This is a translation to English for reference purpose of JNCAP test method which is originally prescribed in Japanese language.
Please be sure to refer to the Japanese test method if you need to be precisely correct.

Child Seat, Safety from Frontal Collision Performance Test Procedure

Created: April 1, 2001
Revised: July 3, 2018
April 1, 2009

1. Dates Effective

This test procedure went into effect starting April 1, 2001. The revisions made on July 3, 2018 went into effect on that date.

2. Scope of Application

This test procedure applies to the "Child Seat, Safety from Frontal Collision Performance Test Procedure" conducted by the National Agency for Automotive Safety and Victims' Aid (hereinafter referred to as "NASVA") in the child seat assessment program information supply project, as well as the adapted western standards for child seats for infants and young children (general/all-purpose use only.)

3. Definitions of Terms

The terms used in this test procedure are defined as follows:

(1) **Child Seat**: A seat for infants or young children.

(2) **Infant Bed**: A device which keeps an infant in a supine state on a flat surface by restraints.

(3) **Child Seat Classifications**: Refer to the table below. Categories are sorted by weight.

Table 1: Child Seat Classifications

Class	Child's weight range (kg)
Infant	Less than 10 or less than 13
Young Child	More than 9 less than 18

(4) **Front-Facing**: Facing the same direction in which the vehicle is moving when traveling forwards.

(5) **Rear-Facing**: Facing the opposite direction in which the vehicle is moving when traveling forwards.

(6) **ECE Regulations**: Regulations pertaining to the agreements (1998, convention #12) regarding the provisions of calibration mutual recognition carried out based on the adopted requirements of unified technology pertaining to parts and devices that can be used on vehicles.

(7) **Test Seat**: A seat specified in ECE Regulation #44, Revised Edition #04.

(8) **Vehicle Belt**: The restraining belt (configured with a winding device to help restrain the child into the seat) installed into the test seat attached to the child seat at the time of the test. (Figure 1.)

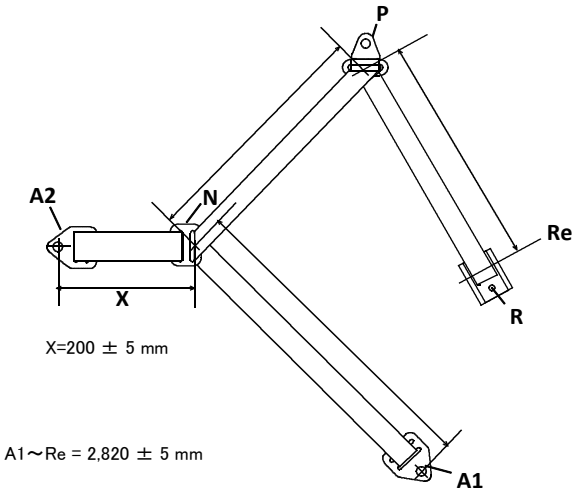


Figure 1: Vehicle Belt

(9) **Youth Belt**: A device used to restrain children, equipped with a belt, buckle, and length-adjuster.

(10) **Device Body**: All devices within the Child Seat, excluding the Youth Belt.

(11) **Seat Cushion**: The seating surface under the pelvis.

(12) **Seatback**: The inclining section of the seat by the neck and trunk.

(13) **6-Month-Old Dummy**: A manikin resembling a 6-month-old child in size and shape.

(14) **9-Month-Old Dummy**: A manikin resembling a 9-month-old child in size and shape.

(15) **3-Year-Old Dummy**: A manikin resembling a 3-year-old child in size and shape.

(16) **Measurement Reference Point**: The intersection between the test seat's seat cushion's upper surface and the seatback's front side (Figure 2.)

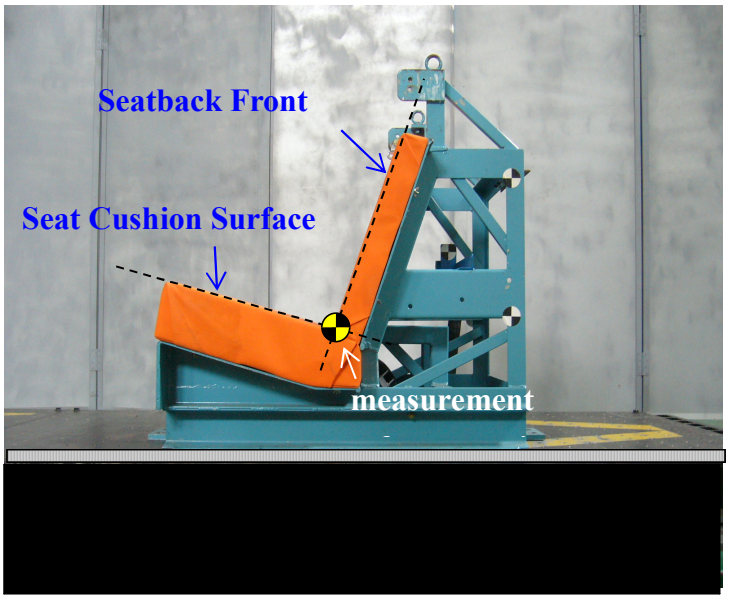


Figure 2: Measurement Reference Point

(17) **Total Head Acceleration**: The total acceleration arising from the dummy's head at the time of collision.

(18) **Total Chest Acceleration**: The total acceleration arising from the dummy's chest at the time of collision.

(19) **Head Movement Value**: The horizontal distance between the measurement reference point and the dummy's head at its forward most moved position at the time of collision.

(20) **Chest Movement Value**: The horizontal distance between the measurement reference point and the dummy's chest at its forward most moved position at the time of collision.

(21) **Abdominal Pressure**: The amount of abdominal pressure measured by the abdominal pressure twin sensors installed in the dummy's abdominal cavity at the time of collision.

(22) **ISOFIX**: A system used to connect the child seat to the vehicle. This child seat is composed of a pitch rotation restricting device (hereinafter referred to as "top tether") or 2 rigid circular horizontal bars, 6mm each, extended from either the vehicle or the seat, complying with the requirements of ECE Regulation #14, (hereinafter referred to as "seat bite anchorage") and 2 rigid fixtures attached to the child seat to correspond to these bars (hereinafter referred to as "connectors").

4. Test Requirements

4.1 Child Seat Conditions

If the youth belt can be adjusted to the dummy's shoulder's sitting height, it shall be adjusted according to the instruction manual. If there is no instruction in the manual, for infant seats, adjust to the point just below the top of the dummy's shoulder, by the vertical line along the seatback. For young child seats, adjust to just above the top of the dummy's

shoulder.

For child seats equipped with adjustment functions such as recliners: if a rear-facing seat, adjust the seatback as far back as it will go; if a front-facing seat, adjust to its most upright position.

For tests with a rear-facing test child seat, attach a target mark on the side of the seat so the seatback's tilt angle can be observed from the high-speed photography.

4.2 Test Seat

4.2.1 The Test Seat's Condition

Use a seat prescribed in ECE Regulation #44, revised edition #04, 6-3. In this case, a carpet and felt (with a combined total thickness of around 20mm) shall be placed on the floor. The vertical distance from the carpet's surface to the measurement reference point shall be 280±5 mm. (Figure 3.)

In this case, if the child seat has leg supports and if the leg support is adjusted to the longest length (hereinafter referred to as, "manufacturer max-design value") established by the manufacturer, if this child seat cannot be set properly, the height of the carpet surface may be adjusted so that the distance between the carpet surface and the measurement reference point matches the manufacturer max-design value.

The test seat's seat cushion shall be a prescribed in Attachment 1.

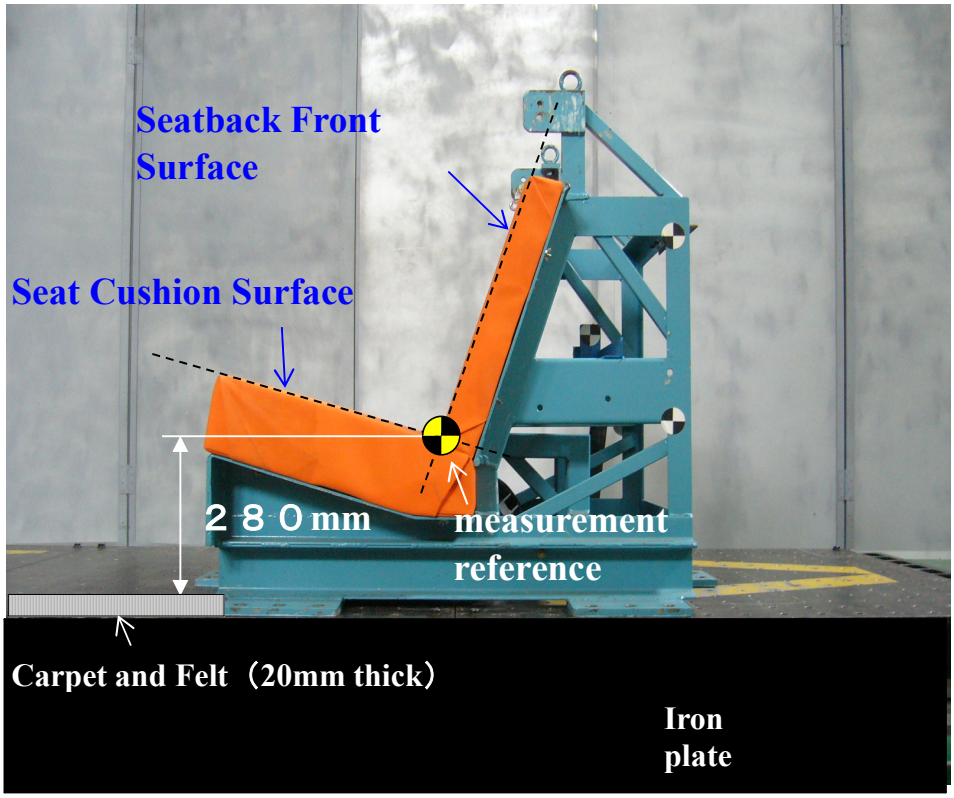


Figure 3

4.2.2 Vehicle Belt Specifications

For the vehicle belt installed in the test seat, the effective strap length (including the minimum winding distance of 150mm in the winding devices, with all the webbing pulled out) between the winding device's axis (Re) on winding device R and A1 shall be unloaded and straight, as well as 2,820 ± 5 mm when measured on the horizontal plane (Figure 4). The belt portion shall have the following specs. The free length of the test pieces within the clump of width and stretch tests shall be 200 ± 40mm.

Material:	Polyester
Width:	10,000N. When loaded, 48 ± 2mm
Thickness:	When unloaded, 1.0 ± 0.2mm
Stretch:	10,000N. When loaded, 8 ± 2%

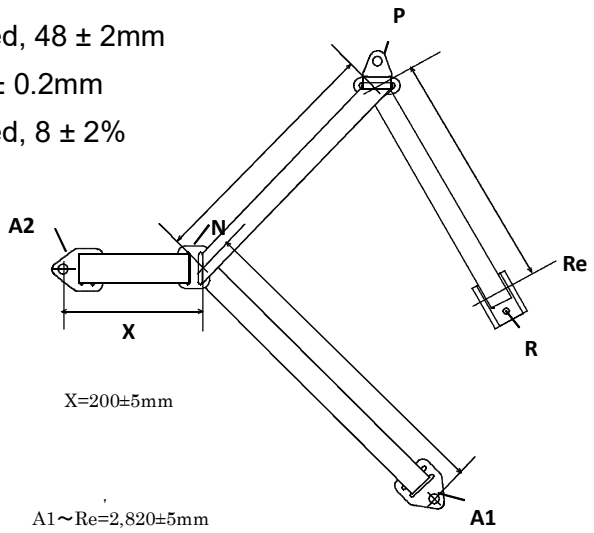


Figure 4

4.3 Installing the Child Seat and Dummy

The child seat shall be installed in the center of the test seat.

4.3.1 When Attaching with a Vehicle Belt

(1) If shell-shaped and the youth belt's slack can be lessened manually:

Set the dummy into the child seat, lining up the dummy's center with the cushion's center. The distance between the dummy and the child seatback shall be filled with a 2.5cm thick board with 6cm wide hinges, or a similar flexible device. This board shall fit the curves of the child seat as closely as possible, and its lower edge shall be the same height as the dummy's hip joints. Adjust the youth belt according to the user's manual, applying 250±25N of tension to lessen the slack. For tests using a 9-month-old dummy, the dummy shall be set so the back of its head makes contact with the hinged board. Try to line up the child seat's center with the test seat's center as much as possible.

Apply 50±5N of tension to the lap portion of the vehicle belt that is attached to the child seat. When this happens, mark the child seat's vehicle belt's through-hole in relation to the lap portion of the belt's position. Next, use this mark as a guide to maintain the lap belt's tension as 50N±5N of tension is applied to the shoulder portion of the belt. Use the

winding system to pull out the belt completely, then apply 4 ± 3N of tension to the portion of belt between the pillar loop and the winding system while the belt is retracted. The belt tension can be measured by taking the winding system's rotation force into account. In this case, the rotation force shall be added to the winding system's initial rotation force.

If the vehicle belt is equipped with a tension-strengthening device, attach it by the directions above, then follow the directions in the user's manual to operate the aforementioned device. If the device's tension is too excessive to use, it shall be deemed inadequate.

Remove the hinged board. For tests using the 9-month-old dummy, keep the head's angle as steady as possible while removing the hinged board, then adjust the head angle while keeping the back of the dummy's head as close to the shell's surface as possible.

Confirm that the center of the dummy is aligned with the center of the child seat's seat cushion.

(2) If the device is shell-shaped and has a youth belt winding system (any case other than (1)):

Line up the dummy's center with the center of the child seat's seat cushion, and after fastening the dummy's hips and/or back to the child seat's seatback, lessen the slack of the youth belt using the winding system. The 250±25N of tension force is not needed for the hinged board in this case.

Attach the child seat to the test seat so their centers line up.

Apply 50±5N of tension to the vehicle belt's lap portion attached to the child seat. When doing so, mark where the child seat's through hole for the vehicle belt meets with the lap portion of the belt. Next, use this mark as a guide to maintain the lap belt's tension as 50N±5N of tension is applied to the shoulder portion of the belt. Use the winding system to pull out the belt completely, then apply 4 ± 3N of tension to the portion of belt between the pillar loop and the winding system while the belt is retracted. The belt tension can be measured by taking the winding system's rotation force into account. In this case, the rotation force shall be added to the winding system's initial rotation force.

Confirm that the center of the dummy is aligned with the center of the child seat's seat cushion.

For tests using the 9-month-old dummy, keep the back of the dummy's head as close to the shell's surface as possible while adjusting.

(3) If the clothed type:

Insert a hinged board (the same shape as the shell) to the dummy's back surface when installing. The lower edge of the board shall be the same height as the dummy's hip joints. If the lower lap belt cannot be slacked due to the hinged board, insert another board (2.5 cm thick) 4 cm on one side between the lap belt and the hip joint.

With the hinged board and the additional board (if needed) inserted, apply 78-118N of tension to the areas of length that are adjustable, removing any slack. In some cases, the

lap belt must enter the groove in the dummy's hip joints.

After installing the dummy in the child seat, attach the child seat to the test seat such that their centers align.

Apply 50±5N of tension to the vehicle belt's lap portion attached to the child seat. When doing so, mark where the child seat's through hole for the vehicle belt meets with the lap portion of the belt. Next, use this mark as a guide to maintain the lap belt's tension as 50N±5N of tension is applied to the shoulder portion of the belt. Use the winding system to pull out the belt completely, then apply 4 ± 3N of tension to the portion of belt between the pillar loop and the winding system while the belt is retracted. The belt tension can be measured by taking the winding system's rotation force into account. In this case, the rotation force shall be added to the winding system's initial rotation force.

Remove the hinged board and the additional board (if using.) However, if the hinged board is difficult to remove after it's been set, remove the hinged board before the test seat is set and carefully affix it to the test seat so as not to change the dummy's bound state.

Confirm that the center of the dummy is aligned with the center of the child seat's seat cushion.

4.3.2 When Attaching With ISO-FIX

(1) If shell-shaped and the youth belt's slack can be lessened manually:

After freely adjusting the connectors of a child seat with the dummy not installed, temporarily connect the seat byte anchorage's child seat's connectors to an arbitrary position. Prepare the connectors so their latch mechanism can push the child seat towards the seat byte anchorage's direction. Staying parallel to the test seat cushion's surface, apply 135±15N of force in the direction of the seat byte anchorage. (This will surpass the friction in the space between the child seat and the seat cushion, assisting in the latch mechanism's self-tensioning.) This force will be applied either on the center line or right next to it, adding less than 100mm of height to the test cushion's upper-surface. After that, attach the top tether. If the top tether is a strap type, apply 50±5N of tension (Figure 5.)

Set the dummy into the child seat so the dummy's center and the seat cushion's center align. A hinged board 2.5 cm thick and 6 cm wide (or a flexible device similar to this) shall be placed between the dummy and the seatback of the child seat. This board should fit as closely to the curve of the child seat as possible, and its lower edge shall be at the height of the dummy's hip joints. Following the user's manual, adjust the youth belt, applying 250±25N of tension to lessen the slack. If using a 9-month-old dummy, set it such that the back of its head makes contact with the hinged board.

Remove the hinged board. For tests using the 9-month-old dummy, keep the back of the dummy's head as close to the shell's surface as possible while adjusting.

Confirm that the center of the dummy is aligned with the center of the child seat's seat

cushion.

Figure 5

(2) If shell-shaped and there is a winding system for the youth belt (anything other than (1)):

After freely adjusting the connectors of a child seat with the dummy not installed, temporarily connect the seat byte anchorage's child seat's connectors to an arbitrary position. Prepare the connectors so their latch mechanism can push the child seat towards the seat byte anchorage's direction. Staying parallel to the test seat cushion's surface, apply 135±15N of force in the direction of the seat byte anchorage. (This will surpass the friction in the space between the child seat and the seat cushion, assisting in the latch mechanism's self-tensioning.) This force will be applied either on the center line or right next to it, adding less than 100mm of height to the test cushion's upper-surface. After that, attach the top tether. If the top tether is a strap type, apply 50±5N of tension

Line up the dummy's center with the center of the child seat's seat cushion, and after fastening the dummy's hips and/or back to the child seat's seatback, lessen the slack of the youth belt using the winding system.

The 250±25N of tension force is not needed for the hinged board in this case.

Confirm that the center of the dummy is aligned with the center of the child seat's seat cushion.

For tests using the 9-month-old dummy, keep the back of the dummy's head as close to the shell's surface as possible while adjusting.

4.4 Temperature Conditions

(1) The Child Seat

Before installing the child seat and dummy, the child seat shall be left in a 20~23°C room for at least 4 hours to stabilize its temperature.

(2) The Test Seat

If the test seat's ambient temperature is outside the range of 20~30°C, it shall be adjusted so that it will be in this range. This adjustment must be carried out until just before the testing commences so that its temperature range will not negatively affect the test.

5. The Testing Facilities, etc.

5.1 The Test Trolley

The test trolley shall be able to run smoothly on a flat, horizontal rail. The test trolley's impact will be affected by its speed.

5.2 Lighting Devices

All lighting devices must generate sufficient light for high-speed photography, without causing halation.

5.3 High-Speed Photography Device

The high-speed photography device shall be set to a resolution higher than 500 frames/sec.

The camera may be equipped with a polarizing filter that will weaken unnecessary light.

5.4 Speed-Measuring Devices

The test trolley's maximum speed shall be the speed used for the test. The test trolley's degree of acceleration shall be integrated into the calculation of this speed. The sampling time (the gap of time between the data samples) of the acceleration shall be 0.1 ms.

Furthermore, when measuring the calculated speed in units of km/h, the value shall be rounded to the first decimal place.

5.5 Electric Measuring Devices

The measuring device used must meet the ISO 6487:2002*1 requirements with all the equipment including its components as well as the output devices (including the computer for analysis) being connected. (The measuring device in this state is called the "measuring channel").

(1) The measuring channel shall measure speed, load, moment, displacement, and pressure in the following channels.

(i) For trolley tests, refer to the following:

(a) Head acceleration: 1,000

(b) Neck load: 1,000

(c) Neck moment: 600

(d) Chest acceleration: 180

*1 Equivalent to ISO 6487:2000

(e) Chest displacement: 600

(f) Abdominal pressure (abdominal pressure twin sensors): 180

(g) Trolley acceleration: 60

(ii) For dummy regulations, refer to (i) or to the following:

(a) Neck rotation detector displacement: 60

(b) Impactor acceleration: 180

(2) For measuring channels, when converting analog to digital, the number of samples per second shall be over 8,000 for the trolley tests, and for dummy regulations, greater than 8x than the channel classes outlined in (ii).

(3) When calculating HIC, the sampling time (the data sample time interval outlined in the previous provisions) shall be conducted at the minimum time interval. The range when calculating shall be 200ms from the moment of collision to post-collision.

(4) To delete (filter) the high-frequency components of the above channel classes, calculate the total head acceleration, total chest acceleration, etc., beforehand.

5.6 Accelerometer, Load Cell, Dummy

5.6.1 In principle, the following (Table 2) shall be used for the measurement ranges of the accelerometer, load cell, moment meter, displacement meter, and manometer to be used in the test.

Table 2: Measurement Ranges

	Infant Seat	Young Child Seat	Infant Bed
Head Acceleration	-1960m/s^2 to +1960m/s^2 (-200G to +200G)	-1960m/s^2 to +1960m/s^2 (-200G to +200G)	-1960m/s^2 to +1960m/s^2 (-200G to +200G)
Neck Load, fore-aft direction	-334daN to +334daN (-341kgf to +341kgf)	-500daN to +500daN (-510kgf to +510kgf)	-89daN to +89daN (-91kgf to +91kgf)
Neck load, lateral direction		-500daN to +500daN (-510kgf to +510kgf)	-89daN to +89daN (-91kgf to +91kgf)
Neck load, vertical direction	-334daN to +334daN (-341kgf to +341kgf)	-600daN to +600daN (-612kgf to +612kgf)	-222daN to +222daN (-227kgf to +227kgf)
Neck Moment, fore-aft direction		-150Nm to +150Nm (-15kgfm to +15kgfm)	-56Nm to +56Nm (-6kgfm to +6kgfm)
Neck Moment, lateral direction	-68Nm to +68Nm (-7kgfm to +7kgfm)	-150Nm to +150Nm (-15kgfm to +15kgfm)	-56Nm to +56Nm (-6kgfm to +6kgfm)
Neck Moment, vertical direction		-80Nm to +80Nm (-8kgfm to +8kgfm)	-34Nm to +34Nm (-3kgfm to +3kgfm)
Chest Acceleration	-980m/s^2 to +980m/s^2 (-100G to +100G)	-1960m/s^2 to +1960m/s^2 (-200G to +200G)	-980m/s^2 to +980m/s^2 (-100G to +100G)
Chest Displacement		0mm to 87mm	
Abdominal Pressure		0kPa to +1000kPa (0bar to +10bar)	
Trolley Speed	-490m/s^2 to +490m/s^2 (-50G to +50G)	-490m/s^2 to +490m/s^2 (-50G to +50G)	-490m/s^2 to +490m/s^2 (-50G to +50G)

5.6.2 The Dummy

(1) For the infant seat, an ECE regulated #44-04, revised edition 8 defined P3/4 dummy shall be used. For the young child seat, an ECE regulated #129-01, revised edition 8 defined Q3 dummy shall be used. For the infant bed, a CRABI 6-month dummy shall be used.

(2) For the characteristics of the dummy's various parts, for Q3 dummies, refer to "Q3 User Manual Rev G" (however, do not use the Hip Insert), apply for verification, then use what was adapted. For the abdominal pressure twin sensors, adapt the manufacturer's regulations. For P3/4 dummies, make adjustments according to Attachment 3 while adhering to the provisions in Attachment 2. For the CRABI 6-month dummy, make adjustments according to Attachment 3. (*Attachment 3 needs review)

(3) The P3/4 dummy and CRABI 6-month dummy may be dressed in short sleeved cotton shirts and shorts. The Q3 dummy shall be dressed in its designated suit.

(4) For the stiffness of the joints of the P3/4 and CRABI 6-month dummies, the limbs shall

be adjusted such that when extended horizontally, they are able to hold their own weight. For the stiffness of the Q3 dummy's shoulder and elbow joints, their rotation is locked in two places, but all other points shall be adjusted such that they may rotate freely.

(5) To position the Q3 dummy's shoulders, lock the upper-arms in a position 20°forward from a parallel position with the upper-body. For the elbows, make the upper and lower-arms parallel, then bend the lower arms forward into their first locking positions.

(6) Make target marks on the dummy's head-center and knee-centers in a position visible by the camera so that the dummy's behavior during collision can be confirmed.

5.6.3 Recording Electric Measurement Results

The measuring results of acceleration and load recording media shall be recorded with the channel class of 1,000 or above.

5.7 Recording Temperature, etc.

Follow the provisions in 4.4 and record the following:

(1) Number of hours the child seat spent in the temperature-controlled room according to 4.4(1)

(2) The test seat's temperature (if adjustments need to be made, record the temperature post-adjustments.)

6. Test Procedure

6.1 Test Speed and Impulse Wave

The maximum speed the moment the trolley finishes creating impact shall be 55.0±1.0km/h.

Set the testing equipment so that the impulse wave is as close to typical as possible, within the permissible range outlined in Figure 6.

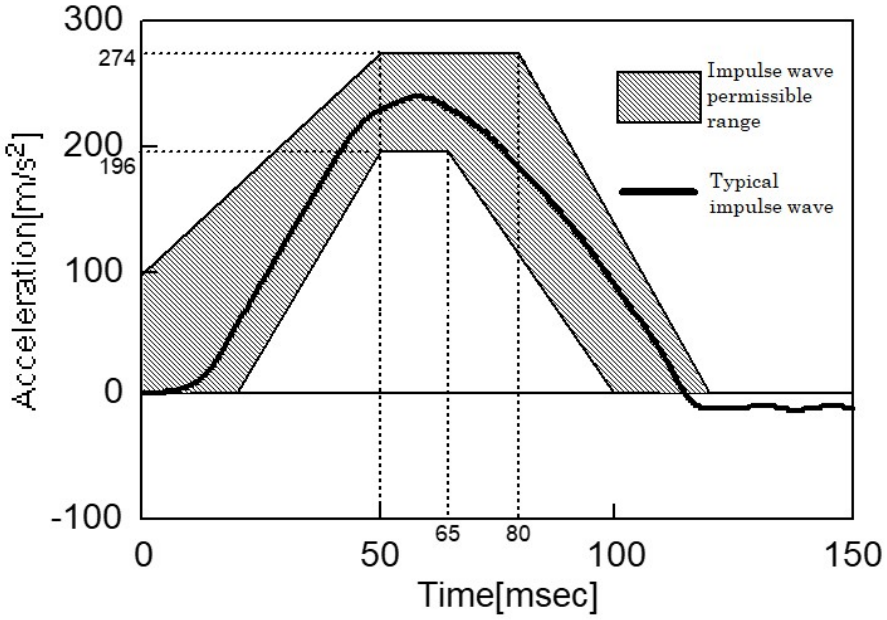


Fig. 6: Collision Permissible Range

6.2 Number of Tests

The test shall be conducted once.

7. Recording, Items to be Measured

7.1 Recording Prior to the Test

7.1.1 Recording the Child Seat

Record the following items into Appendix 1:

(1) The maker name or import agency name

(2) The model name

(3) The model type

(4) The model type designation (certification) number

(5) The number of adjustment stages for the recliner

7.1.2 Recording the Dummy Licensing/Inspection Results

(1) The testing institute shall record licensing results for the P3/4 and Q3 dummies, and inspection results for the CRABI 6-month dummy.

(2) The dummies can be used up to 10 times after licensing/inspection. If any part of the dummy is damaged during the test, the affected part shall be exchanged with one that has passed licensing/inspection.

7.1.3 Recording Instrument Calibration Results

(1) Record the calibration results of the measuring instruments (measurement channels including the transducer) implemented before the test. Calibrated instruments are effective for use up to 1 year.

(2) Use a calibration signal generator to verify that the injury values are calculated correctly.

7.1.4 Filming the Moments Prior to the Test's Start

Immediately before conducting the test, the child seat and the way the dummy is strapped in shall be photographed.

7.2 Recording During the Test

7.2.1 Test Trolley Acceleration and Speed

Measure and record the maximum speed of the test trolley at the end of the collision. This maximum speed may be calculated by integrating the acceleration measured on the accelerometer attached to the trolley.

Measure and record the acceleration of the test trolley during the collision.

7.2.2 Recording Electric Measurement Results of the Dummy's Parts and the Trolley

For the various parts listed in Table 3 that are attached to the dummy's parts and the test trolley (the accelerometer, load cell, displacement meter, and manometer) record these electric measurement results from 20 ms before the collision to over 200 ms. The starting point (T0) of the collision shall be at a 0.5g acceleration level as specified in ISO 17 373.

Table 3: Electric Measurement Items

Infant Seat	Young Child Seat	Infant Bed
Dummy head acceleration, fore-aft	Dummy head acceleration, fore-aft	Dummy head acceleration, fore-aft
Dummy head acceleration, lateral	Dummy head acceleration, lateral	Dummy head acceleration, lateral
Dummy head acceleration, vertical	Dummy head acceleration, vertical	Dummy head acceleration, vertical
Dummy neck load, fore-aft	Dummy neck load, fore-aft	Dummy neck load, fore-aft
Dummy neck load, lateral	Dummy neck load, lateral	Dummy neck load, lateral
Dummy neck moment, lateral	Dummy neck load, vertical	Dummy neck load, vertical
Dummy chest acceleration, fore-aft	Dummy neck moment, fore-aft	Dummy neck moment, fore-aft
Dummy chest acceleration, lateral	Dummy neck moment, lateral	Dummy neck moment, lateral
Dummy chest acceleration, vertical	Dummy neck moment, vertical	Dummy neck moment, vertical
Trolley acceleration, fore-aft	Dummy chest acceleration, fore-aft	Dummy chest acceleration, fore-aft
	Dummy chest acceleration, lateral	Dummy chest acceleration, lateral
	Dummy chest acceleration, vertical	Dummy chest acceleration, vertical
	Dummy displacement, fore-aft	Trolley acceleration, fore-aft
	Dummy abdominal pressure (R)	
	Dummy abdominal pressure (L)	
	Trolley acceleration, fore-aft	

7.2.3 Recording Injury Values

Use the waveforms from 7.2.2 and the formulas below to calculate and record the dummies' injuries.

(1) Head Injuries

・The maximum value of a cumulative time of 3ms of the dummy's total head acceleration.

・HIC (Head Injury Criteria)

Use the dummy's total head acceleration to calculate the maximum value following the

formula below.

$$a_R = \sqrt{a_X{}^2 + a_Y{}^2 + a_Z{}^2}$$

Where,

a_R = the total acceleration of the head acceleration in the fore-aft, lateral, and vertical directions (ax, ay, az)

(Unit: m/s^2)

$$HIC = \left[\frac{1}{t_2 - t_1} \int_{t_1}^{t_2} \frac{a_R}{9.8} dt \right]^{2.5} (t_2 - t_1)$$

t_1 and t_2 are two times on either side of the collision (in seconds)

However, $|t_2 - t_1| \leqq 0.036s$

(2) Chest Injuries (when using an Infant Seat.)

・The maximum value of a cumulative time of 3 ms of the dummy's total chest acceleration.

(3) Chest Injuries (when using a Young Child Seat.)

・The maximum value of a cumulative time of 3 ms of the dummy's total chest acceleration.

(4) Chest Displacement (when using a Young Child Seat)

・Rib displacement from pressure to the dummy's chest

(5) Abdominal Pressure (when using a Young Child Seat)

・The maximum reading on the abdominal pressure twin sensors of the right or left side – whichever is greater.

Follow the provisions of 7.22 and 7.23 and enter the calculated electric measurement results into Appendix 3.

7.2.4 High-Speed Filming

A high speed VTR shall be used to record dummy and child seat behavior and degree of movement during the collision (Table 4). A strobe light shall be added so that the electric data from each camera can be recorded simultaneously. The items in Table 5 shall be filmed in high-speed and analyzed (Table 5.) Measured movements shall be at a resolution of less than 5mm or less.

Table 4(a)　High-Speed Film (Infant Seat, Child Seat)

Camera	Screen Angle
A	The dummy's behavior, amount of movement, and the dummy's restrained state in the child seat
B	R: Infant Seat F: Child Seat (Move to match the child seat)

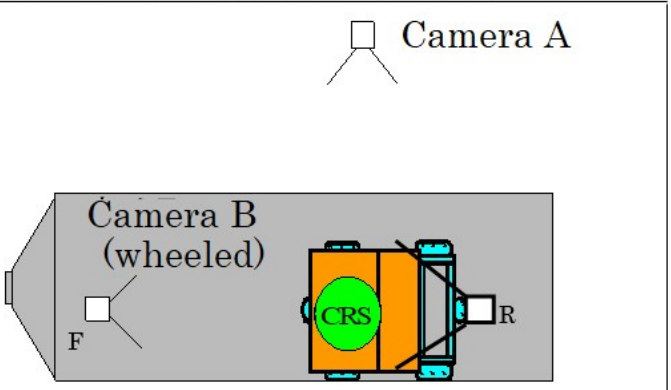


Table 4(b)　High-Speed Film (Infant Bed)

Camera	Screen Angle
B C	The dummy's movement, restrained state, and the child seat's behavior
D	Dummy's state of restraint

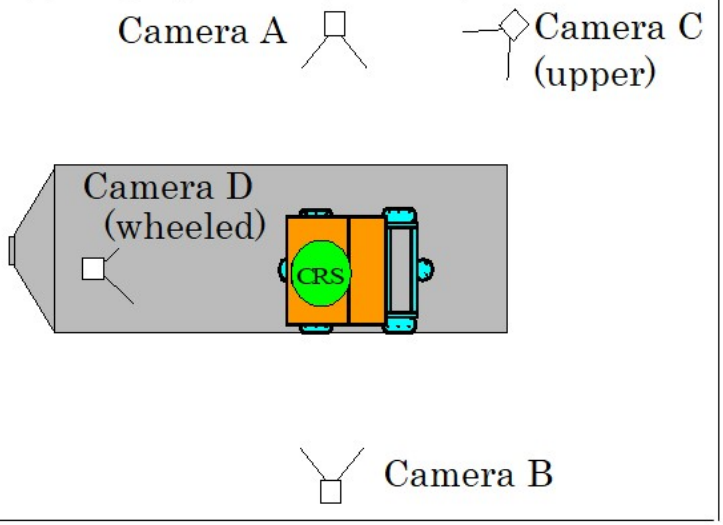


Table 5:　Items to be Filmed

Infant Seat	Young Child Seat	Infant Bed
• Seatback max. angle • Position of tip of the head	• Max. head movement (forward) • Max. knee movement (forward)	• Max. head movement (forward) • Max. slop of bed bottom • Head overhang off the bed

7.3 Recording After the Test

The condition of the child seat and dummy's restrained position shall be photographed immediately after the test.

All other records shall be entered into Appendix 2.

7.4 Handling Measured Values

Measured values shall be recorded as follows:

(1) Speed (km/h) shall be rounded to the first decimal place.

(2) Distance (mm) shall be rounded to the nearest whole number.
(3) Acceleration (m/s^2) shall be rounded to the first decimal place.
(4) Load (kN) shall be rounded to the second decimal place.
(5) Moment (Nm) shall be rounded to the second decimal place.
(6) Pressure (kPa) shall be rounded to the first decimal place.

Attachment 1

Seat Cushion Calibration Procedure

【Test Device】	【Measurement Items / Filters】
・Headform ・Pedestal for seat cushion	・Headform deceleration; channel class 60 ・Collision penetration level: calculate from headform deceleration

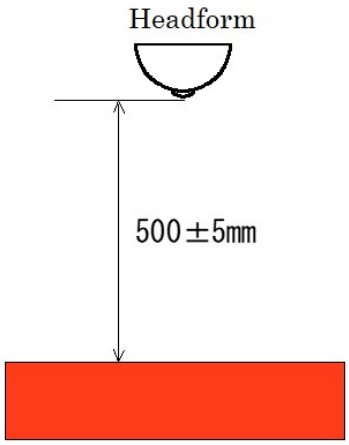
【Performance Requirements】

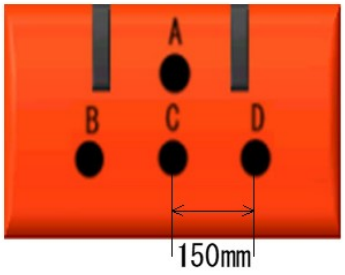
There must not be a difference of over 15% from the start value, for collision penetration level and peak deceleration regarding the seat cushion.

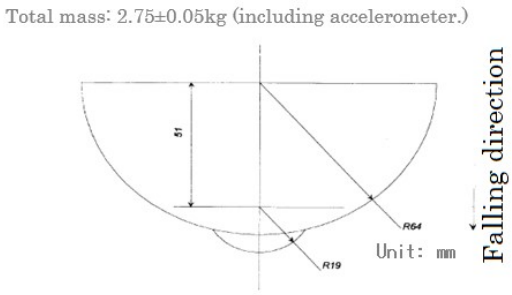
【Test Setup】

The test shall be carried out 3 times at Points A, B, and D (150 ± 5mm right, left, forward, or backward from Point C, which is 150 ± 5mm from the front edge of the seat cushion's centerline.) The devices shall be laid on a flat, hard surface. The device shall be set on top of the point to be measured, the headform lifted 500 ± 5mm, then let it fall naturally to hit the seat cushion to record the collision penetration level and deceleration curve.

When the seat cushion is not in use, conduct calibrations to determine its collision penetration degree and peak deceleration, and certify again after 50 motion tests or at least once per month - whichever is sooner.







Headform

Attachment 2

P3/4 Dummy Calibration Procedure

1. Neck Tension Test Procedure

【Test Devices】	【Measurement Items】
・Table for adjusting P-Dummy ・Height Gauge ・50N Weights	・Atlas-Axis Deflection in the lower direction

【Performance Requirements】

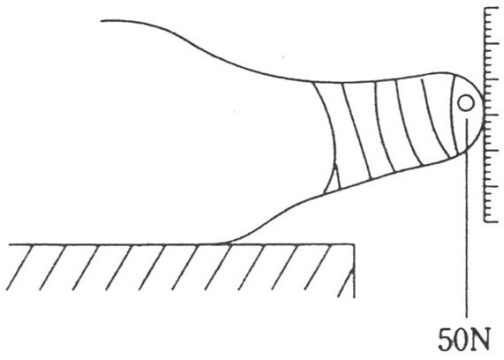
Atlas-Axis Deflection in the lower direction ; 10±1mm

【Test Setup】

・Tighten the tension nuts on the Atlas-Axis block.

・Attach the appropriate rods and bolts through the Atlas-Axis block.

・Pass a 50N weight through the Atlas-Axis block facing downward. When it meets with the rods or bolts, loosen the tension nuts until the Atlas-Axis block lowers by 10±1mm.



2. Abdominal Stuffing Test Procedure

【Test Devices】	【Measurement Items】
・TNO dummy abdominal pressure calibrator ・A rigid block (abdominal platform) ・Height Gauge ・30N weights	・Amount of abdominal stuffing deformation

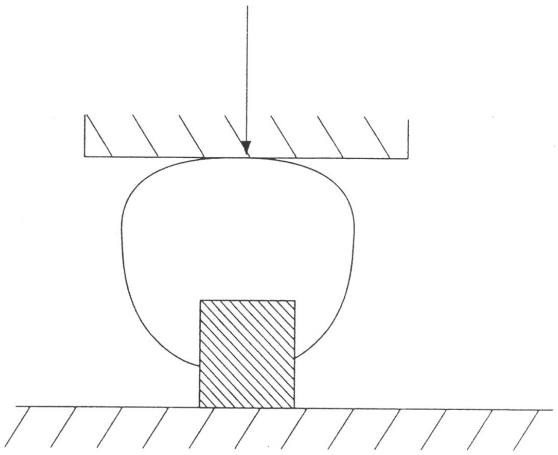
【Performance Requirements】

・The abdominal stuffing deformation after 2 minutes shall be as follows:

For 9-month dummies: 11.5±2.0mm

【Test Setup】

1) Conduct the test using the appropriate tension generator.
2) Rest the abdominal stuffing on top of a rigid block the same length and width as a lumbar spine. This block should be at least twice as thick as an actual lumbar spine.
3) Apply an initial load of 20N.
4) Add a constant load of 30N (50N total).
5) Measure the amount of deformation to the abdominal stuffing 2 minutes after load application.



Attachment 3

Procedure for Joint Adjustments

1. CRABI

【Shoulder Joints】

(1) Put the torso upright.

(2) Make the upper and lower arms horizontal and tighten the shoulder adjustment nuts.

(3) Tighten the adjustment nuts until a light tap on the wrist makes the upper arm move.

【Elbow Joints】

(1) Make the torso and upper arms vertical.

(2) Make the lower arms horizontal, tighten the elbow adjustment nuts.

(3) Tighten the adjustment nuts until a light tap on the wrist makes the lower arm move.

【Hip Joints】

(1) Make the torso vertical.

(2) Make the angle between the upper and lower legs 90°, then make the upper-legs horizontal while tightening the hip adjustment nuts.

(3) Tighten the adjustment nuts until a light tap on the knee makes the lower leg move.

【Knee Joints】

(1) Make the torso vertical.

(2) Make the upper and lower legs horizontal and tighten the knee joints.

(3) Tighten the adjustment nuts until a light tap on the ankle makes the lower leg move.

2. P Dummy

【Atlas-Axis Joints】

(1) Lie the torso horizontally on its back.

(2) Fully assemble all the parts of the neck and head.

(3) Make the head horizontal and tighten the adjustment nuts through the Atlas-Axis block.

(4) Loosen the adjustment nuts until the head begins to move.

【Hip Joints】

(1) Lie the pelvis horizontally on its own front.

(2) Attach the upper-legs without the lower-legs.

(3) Make the upper-legs horizontal and tighten the adjustment nuts.

(4) Loosen the adjustment nuts until the upper-legs begin to move.

【Knee Joints】

(1) Make the upper-legs horizontal.

(2) Attach the lower-legs.

(3) Make the lower-legs horizontal and tighten the knee adjustment nuts.

(4) Loosen the adjustment nuts until the lower-legs begin to move.

【Shoulder Joints】

(1) Make the torso vertical.

(2) Attach the upper-arms without the lower-arms.

(3) Make the upper-arms horizontal and tighten the shoulder adjustment nuts.

(4) Loosen the adjustment nuts until the upper-arms begin to move.

【Elbow Joints】

(1) Make the upper-arms vertical.

(2) Attach the lower-arms.

(3) Make the lower-arms horizontal while tightening the elbow adjustment nuts.

(4) Loosen the adjustment nuts until the lower-arms begin to move.

Appendix 1: Recording Prior to the Test

Recording Prior to the Test

Maker name or importer	
Model name	
Type	
Model Specification (ID) No.	
Classification	
# of Reclining Adjustment Stages	_____stages

Appendix 2: Recording During and After the Test

【Infant Seat】

Recording During Test

Seatback's Maximum Tilt	_____deg.	From the strobe: _____frames
Head Tip Position	Seatback Upper-Edge Within / Over (If over: mm)	From the strobe: _____frames

Recording After Test

Damages to Parts	Yes / No (If Yes: mm)
Buckle Dissociation	Yes / No
Escape from Seatbelt	Yes / No

※For Bed Use

Recording During Test

Maximum Head Tilt (forwards)	_____mm	From the strobe: _____frames
Bed Floor Maximum Tilt	Head Side〔 〕deg. Foot Side〔 〕deg. Inside〔 〕is the initial tilt	From the strobe: _____frames From the strobe: _____frames

Pedestal Side Angle

Bed Floor Maximum Tilt	Head Side〔 〕deg. Foot Side〔 〕deg. Inside〔 〕is the initial tilt	From the strobe: _____frames From the strobe: _____frames

Recording After Test

Damages to Parts	Yes / No (If Yes: mm)
Buckle Dissociation	Yes / No
Escape from Seatbelt	Yes / No

【Young Child Seat】

Recording During Test

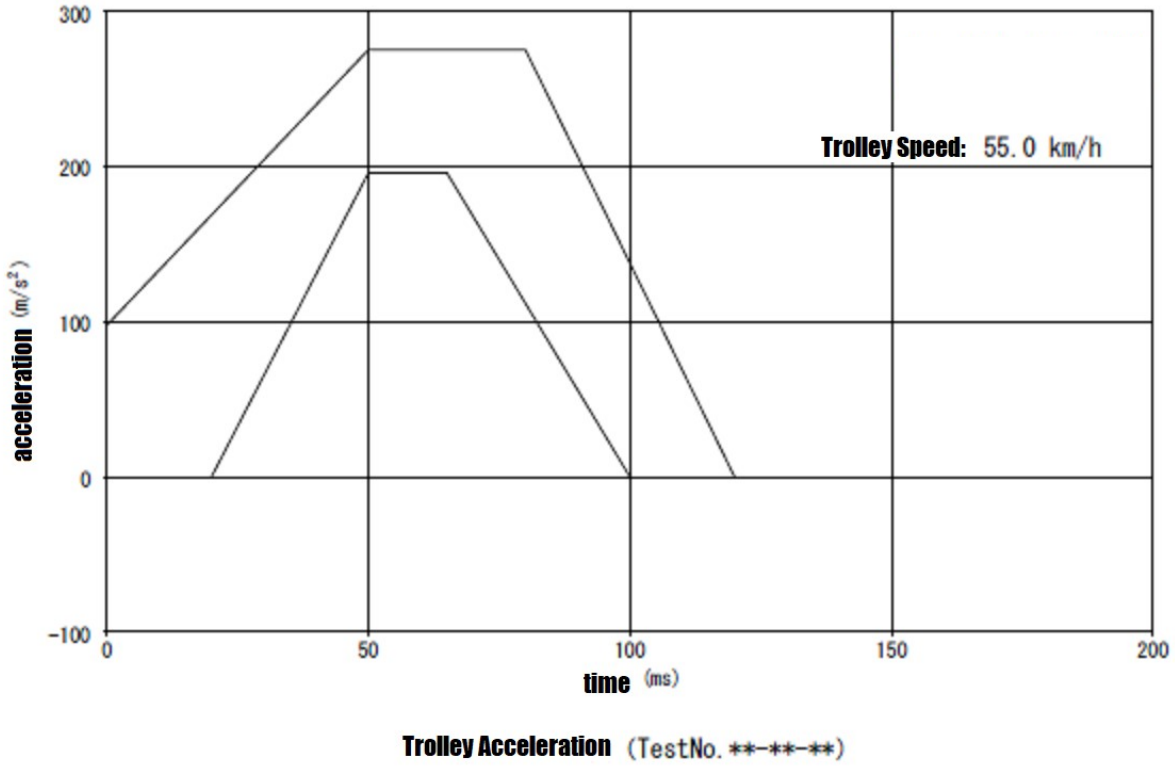
Maximum Head Tilt (forwards)	_____mm	From the strobe: _____frames
Maximum Neck Tilt (forwards)	_____mm	From the strobe: _____frames

Recording After Test

Damages to Parts	Yes / No (If Yes: mm)
Buckle Dissociation	Yes / No
Escape from Seatbelt	Yes / No

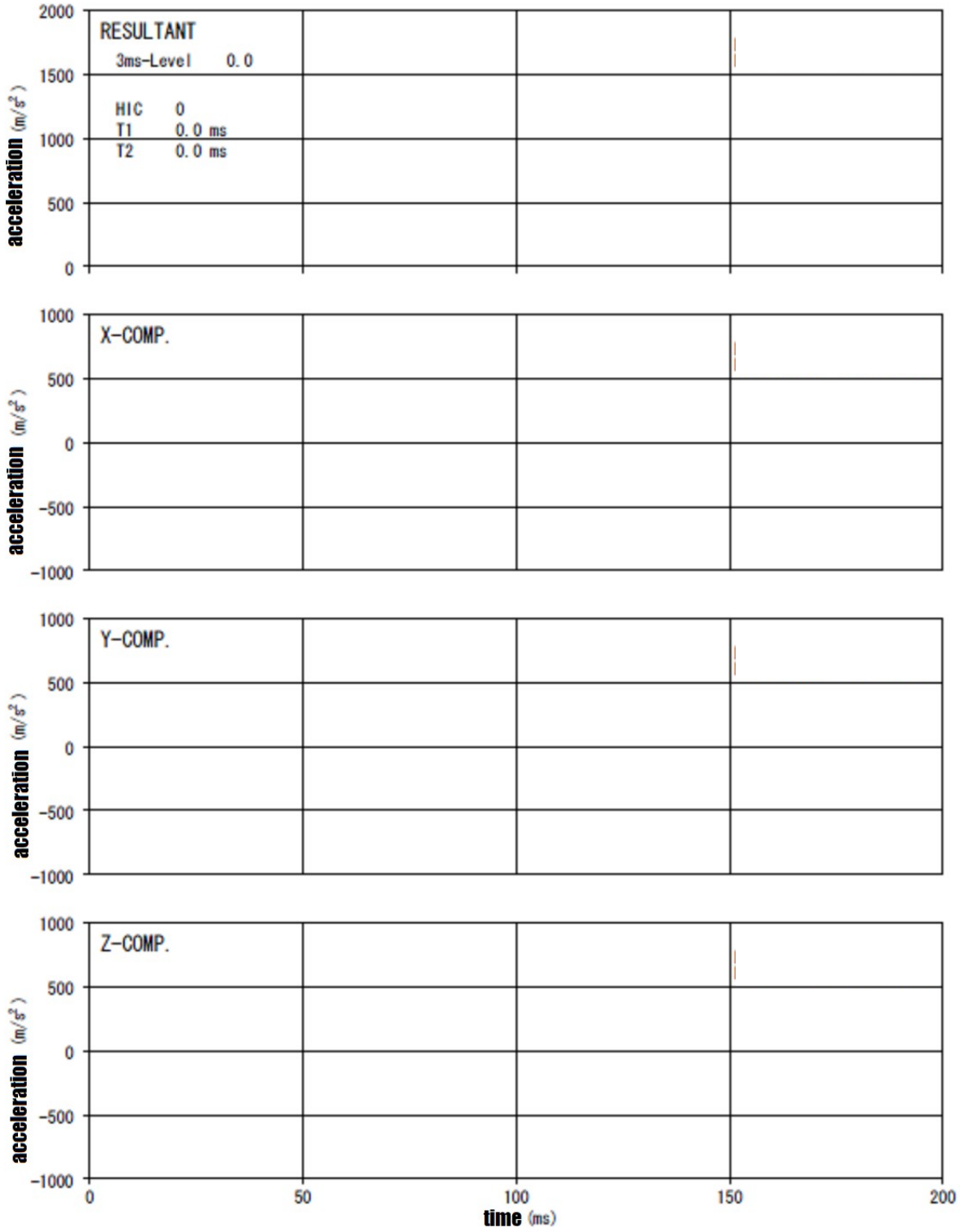
Appendix 3: Examples of Recorded Electric Measurement Results

【Trolley Waveform (Common)】

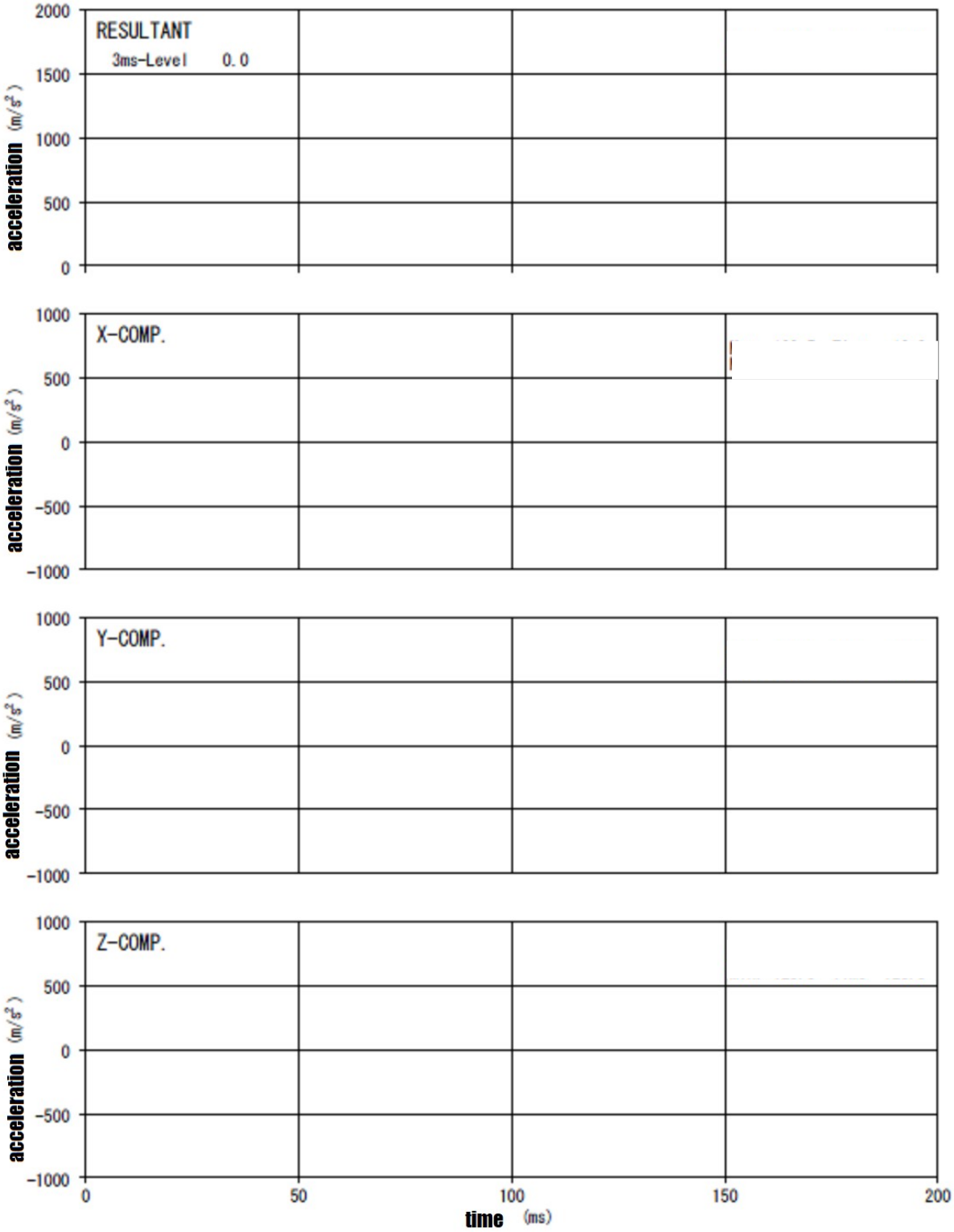


Trolley Acceleration (TestNo.**-**-**)

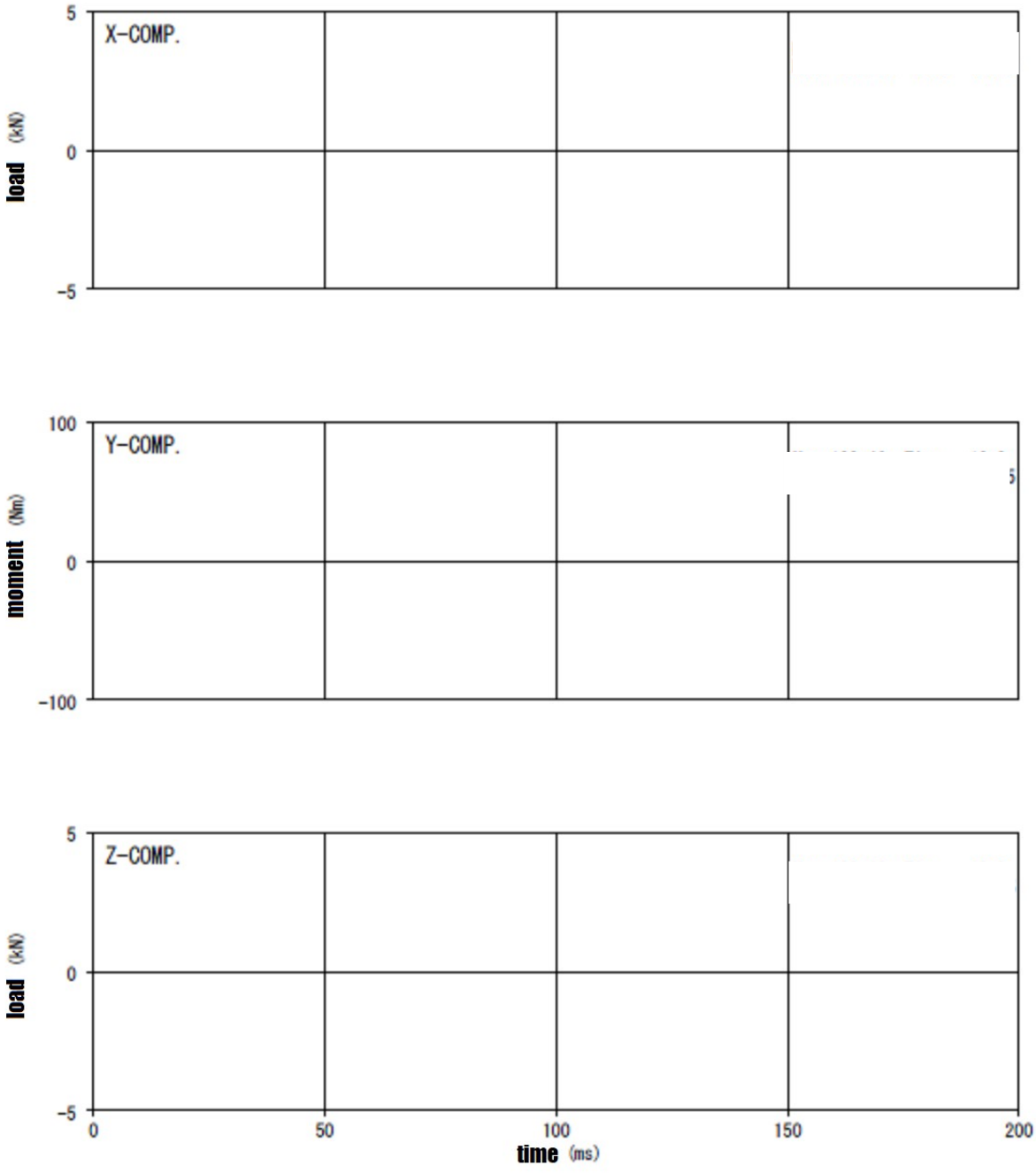
【Infant Seat】



Dummy Head Acceleration (TestNo. **-**-**)

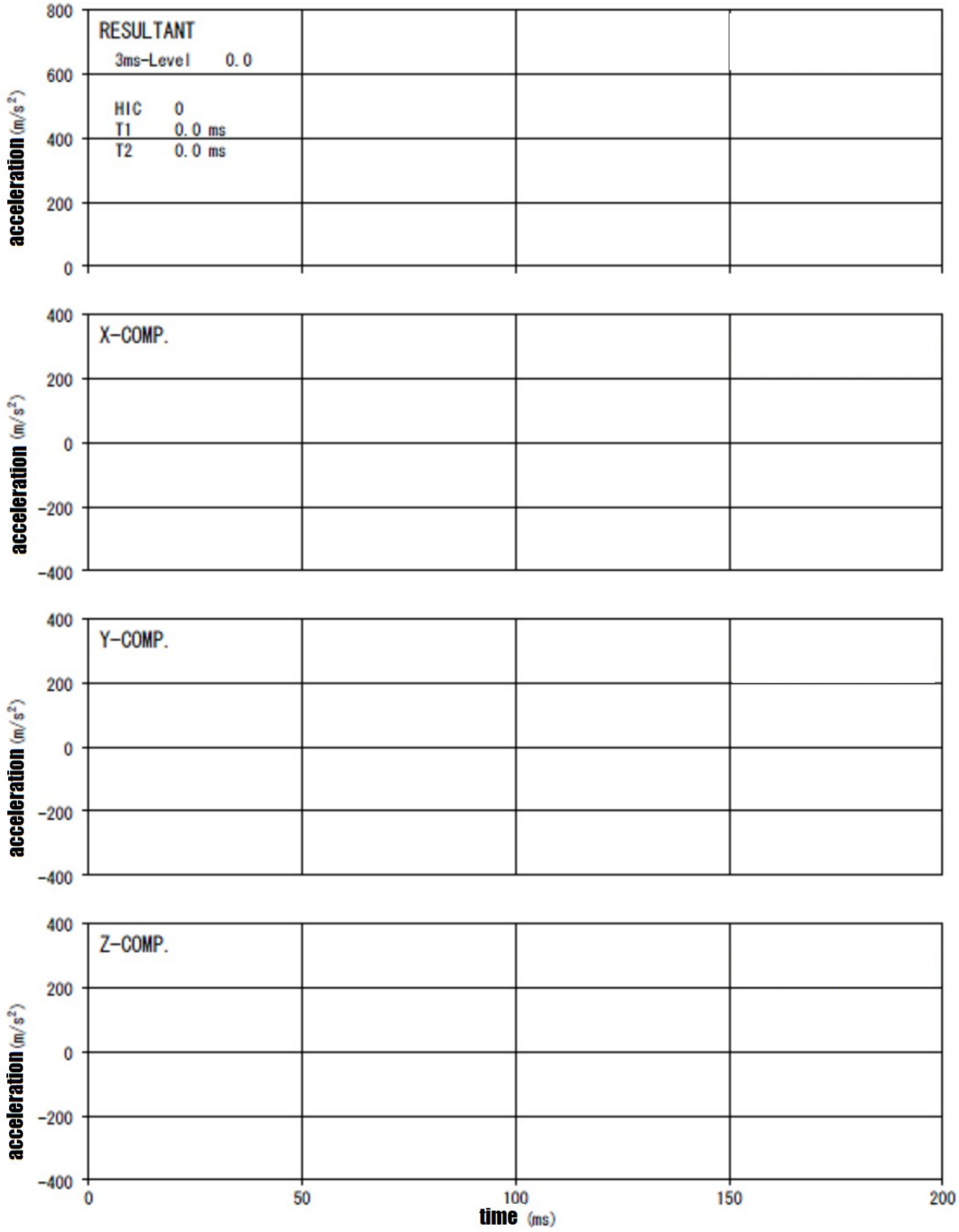


Dummy Chest Acceleration (TestNo. **-**-**)

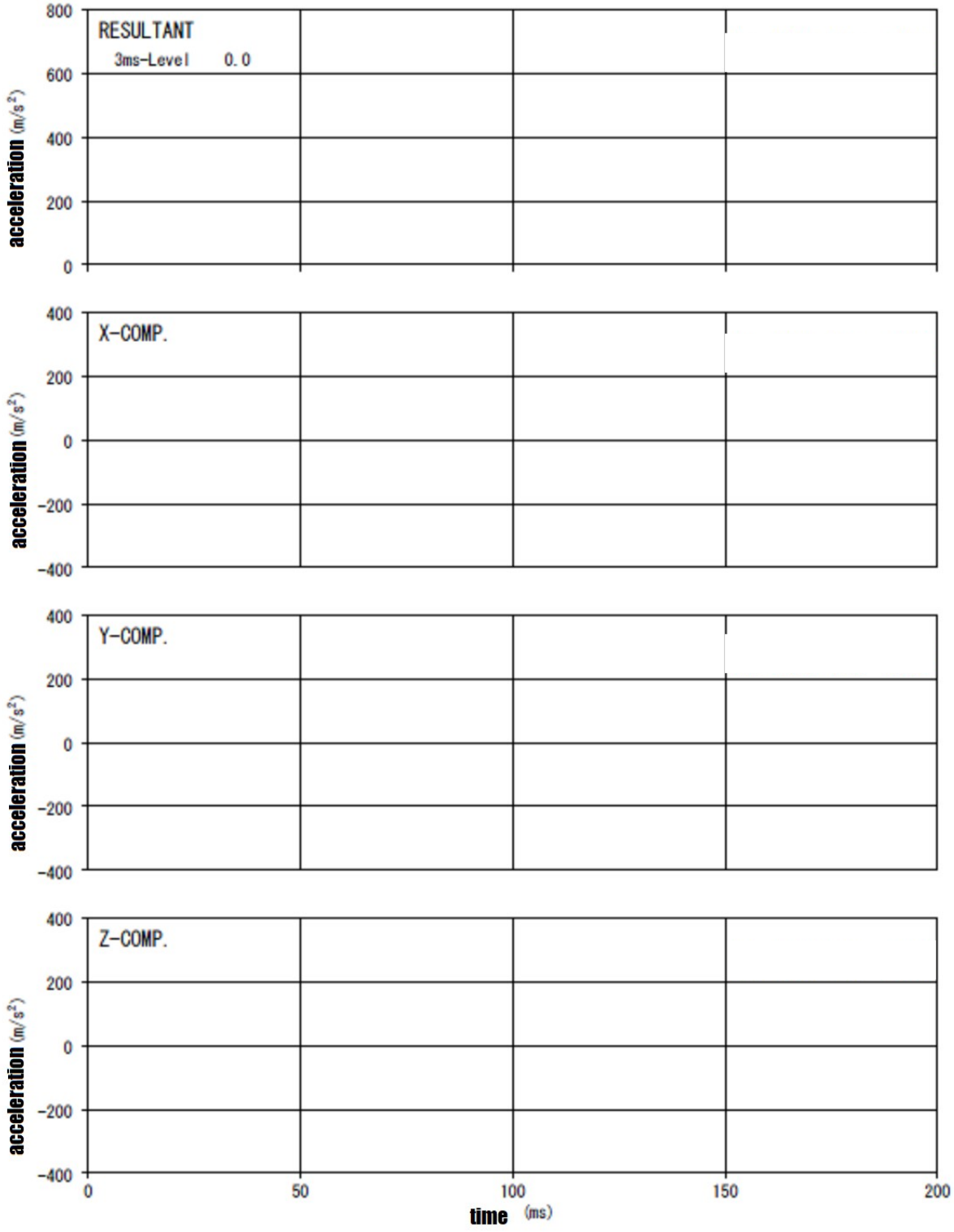


Dummy Neck Load / Moment (TestNo. **-**-**)

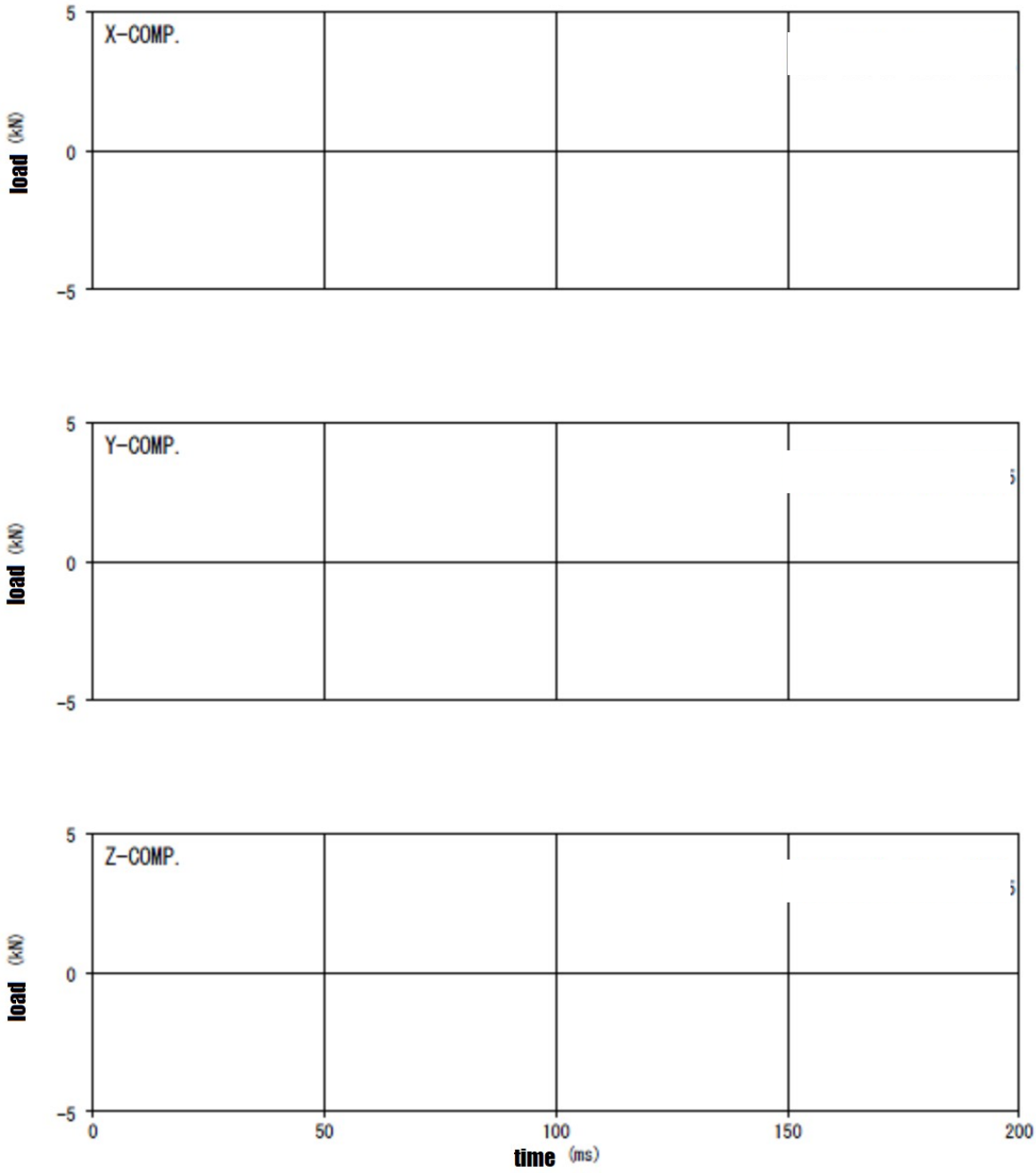
【Young Child Seat】



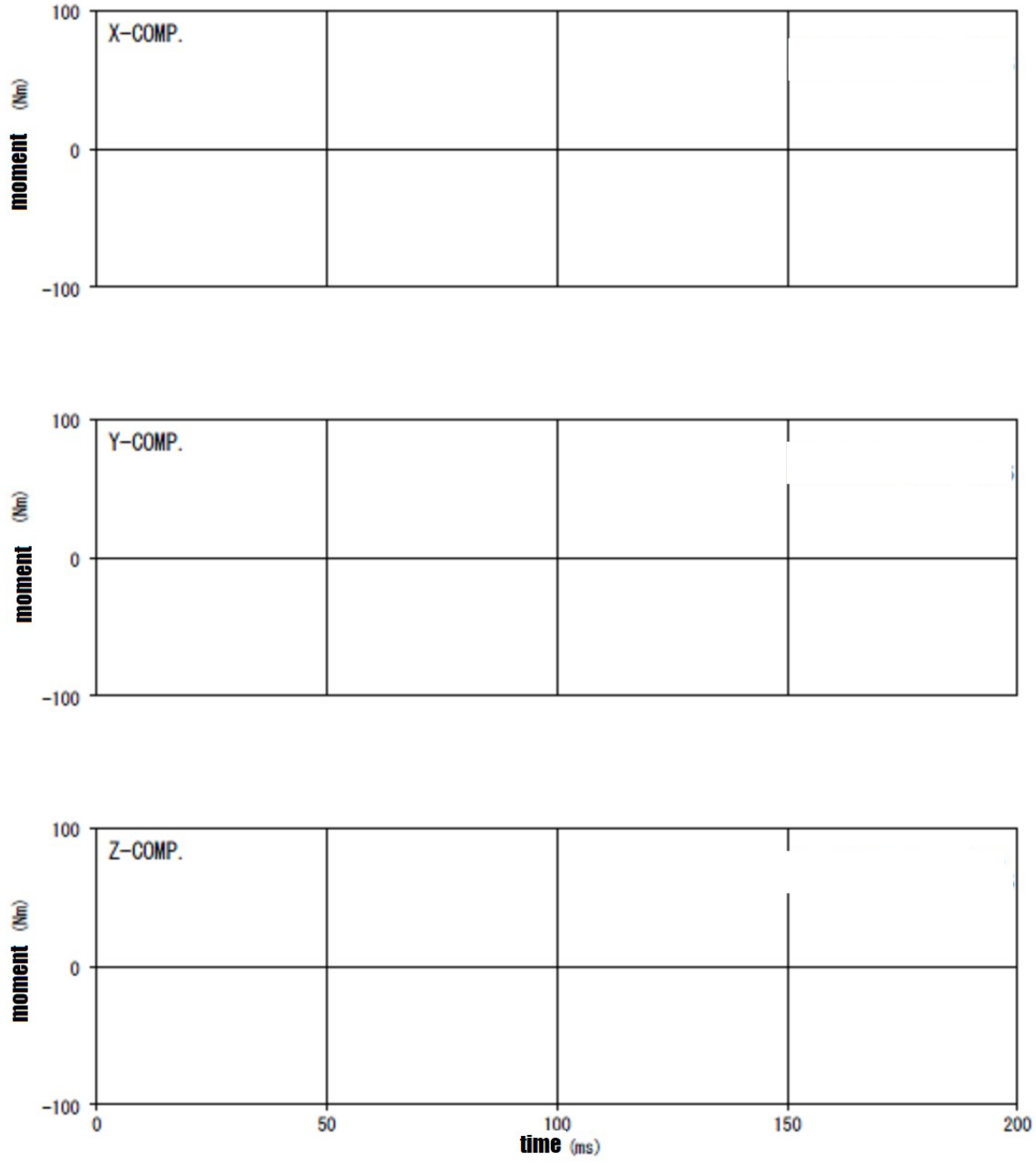
Dummy Head Acceleration (TestNo. **-**-**)



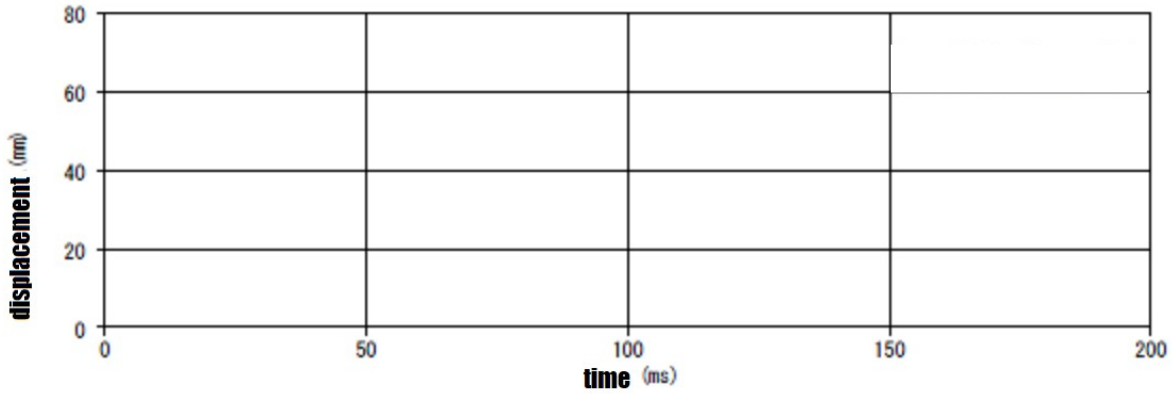
Dummy Chest Acceleration (TestNo. **-**-**)



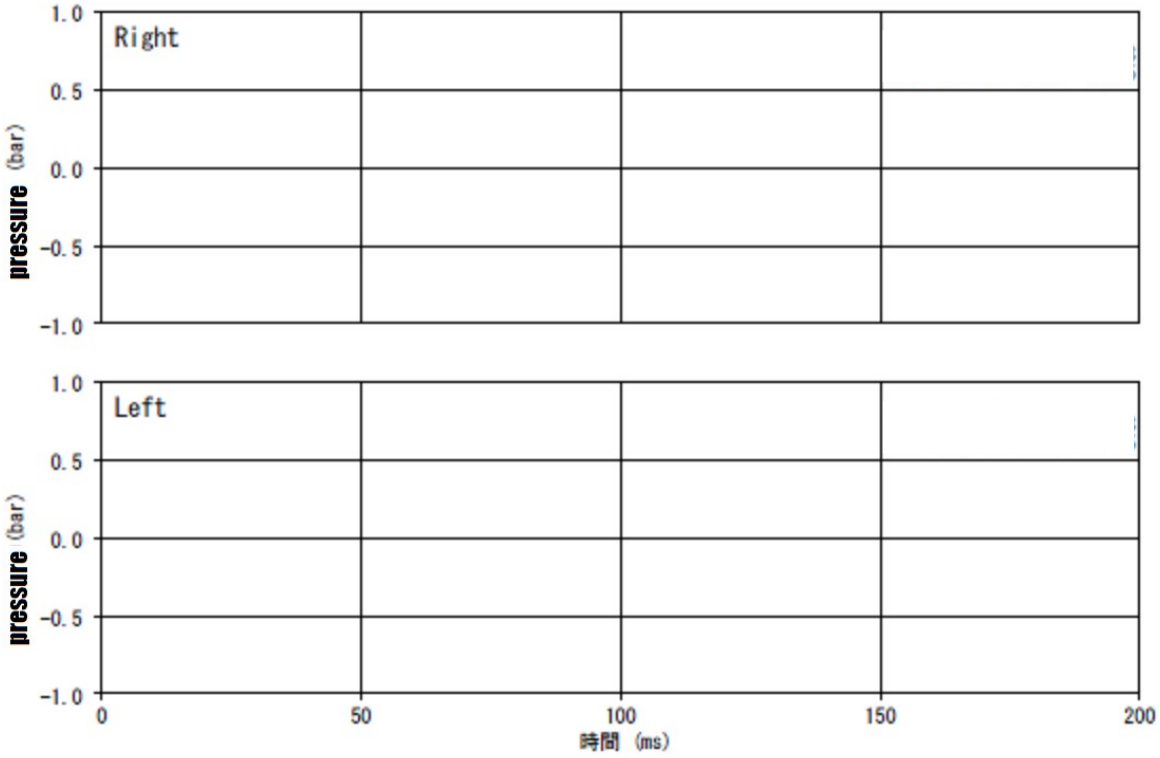
Dummy Neck Load (TestNo. **-**-**)



Dummy Neck Moment (TestNo. **-**-**)

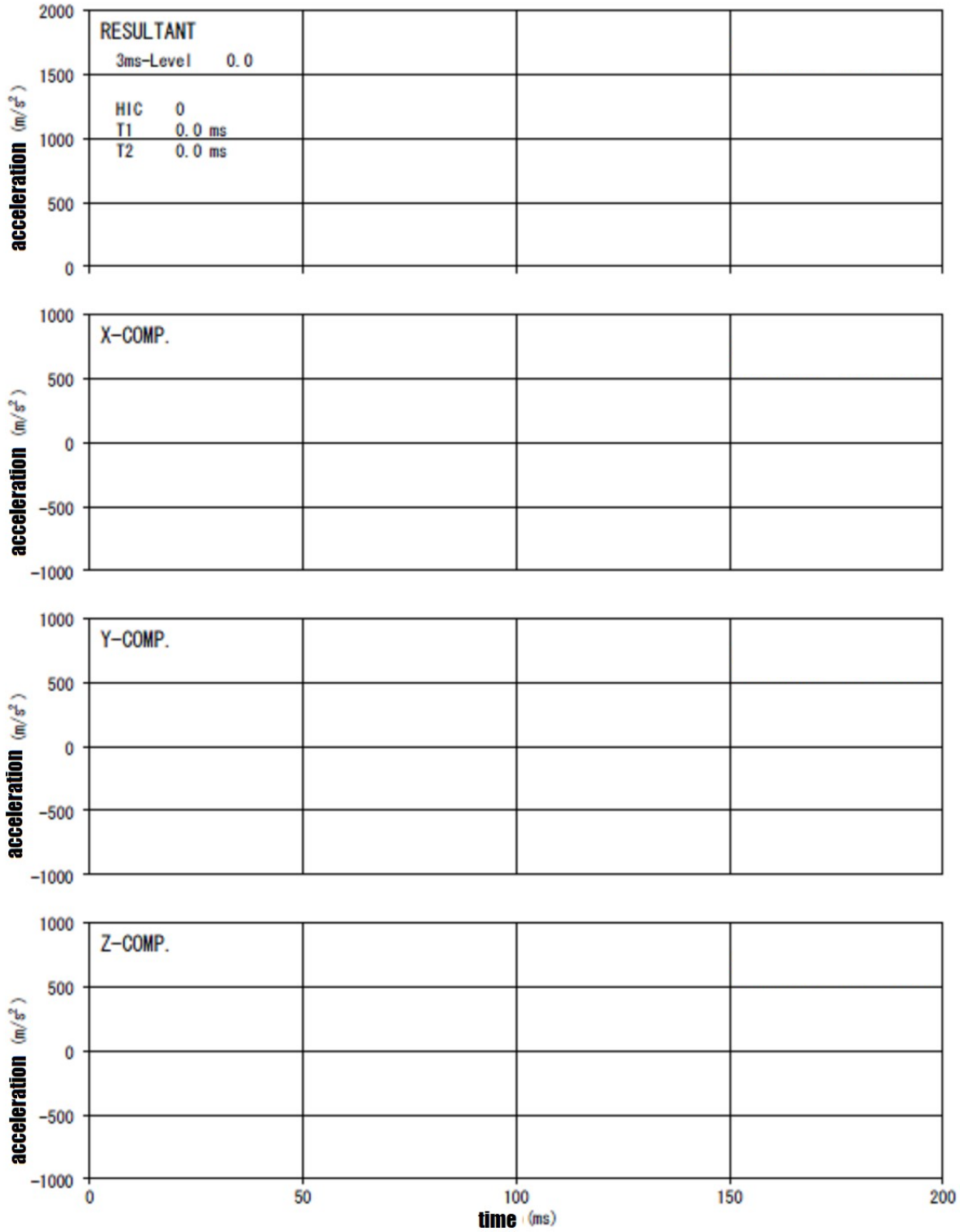


Dummy Chest Displacement (TestNo.**-**-**)

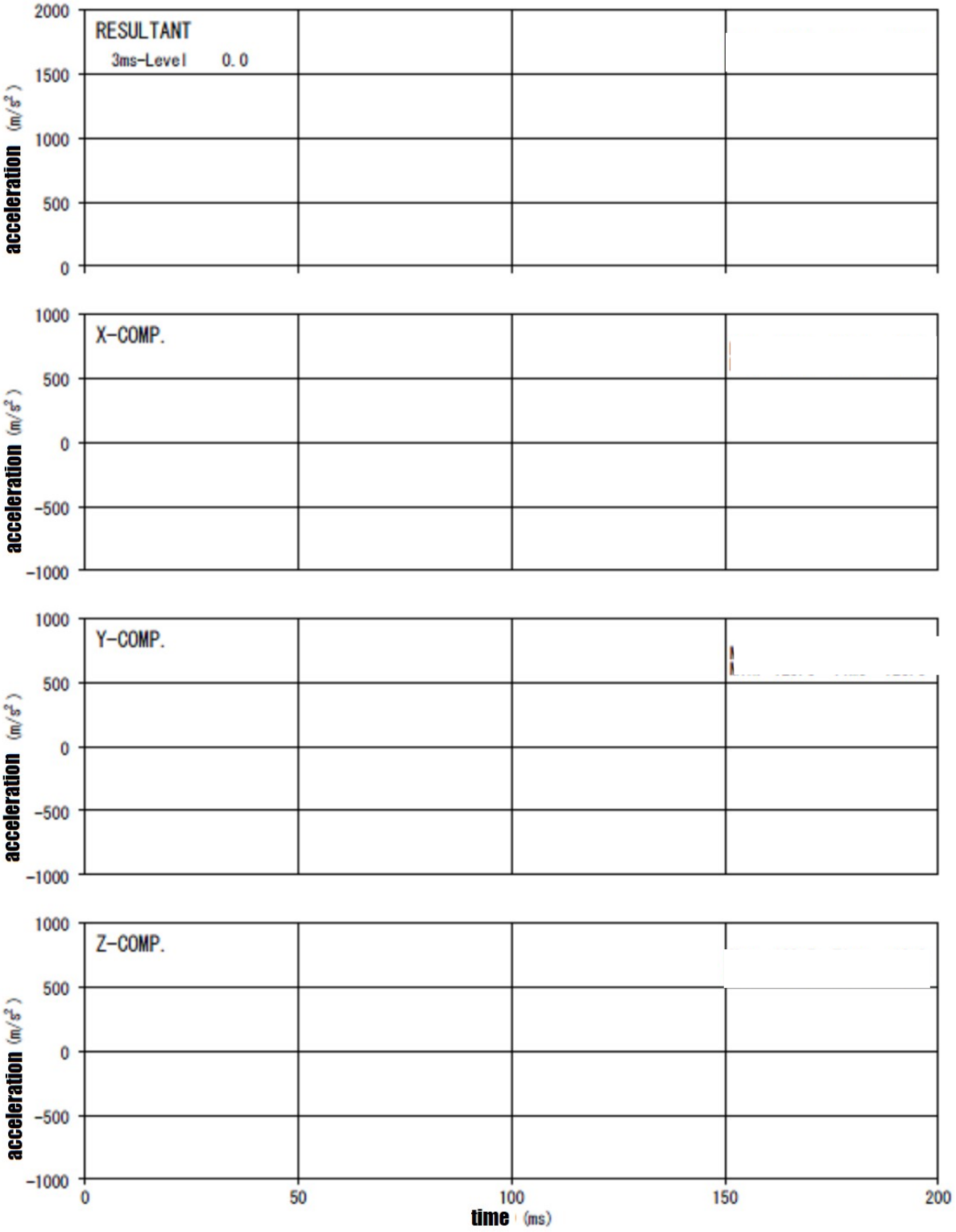


Dummy Abdominal Presssure (TestNo.**-**-**)

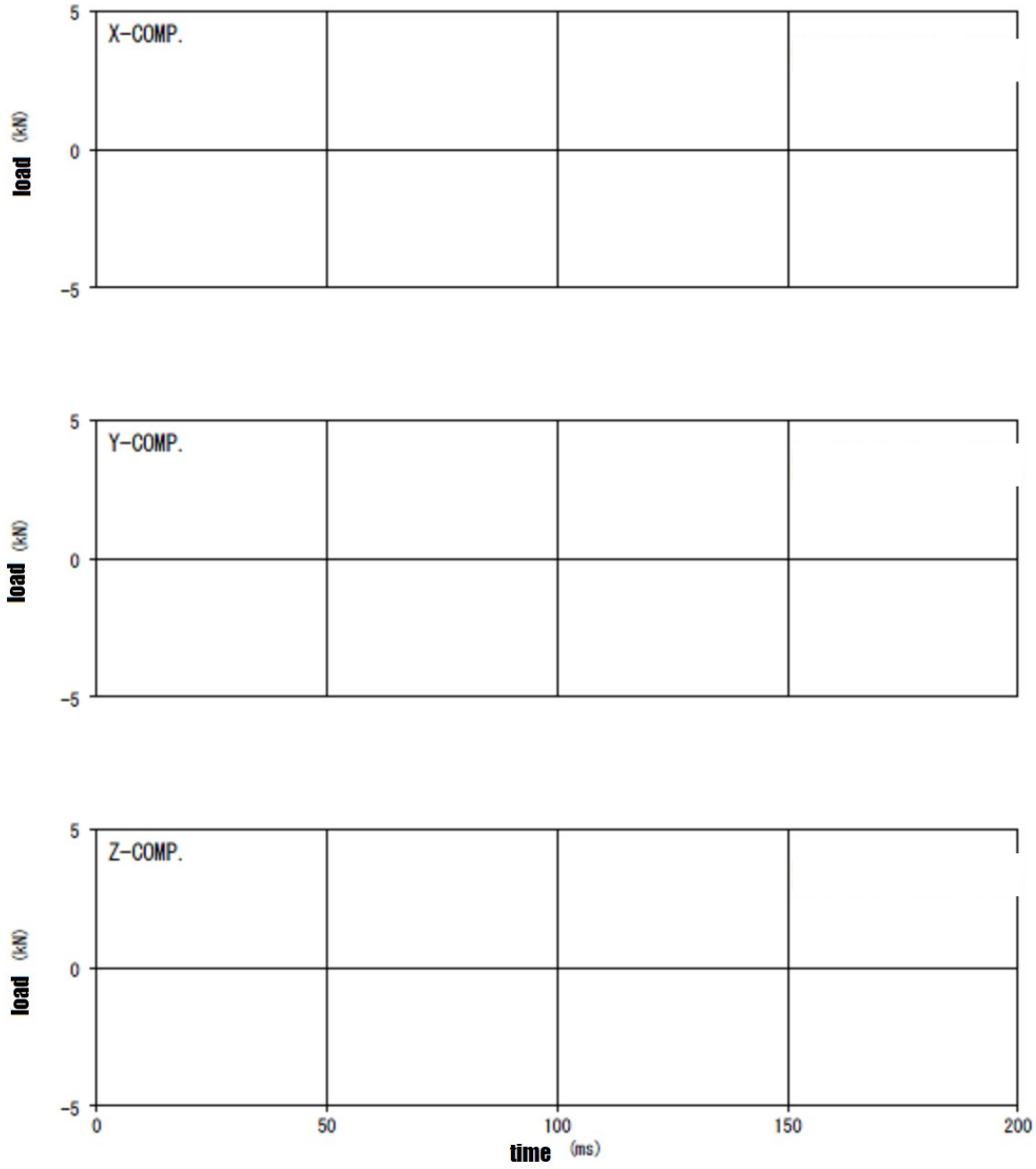
【Infant Bed】



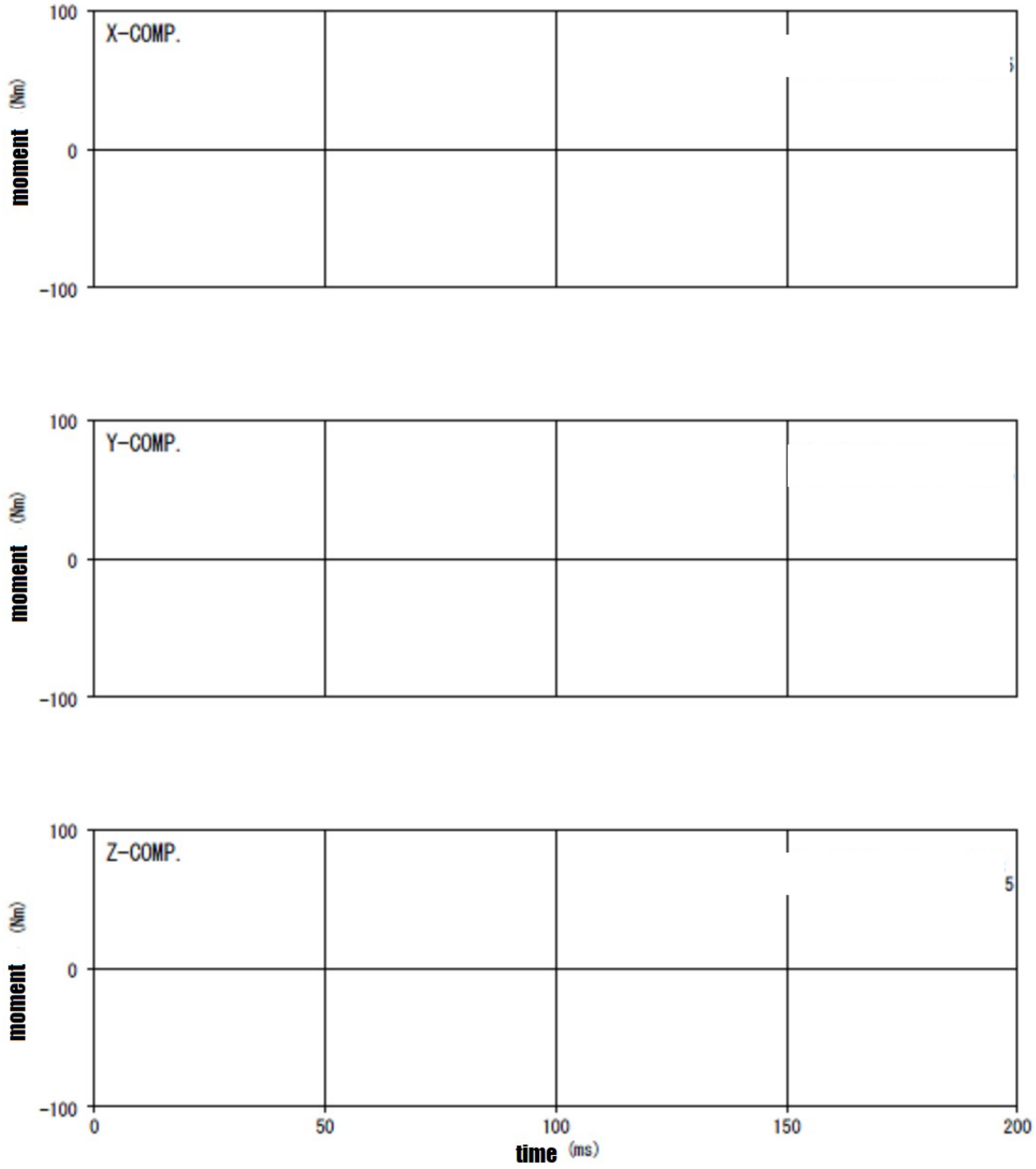
Dummy Head Acceleration (TestNo. **-**-**)



Dummy Chest Acceleration (TestNo. **-**-**)



Dummy Neck Load (TestNo. **-**-**)



Dummy Neck Moment (TestNo. **-**-**)