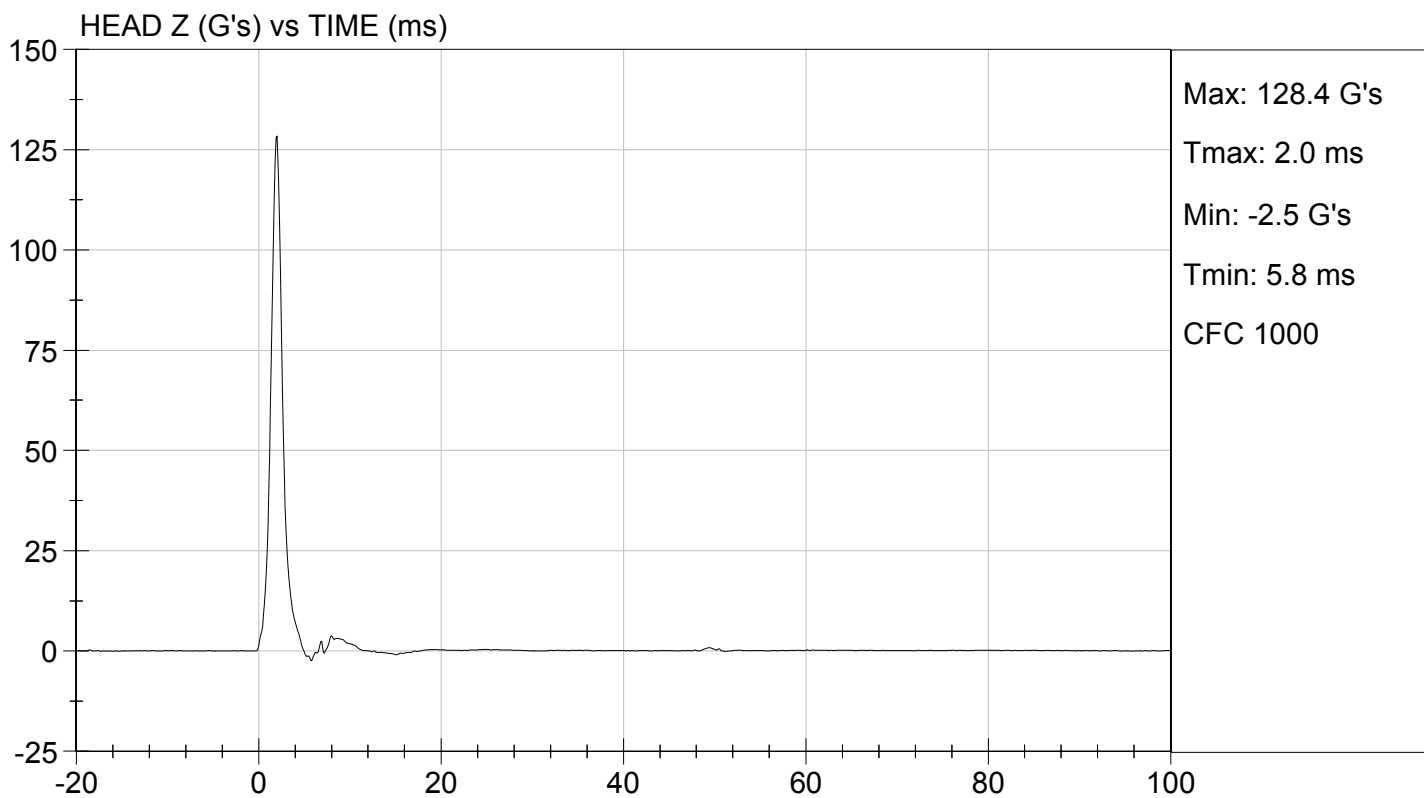
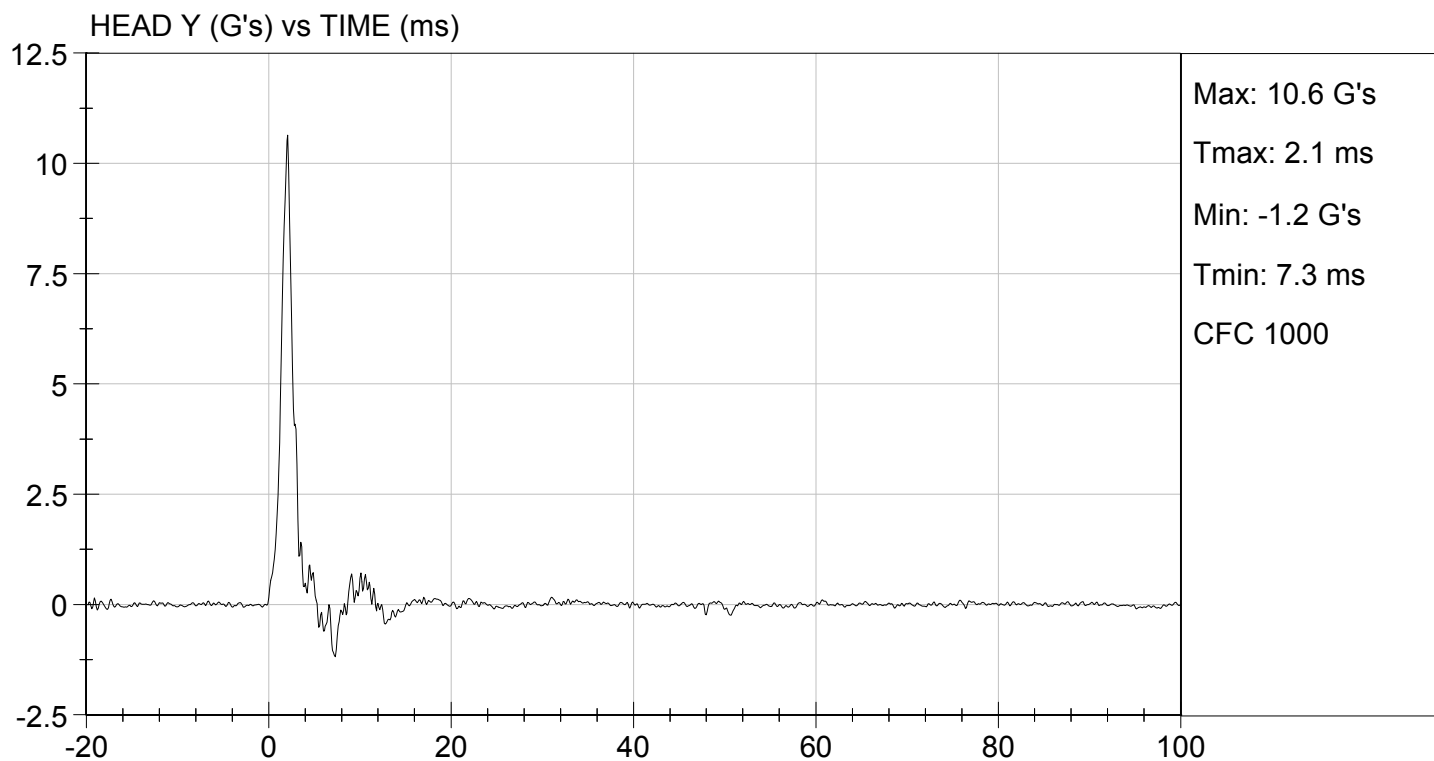
Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 to 25.6	20.9	Pass
Laboratory Relative Humidity	%	10 to 70	20	Pass
Peak Resultant Acceleration	G's	250 to 300	270	Pass
Peak Lateral Acceleration	G's	<= +/- 15.0	10.6	Pass
Unimodal	N/A	Yes	Yes	Pass
Oscillations	N/A	within 10% of peak	Yes	Pass
Overall Test Results				Pass

David Schoedel
Laboratory Technician

01/20/2014
Test Date

Jeff Leonard
Approved By





DATA SHEET B4
NECK FLEXION TEST (572.132) (5th Female)

Dummy Serial Number: 124

Test Date: 01/20/2014

Technician: David Schoedel

- X Pre test calibration
 Post test calibration verification

Test attempt no. 1 (when successive flexion tests are necessary)

- X 1. It has been at least 30 minutes since the last flexion test. (572.137(q))
 X N/A, ONLY one neck test performed
- X 2. The components required for the neck tests include the head assembly (880105-100X), neck (880105-250), bib simulator (880105-371), upper neck adjusting bracket (880105-207), lower neck adjusting bracket (880105-208), six axis neck transducer (SA572-S11) and either three accelerometers (SA572-S4) or their mass equivalent installed in the head assembly as specified in drawing 880105-100X. Data from the accelerometers are not required. (572.133(b))
- X 3. The assembly soaked at a temperature between 20.6°C (69°F) and 22.2°C (72°F) and at a relative humidity from 10% to 70% for a period of at least four (4) hours prior to a test. (572.133(c)(1))
- | | |
|---------------------------------|---------------|
| Record the maximum temperature: | <u>20.9°C</u> |
| Record the minimum temperature: | <u>20.8°C</u> |
| Record the maximum humidity: | <u>20%</u> |
| Record the minimum humidity: | <u>18%</u> |
- X 4. Visually inspect neck assembly for cracks, cuts and separation of the rubber from the metal segments. Note: If the damage resulted from the vehicle crash test in which the dummy was an occupant, the damaged area is to be documented with photography and the post test calibration verification testing completed before any replacement or repairs are made.
- | | |
|------------------------------|------------------|
| Record findings and actions: | <u>No damage</u> |
|------------------------------|------------------|
- X 5. Inspect the nodding blocks (78051-351) for any deterioration, but when replacement is necessary, ONLY replace during pre-test calibration. Using a Shore "A" type Durometer, verify the hardness of the nodding blocks is between 80 and 90. Ensure the nodding blocks are installed correctly. (880105-250 and PADI page17).
- | | |
|------------------------------|---|
| Record findings and actions: | <u>No Deterioration; Hardness: Front 89; Back 90.</u> |
|------------------------------|---|
- X 6. Torque the jam nut (9000018) on the neck cable (880105-206) to 1.4 ± 0.2 Nm (12.0 ± 2.0 in-lb). (572.133(c)(2))

- X 7. The data acquisition system, including transducers, conforms to the requirements of SAE Recommended Practice J211/1 MAR95. (572.137(m))
- X 8. The test fixture pendulum conforms to the specifications in Figure 7B. (572.133(c)(3))
- X 9. The head-neck assembly is mounted on the pendulum so the midsagittal plane of the head is vertical and coincides with the plane of motion of the pendulum longitudinal centerline as shown in Figure 8B for the flexion test. (572.133(c)(3))
- X 10. Install the transducers or other devices for measuring the "D" plane rotation with respect to the pendulum longitudinal centerline. Note: Plane "D" is the bottom horizontal surface of the skull. These measurement devices should be designed to minimize their influence upon the performance of the head-neck assembly. An example of a measurement device is shown in Figure 10B.
- X 11. With the pendulum resting against the honeycomb material, the neck bracket was adjusted until the longitudinal centerline of the pendulum was perpendicular ± 1 degree to plane "D" on the dummy's head.
- X 12. Release the pendulum and allow it to fall freely from a height to achieve an impact speed of 6.89 m/s to 7.13 m/s as measured at the center of the pendulum accelerometer. (572.133(c)(4)(i))
- X 13. Complete the following table:

Neck Flexion Test Results (572.133(b)(1) & 572.133(c)(4)(i & ii))

Parameter		Specification	Results
Pendulum impact speed		6.89 m/s $\leq$ speed $\leq$ 7.13 m/s	7.04 m/s
Pendulum ΔV with respect to impact speed	@ 10 ms	2.1 m/s $\leq \Delta V \leq$ 2.5 m/s	2.5 m/s
	@ 20 ms	4.0 m/s $\leq \Delta V \leq$ 5.0 m/s	4.6 m/s
	@ 30 ms	5.8 m/s $\leq \Delta V \leq$ 7.0 m/s	6.5 m/s
Plane D Rotation		Peak moment* 69 Nm $\leq$ moment $\leq$ 83 Nm during the following rotation range 77° $\leq$ angle $\leq$ 91°	73 Nm @ 84 degrees
Positive Moment Decay** (Flexion)		Time to decay to 10 Nm 80 ms $\leq$ time $\leq$ 100 ms	83 ms

*Moment about the occipital condyle = $M_y - (0.01778 \text{ m} \times F_x)$ (572.133(b)(1)(ii))

M_y = Moment in Nm measured by the transducer

F_x = Force, in N measured by the transducer

**Time zero is defined as the time of initial contact between the pendulum striker plate and the honeycomb material. (572.133(b)(3))

- X 14. Plots of acceleration, velocity, y-axis moment, and x-axis force and y-axis moment about the occipital condyle follows this sheet.

David Schoedel
Signature

01/20/2014
Date

MGA RESEARCH CORPORATION

NECK FLEXION TEST

HYBRID III 5TH PERCENTILE

ATD Serial No: 124

Test I.D: D14192

Tested Parameter		Units	Specification	Result	Pass/Fail
Laboratory Temperature		deg C	20.6 to 22.2	20.9	Pass
Laboratory Relative Humidity		%	10 to 70	20	Pass
Pendulum Speed		m/s	6.89 to 7.13	7.04	Pass
Pendulum Velocity	10 ms	m/s	2.1 to 2.5	2.5	Pass
	20 ms	m/s	4.0 to 5.0	4.6	Pass
	30 ms	m/s	5.8 to 7.0	6.5	Pass
D Plane Rotation	Max	deg	77 to 91	84	Pass
Occipital Condyle Moment within Rotation Corridor		Nm	69 to 83	73	Pass
Positive Moment Time Curve Decay to 10 Nm		ms	80 to 100	83	Pass
Overall Results					Pass



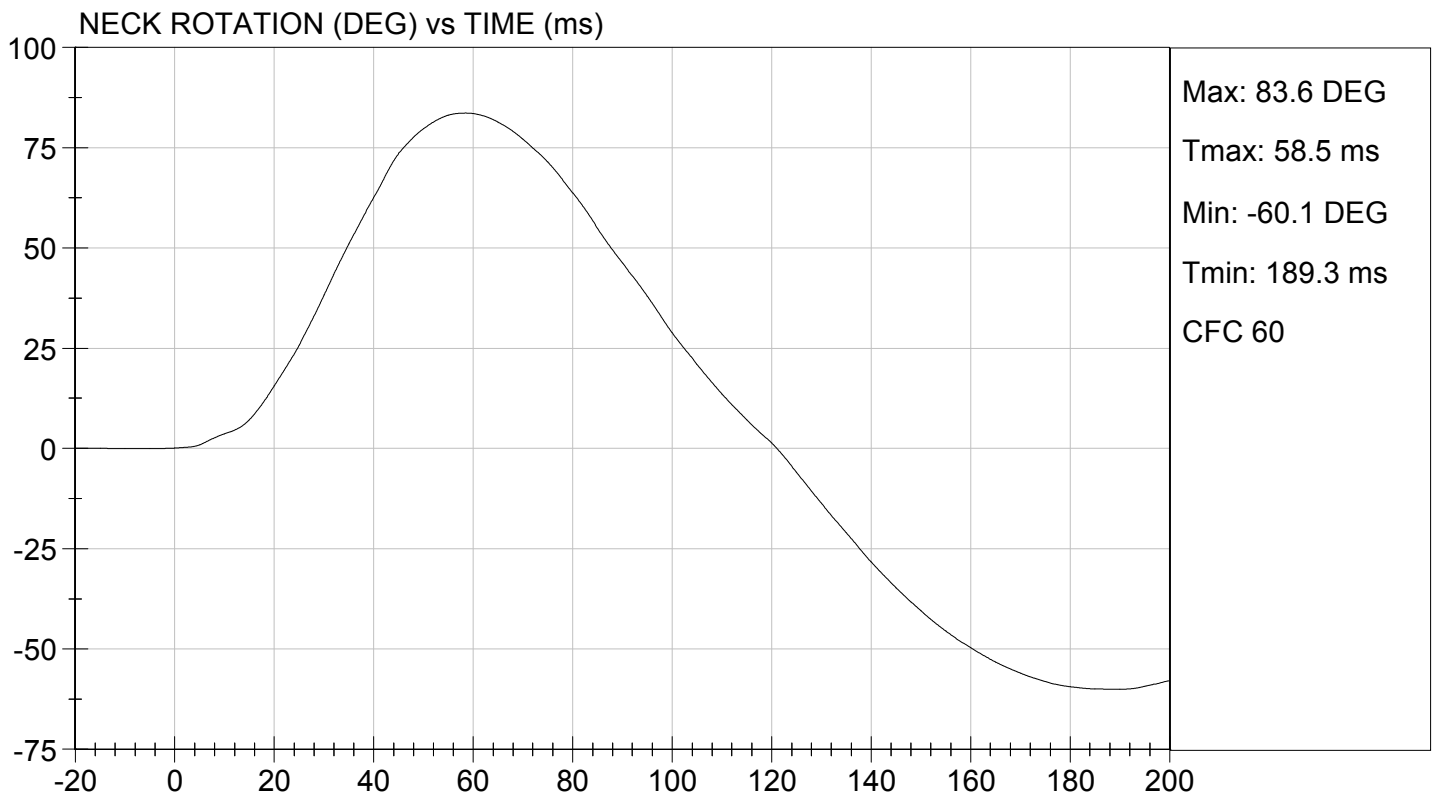
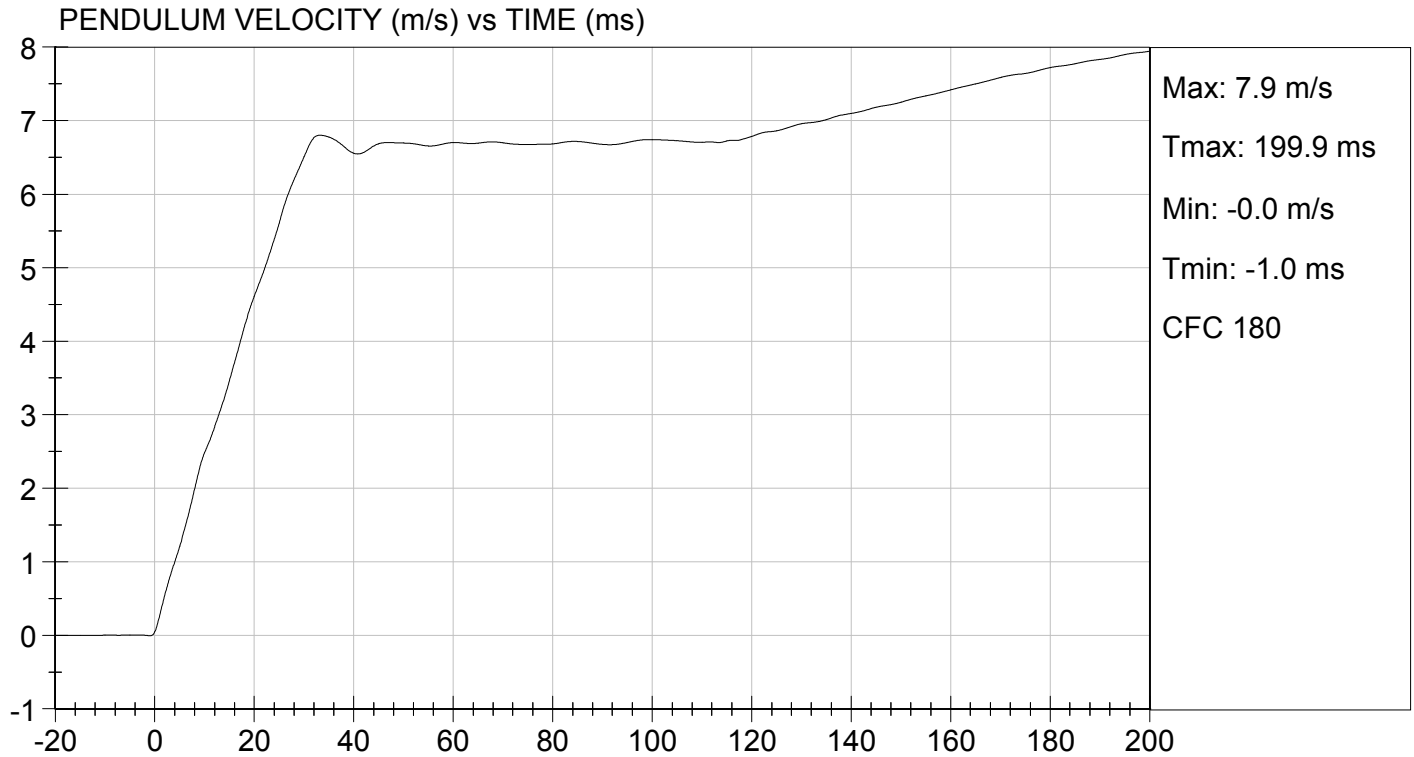
Laboratory Technician

01/20/2014

Test Date



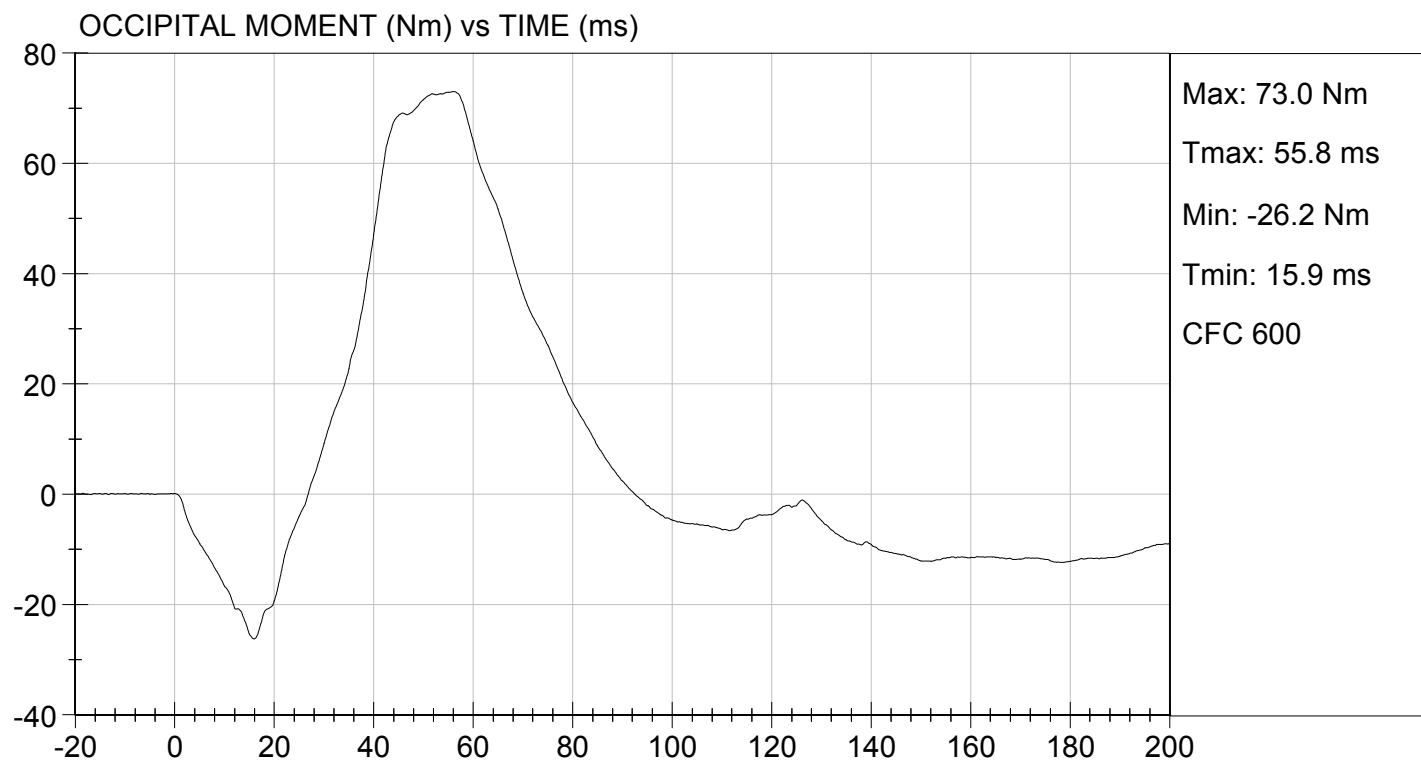
Approved By





TEST DESC: NECK FLEXION
VELOCITY: 23.10 ft/s, 7.04 m/s

TEST DATE: 01/20/2014
TEST #: D14192



DATA SHEET B5
NECK EXTENSION TEST (572.133) (5th Female)

Dummy Serial Number: 124

Test Date: 01/20/2014

Technician: David Schoedel

- ☒ Pre test calibration
☐ Post test calibration verification

Test attempt no. 1 (when successive extension tests are necessary)

- ☒ 1. It has been at least 30 minutes since the last extension test. (572.137(q))
☒ N/A, ONLY one neck test performed
- ☒ 2. The components required for the neck tests include the head assembly (880105-100X), neck (880105-250), bib simulator (880105-371), upper neck adjusting bracket (880105-207), lower neck adjusting bracket (880105-208), six axis neck transducer (SA572-S11) and either three accelerometers (SA572-S4) or their mass equivalent installed in the head assembly as specified in drawing 880105-100X. Data from the accelerometers are not required. (572.133(b))
- ☒ 3. The assembly soaked at a temperature between 20.6°C (69°F) and 22.2°C (72°F) and at a relative humidity from 10% to 70% for a period of at least four (4) hours prior to a test. (572.133(c)(1))
- | | |
|---------------------------------|---------------|
| Record the maximum temperature: | <u>20.9°C</u> |
| Record the minimum temperature: | <u>20.8°C</u> |
| Record the maximum humidity: | <u>20%</u> |
| Record the minimum humidity: | <u>18%</u> |
- ☒ 4. Visually inspect neck assembly for cracks, cuts and separation of the rubber from the metal segments. Note: If the damage resulted from the vehicle crash test in which the dummy was an occupant, the damaged area is to be documented with photography and the post test calibration verification testing completed before any replacement or repairs are made.
- Record findings and actions: No damage
- ☒ 5. Inspect the nodding blocks (78051-351) for any deterioration, but when replacement is necessary, ONLY replace during pre-test calibration. Using a Shore "A" type Durometer, verify the hardness of the nodding blocks is between 80 and 90. Ensure the nodding blocks are installed correctly. (880105-250 and PADI page17).
- Record findings and actions: No Deterioration; Hardness: Front 89; Back 90.
- ☒ 6. Torque the jam nut (9000018) on the neck cable (880105-206) to 1.4 ± 0.2 Nm (12.0 ± 2.0 in-lb). (572.133(c)(2))

- X 7. The data acquisition system, including transducers, conforms to the requirements of SAE Recommended Practice J211/1 MAR95. (572.137(m))
- X 8. The test fixture pendulum conforms to the specifications in Figure 7B. (572.133(c)(3))
- X 9. The head-neck assembly is mounted on the pendulum so the midsagittal plane of the head is vertical and coincides with the plane of motion of the pendulum longitudinal centerline as shown in Figure 9B for the extension test. (572.133(c)(3))
- X 10. Install the transducers or other devices for measuring the "D" plane rotation with respect to the pendulum longitudinal centerline. Note: Plane "D" is the bottom horizontal surface of the skull. These measurement devices should be designed to minimize their influence upon the performance of the head-neck assembly. An example of a measurement device is shown in Figure 10B.
- X 11. With the pendulum resting against the honeycomb material, the neck bracket was adjusted until the longitudinal centerline of the pendulum was perpendicular ± 1 degree to plane "D" on the dummy's head.
- X 12. Release the pendulum and allow it to fall freely from a height to achieve an impact speed of 5.95 m/s to 6.19 m/s as measured at the center of the pendulum accelerometer. (572.133(c)(4)(i))
- X 13. Complete the following table:
Neck Extension Test Results (572.133(b)(2) & 572.133(c)(4)(I & ii))

Parameter		Specification	Results
Pendulum impact speed		$5.95 \text{ m/s} \leq \text{speed} \leq 6.19 \text{ m/s}$	6.19 m/s
Pendulum ΔV with respect to impact speed	@ 10 ms	$1.5 \text{ m/s} \leq \Delta V \leq 1.9 \text{ m/s}$	1.7 m/s
	@ 20 ms	$3.1 \text{ m/s} \leq \Delta V \leq 3.9 \text{ m/s}$	3.5 m/s
	@ 30 ms	$4.6 \text{ m/s} \leq \Delta V \leq 5.6 \text{ m/s}$	5.2 m/s
Plane D Rotation		Peak moment* $-65 \text{ Nm} \leq \text{moment} \leq -53 \text{ Nm}$ during the following rotation range $99^\circ \leq \text{angle} \leq 114^\circ$	-57 Nm @ 104 degrees
Positive Moment Decay** (Extension)		Time to decay to -10 Nm $94 \text{ ms} \leq \text{time} \leq 114 \text{ ms}$	102 ms

*Moment about the occipital condyle = $M_y - (0.01778 \text{ m} \times F_x)$ (572.133(b)(1)(ii))

M_y = Moment in Nm measured by the transducer

F_x = Force, in N measured by the transducer

**Time zero is defined as the time of initial contact between the pendulum striker plate and the honeycomb material. (572.133(b)(3))

- X 14. Plots of acceleration, velocity, y-axis moment, and x-axis force and y-axis moment about the occipital condyle follow this sheet.

David Schoedel
Signature

01/20/2014
Date

MGA RESEARCH CORPORATION
NECK EXTENSION TEST
HYBRID III 5TH PERCENTILE

ATD Serial No: 124

Test I.D: D14193

Tested Parameter		Units	Specification	Result	Pass/Fail
Laboratory Temperature		deg C	20.6 to 22.2	20.9	Pass
Laboratory Relative Humidity		%	10 to 70	20	Pass
Pendulum Speed		m/s	5.95 to 6.19	6.19	Pass
Pendulum Velocity	10 ms	m/s	1.5 to 1.9	1.7	Pass
	20 ms	m/s	3.1 to 3.9	3.5	Pass
	30 ms	m/s	4.6 to 5.6	5.2	Pass
D Plane Rotation	Max	deg	99 to 114	104	Pass
Occipital Condyle Moment within Rotation Corridor		Nm	-65 to -53	-57	Pass
Negative Moment Time Curve Decay to -10 Nm		ms	94 to 114	102	Pass
Overall Results					Pass

David Schoedel
Laboratory Technician

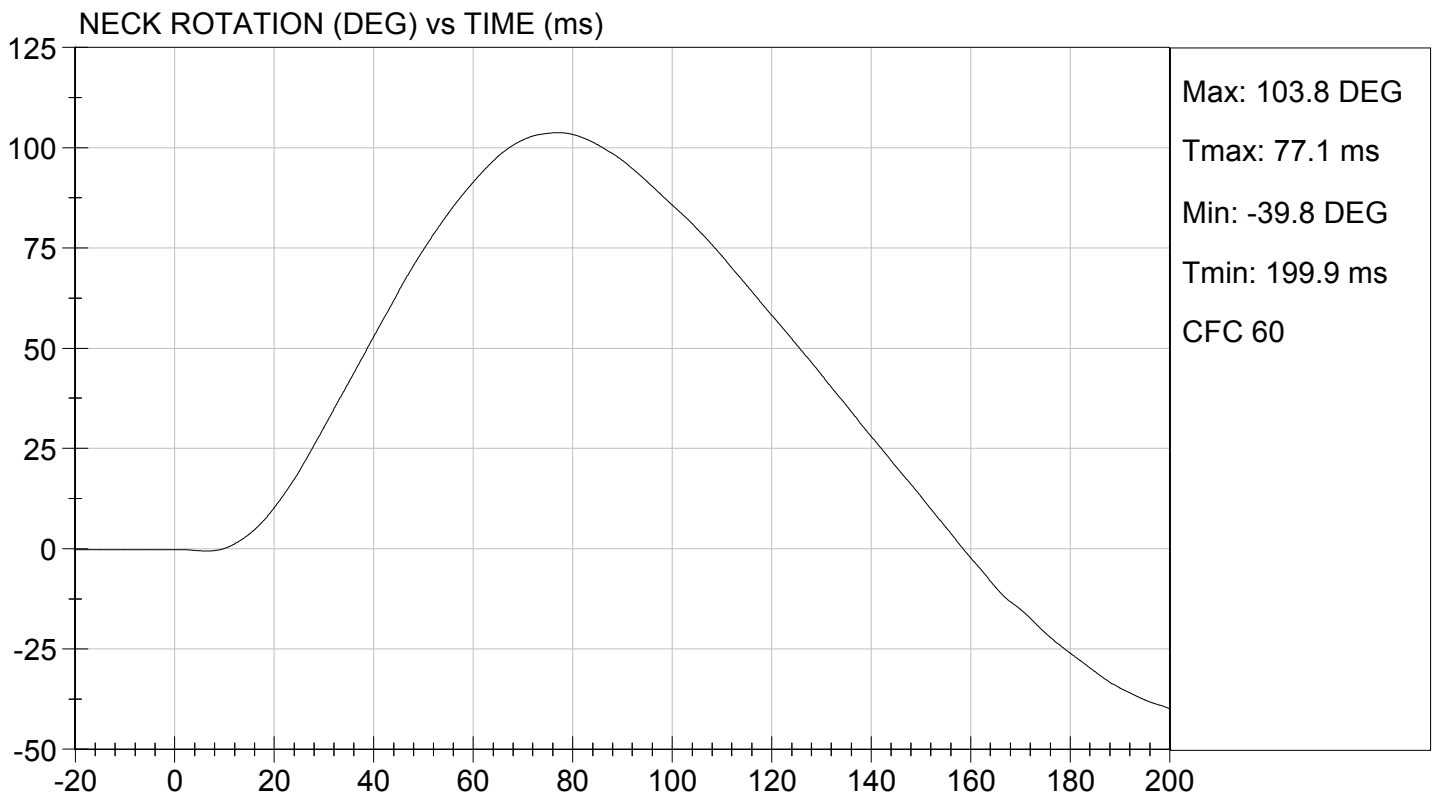
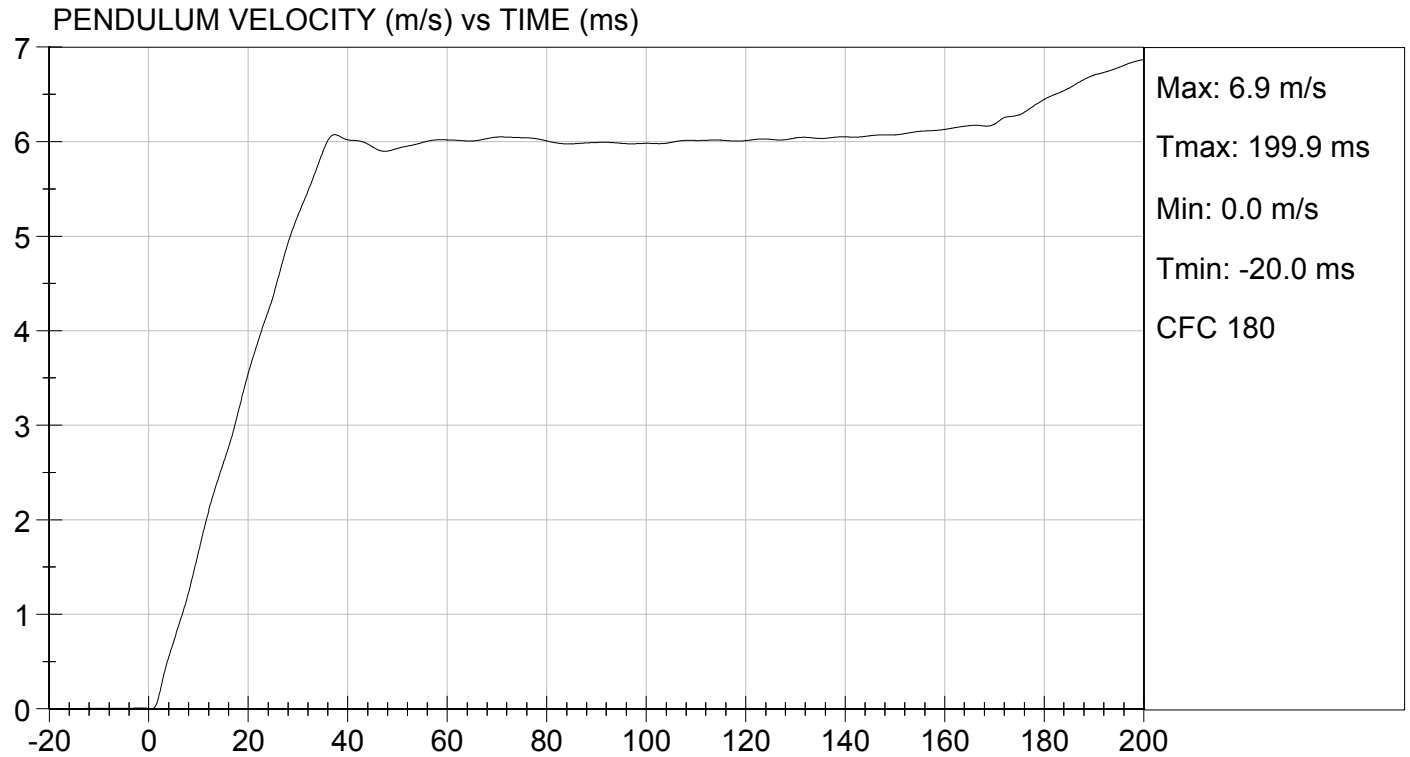
01/20/2014
Test Date

Jeff Leonard
Approved By



TEST DESC: NECK EXTENSION
VELOCITY: 20.30 ft/s, 6.19 m/s

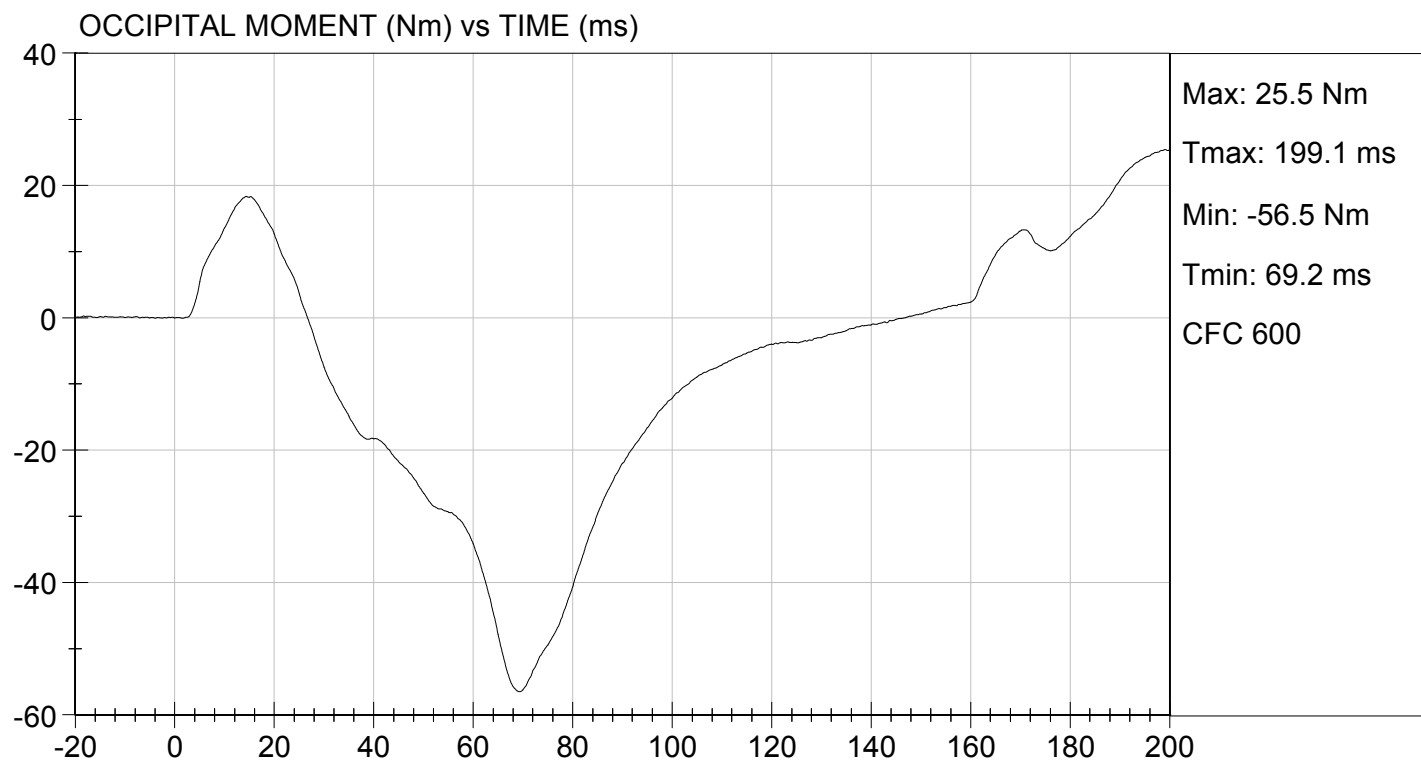
TEST DATE: 01/20/2014
TEST #: D14193





TEST DESC: NECK EXTENSION
VELOCITY: 20.30 ft/s, 6.19 m/s

TEST DATE: 01/20/2014
TEST #: D14193



DATA SHEET B6
THORAX IMPACT TEST (572.134) (5th Female)

Dummy Serial Number: 124

Test Date: 01/20/2014

Technician: David Schoedel

- ☒ Pre test calibration
☐ Post test calibration verification

Test attempt no. 1 (when successive thorax impact tests are necessary)

- ☒ 1. It has been at least 30 minutes since the last thorax impact test. (572.137(q))
☒ N/A, ONLY one thorax impact test performed
- ☒ 2. The test fixture conforms to the specifications in Figure 11B.
- ☒ 3. The complete assembled dummy (880105-000) is used (572.134(b)) and is dressed in a form fitting cotton stretch above-the-elbow sleeved shirt and above-the-knee pants. The weight of the shirt and pants shall not exceed 0.14 kg. (572.134(c)(1))
- ☒ 4. The dummy assembly soaked at a temperature between 20.6°C (69°F) and 22.2°C (72°F) and at a relative humidity from 10% to 70% for a period of at least four (4) hours prior to this test. (572.134(c)(2))

Record the maximum temperature:	<u>20.9°C</u>
Record the minimum temperature:	<u>20.8°C</u>
Record the maximum humidity:	<u>20%</u>
Record the minimum humidity:	<u>18%</u>

- ☒ 5. Remove the chest skin and visually inspect the thorax assembly for cracks, cuts, abrasions, etc. Particular attention should be given to the rib damping material, chest displacement transducer assembly and the rear rib supports. Inspect for rib deformation using the chest depth gage. If any damage is noted repair and/or replace the damaged components unless the damage resulted from the vehicle crash test in which the dummy was an occupant in which case the damage must be documented and post test calibration verification testing completed before any repairs or replacements are made.

☒ - No Damage
☐ - Damage from crash test, no repairs or replacement because this is a post test calibration verification. Record damage:

☐ - The following repairs or replacement was performed. Record:

- X 6. Seat the dummy, (chest skin still removed) without back and arm supports on the test fixture surface as shown in Figure 11B. The surface must be long enough to support the pelvis and outstretched legs. (572.134(c)(3))
- X 7. Level the ribs both longitudinally and laterally $\pm 0.5^\circ$ and adjust the pelvis angle to $7^\circ \pm 2^\circ$. The angle may be measured using the special H-point tool (TE-2504) that inserts into the pelvic structure and extends outward beyond the pelvic skin surface or by using the surface of the pelvic adaptor block.
- X 8. The midsagittal plane of the dummy is vertical within $\pm 1^\circ$. (572.134(c)(3))
- X 9. The longitudinal centerline of the test probe is centered within ± 2.5 mm of the midsagittal plane of the dummy and is $12.7 \text{ mm} \pm 1 \text{ mm}$ below the horizontal peripheral centerline of the No. 3 rib and is within 0.5° of a horizontal line in the dummy's midsagittal plane. (572.134(c)(4))
- X 10. Align the adjustable neck bracket index marks to the "zero" position.
- X 11. Record locations such as the rear surfaces of the thoracic spine and the lower neck bracket reference with respect to the laboratory coordinate system. These reference measurements are necessary to ensure the dummy is in the same position after the chest skin is installed. The reference locations must be accessible after installation of the chest skin. It may be necessary to leave the chest skin zipper unfastened until the references are checked and fasten it just prior to the test.
- X 12. Install the chest skin and reposition the dummy as described in the preceding paragraph using the reference measurements recorded.
- X 13. Place the arm assemblies horizontal $\pm 2^\circ$ and parallel to the midsagittal plane. The arms are held in place by tightening the adjustment nut that holds the arm yoke to the clavicle assembly.
- X 14. The data acquisition system, including transducers, must conform to the requirements of SAE Recommended Practice J211/1 MAR95 (572.136(m)) Class 180.
- X 15. Impact the anterior surface of the thorax with the test probe so the longitudinal centerline of the probe is within 2° of a horizontal line in the dummy's midsagittal plane at the moment of impact. (572.134(c)(5)) The velocity of the test probe at the time of impact is $6.71 \text{ m/s} \pm 0.12 \text{ m/s}$. (572.134(b)) The probe is guided so there is no significant lateral, vertical or rotational movement during the impact. (572.134(c)(6)) Neither the suspension hardware, suspension cables, nor other attachments to the probe, including the velocity vane, make contact with the dummy. (572.134(c)(7))

- X 16. Complete the following table:
Thorax Impact Results (572.134(b) and 572.134(b)(1)&(2))

Parameter*	Specification	Result
Test Probe Speed	$6.59 \text{ m/s} \leq \text{speed} \leq 6.83 \text{ m/s}$	6.77 m/s
Chest Compression	$50.0 \text{ mm} \leq \text{compression} \leq 58.0 \text{ mm}$	53 mm
Peak force** between 50.0 and 58.0 mm chest compression	$3900\text{N} \leq \text{peak force} \leq 4400\text{N}$	4384 N
Peak Force** between 18.0 and 50.0 mm chest compression	Peak Force $\leq 4600 \text{ N}$	4390 N
Internal Hysteresis***	$69\% \leq \text{hysteresis} \leq 85\%$	71%

*Time zero is defined as the time of initial contact between the test probe and the chest skin.

**Force = impactor mass x acceleration (572.134(b)(3))

***Area under loading curve minus the area under the unloading curve divided by the area under the loading curve. (Figure 12B)

- X 17. Plots of chest compression, acceleration, force, force versus deflection follow this sheet.

David Schoedel
Signature

01/20/2014
Date

MGA RESEARCH CORPORATION
THORAX IMPACT
HYBRID III 5TH PERCENTILE

ATD Serial No: 124

Test I.D: D14194

Tested Parameter	Units	Specification	Result	Pass/Fail
Temperature	deg C	20.6 to 22.2	20.9	Pass
Relative Humidity	%	10 to 70	20	Pass
Probe Speed	m/s	6.59 to 6.83	6.77	Pass
Peak Deflection	mm	50 to 58	53	Pass
Peak Resistive Force w/in Deflection Corridor	N	3900 to 4400	4384	Pass
Internal Hysteresis	%	69 to 85	71	Pass
Peak Force 18 mm - 50 mm	N	<= 4600	4390	Pass
Overall Test Results				Pass

David Schoedel
Laboratory Technician

01/20/2014

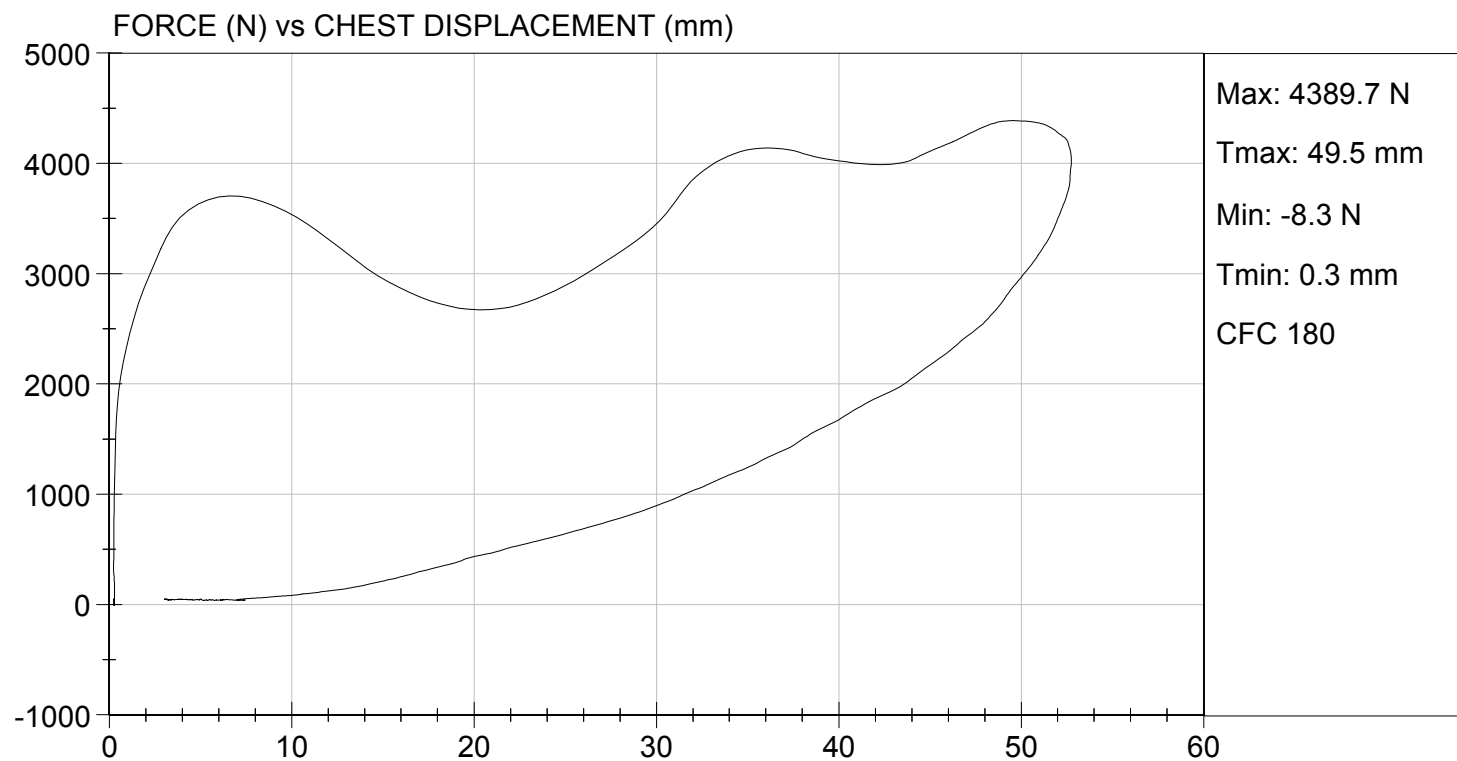
Test Date

Jeff Leonard
Approved By



TEST DESC: THORAX IMPACT
VELOCITY: 22.22 ft/s, 6.77 m/s

TEST DATE: 01/20/2014
TEST #: D14194



DATA SHEET B7
TORSO FLEXION TEST (572.135) (5th Female)

Dummy Serial Number: 124

Test Date: 01/20/2014

Technician: David Schoedel

- ☒ Pre test calibration
☐ Post test calibration verification

Test attempt no. 1 (when successive torso flexion tests are necessary)

- ☒ 1. It has been at least 30 minutes since the last torso flexion test. (572.137(q))
☒ N/A, ONLY one torso flexion test performed
- ☒ 2. The test fixture conforms to the specifications in Figure 13B.
- ☒ 3. The complete assembled dummy (880105-000) is used (572.135(c)(2)).
☐ With legs below femurs.
☒ Without legs below femurs.
- ☒ 4. The dummy assembly soaked at a temperature between 18.9°C (66°F) and 25.6°C (78°F) and at a relative humidity from 10% to 70% for a period of at least four (4) hours prior to this test. (572.135(c)(1))
- | | |
|---------------------------------|---------------|
| Record the maximum temperature: | <u>20.9°C</u> |
| Record the minimum temperature: | <u>20.8°C</u> |
| Record the maximum humidity: | <u>20%</u> |
| Record the minimum humidity: | <u>18%</u> |
- ☒ 5. Secure the pelvis to the fixture at the pelvis instrument cavity rear face by threading four ¼ cap screws into the available threaded attachment holes. Tighten the mountings so that the test material is rigidly affixed to the test fixture and the pelvic lumbar joining surface is horizontal. (572.135(c)(3))
- ☒ 6. Attach the loading adapter bracket to the spine of the dummy as shown in Figure 13B. (572.135(c)(4))
- ☒ 7. Inspect and adjust, if necessary, the seating of the abdominal insert within the pelvis cavity and with respect to the torso flesh, assuring that the torso flesh provides uniform fit and overlap with respect to the outside surface of the pelvis flesh. (572.135(c)(5))
- ☒ 8. Flex the dummy forward and back 3 times such that the angle reference plane moves between 0° and 30° with respect to the vertical transverse plane. (572.135(c)(6))

- X 9. Support the dummy such that the angle reference plane is at or near 0° (vertical with respect to the vertical transverse plane). Wait at least 30 minutes before continuing. (572.135(c)(6))
- X 10. Remove all external support that was implemented in 9 above. (572.135(c)(7))
- X 11. Measure the initial orientation angle of the torso reference plane of the seated, unsupported dummy. (572.135(c)(7))
 Record reference plane angle (max. allowed 20°): See Result Table
- X 12. Attach the pull cable and the load cell. (572.135(c)(8))
- X 13. Apply a tension force in the midsagittal plane to the pull cable at any upper torso deflection rate between 0.5° and 1.5° per second, until the angle reference plane is at 45° ± 0.5° of flexion relative to the vertical transverse plane. (572.135(c)(9))
- X 14. Maintain angle reference plane at 45° ± 0.5° of flexion for 10 seconds. (572.135(c)(10))
- X 15. As quickly as possible release the force applied to the attachment bracket. (572.135(c)(11))
- X 16. 3 minutes after the release of the force, measure the reference plane angle. (572.135(c)(11))
- X 17. Complete the following table:
 Torso Flexion Results (572.135(b), 572.135(c)(7), 572.135(c)(9))

Parameter	Specification	Result
Initial ref. plane angle	Angle ≤ 20°	19 deg
Torso rotation rate	0.5°/s ≤ rate ≤ 1.5°/s	0.9 deg/sec
Force at 45° ± 0.5°	320 N ≤ force ≤ 390 N	384 N
Final ref. plane angle	Initial ref. plane angle ± 8°	20 deg

David Schoedel
 Signature

01/20/2014
 Date

MGA RESEARCH CORPORATION

TORSO FLEXION TEST

HYBRID III 5TH PERCENTILE

ATD Serial No: 124

Test I.D: D14197

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 to 25.6	20.9	Pass
Laboratory Relative Humidity	%	10 to 70	20	Pass
Initial Angle	deg	0 to 20	19	Pass
Return Angle	deg	+/- 8	20	Pass
Force at 45 deg	N	320 to 390	384	Pass
Upper Torso Deflection Rate	deg/s	0.5 to 1.5	0.9	Pass
Overall Result				Pass

David Schoedel
Laboratory Technician

01/20/2014

Test Date

Jeff Leonard
Approved By

DATA SHEET B8
LEFT KNEE IMPACT TEST (572.136) (5th Female)

Dummy Serial Number: 124

Test Date: 01/20/2014

Technician: David Schoedel

X Pre test calibration
 Post test calibration verification

Test attempt no. 1 (when successive knee impact tests are necessary)

- X 1. It has been at least 30 minutes since the last knee impact test. (572.137(q))
X N/A, ONLY one knee impact test performed
- X 2. The test fixture conforms to the specifications in Figure 14B.
- X 3. The knee assembly (880105-528L), lower leg structural replacement (880105-603), lower leg flesh (880105-601), ankle assembly (880105-660), foot assembly (880105-650), and femur load transducer (SA572-S14) (may use the load cell structural replacement (78051-319)) were used. (572.136(b)(1))
- X 4. The knee assembly soaked at a temperature between 18.9°C (66°F) and 25.6°C (78°F) and at a relative humidity from 10% to 70% for a period of at least four (4) hours prior to this test. (572.136(c)(1))
- | | |
|---------------------------------|---------------|
| Record the maximum temperature: | <u>20.9°C</u> |
| Record the minimum temperature: | <u>20.8°C</u> |
| Record the maximum humidity: | <u>20%</u> |
| Record the minimum humidity: | <u>18%</u> |
- X 5. Mount the test specimen and secure it to the rigid test fixture. (572.136(c)(2))
- X 6. No parts of the foot or tibia contact any exterior surface. (572.136(c)(2))
- X 7. Align the test probe so that throughout its stroke and at contact with the knee it is within 2 degrees of horizontal and collinear with the longitudinal centerline of the femur. (572.136(c)(3))
- X 8. The probe is guided so there is no significant lateral, vertical or rotational movement during the impact with the knee. (572.136(c)(4))
- X 9. The data acquisition system, including transducers, must conform to the requirements of SAE Recommended Practice J211/1 MAR95 (572.136(m)) Class 600.

X 10. Contact the knee with the test probe at a speed between 2.07 m/s and 2.13 m/s.
(572.136(c)(5)) Neither the suspension hardware, suspension cables, nor other
attachments to the probe, including the velocity vane, make contact with the dummy.
(572.136(c)(6))

 X 11. Complete the following table:
Knee Impact Results (572.136(b)(1) and 572.136(c)(5))

Parameter	Specification	Result
Probe speed	$2.07 \text{ m/s} \leq \text{speed} \leq 2.13 \text{ m/s}$	2.13 m/s
Peak resistance force*	$3450 \text{ N} \leq \text{force} \leq 4060 \text{ N}$	3475 N

*Force = impactor mass x deceleration (572.136(b)(2))

 X 12. Plots of acceleration versus time and force versus time follow this sheet.

David Schoedel
Signature

01/20/2014
Date

MGA RESEARCH CORPORATION

**LEFT KNEE IMPACT TEST
HYBRID III 5TH PERCENTILE**

ATD Serial No: 124

Test I.D: D14196

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 to 25.6	20.9	Pass
Laboratory Relative Humidity	%	10 to 70	20	Pass
Probe Speed	m/s	2.07 to 2.13	2.13	Pass
Maximum Force	N	3450 to 4060	3475	Pass
Overall Test Results				Pass

David Schoedel
Laboratory Technician

01/20/2014

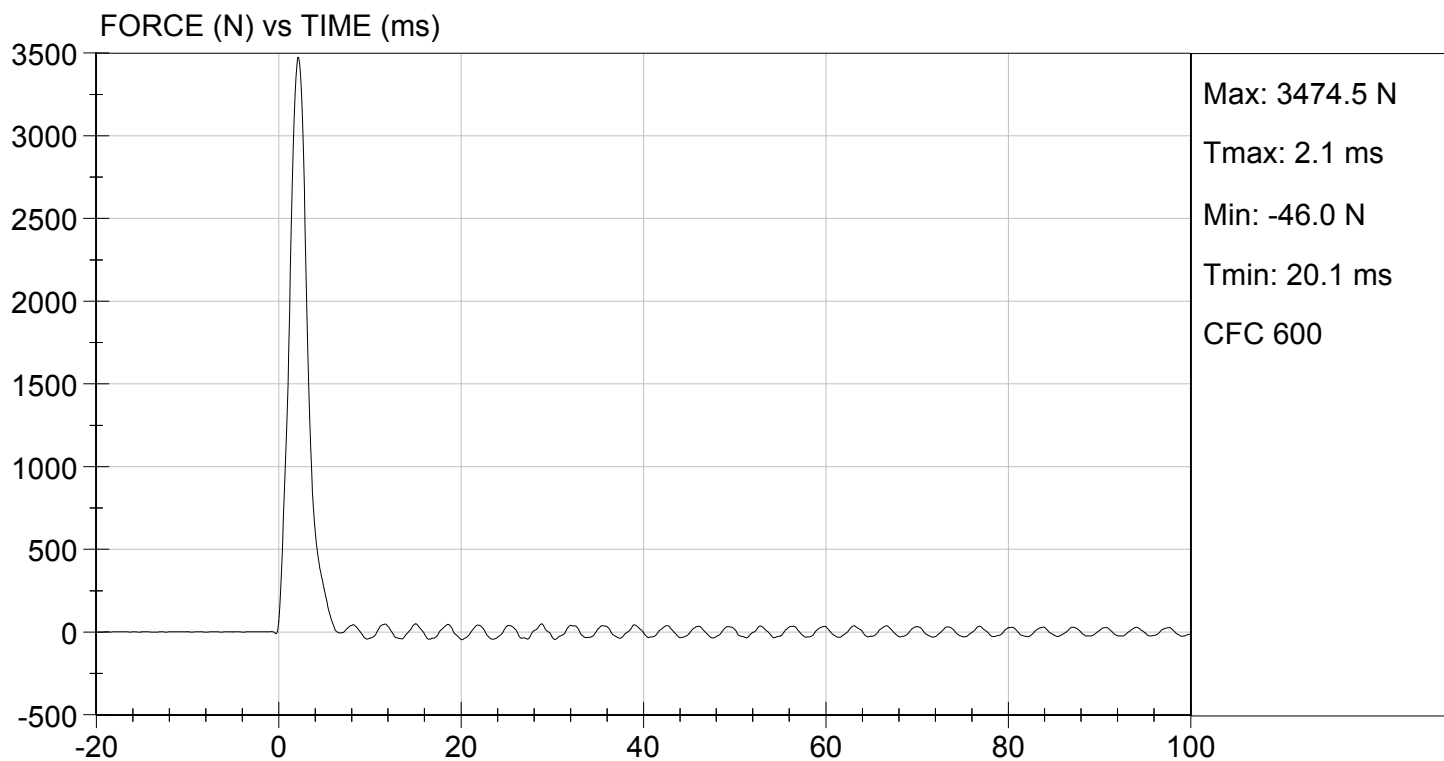
Test Date

Jeff Leonard
Approved By



TEST DESC: LEFT KNEE
VELOCITY: 7.00 ft/s, 2.13 m/s

TEST DATE: 01/20/2014
TEST #: D14196



DATA SHEET B9
RIGHT KNEE IMPACT TEST (572.136) (5th Female)

Dummy Serial Number: 124

Test Date: 01/20/2014

Technician: David Schoedel

- ☒ Pre test calibration
☐ Post test calibration verification

Test attempt no. 1 (when successive knee impact tests are necessary)

- ☒ 1. It has been at least 30 minutes since the last knee impact test. (572.137(q))
☒ N/A, ONLY one knee impact test performed
- ☒ 2. The test fixture conforms to the specifications in Figure 14B.
- ☒ 3. The knee assembly (880105-528R), lower leg structural replacement (880105- 603), lower leg flesh (880105-601), ankle assembly (880105-660), foot assembly (880105-651), and femur load transducer (SA572-S14) (may use the load cell structural replacement (78051-319)) were used. (572.136(b)(1))
- ☒ 4. The knee assembly soaked at a temperature between 18.9°C (66°F) and 25.6°C (78°F) and at a relative humidity from 10% to 70% for a period of at least four (4) hours prior to this test. (572.136(c)(1))

Record the maximum temperature:	<u>20.9°C</u>
Record the minimum temperature:	<u>20.8°C</u>
Record the maximum humidity:	<u>20%</u>
Record the minimum humidity:	<u>18%</u>

- ☒ 5. Mount the test specimen and secure it to the rigid test fixture. (572.136(c)(2))
- ☒ 6. No parts of the foot or tibia contact any exterior surface. (572.136(c)(2))
- ☒ 7. Align the test probe so that throughout its stroke and at contact with the knee it is within 2 degrees of horizontal and collinear with the longitudinal centerline of the femur. (572.136(c)(3))
- ☒ 8. The probe is guided so there is no significant lateral, vertical or rotational movement during the impact with the knee. (572.136(c)(4))
- ☒ 9. The data acquisition system, including transducers, must conform to the requirements of SAE Recommended Practice J211/1 MAR95 (572.136(m)) Class 600.

X 10. Contact the knee with the test probe at a speed between 2.07 m/s and 2.13 m/s.
(572.136(c)(5)) Neither the suspension hardware, suspension cables, nor other
attachments to the probe, including the velocity vane, make contact with the dummy.
(572.136(c)(6))

 X 11. Complete the following table:
Knee Impact Results (572.136(b)(1) and 572.136(c)(5))

Parameter	Specification	Result
Probe speed	$2.07 \text{ m/s} \leq \text{speed} \leq 2.13 \text{ m/s}$	2.09 m/s
Peak resistance force*	$3450 \text{ N} \leq \text{force} \leq 4060 \text{ N}$	3537 N

*Force = impactor mass x deceleration (572.136(b)(2))

 X 12. Plots of acceleration versus time and force versus time follow this sheet.

David Schoedel
Signature

01/20/2014
Date

MGA RESEARCH CORPORATION

RIGHT KNEE IMPACT TEST

HYBRID III 5TH PERCENTILE

ATD Serial No: 124

Test I.D: D14195

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 to 25.6	20.9	Pass
Laboratory Relative Humidity	%	10 to 70	20	Pass
Probe Speed	m/s	2.07 to 2.13	2.09	Pass
Maximum Force	N	3450 to 4060	3537	Pass
Overall Test Results				Pass

David Schoedel
Laboratory Technician

01/20/2014

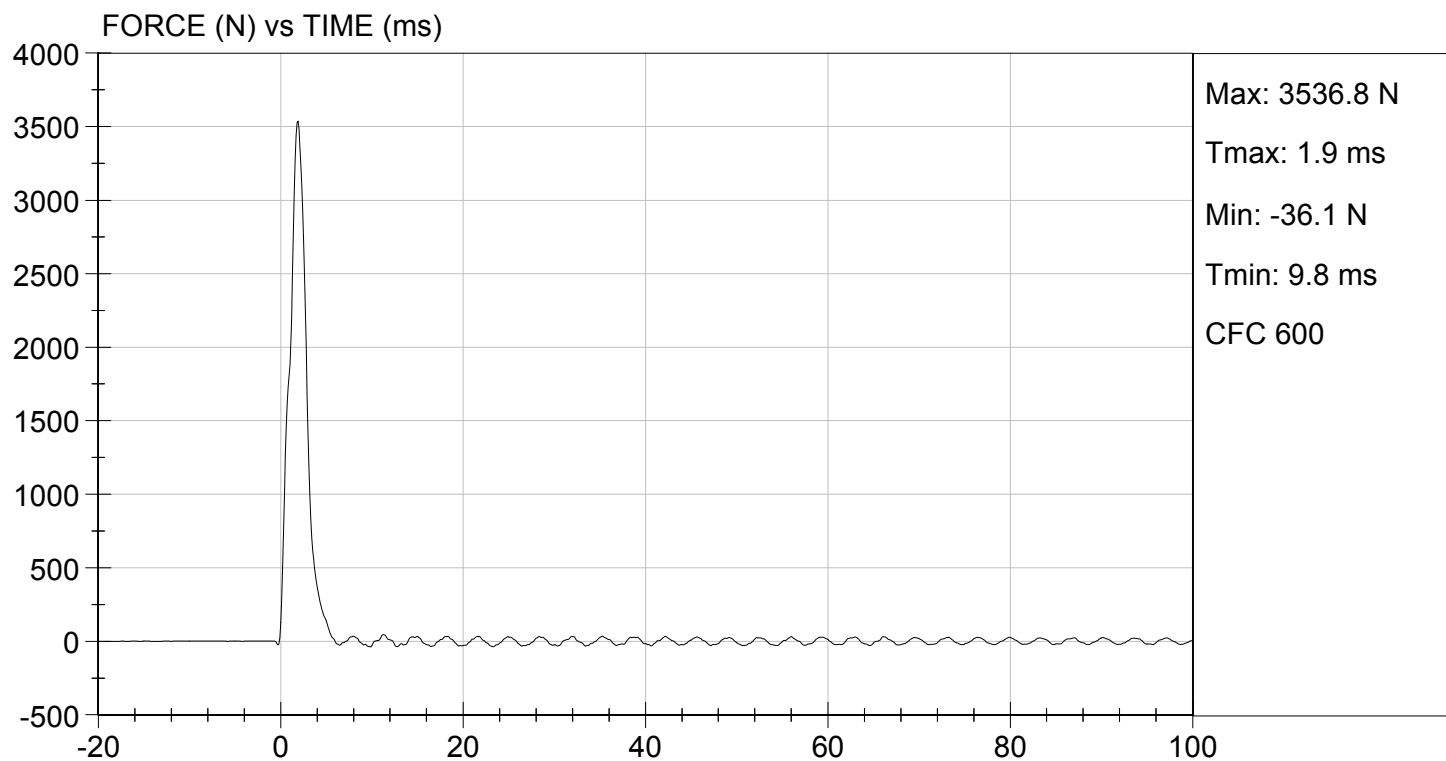
Test Date

Jeff Leonard
Approved By



TEST DESC: RIGHT KNEE
VELOCITY: 6.86 ft/s, 2.09 m/s

TEST DATE: 01/20/2014
TEST #: D14195



DATA SHEET B10

PART 572 INSTRUMENTATION CALIBRATION INFORMATION

I.D. NO.	MANUFACTURER	MODEL NO.	SERIAL NO.	DATE OF LAST CALIBRATION	DATE OF NEXT CALIBRATION
DUMMY INSTRUMENTATION					
HEAD ACCELEROMETERS					
(1) LONGITUDINAL	Endevco	7264C-2KTZ-2-360M17	P77650	01/16/2014	07/16/2014
(2) LATERAL	Endevco	7264C-2KTZ-2-360M17	P77651	01/16/2014	07/16/2014
(3) VERTICAL	Endevco	7264C-2KTZ-2-360M17	P77653	01/16/2014	07/16/2014
NECK TRANSDUCER	Denton	1716	1673	11/20/2013	05/20/2014
CHEST ACCELEROMETERS					
(1) LONGITUDINAL	Endevco	7264C-2KTZ-2-360M17	P78817	01/16/2014	07/16/2014
(2) LATERAL	Endevco	7264C-2KTZ-2-360M17	P78822	01/16/2014	07/16/2014
(3) VERTICAL	Endevco	7264C-2KTZ-2-360M17	P8825	01/16/2014	07/16/2014
CHEST POTENTIOMETER	Servo	14CBI-2897	124	01/20/2014	07/20/2014
FEMUR LOAD CELLS					
(1) RIGHT FEMUR	GSE	2430	1361	10/31/2013	05/01/2014
(2) LEFT FEMUR	GSE	2430	1362	10/31/2013	05/01/2014
LABORATORY INSTRUMENTATION					
NECK PENDULUM ACCELEROMETER	Endevco	7231C-750	AGH70	08/27/2013	02/27/2014
THORAX PENDULUM ACCELEROMETER	Endevco	7264C-2KTZ-2-240	P82319	11/01/2013	05/01/2014
KNEE PENDULUM ACCELEROMETER	Endevco	7264C-2KTZ-2-240	P77579	01/10/2014	07/10/2014
NECK ROTATION TRANSDUCER 1 (OPTIONAL)	Spectrol	132-0-0-102	18	08/13/2013	02/13/2014
NECK ROTATION TRANSDUCER 2 (OPTIONAL)	Spectrol	132-0-0-102	29	08/13/2013	02/13/2014

LABORATORY TECHNICIAN:

Jessica Hall

DATA SHEET B3
HEAD DROP TEST (572.132) (5th Female)

Dummy Serial Number: 124

Test Date: 01/30/2014

Technician: Jessica Gall

 Pre test calibration
 X Post test calibration verification

Test attempt no. 1 (when successive head drops are necessary)

- X 1. It has been at least 2 hours since the last head drop. (572.132(c)(5))
 X N/A, ONLY one head drop performed
- X 2. The head assembly consists of the complete head (880105-100X), the six-axis neck transducer (SA572-S11) or neck transducer structural replacement (78051-383X), and three (3) accelerometers (SA572-S4). (572.132(a))
- X 3. The head accelerometer mounting plate screws (10-24 x 3/8 SHCS) are torqued to 9.0 Nm.
- X 4. Accelerometers and their respective mounts are smooth and clean.
- X 5. Torque the skull cap screws (10-24 x 1/2 SHCS) to 9.0 Nm.
- X 6. The data acquisition system, including transducers, conforms to the requirements of SAE Recommended Practice J211/1 MAR95. (572.136(m))
- X 7. The head assembly soaked at a temperature between 18.9°C (66°F) and 25.6°C (78°F) and at a relative humidity from 10% to 70% for a period of at least four (4) hours prior to a test. (572.132(c)(1))
- | | |
|---------------------------------|---------------|
| Record the maximum temperature: | <u>21.1°C</u> |
| Record the minimum temperature: | <u>20.6°C</u> |
| Record the maximum humidity: | <u>15%</u> |
| Record the minimum humidity: | <u>12%</u> |
- X 8. Visually inspect the head skin for cracks, cuts, abrasions, etc. Repair or replace the head skin if the damaged area is more than superficial. Note: If the damage resulted from the vehicle crash test in which the dummy was an occupant, the damaged area is to be documented with photography and the post test calibration verification testing completed before any replacement or repairs are made.
- Record findings and actions: No Damage

X 9. Clean the impact surface of the skin and the impact surface of the fixture with isopropyl alcohol, trichloroethane or equivalent prior to the test. (572.132(c)(2))

X 10. Suspend and orient the head assembly as shown in Figure 5B. The lowest point on the forehead is 376.0 ± 1.0 mm (14.8 ± 0.04 inch) from the impact surface. (572.132(c)(3))
Record the actual distance: 376 mm

NOTE: The masses of the suspension device and the accelerometer cables are to be kept as lightweight as possible to minimize their effect on the test results.

X 11. The 1.57 mm (0.062 inch) diameter holes located on either side of the dummy's head are equidistance within 2 mm from the impact surface. A typical test setup is shown in Figure 6B. (572.132(c)(3))

Record the right side distance: 501 mm

Record the left side distance: 501 mm

X 12. The impact surface is clean and dry and has a micro finish in the range of 203.2×10^{-6} mm (8 micro inches) to 2032.0×10^{-6} mm (80 micro inches) (RMS). (572.132(c)(4))

Record actual micro finish: 24.8 micro inches

X 13. The impact surface is rigidly supported. (572.132(c)(4))

X 14. The impact surface is a flat horizontal steel plate 50.8 mm (2 inches) thick and 610 mm (24 inches) square. (572.132(c)(4))

Record thickness: 50.9 mm

Record width: 604 mm

Record length: 595 mm

X 15. Drop the head assembly from a height of 376.0 ± 1.0 mm (14.8 inches $\pm$ 0.04 inches) by a means that ensures a smooth, instant release onto the impact surface. (572.132(b) & (572.132(c)(4))

X 16. Complete the following table using channel class 1000 data. (572.132(b)):

Parameter	Specification	Result
Peak resultant acceleration	$250 \text{ g} \leq x \leq 300 \text{ g}$	276 g
Resultant versus time history curve	Unimodal	Yes
Oscillations after the main pulse	Less than 10% of the peak resultant acceleration	Yes
Lateral acceleration	y-axis acceleration $\leq 15 \text{ g}$	3.7 g

X 17. Plots of the x, y, z, and resultant acceleration data follow this sheet.

Jessica Hall
Signature

01/30/2014
Date

MGA RESEARCH CORPORATION
HEAD DROP TEST
HYBRID III 5TH PERCENTILE

ATD Serial No: 124

Test ID: D14311

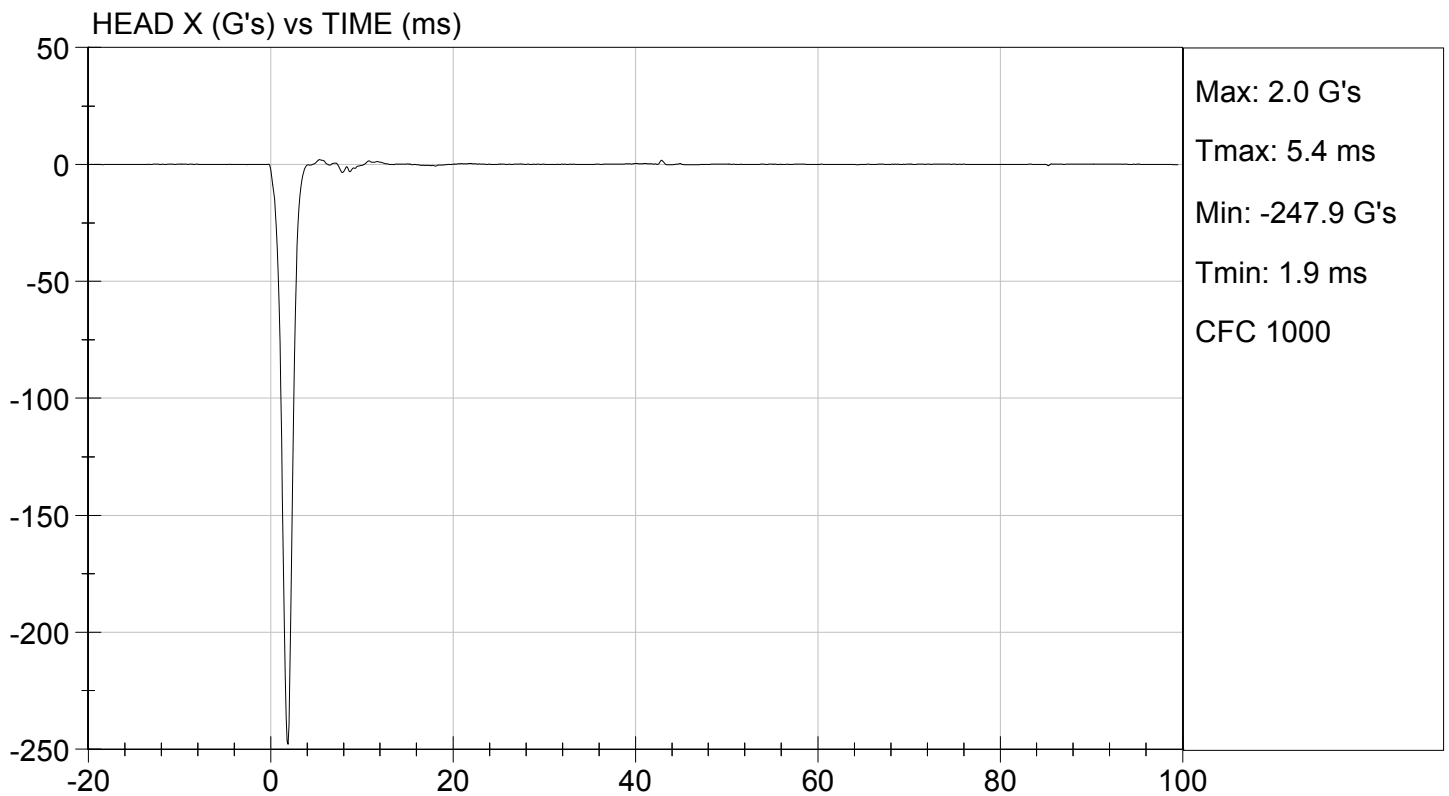
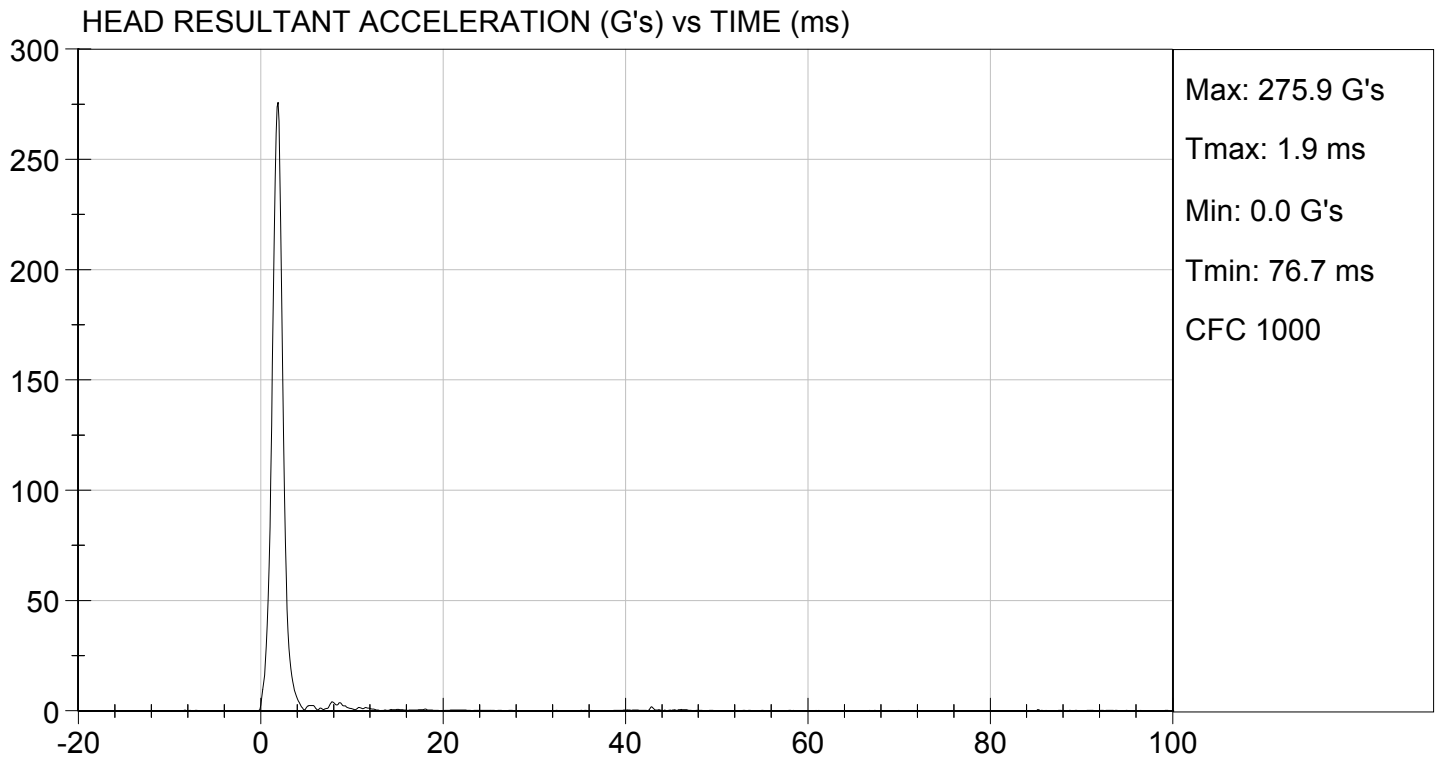
Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 to 25.6	21.0	Pass
Laboratory Relative Humidity	%	10 to 70	15	Pass
Peak Resultant Acceleration	G's	250 to 300	276	Pass
Peak Lateral Acceleration	G's	<= +/- 15.0	3.7	Pass
Unimodal	N/A	Yes	Yes	Pass
Oscillations	N/A	within 10% of peak	Yes	Pass
Overall Test Results				Pass

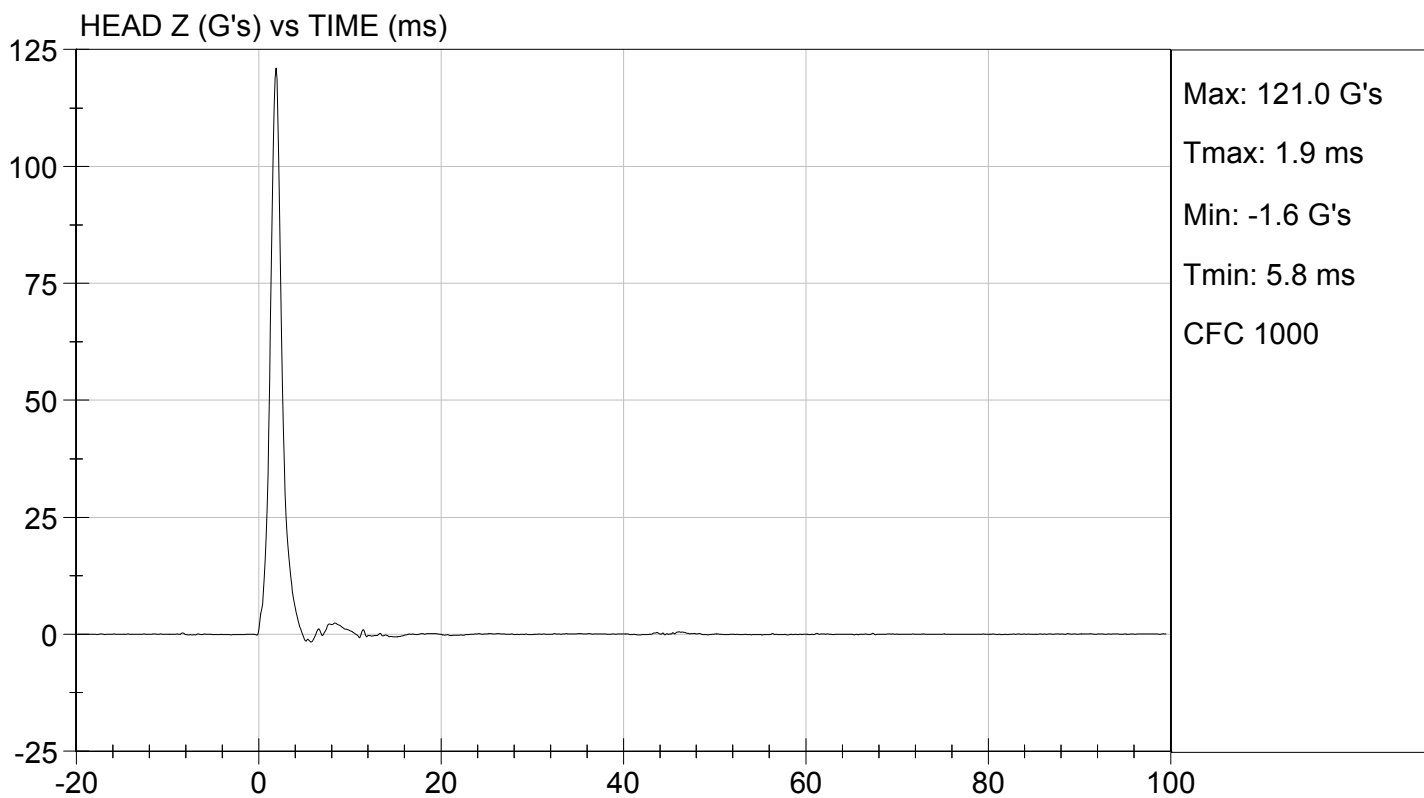
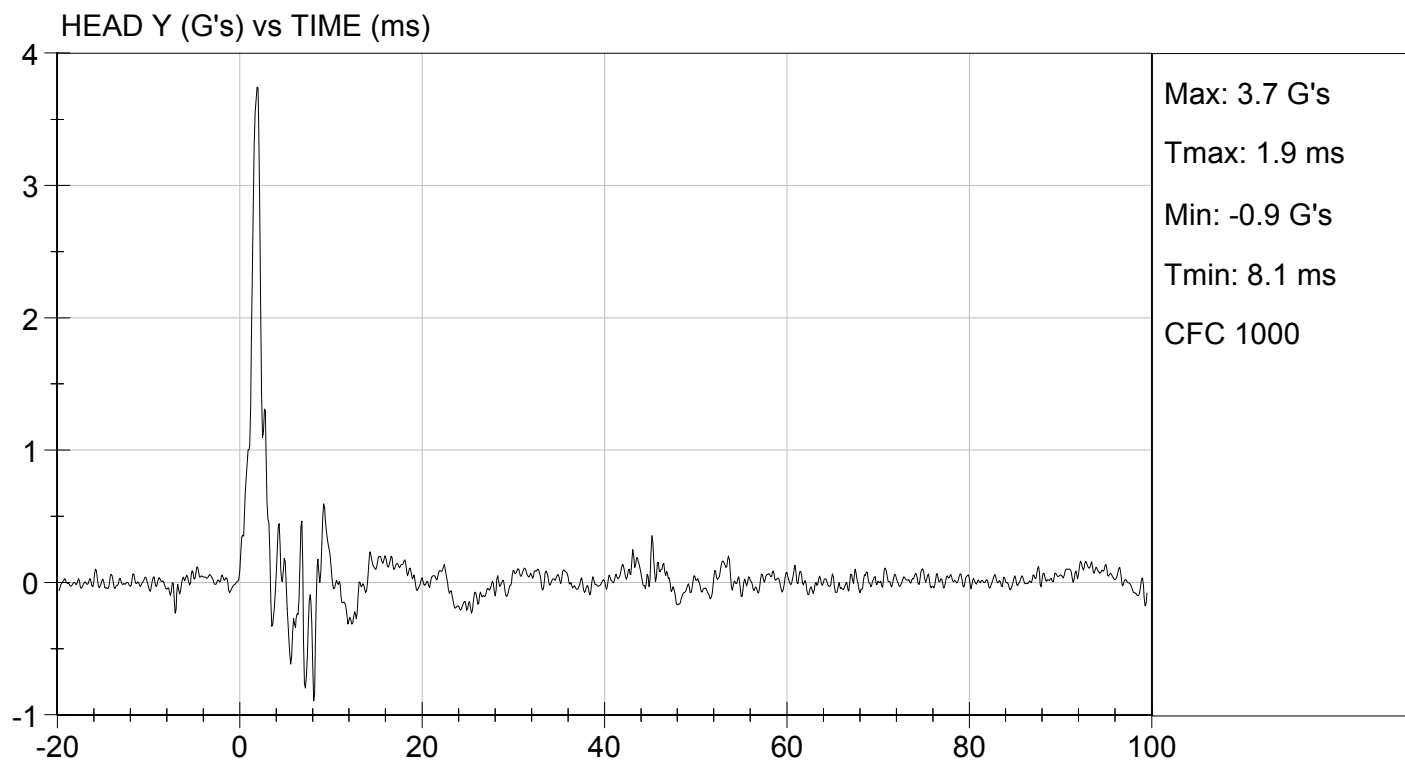
Jessica Hall
Laboratory Technician

01/30/2014

Test Date

Jeff Leonard
Approved By





DATA SHEET B4
NECK FLEXION TEST (572.132) (5th Female)

Dummy Serial Number: 124

Test Date: 01/30/2014

Technician: Jessica Gall

 Pre test calibration
 X Post test calibration verification

Test attempt no. 1 (when successive flexion tests are necessary)

 X 1. It has been at least 30 minutes since the last flexion test. (572.137(q))
 X N/A, ONLY one neck test performed

 X 2. The components required for the neck tests include the head assembly (880105-100X), neck (880105-250), bib simulator (880105-371), upper neck adjusting bracket (880105-207), lower neck adjusting bracket (880105-208), six axis neck transducer (SA572-S11) and either three accelerometers (SA572-S4) or their mass equivalent installed in the head assembly as specified in drawing 880105-100X. Data from the accelerometers are not required. (572.133(b))

 X 3. The assembly soaked at a temperature between 20.6°C (69°F) and 22.2°C (72°F) and at a relative humidity from 10% to 70% for a period of at least four (4) hours prior to a test. (572.133(c)(1))

Record the maximum temperature:	<u>21.1°C</u>
Record the minimum temperature:	<u>20.6°C</u>
Record the maximum humidity:	<u>15%</u>
Record the minimum humidity:	<u>12%</u>

 X 4. Visually inspect neck assembly for cracks, cuts and separation of the rubber from the metal segments. Note: If the damage resulted from the vehicle crash test in which the dummy was an occupant, the damaged area is to be documented with photography and the post test calibration verification testing completed before any replacement or repairs are made.

Record findings and actions: No damage

 X 5. Inspect the nodding blocks (78051-351) for any deterioration, but when replacement is necessary, ONLY replace during pre-test calibration. Using a Shore "A" type Durometer, verify the hardness of the nodding blocks is between 80 and 90. Ensure the nodding blocks are installed correctly. (880105-250 and PADI page17).

Record findings and actions: No Deterioration; Hardness: Front 89; Back 90.

 X 6. Torque the jam nut (9000018) on the neck cable (880105-206) to 1.4 ± 0.2 Nm (12.0 ± 2.0 in-lb). (572.133(c)(2))

- X 7. The data acquisition system, including transducers, conforms to the requirements of SAE Recommended Practice J211/1 MAR95. (572.137(m))
- X 8. The test fixture pendulum conforms to the specifications in Figure 7B. (572.133(c)(3))
- X 9. The head-neck assembly is mounted on the pendulum so the midsagittal plane of the head is vertical and coincides with the plane of motion of the pendulum longitudinal centerline as shown in Figure 8B for the flexion test. (572.133(c)(3))
- X 10. Install the transducers or other devices for measuring the "D" plane rotation with respect to the pendulum longitudinal centerline. Note: Plane "D" is the bottom horizontal surface of the skull. These measurement devices should be designed to minimize their influence upon the performance of the head-neck assembly. An example of a measurement device is shown in Figure 10B.
- X 11. With the pendulum resting against the honeycomb material, the neck bracket was adjusted until the longitudinal centerline of the pendulum was perpendicular ± 1 degree to plane "D" on the dummy's head.
- X 12. Release the pendulum and allow it to fall freely from a height to achieve an impact speed of 6.89 m/s to 7.13 m/s as measured at the center of the pendulum accelerometer. (572.133(c)(4)(i))
- X 13. Complete the following table:

Neck Flexion Test Results (572.133(b)(1) & 572.133(c)(4)(i & ii))

Parameter		Specification	Results
Pendulum impact speed		6.89 m/s $\leq$ speed $\leq$ 7.13 m/s	6.96 m/s
Pendulum ΔV with respect to impact speed	@ 10 ms	2.1 m/s $\leq \Delta V \leq$ 2.5 m/s	2.4 m/s
	@ 20 ms	4.0 m/s $\leq \Delta V \leq$ 5.0 m/s	4.7 m/s
	@ 30 ms	5.8 m/s $\leq \Delta V \leq$ 7.0 m/s	6.5 m/s
Plane D Rotation		Peak moment* 69 Nm $\leq$ moment $\leq$ 83 Nm during the following rotation range 77° $\leq$ angle $\leq$ 91°	69 Nm @ 79 degrees
Positive Moment Decay** (Flexion)		Time to decay to 10 Nm 80 ms $\leq$ time $\leq$ 100 ms	84 ms

*Moment about the occipital condyle = $M_y - (0.01778 \text{ m} \times F_x)$ (572.133(b)(1)(ii))

M_y = Moment in Nm measured by the transducer

F_x = Force, in N measured by the transducer

**Time zero is defined as the time of initial contact between the pendulum striker plate and the honeycomb material. (572.133(b)(3))

- X 14. Plots of acceleration, velocity, y-axis moment, and x-axis force and y-axis moment about the occipital condyle follows this sheet.


Signature

01/30/2014
Date

MGA RESEARCH CORPORATION

NECK FLEXION TEST

HYBRID III 5TH PERCENTILE

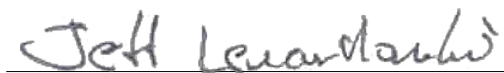
ATD Serial No: 124

Test I.D: D14312

Tested Parameter		Units	Specification	Result	Pass/Fail
Laboratory Temperature		deg C	20.6 to 22.2	20.7	Pass
Laboratory Relative Humidity		%	10 to 70	15	Pass
Pendulum Speed		m/s	6.89 to 7.13	6.96	Pass
Pendulum Velocity	10 ms	m/s	2.1 to 2.5	2.4	Pass
	20 ms	m/s	4.0 to 5.0	4.7	Pass
	30 ms	m/s	5.8 to 7.0	6.5	Pass
D Plane Rotation	Max	deg	77 to 91	79	Pass
Occipital Condyle Moment within Rotation Corridor		Nm	69 to 83	69	Pass
Positive Moment Time Curve Decay to 10 Nm		ms	80 to 100	84	Pass
Overall Results					Pass


 Laboratory Technician

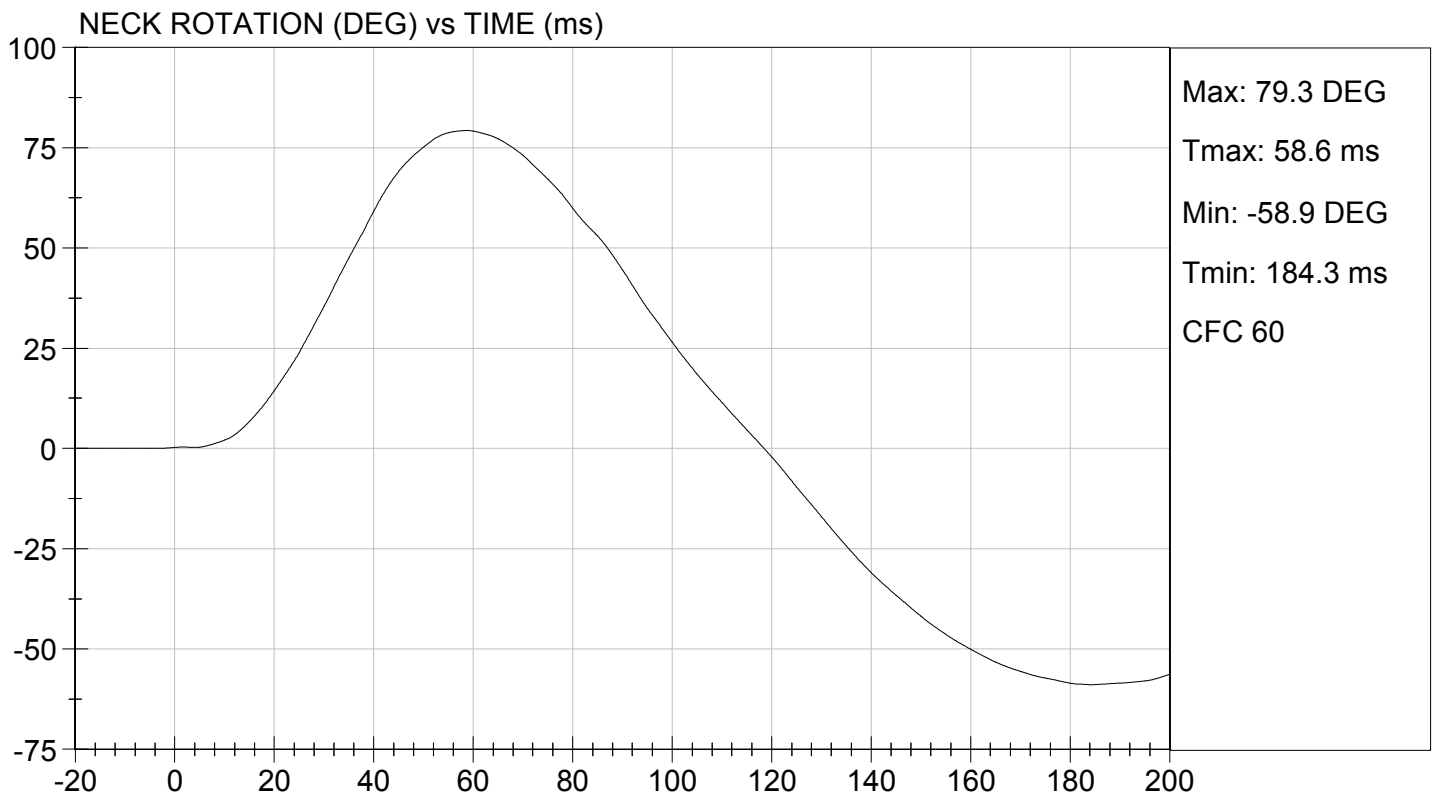
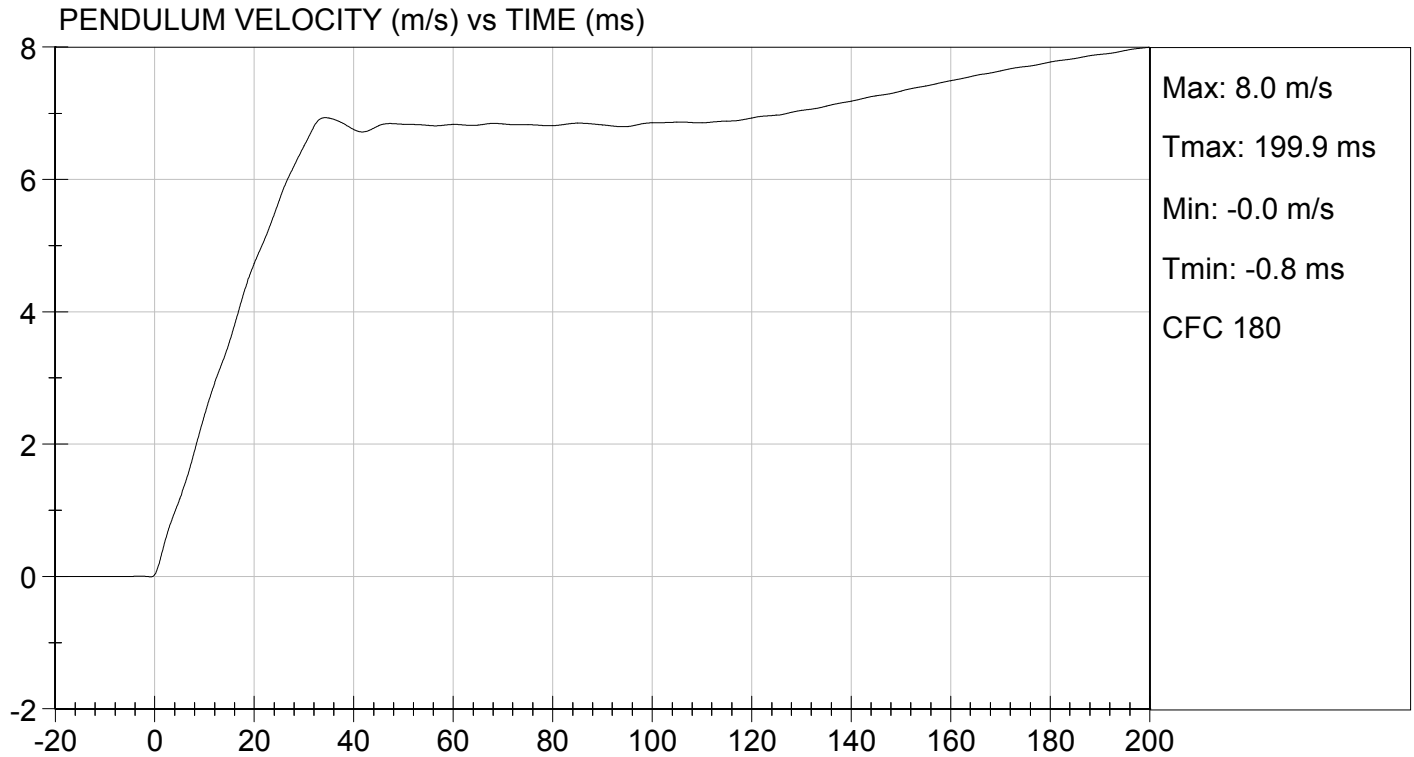
01/30/2014
 Test Date


 Approved By



TEST DESC: NECK FLEXION
VELOCITY: 22.83 ft/s, 6.96 m/s

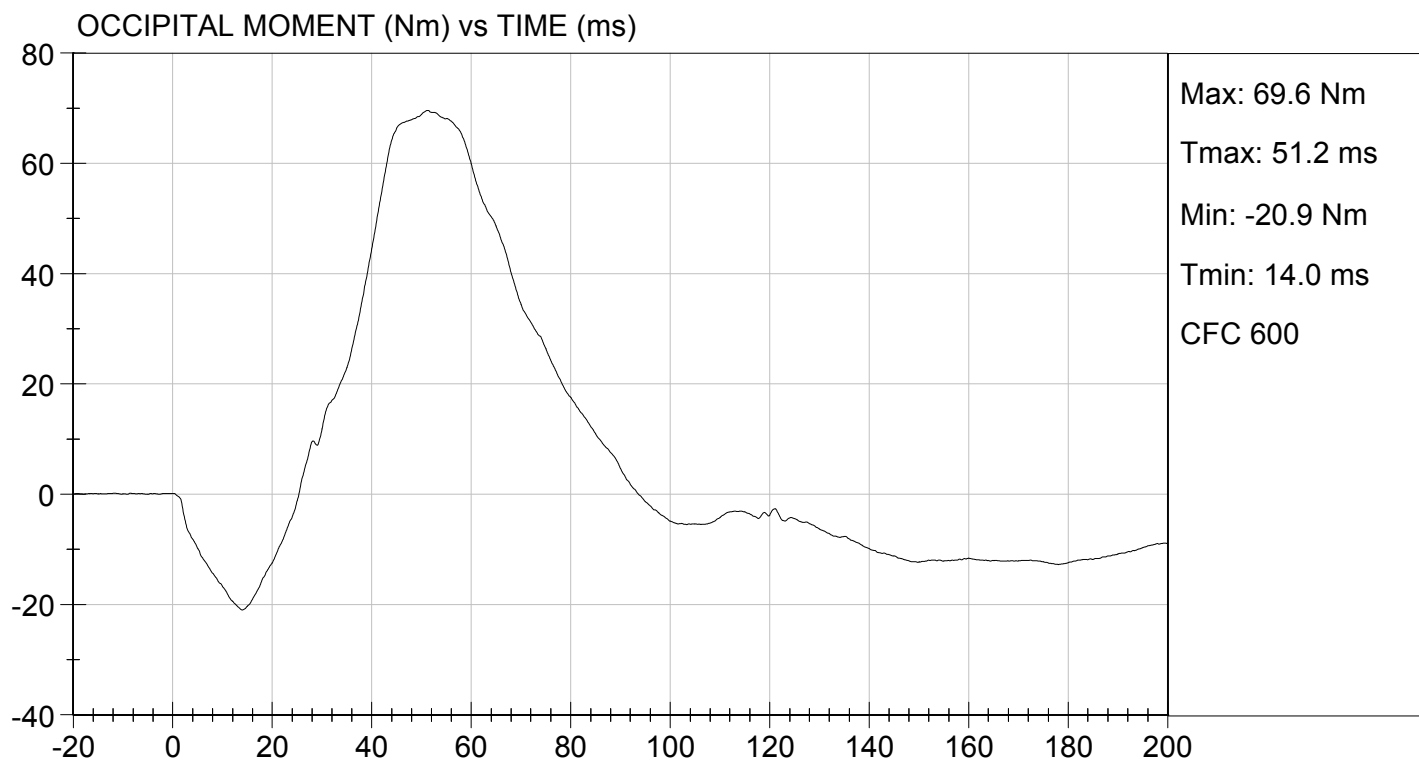
TEST DATE: 01/30/2014
TEST #: D14312





TEST DESC: NECK FLEXION
VELOCITY: 22.83 ft/s, 6.96 m/s

TEST DATE: 01/30/2014
TEST #: D14312



DATA SHEET B5
NECK EXTENSION TEST (572.133) (5th Female)

Dummy Serial Number: 124

Test Date: 01/30/2014

Technician: Jessica Gall

- ☐ Pre test calibration
☒ Post test calibration verification

Test attempt no. 1 (when successive extension tests are necessary)

- ☒ 1. It has been at least 30 minutes since the last extension test. (572.137(q))
☒ N/A, ONLY one neck test performed
- ☒ 2. The components required for the neck tests include the head assembly (880105-100X), neck (880105-250), bib simulator (880105-371), upper neck adjusting bracket (880105-207), lower neck adjusting bracket (880105-208), six axis neck transducer (SA572-S11) and either three accelerometers (SA572-S4) or their mass equivalent installed in the head assembly as specified in drawing 880105-100X. Data from the accelerometers are not required. (572.133(b))
- ☒ 3. The assembly soaked at a temperature between 20.6°C (69°F) and 22.2°C (72°F) and at a relative humidity from 10% to 70% for a period of at least four (4) hours prior to a test. (572.133(c)(1))
- | | |
|---------------------------------|---------------|
| Record the maximum temperature: | <u>21.1°C</u> |
| Record the minimum temperature: | <u>20.6°C</u> |
| Record the maximum humidity: | <u>15%</u> |
| Record the minimum humidity: | <u>12%</u> |
- ☒ 4. Visually inspect neck assembly for cracks, cuts and separation of the rubber from the metal segments. Note: If the damage resulted from the vehicle crash test in which the dummy was an occupant, the damaged area is to be documented with photography and the post test calibration verification testing completed before any replacement or repairs are made.
- Record findings and actions: No damage
- ☒ 5. Inspect the nodding blocks (78051-351) for any deterioration, but when replacement is necessary, ONLY replace during pre-test calibration. Using a Shore "A" type Durometer, verify the hardness of the nodding blocks is between 80 and 90. Ensure the nodding blocks are installed correctly. (880105-250 and PADI page17).
- Record findings and actions: No Deterioration; Hardness: Front 89; Back 90.
- ☒ 6. Torque the jam nut (9000018) on the neck cable (880105-206) to 1.4 ± 0.2 Nm (12.0 ± 2.0 in-lb). (572.133(c)(2))

- X 7. The data acquisition system, including transducers, conforms to the requirements of SAE Recommended Practice J211/1 MAR95. (572.137(m))
- X 8. The test fixture pendulum conforms to the specifications in Figure 7B. (572.133(c)(3))
- X 9. The head-neck assembly is mounted on the pendulum so the midsagittal plane of the head is vertical and coincides with the plane of motion of the pendulum longitudinal centerline as shown in Figure 9B for the extension test. (572.133(c)(3))
- X 10. Install the transducers or other devices for measuring the "D" plane rotation with respect to the pendulum longitudinal centerline. Note: Plane "D" is the bottom horizontal surface of the skull. These measurement devices should be designed to minimize their influence upon the performance of the head-neck assembly. An example of a measurement device is shown in Figure 10B.
- X 11. With the pendulum resting against the honeycomb material, the neck bracket was adjusted until the longitudinal centerline of the pendulum was perpendicular ± 1 degree to plane "D" on the dummy's head.
- X 12. Release the pendulum and allow it to fall freely from a height to achieve an impact speed of 5.95 m/s to 6.19 m/s as measured at the center of the pendulum accelerometer. (572.133(c)(4)(i))
- X 13. Complete the following table:
Neck Extension Test Results (572.133(b)(2) & 572.133(c)(4)(I & ii))

Parameter		Specification	Results
Pendulum impact speed		$5.95 \text{ m/s} \leq \text{speed} \leq 6.19 \text{ m/s}$	6.12 m/s
Pendulum ΔV with respect to impact speed	@ 10 ms	$1.5 \text{ m/s} \leq \Delta V \leq 1.9 \text{ m/s}$	1.6 m/s
	@ 20 ms	$3.1 \text{ m/s} \leq \Delta V \leq 3.9 \text{ m/s}$	3.3 m/s
	@ 30 ms	$4.6 \text{ m/s} \leq \Delta V \leq 5.6 \text{ m/s}$	4.7 m/s
Plane D Rotation		Peak moment* $-65 \text{ Nm} \leq \text{moment} \leq -53 \text{ Nm}$ during the following rotation range $99^\circ \leq \text{angle} \leq 114^\circ$	-56 Nm @ 102 degrees
Positive Moment Decay** (Extension)		Time to decay to -10 Nm $94 \text{ ms} \leq \text{time} \leq 114 \text{ ms}$	105 ms

*Moment about the occipital condyle = $M_y - (0.01778 \text{ m} \times F_x)$ (572.133(b)(1)(ii))

M_y = Moment in Nm measured by the transducer

F_x = Force, in N measured by the transducer

**Time zero is defined as the time of initial contact between the pendulum striker plate and the honeycomb material. (572.133(b)(3))

- X 14. Plots of acceleration, velocity, y-axis moment, and x-axis force and y-axis moment about the occipital condyle follow this sheet.

Jessica Hall
Signature

01/30/2014
Date

MGA RESEARCH CORPORATION
NECK EXTENSION TEST
HYBRID III 5TH PERCENTILE

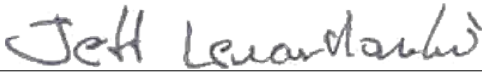
ATD Serial No: 124

Test I.D: D14313

Tested Parameter		Units	Specification	Result	Pass/Fail
Laboratory Temperature		deg C	20.6 to 22.2	20.7	Pass
Laboratory Relative Humidity		%	10 to 70	15	Pass
Pendulum Speed		m/s	5.95 to 6.19	6.12	Pass
Pendulum Velocity	10 ms	m/s	1.5 to 1.9	1.6	Pass
	20 ms	m/s	3.1 to 3.9	3.3	Pass
	30 ms	m/s	4.6 to 5.6	4.7	Pass
D Plane Rotation	Max	deg	99 to 114	102	Pass
Occipital Condyle Moment within Rotation Corridor		Nm	-65 to -53	-56	Pass
Negative Moment Time Curve Decay to -10 Nm		ms	94 to 114	105	Pass
Overall Results					Pass


 Laboratory Technician

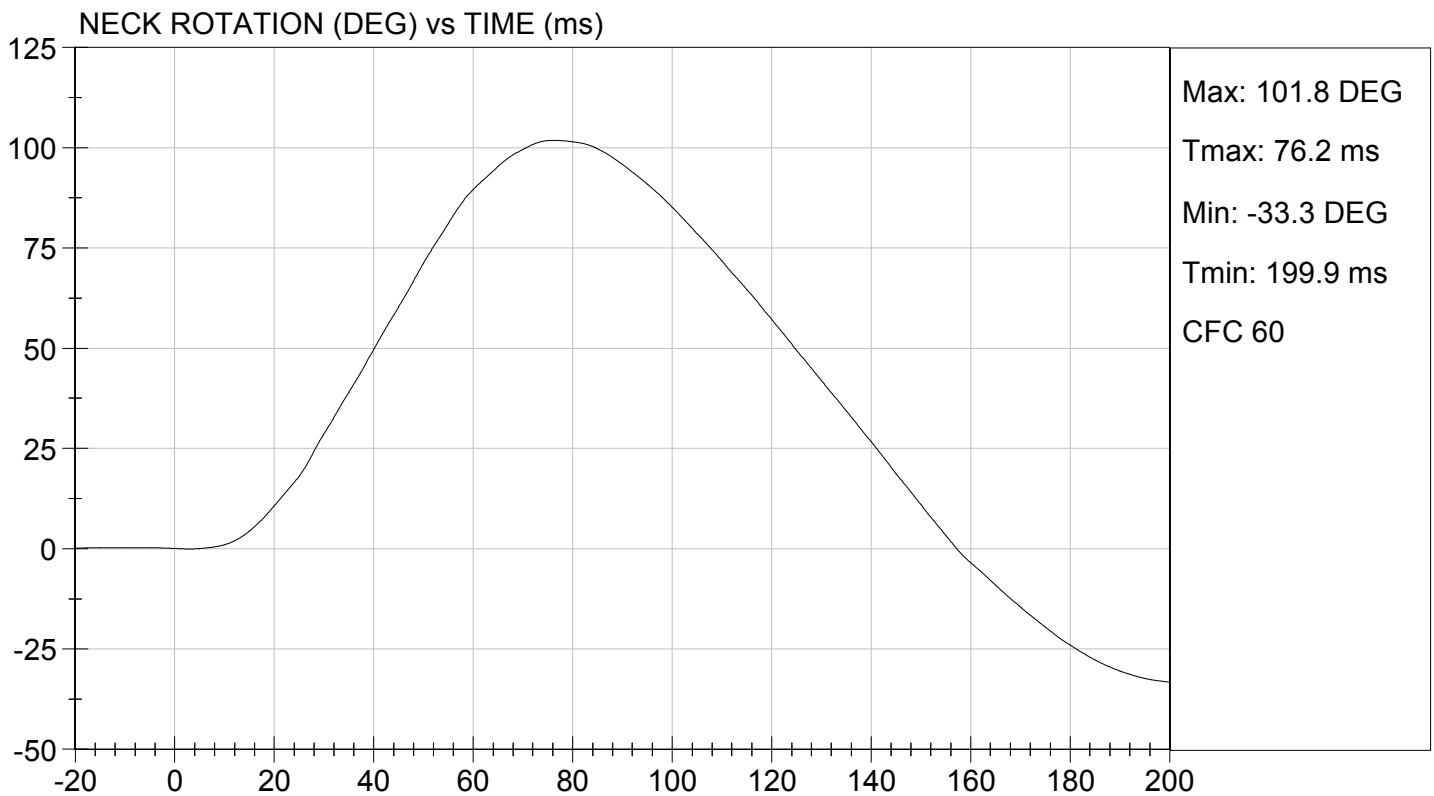
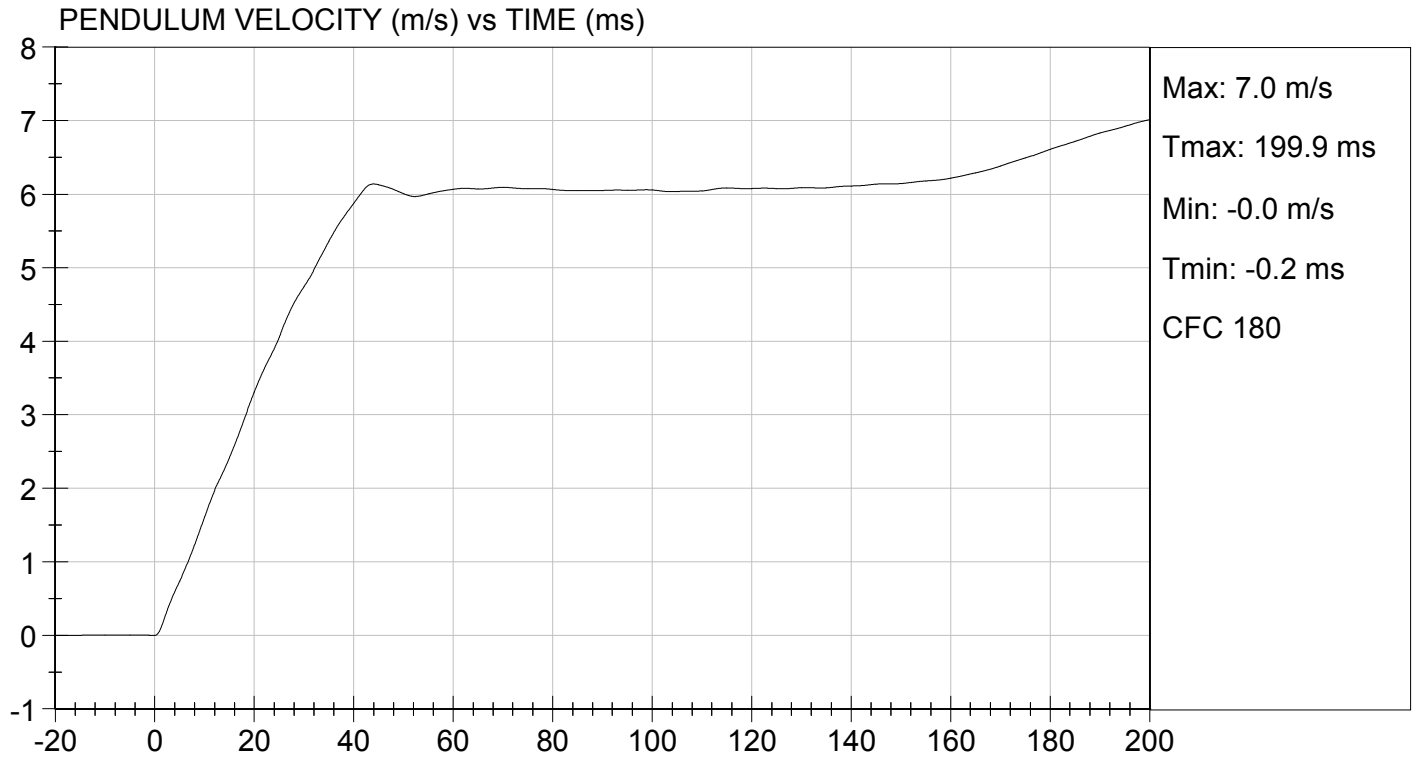
01/30/2014
 Test Date


 Approved By



TEST DESC: NECK EXTENSION
VELOCITY: 20.08 ft/s, 6.12 m/s

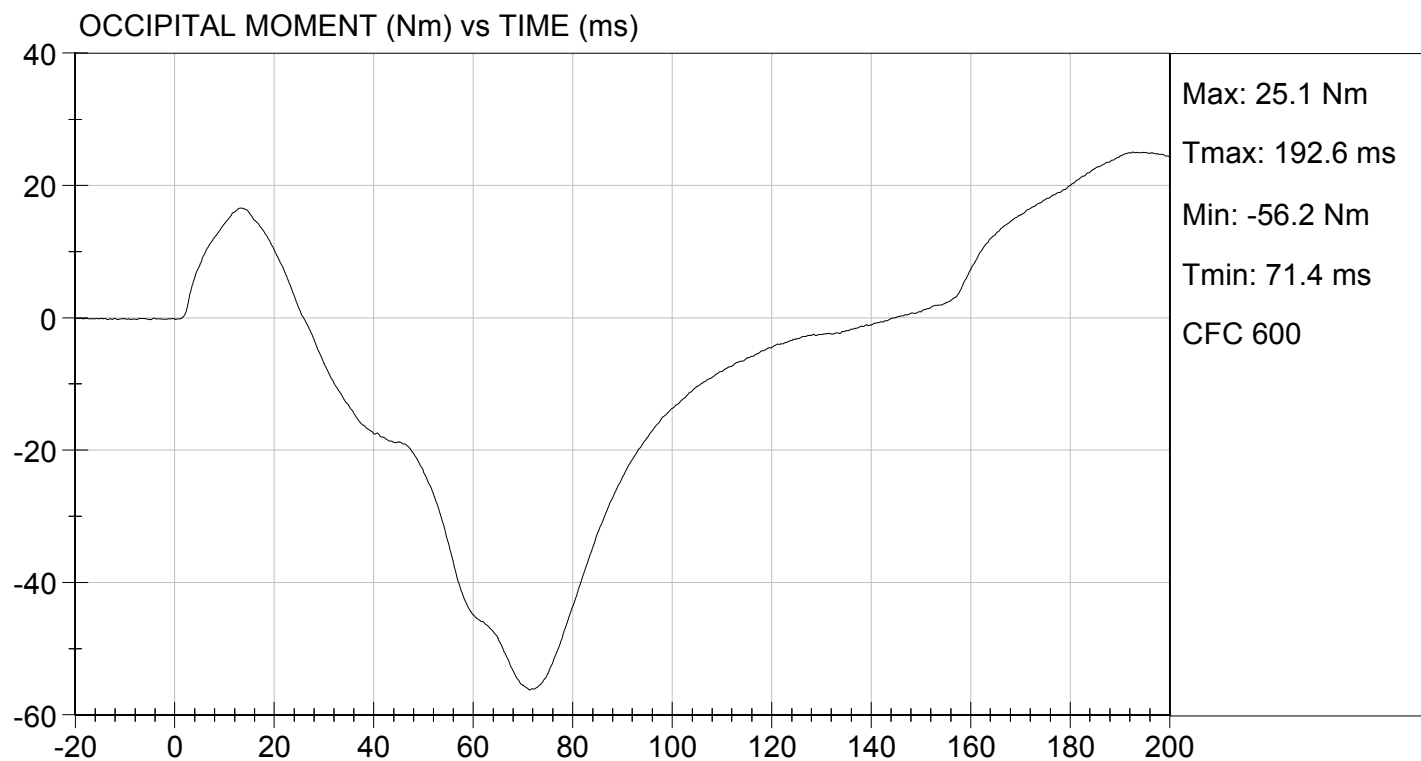
TEST DATE: 01/30/2014
TEST #: D14313





TEST DESC: NECK EXTENSION
VELOCITY: 20.08 ft/s, 6.12 m/s

TEST DATE: 01/30/2014
TEST #: D14313



DATA SHEET B6
THORAX IMPACT TEST (572.134) (5th Female)

Dummy Serial Number: 124

Test Date: 01/30/2014

Technician: Jessica Gall

 Pre test calibration
 X Post test calibration verification

Test attempt no. 1 (when successive thorax impact tests are necessary)

- X 1. It has been at least 30 minutes since the last thorax impact test. (572.137(q))
 X N/A, ONLY one thorax impact test performed
- X 2. The test fixture conforms to the specifications in Figure 11B.
- X 3. The complete assembled dummy (880105-000) is used (572.134(b)) and is dressed in a form fitting cotton stretch above-the-elbow sleeved shirt and above-the-knee pants. The weight of the shirt and pants shall not exceed 0.14 kg. (572.134(c)(1))
- X 4. The dummy assembly soaked at a temperature between 20.6°C (69°F) and 22.2°C (72°F) and at a relative humidity from 10% to 70% for a period of at least four (4) hours prior to this test. (572.134(c)(2))

Record the maximum temperature:	<u>21.1°C</u>
Record the minimum temperature:	<u>20.6°C</u>
Record the maximum humidity:	<u>15%</u>
Record the minimum humidity:	<u>12%</u>

- X 5. Remove the chest skin and visually inspect the thorax assembly for cracks, cuts, abrasions, etc. Particular attention should be given to the rib damping material, chest displacement transducer assembly and the rear rib supports. Inspect for rib deformation using the chest depth gage. If any damage is noted repair and/or replace the damaged components unless the damage resulted from the vehicle crash test in which the dummy was an occupant in which case the damage must be documented and post test calibration verification testing completed before any repairs or replacements are made.

X - No Damage

 - Damage from crash test, no repairs or replacement because this is a post test calibration verification. Record damage:

 - The following repairs or replacement was performed. Record:

- X 6. Seat the dummy, (chest skin still removed) without back and arm supports on the test fixture surface as shown in Figure 11B. The surface must be long enough to support the pelvis and outstretched legs. (572.134(c)(3))
- X 7. Level the ribs both longitudinally and laterally $\pm 0.5^\circ$ and adjust the pelvis angle to $7^\circ \pm 2^\circ$. The angle may be measured using the special H-point tool (TE-2504) that inserts into the pelvic structure and extends outward beyond the pelvic skin surface or by using the surface of the pelvic adaptor block.
- X 8. The midsagittal plane of the dummy is vertical within $\pm 1^\circ$. (572.134(c)(3))
- X 9. The longitudinal centerline of the test probe is centered within ± 2.5 mm of the midsagittal plane of the dummy and is $12.7 \text{ mm} \pm 1 \text{ mm}$ below the horizontal peripheral centerline of the No. 3 rib and is within 0.5° of a horizontal line in the dummy's midsagittal plane. (572.134(c)(4))
- X 10. Align the adjustable neck bracket index marks to the "zero" position.
- X 11. Record locations such as the rear surfaces of the thoracic spine and the lower neck bracket reference with respect to the laboratory coordinate system. These reference measurements are necessary to ensure the dummy is in the same position after the chest skin is installed. The reference locations must be accessible after installation of the chest skin. It may be necessary to leave the chest skin zipper unfastened until the references are checked and fasten it just prior to the test.
- X 12. Install the chest skin and reposition the dummy as described in the preceding paragraph using the reference measurements recorded.
- X 13. Place the arm assemblies horizontal $\pm 2^\circ$ and parallel to the midsagittal plane. The arms are held in place by tightening the adjustment nut that holds the arm yoke to the clavicle assembly.
- X 14. The data acquisition system, including transducers, must conform to the requirements of SAE Recommended Practice J211/1 MAR95 (572.136(m)) Class 180.
- X 15. Impact the anterior surface of the thorax with the test probe so the longitudinal centerline of the probe is within 2° of a horizontal line in the dummy's midsagittal plane at the moment of impact. (572.134(c)(5)) The velocity of the test probe at the time of impact is $6.71 \text{ m/s} \pm 0.12 \text{ m/s}$. (572.134(b)) The probe is guided so there is no significant lateral, vertical or rotational movement during the impact. (572.134(c)(6)) Neither the suspension hardware, suspension cables, nor other attachments to the probe, including the velocity vane, make contact with the dummy. (572.134(c)(7))

X 16. Complete the following table:

Thorax Impact Results (572.134(b) and 572.134(b)(1)&(2))

Parameter*	Specification	Result
Test Probe Speed	$6.59 \text{ m/s} \leq \text{speed} \leq 6.83 \text{ m/s}$	6.77 m/s
Chest Compression	$50.0 \text{ mm} \leq \text{compression} \leq 58.0 \text{ mm}$	52 mm
Peak force** between 50.0 and 58.0 mm chest compression	$3900\text{N} \leq \text{peak force} \leq 4400\text{N}$	4382 N
Peak Force** between 18.0 and 50.0 mm chest compression	Peak Force $\leq 4600 \text{ N}$	4447 N
Internal Hysteresis***	$69\% \leq \text{hysteresis} \leq 85\%$	71%

*Time zero is defined as the time of initial contact between the test probe and the chest skin.

**Force = impactor mass x acceleration (572.134(b)(3))

***Area under loading curve minus the area under the unloading curve divided by the area under the loading curve. (Figure 12B)

 X 17. Plots of chest compression, acceleration, force, force versus deflection follow this sheet.

 Jessica Hall
Signature

 01/30/2014
Date

MGA RESEARCH CORPORATION
THORAX IMPACT
HYBRID III 5TH PERCENTILE

ATD Serial No: 124

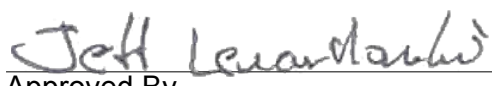
Test I.D: D14314

Tested Parameter	Units	Specification	Result	Pass/Fail
Temperature	deg C	20.6 to 22.2	21.1	Pass
Relative Humidity	%	10 to 70	15	Pass
Probe Speed	m/s	6.59 to 6.83	6.77	Pass
Peak Deflection	mm	50 to 58	52	Pass
Peak Resistive Force w/in Deflection Corridor	N	3900 to 4400	4382	Pass
Internal Hysteresis	%	69 to 85	71	Pass
Peak Force 18 mm - 50 mm	N	<= 4600	4447	Pass
Overall Test Results				Pass


 Laboratory Technician

01/30/2014

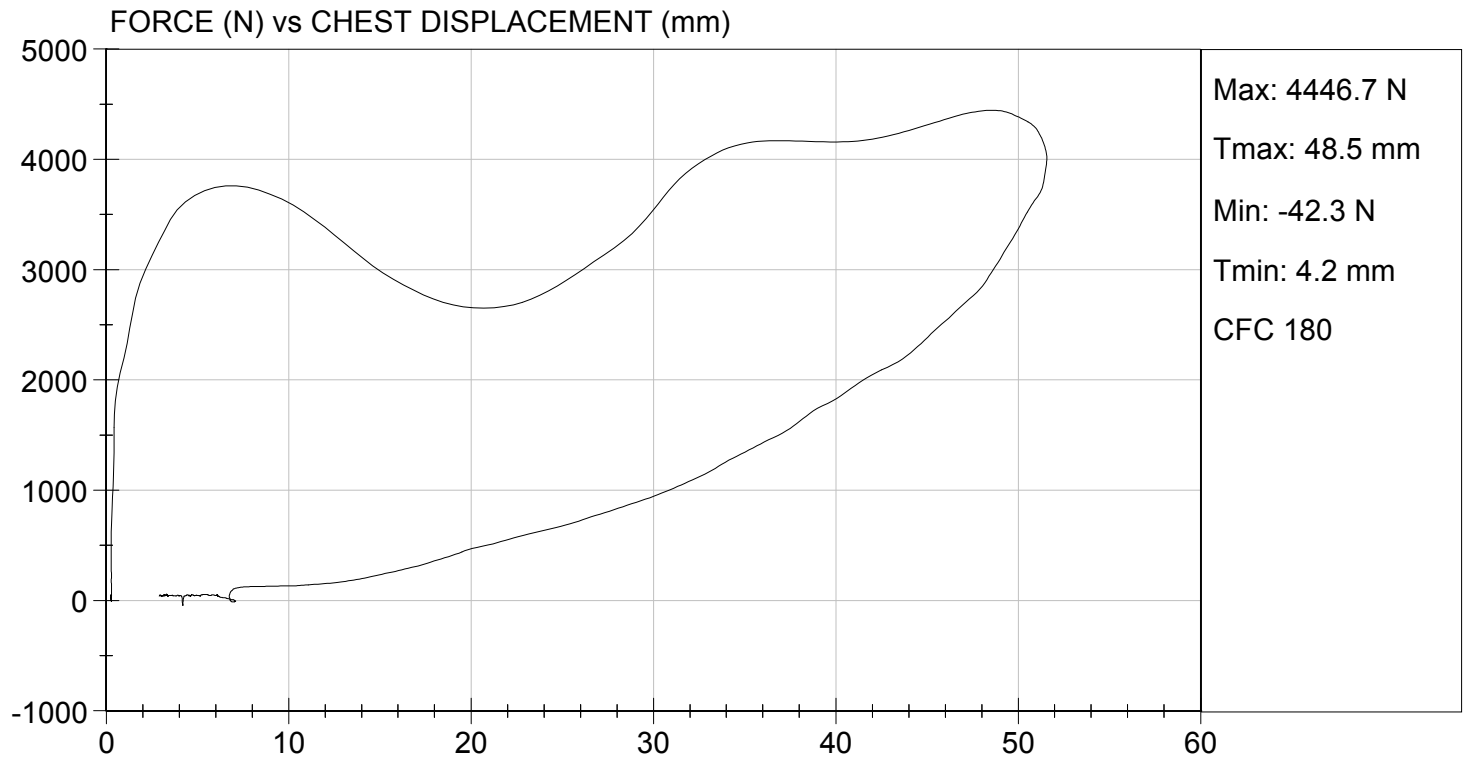
Test Date


 Approved By



TEST DESC: THORAX IMPACT
VELOCITY: 22.22 ft/s, 6.77 m/s

TEST DATE: 01/30/2014
TEST #: D14314



DATA SHEET B7
TORSO FLEXION TEST (572.135) (5th Female)

Dummy Serial Number: 124

Test Date: 01/30/2014

Technician: Tim Grochowske

 Pre test calibration
 X Post test calibration verification

Test attempt no. 1 (when successive torso flexion tests are necessary)

- X 1. It has been at least 30 minutes since the last torso flexion test. (572.137(q))
 X N/A, ONLY one torso flexion test performed
- X 2. The test fixture conforms to the specifications in Figure 13B.
- X 3. The complete assembled dummy (880105-000) is used (572.135(c)(2)).
 With legs below femurs.
 X Without legs below femurs.
- X 4. The dummy assembly soaked at a temperature between 18.9°C (66°F) and 25.6°C (78°F) and at a relative humidity from 10% to 70% for a period of at least four (4) hours prior to this test. (572.135(c)(1))
- | | |
|---------------------------------|---------------|
| Record the maximum temperature: | <u>21.1°C</u> |
| Record the minimum temperature: | <u>20.6°C</u> |
| Record the maximum humidity: | <u>15%</u> |
| Record the minimum humidity: | <u>12%</u> |
- X 5. Secure the pelvis to the fixture at the pelvis instrument cavity rear face by threading four ¼ cap screws into the available threaded attachment holes. Tighten the mountings so that the test material is rigidly affixed to the test fixture and the pelvic lumbar joining surface is horizontal. (572.135(c)(3))
- X 6. Attach the loading adapter bracket to the spine of the dummy as shown in Figure 13B. (572.135(c)(4))
- X 7. Inspect and adjust, if necessary, the seating of the abdominal insert within the pelvis cavity and with respect to the torso flesh, assuring that the torso flesh provides uniform fit and overlap with respect to the outside surface of the pelvis flesh. (572.135(c)(5))
- X 8. Flex the dummy forward and back 3 times such that the angle reference plane moves between 0° and 30° with respect to the vertical transverse plane. (572.135(c)(6))

- X 9. Support the dummy such that the angle reference plane is at or near 0° (vertical with respect to the vertical transverse plane). Wait at least 30 minutes before continuing. (572.135(c)(6))
- X 10. Remove all external support that was implemented in 9 above. (572.135(c)(7))
- X 11. Measure the initial orientation angle of the torso reference plane of the seated, unsupported dummy. (572.135(c)(7))
 Record reference plane angle (max. allowed 20°): See Result Table
- X 12. Attach the pull cable and the load cell. (572.135(c)(8))
- X 13. Apply a tension force in the midsagittal plane to the pull cable at any upper torso deflection rate between 0.5° and 1.5° per second, until the angle reference plane is at 45° ± 0.5° of flexion relative to the vertical transverse plane. (572.135(c)(9))
- X 14. Maintain angle reference plane at 45° ± 0.5° of flexion for 10 seconds. (572.135(c)(10))
- X 15. As quickly as possible release the force applied to the attachment bracket. (572.135(c)(11))
- X 16. 3 minutes after the release of the force, measure the reference plane angle. (572.135(c)(11))
- X 17. Complete the following table:
 Torso Flexion Results (572.135(b), 572.135(c)(7), 572.135(c)(9))

Parameter	Specification	Result
Initial ref. plane angle	Angle ≤ 20°	17 deg
Torso rotation rate	0.5°/s ≤ rate ≤ 1.5°/s	0.9 deg/sec
Force at 45° ± 0.5°	320 N ≤ force ≤ 390 N	388 N
Final ref. plane angle	Initial ref. plane angle ± 8°	19 deg

 Tim Archambault
 Signature

 01/30/2014
 Date

MGA RESEARCH CORPORATION

TORSO FLEXION TEST

HYBRID III 5TH PERCENTILE

ATD Serial No: 124

Test I.D: D14317

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 to 25.6	20.6	Pass
Laboratory Relative Humidity	%	10 to 70	15	Pass
Initial Angle	deg	0 to 20	17	Pass
Return Angle	deg	+/- 8	19	Pass
Force at 45 deg	N	320 to 390	388	Pass
Upper Torso Deflection Rate	deg/s	0.5 to 1.5	0.9	Pass
Overall Result				Pass


Laboratory Technician

01/30/2014

Test Date


Approved By

DATA SHEET B8
LEFT KNEE IMPACT TEST (572.136) (5th Female)

Dummy Serial Number: 124

Test Date: 01/30/2014

Technician: Tim Grochowske

 Pre test calibration
 X Post test calibration verification

Test attempt no. 1 (when successive knee impact tests are necessary)

- X 1. It has been at least 30 minutes since the last knee impact test. (572.137(q))
 X N/A, ONLY one knee impact test performed
- X 2. The test fixture conforms to the specifications in Figure 14B.
- X 3. The knee assembly (880105-528L), lower leg structural replacement (880105-603), lower leg flesh (880105-601), ankle assembly (880105-660), foot assembly (880105-650), and femur load transducer (SA572-S14) (may use the load cell structural replacement (78051-319)) were used. (572.136(b)(1))
- X 4. The knee assembly soaked at a temperature between 18.9°C (66°F) and 25.6°C (78°F) and at a relative humidity from 10% to 70% for a period of at least four (4) hours prior to this test. (572.136(c)(1))
- | | |
|---------------------------------|---------------|
| Record the maximum temperature: | <u>21.1°C</u> |
| Record the minimum temperature: | <u>20.6°C</u> |
| Record the maximum humidity: | <u>15%</u> |
| Record the minimum humidity: | <u>12%</u> |
- X 5. Mount the test specimen and secure it to the rigid test fixture. (572.136(c)(2))
- X 6. No parts of the foot or tibia contact any exterior surface. (572.136(c)(2))
- X 7. Align the test probe so that throughout its stroke and at contact with the knee it is within 2 degrees of horizontal and collinear with the longitudinal centerline of the femur. (572.136(c)(3))
- X 8. The probe is guided so there is no significant lateral, vertical or rotational movement during the impact with the knee. (572.136(c)(4))
- X 9. The data acquisition system, including transducers, must conform to the requirements of SAE Recommended Practice J211/1 MAR95 (572.136(m)) Class 600.

X 10. Contact the knee with the test probe at a speed between 2.07 m/s and 2.13 m/s.
(572.136(c)(5)) Neither the suspension hardware, suspension cables, nor other
attachments to the probe, including the velocity vane, make contact with the dummy.
(572.136(c)(6))

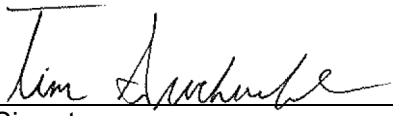
 X 11. Complete the following table:

Knee Impact Results (572.136(b)(1) and 572.136(c)(5))

Parameter	Specification	Result
Probe speed	$2.07 \text{ m/s} \leq \text{speed} \leq 2.13 \text{ m/s}$	2.12 m/s
Peak resistance force*	$3450 \text{ N} \leq \text{force} \leq 4060 \text{ N}$	3497 N

*Force = impactor mass x deceleration (572.136(b)(2))

 X 12. Plots of acceleration versus time and force versus time follow this sheet.



Signature

01/30/2014

Date

MGA RESEARCH CORPORATION

**LEFT KNEE IMPACT TEST
HYBRID III 5TH PERCENTILE**

ATD Serial No: 124

Test I.D: D14316

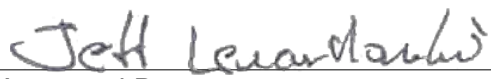
Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 to 25.6	21.7	Pass
Laboratory Relative Humidity	%	10 to 70	15	Pass
Probe Speed	m/s	2.07 to 2.13	2.12	Pass
Maximum Force	N	3450 to 4060	3497	Pass
Overall Test Results				Pass



Laboratory Technician

01/30/2014

Test Date

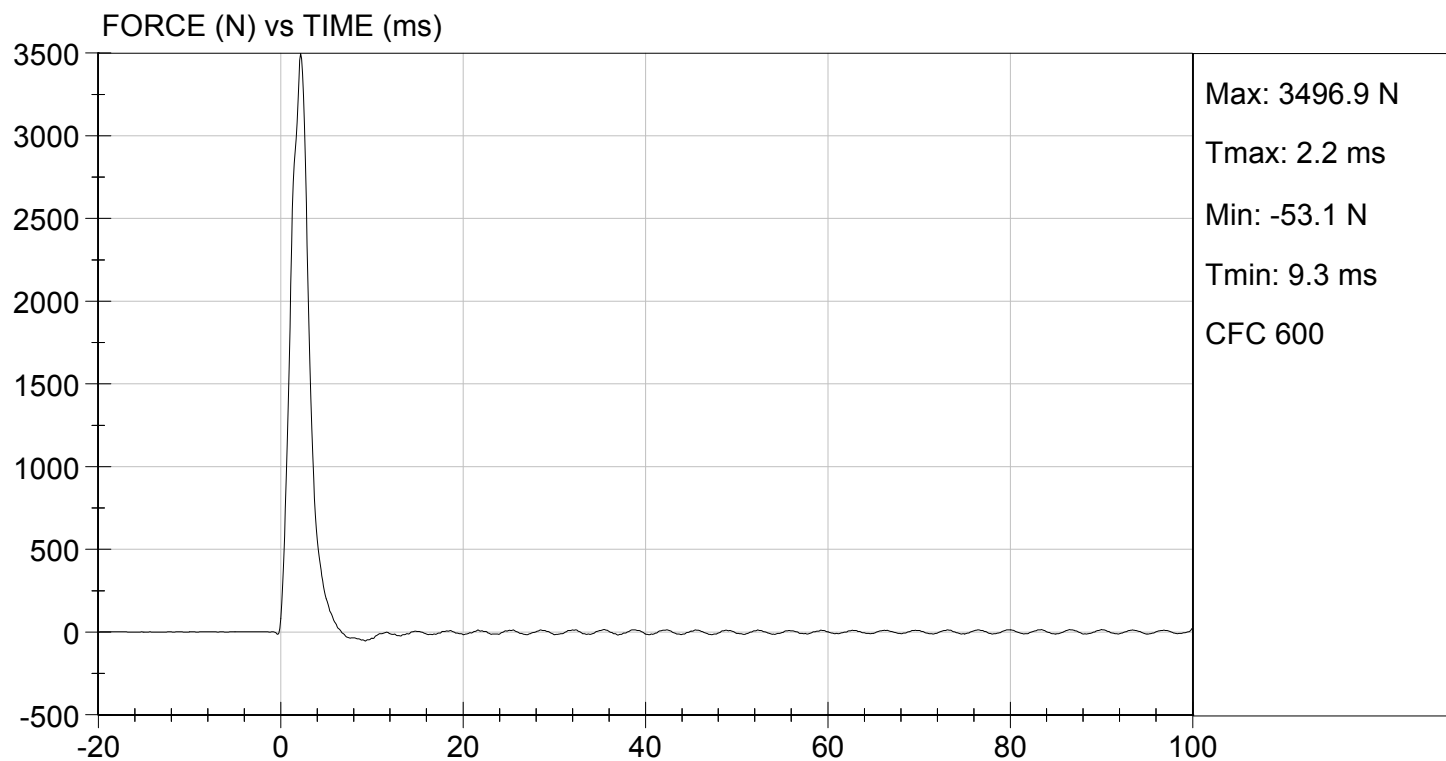


Approved By



TEST DESC: LEFT KNEE
VELOCITY: 6.97 ft/s, 2.12 m/s

TEST DATE: 01/30/2014
TEST #: D14316



DATA SHEET B9
RIGHT KNEE IMPACT TEST (572.136) (5th Female)

Dummy Serial Number: 124

Test Date: 01/30/2014

Technician: Tim Grochowske

 Pre test calibration
X Post test calibration verification

Test attempt no. 1 (when successive knee impact tests are necessary)

- X 1. It has been at least 30 minutes since the last knee impact test. (572.137(q))
X N/A, ONLY one knee impact test performed
- X 2. The test fixture conforms to the specifications in Figure 14B.
- X 3. The knee assembly (880105-528R), lower leg structural replacement (880105- 603), lower leg flesh (880105-601), ankle assembly (880105-660), foot assembly (880105-651), and femur load transducer (SA572-S14) (may use the load cell structural replacement (78051-319)) were used. (572.136(b)(1))
- X 4. The knee assembly soaked at a temperature between 18.9°C (66°F) and 25.6°C (78°F) and at a relative humidity from 10% to 70% for a period of at least four (4) hours prior to this test. (572.136(c)(1))

Record the maximum temperature:	<u>21.1°C</u>
Record the minimum temperature:	<u>20.6°C</u>
Record the maximum humidity:	<u>15%</u>
Record the minimum humidity:	<u>12%</u>

- X 5. Mount the test specimen and secure it to the rigid test fixture. (572.136(c)(2))
- X 6. No parts of the foot or tibia contact any exterior surface. (572.136(c)(2))
- X 7. Align the test probe so that throughout its stroke and at contact with the knee it is within 2 degrees of horizontal and collinear with the longitudinal centerline of the femur. (572.136(c)(3))
- X 8. The probe is guided so there is no significant lateral, vertical or rotational movement during the impact with the knee. (572.136(c)(4))
- X 9. The data acquisition system, including transducers, must conform to the requirements of SAE Recommended Practice J211/1 MAR95 (572.136(m)) Class 600.

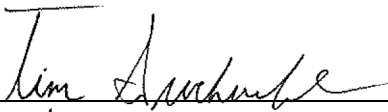
X 10. Contact the knee with the test probe at a speed between 2.07 m/s and 2.13 m/s.
(572.136(c)(5)) Neither the suspension hardware, suspension cables, nor other
attachments to the probe, including the velocity vane, make contact with the dummy.
(572.136(c)(6))

 X 11. Complete the following table:
Knee Impact Results (572.136(b)(1) and 572.136(c)(5))

Parameter	Specification	Result
Probe speed	$2.07 \text{ m/s} \leq \text{speed} \leq 2.13 \text{ m/s}$	2.12 m/s
Peak resistance force*	$3450 \text{ N} \leq \text{force} \leq 4060 \text{ N}$	3849 N

*Force = impactor mass x deceleration (572.136(b)(2))

 X 12. Plots of acceleration versus time and force versus time follow this sheet.



Signature

01/30/2014

Date

MGA RESEARCH CORPORATION

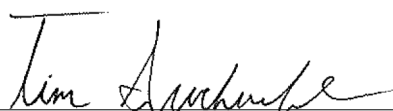
RIGHT KNEE IMPACT TEST

HYBRID III 5TH PERCENTILE

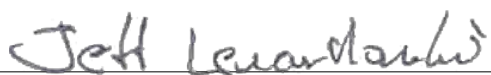
ATD Serial No: 124

Test I.D: D14315

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 to 25.6	21.7	Pass
Laboratory Relative Humidity	%	10 to 70	15	Pass
Probe Speed	m/s	2.07 to 2.13	2.12	Pass
Maximum Force	N	3450 to 4060	3849	Pass
Overall Test Results				Pass


Laboratory Technician

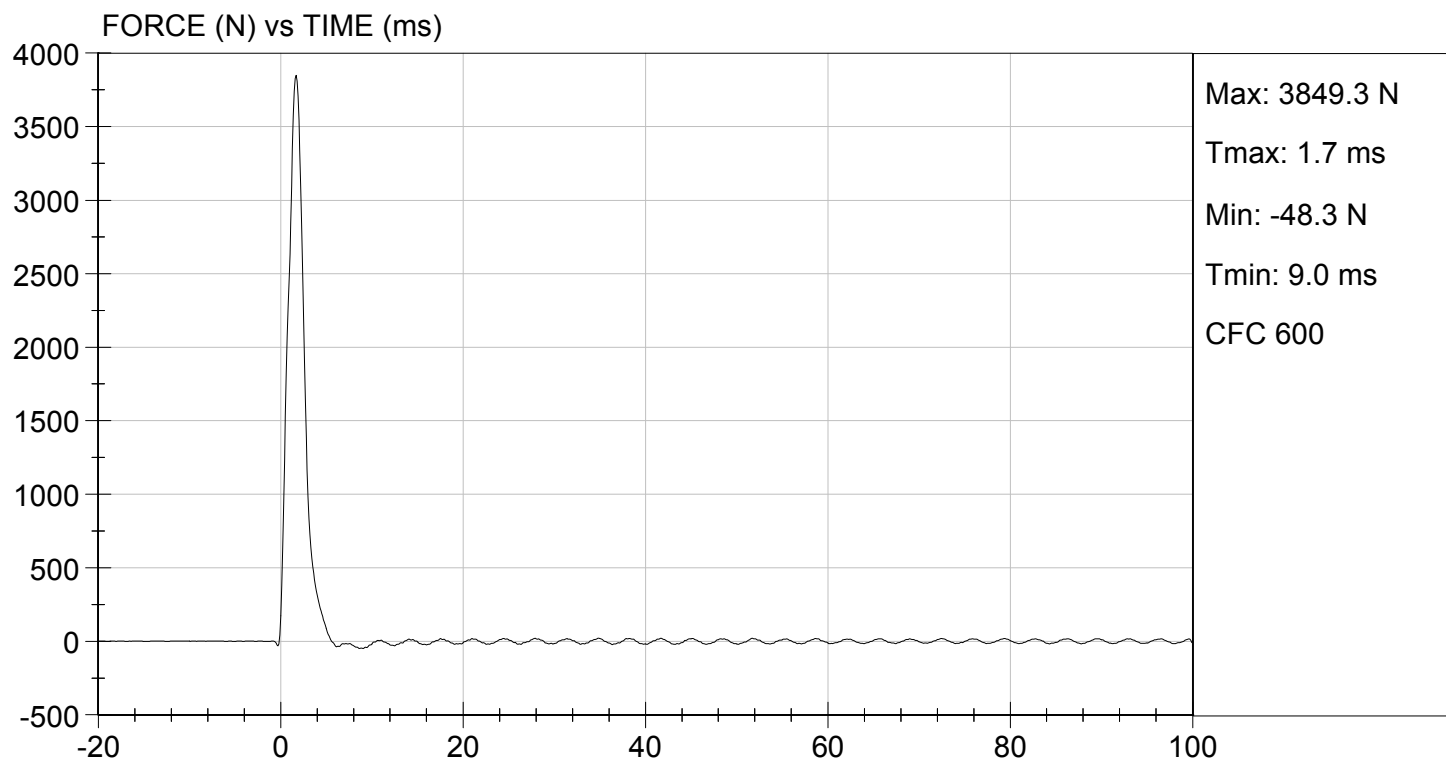
01/30/2014
Test Date


Approved By



TEST DESC: RIGHT KNEE
VELOCITY: 6.97 ft/s, 2.12 m/s

TEST DATE: 01/30/2014
TEST #: D14315



DATA SHEET B10

PART 572 INSTRUMENTATION CALIBRATION INFORMATION

I.D. NO.	MANUFACTURER	MODEL NO.	SERIAL NO.	DATE OF LAST CALIBRATION	DATE OF NEXT CALIBRATION
DUMMY INSTRUMENTATION					
HEAD ACCELEROMETERS					
(1) LONGITUDINAL	Endevco	7264C-2KTZ-2-360M17	P77650	01/16/2014	07/16/2014
(2) LATERAL	Endevco	7264C-2KTZ-2-360M17	P77651	01/16/2014	07/16/2014
(3) VERTICAL	Endevco	7264C-2KTZ-2-360M17	P77653	01/16/2014	07/16/2014
NECK TRANSDUCER	Denton	1716	1673	11/20/2013	05/20/2014
CHEST ACCELEROMETERS					
(1) LONGITUDINAL	Endevco	7264C-2KTZ-2-360M17	P78817	01/16/2014	07/16/2014
(2) LATERAL	Endevco	7264C-2KTZ-2-360M17	P78822	01/16/2014	07/16/2014
(3) VERTICAL	Endevco	7264C-2KTZ-2-360M17	P8825	01/16/2014	07/16/2014
CHEST POTENTIOMETER	Servo	14CBI-2897	124	01/20/2014	07/20/2014
FEMUR LOAD CELLS					
(1) RIGHT FEMUR	GSE	2430	1361	10/31/2013	05/01/2014
(2) LEFT FEMUR	GSE	2430	1362	10/31/2013	05/01/2014
LABORATORY INSTRUMENTATION					
NECK PENDULUM ACCELEROMETER	Endevco	7231C-750	AGH70	08/27/2013	02/27/2014
THORAX PENDULUM ACCELEROMETER	Endevco	7264C-2KTZ-2-240	P82319	11/01/2013	05/01/2014
KNEE PENDULUM ACCELEROMETER	Endevco	7264C-2KTZ-2-240	P77579	01/10/2014	07/10/2014
NECK ROTATION TRANSDUCER 1 (OPTIONAL)	Spectrol	132-0-0-102	18	08/13/2013	02/13/2014
NECK ROTATION TRANSDUCER 2 (OPTIONAL)	Spectrol	132-0-0-102	29	08/13/2013	02/13/2014

LABORATORY TECHNICIAN: Jessica Hall

DATA SHEET B1
DUMMY DAMAGE CHECKLIST

Dummy Serial Number: 124

Test Date: 01/27/2014

Technician: Jessica Gall

This check sheet is completed as part of the post test calibration verification.

X Perform general cleaning.

Dummy Item	Inspect for	Comments	Damage	OK
Outer skin	Gashes, rips, cracks			X
Head	Ballast secure			X
	General appearance			X
Neck	Broken or cracked rubber			X
	Upper neck bracket firmly attached to the lower neck bracket			X
	Looseness at the condyle joint			X
	Nodding blocks cracked or out of position			X
Spine	Broken or cracks in rubber			X
Ribs	Broken or bent ribs			X
	Broken or bent rib supports			X
	Damping material separated or cracked			X
	Rubber bumpers in place			X
Chest Displacement Assembly	Bent shaft			X
	Slider arm riding in track			X
Transducer leads	Torn cables			X
Accelerometer Mountings	Head mounting secure			X
	Chest mounting secure			X
Knees	Skin condition			X
	Insert (do not remove)			X
	Casting			X
Limbs	Normal movement and adjustment			X
Knee Sliders	Wires intact			X
	Rubber returned to "at rest" position			X
Pelvis	Broken			X
Other				X

If upon visual examination, damage is apparent in any of these areas, the appropriate engineer or engineering technician is to be consulted for a decision on repair or replacement of parts.

Repair or Replacement approved by:

Jessica Hall
Signature

01/30/2014
Date

Describe the repair or replacement of parts:

Checked by:

Jeff Leonard
Signature

01/30/2014
Date