

AS/NZS 3629.1:2024



Australian/New Zealand Standard™

Methods of testing child restraints

Method 1: Dynamic testing



AS/NZS 3629.1:2024

This Joint Australian/New Zealand Standard™ was prepared by Joint Technical Committee CS-085, Child Restraints For Use In Motor Vehicles. It was approved on behalf of Standards Australia's Standards Development and Accreditation Committee on 20 September 2024 and by the New Zealand Standards Approval Board on 04 September 2024.

This Standard was published on 11 October 2024.

The following are represented on Committee CS-085:

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This Standard was issued in draft form for comment as DR AS/NZS 3629.1:2023.

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ISBN 978 1 76139 868 1

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Methods of testing child restraints

Method 1: Dynamic testing

Originated as AS 3629.1—1989.
Revised and redesignated as AS/NZS 3629.1:1995.
Sixth edition 2024.

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Preface

This Standard was prepared by the Joint Standards Australia/Standards New Zealand Committee CS-085, *Child Restraints for Use in Motor Vehicles*, to supersede AS/NZS 3629.1:2013.

The objective of this document is to provide manufacturers and testing authorities with a method for testing a child restraint under various dynamic conditions, in order to assess its performance under the requirements of AS/NZS 1754.

The dynamic test set out in this document applies to all types of child restraints specified in AS/NZS 1754.

Major revisions in this edition include the following:

- (a) Procedure for calibrating the test rig has been revised. It now includes upper and lower deceleration corridors.
- (b) Anchor fittings required for testing have been revised as anchorage components are no longer required to be supplied with a child restraint.
- (c) Removed requirements for measuring genital contact.

The terms “normative” and “informative” are used in Standards (and other publications) to define the application of the appendices to which they apply. A “normative” appendix is an integral part of a Standard, whereas an “informative” appendix is only for information and guidance.

NOTES

Australian/New Zealand Standard

Methods of testing child restraints

Method 1: Dynamic testing

1 Scope

This document sets out the method for determining the dynamic performance of a child restraint system.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements of this document.

AS/NZS 1754, *Child restraint systems for use in motor vehicles*

SAE J211, Instrumentation for impact tests—*Part 1—Electronic Instrumentation*

3 Terms and definitions

For the purpose of this document, the definitions given in AS/NZS 1754 apply.

4 Principle

Samples of the child restraint system are subjected to a series of dynamic forces caused by the nominated decelerations of a test rig to simulate frontal, rearward, sideways, and inverted vehicle impacts.

5 Apparatus

The following apparatus is required:

- (a) A test rig of mass not less than 380 kg, consisting of a sled, a test seat conforming to [Figure 1](#), and a structure for providing seatbelt anchorages.
- (b) A series of test dummies as specified in AS/NZS 1754.
- (c) A means of measuring deceleration of the test rig for calibration purposes. Instrumentation shall conform to the requirements of SAE J211 for Channel Frequency Class 60.
- (d) Where required, a simulated seatbelt as detailed in [Appendix C](#).
- (e) Where required, a means to measure the force in the webbing of the top tether strap.
- (f) A probe, to measure the force required to operate the quick-release device actuator to an accuracy of ± 1 N. The end of the probe shall have a $7 \text{ mm} \pm 0.5 \text{ mm}$ radius hemispherical surface.
- (g) Self-adjusting slings for attachment to the dummy's wrists and ankles as shown in [Figure 2](#).
- (h) A means of applying a force of 200 N to the dummy through the self-adjusting slings referred to in Item (g).
- (i) A means of measuring the force referred to in Item (h) to an accuracy of ± 1 N.
- (j) Where required, a break-away retention system for the dummy's head that will ensure that light head contact is maintained with the child restraint during the run-down to impact.

- (k) Where required, a means of measuring the head deceleration. Instrumentation shall conform to the requirements of SAE J211 for Channel Frequency Class 1000. The location of accelerometers shall be as specified in technical drawings produced by the dummy manufacturer.

NOTE 1 A triaxial accelerometer is considered to be the minimum required.

- (l) Where required, a door structure as specified in [Figure 5](#) used in conjunction with the test seat specified in [Figure 1](#).
- (m) One or more high-speed cameras, each with a minimum capability of 400 frames per second, to record the kinematics of the child restraint and the test dummy, and where required —
- (i) to provide evidence of any adverse interaction that occurs between the child restraint hardware, the test dummy, the seatbelt and the test seat;
 - (ii) to enable observation the dummy's head with respect to the surface of the door structure;
 - (iii) to enable measurement of head excursion;
 - (iv) to enable measurement of knee displacement; and
 - (v) to enable measurement of head rotation.
- (n) Where required, a system to minimize the movement of both the child restraint and the test dummy during the run-down to impact.
- (o) A spacer conforming to [Figure 3](#).

NOTE 2 Material should be flexible but substantially incompressible.

- (p) A sheet of white paper or similar material that shall not be smaller than A4 size.
- (q) A rigid indicator with sufficient length to be visible by a side camera and weighing no more than 150 g, designed to be attached to the top of the dummy's head through the vertical axis and the midsagittal plane of the dummy.
- (r) Where required, a means to apply a 10 kg mass to the booster seat.
- (s) Where required for testing child restraints that are stated as being suitable for use on aircraft, a dynamic test seat conforming to the dimensions in [Figure 6](#) and conforming to the following requirements:
- (i) The dynamic test seat shall include a means of attachment at each anchor point to allow a length of seatbelt webbing specified in Item (iv) below to be clamped.
 - (ii) The anchorages shall be free to rotate in the longitudinal vertical plane.
 - (iii) The anchorages shall not extend vertically above the test seat cushion.
 - (iv) The dynamic test seat shall include a length of seatbelt webbing of 50 mm width and elongation of 6 % to 10 % (at 1140 N).

6 Test samples

Test samples shall be new, unused, and not previously tested child restraints.

7 Test set-up

The following requirements apply to each mode of testing:

- (a) *Frontal* — The following requirements apply:
 - (i) Install the test seat onto the test rig in the orientation to simulate the frontal test mode.
 - (ii) Install applicable high-speed camera(s), Item 5(m). If mounts are required, install the appropriate camera mounts, i.e. rear on-board mounted camera for Type A mode or 45° front on-board for Type B mode.
 - (iii) Use the seatbelt anchorage locations or lower anchorages as applicable and as shown in [Figure 1](#).
 - (iv) Use the upper anchorage point as shown in [Figure 1](#).
- (b) *Rearward* — The following requirements apply:
 - (i) Install the test seat onto the test rig in the orientation to simulate the rearward test mode.
 - (ii) Install applicable high-speed camera(s), see Item 5(m). If mounts are required, install the appropriate camera mounts, i.e. rear on-board mounted camera for Type A mode or side mounted for Type B head rotation.
 - (iii) Use the seatbelt anchorage locations or lower anchorages as applicable and as shown in [Figure 1](#).
 - (iv) Use the upper anchorage point as shown in [Figure 1](#).
- (c) *Sideways (without door structure)* — The following requirements apply:
 - (i) Install the test seat onto the test rig in the orientation to simulate the sideways test mode.
 - (ii) Install applicable high-speed camera(s), see Item 5(m).
 - (iii) Use the seatbelt anchorage locations or lower anchorages as applicable and as shown in [Figure 1](#).
 - (iv) Use the upper anchorage point as shown in [Figure 1](#).
- (d) *Sideways (with door structure)* — The following requirements apply:
 - (i) Install the test seat onto the test rig in the orientation to simulate the sideways test mode.
 - (ii) Install applicable high-speed camera(s), see Item 5(m).
 - (iii) Install the door structure as specified in [Figure 5](#).
 - (iv) Use the seatbelt anchorage locations or lower anchorages as applicable and as shown in [Figure 1](#).
 - (v) Use the upper anchorage point as shown in [Figure 1](#).
- (e) *Inverted* — The following requirements apply:
 - (i) Install the test seat onto the test rig in the orientation to simulate the inverted test mode.
 - (ii) Install applicable high-speed camera(s), see Item 5(m).

- (iii) Use the seatbelt anchorage locations or lower anchorages as applicable and as shown in [Figure 1](#).
- (iv) Use the upper anchorage point as shown in [Figure 1](#).
- (f) *Frontal (aircraft)* — The following requirements apply:
 - (i) Install the test seat (aircraft) onto the test rig in the orientation to simulate the frontal test mode.
 - (ii) Position a high-speed camera [see Item 5(m)] on the side of the test rig to facilitate angle measurement. If mounts are required, install the appropriate camera mounts.
 - (iii) Use the seatbelt anchorage locations as shown in [Figure 6](#).

8 Procedure

The procedure shall be as follows:

- (a) After setting up with the appropriate test orientation, calibrate the test rig as specified in [Appendix A](#), including camera mounts and other fixtures, if required.
- (b) Remove the ballast mass from the sled.
- (c) Install the child restraint system on the test seat with the test seat in the position for the required mode of testing.

For testing in the inverted mode, the orientation of the child restraint shall be as shown in [Figure 4](#).

- (d) Place the child restraint onto the test seat and attach the seatbelt or connect to the ISOFIX low anchorages as applicable, and attach the top tether strap, all according to the instructions provided by the manufacturer. Additional requirements are as follows:
 - (i) Where the child restraint is attached to the test rig using a lap sash belt, the seatbelt shall be attached at the points shown in [Figure 1](#).
 - (ii) Where the child restraint is attached to the test rig using the lower attachment connectors, the ISOFIX low anchorage location shall be as shown in [Figure 1\(a\)](#) and either [Figure 1\(b\)](#) or [Figure 1\(c\)](#).
 - (iii) An anchor fitting shall be installed at the applicable anchorage point location specified in Figure 1. The anchor fitting shall meet the following requirements:
 - (A) The anchor fitting shall meet the interface profile specified in AS/NZS 1754:2024 Figure 3.11 Detail A.
 - (B) The edge of the interface profile contacted by the attachment clip shall be located within 29 mm of the anchorage point location
 - (C) The anchor fitting shall be capable of withstanding the dynamic forces prescribed in this test method.
 - (iv) The anchor fitting strap shall be connected as shown in [Figure 1](#) and as follows:
 - (A) Point A1 for frontal, sideways and inverted testing.
 - (B) Point A1 for sideways with door testing when attached to the ISOFIX lower anchorages.
 - (C) Point A2 for frontal testing with extended tether.

- (D) Point A3 for sideways with door testing when attached by a seatbelt.
- (E) Point A4 for frontal testing when upper anchorage loads are required.
- (v) The seatbelt and top tether strap shall be adjusted to remove slack, by applying a force of 60 N to 80 N to the free-end of the webbing. For a lap sash seatbelt, the force shall be first applied to the lap belt external to the buckle tongue and then to the sash belt external to seatbelt sash guide on the test seat following any engagement of a locking device or lock-off.

Where the top tether strap is fitted with a tension indicator then the strap shall be adjusted until the tension indicator is activated.
- (vi) Flexible lower attachment straps shall be adjusted until the tension indicator is activated.
- (e) Remove the slack from the top tether strap and where applicable, the seatbelt assembly or flexible lower anchorage connectors.

NOTE 1 For Type A1, A2, A4 and Type D, the anchorage strap should be connected or tightened in accordance with the manufacturer's instructions.
- (f) Place the appropriate test dummy as specified in AS/NZS 1754 in the child restraint and, when required, insert the appropriate spacer between the back of the dummy and the child restraint. The appropriate spacer from Figure 3 shall be used in all tests except the following:
 - (i) Type A0 child restraint systems when used with low birth weight dummy.
 - (ii) Type B and G child restraint systems when tested for head excursion measurement.
 - (iii) Type E8, E10 and F booster seats when tested with adult seatbelt only.
- (g) Restrain the test dummy and adjust the harness in accordance with the manufacturer's instructions.
- (h) Remove the spacer without repositioning of adjuster/s and mark the non-load bearing webbing to enable adjuster slips to be measured.
- (i) In frontal testing on Type A1, Type A2, Type A4 and Type D devices carried out on impact test rigs, restrain the dummy's head with the break-away retention system, see Item 5(i).
- (j) For sideways testing using the door structure, use a movement minimization system [see Item 4(n)] to minimize the sideways movement of child restraint and test dummy.
- (k) For frontal tests of Type A1, Type A2, Type A3, Type A4 and Type D child restraints, attach the sheet of paper [see Item 5(p)] to the top of the front face of the seat back so that it is centred laterally across the seat back.
- (l) Set the test rig to the settings established during calibration of the test rig for the selected mode, i.e. frontal, sideways, rearwards or inverted (see [Appendix A](#)).
- (m) If required, ensure that the applicable cameras [see Item 5(m)] are set up to capture the kinematics of the child restraint and the test dummy, and enable any observations or measurements to be made.
- (n) As required, apply paint to the head of the test dummy with an indicator solution sufficient to enable the determination of head contact.
 - (i) For frontal tests on Type A1, Type A2, Type A3, Type A4 and Type D child restraints, apply sufficient indicator solution to the head of the test dummy to enable the determination of head contact.