



**EUROPEAN NEW CAR ASSESSMENT PROGRAMME  
(Euro NCAP)**



**ASSESSMENT PROTOCOL – CHILD OCCUPANT PROTECTION**

**Implementation 2020**

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## Preface

- During the test preparation, vehicle manufacturers are encouraged to liaise with the laboratory and to check that they are satisfied with the way cars are set up for testing. Where a manufacturer feels that a particular item should be altered, they should ask the laboratory staff to make any necessary changes. Manufacturers are forbidden from making changes to any parameter that will influence the test, such as dummy positioning, vehicle setting, laboratory environment etc.
- It is the responsibility of the test laboratory to ensure that any requested changes satisfy the requirements of Euro NCAP. Where a disagreement exists between the laboratory and manufacturer, the Euro NCAP secretariat should be informed immediately to pass final judgment. Where the laboratory staff suspect that a manufacturer has interfered with any of the set up, the manufacturer's representative should be warned that they are not allowed to do so themselves. They should also be informed that if another incident occurs, they will be asked to leave the test site.
- Where there is a recurrence of the problem, the manufacturer's representative will be told to leave the test site and the Secretary General should be immediately informed. Any such incident may be reported by the Secretary General to the manufacturer and the person concerned may not be allowed to attend further Euro NCAP tests.

DISCLAIMER: Euro NCAP has taken all reasonable care to ensure that the information published in this protocol is accurate and reflects the technical decisions taken by the organisation. In the unlikely event that this protocol contains a typographical error or any other inaccuracy, Euro NCAP reserves the right to make corrections and determine the assessment and subsequent result of the affected requirement(s).

# EUROPEAN NEW CAR ASSESSMENT PROGRAMME (Euro NCAP)

## ASSESSMENT PROTOCOL – CHILD OCCUPANT PROTECTION

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# 1 INTRODUCTION

## 1.1 Background

Euro NCAP has carried out a child occupant safety assessment since its very first test to ensure that manufacturers take responsibility for the children travelling in their vehicles. In November 2003, Euro NCAP introduced a child occupant protection rating to provide clearer information for consumers about the results of these tests. As part of this assessment, Euro NCAP has used 18 month old and 3 year old sized dummies, placed in manufacturers 'recommended' child restraint systems (CRS), in the frontal and side impact tests. As well as studying the results from the impact tests, Euro NCAP verified the clarity of instructions on the CRS and vehicle as well as the CRS installation in the vehicle to ensure that the CRS could be fitted safely and securely. In 2009, the child score became integral part of the overall rating scheme but the technical assessment remained the same.

Starting from 2013, the assessment of child safety is extended by an installation check of a selection of popular, well performing seats available in Europe. This will assess the vehicle's ability to safely and correctly accommodate a broader range of CRS instead of a single combination of recommended CRS and car. For this purpose, a so-called 'top pick' list is populated with widely available, well performing child restraints that represent most common types of products available on the European market. The particular CRS included on the 'top pick' list are published on Euro NCAP's website and will be checked every year for availability of the CRS. Every 2 years the list will be completely reviewed and updated. Each update will occur at the start of the year preceding the year of application. The 'top pick' list may be extended to include manufacturer's recommended seats and/or regionally popular seats.

In 2016, the dynamic test part of the assessment has been revised, replacing the 1.5 and 3 years old dummies by 6 and 10 years old respectively. Also, from this date only fully i-Size compliant vehicles are rewarded in the relevant vehicle based assessments.

## 1.2 Overview

This protocol defines how protection for children is assessed in Euro NCAP. The principle behind the Child Occupant Protection assessment is that children should be as equally well protected as adults in the event of a crash. The protocol is applicable to all classes of vehicles currently assessed by Euro NCAP, including vehicles where there is no rear bench or where there is limited space for carrying CRS on the rear seats.

As part of the assessment, various types of child restraints will be installed in the vehicle to assess its ability to accommodate restraints for all ages of children. Instrumented Q6 and Q10 dummies will be used to assess the protection offered in the event of front and side crashes. During a post-crash vehicle inspection, the car will be assessed on aspects such as labelling, airbag disabling, ISOFIX usability, i-Size readiness and more. The results from these tests are separately assessed as follows:

- Vehicle based assessment (Chapter 2),
- Problem-free installation of child restraints (Chapter 3),
- Dynamic performance (Chapter 4).

The application of the requirements in this protocol to vehicles with limited rear space and two seaters is detailed in Chapter 5.

## 2 VEHICLE BASED ASSESSMENT

All vehicle based assessments will be only performed on vehicles that meet the relevant fitment requirements at the time of assessment. Hence, before the assessment starts, the total number of passenger seating positions in the vehicle must be identified including 1<sup>st</sup>, 2<sup>nd</sup> and 3<sup>rd</sup> row if available. Where a vehicle is available with optional seat rows on any variant, the assessment will be based on a vehicle fitted with the optional seats.

### 2.1 Preconditions

#### 2.1.1 Provision of Three-point Seat Belts

If any passenger seat is not equipped with (at least) three-point lap and diagonal seatbelts, **0 points** shall be awarded for the vehicle based assessment.

#### 2.1.2 Vehicle Handbook Information

Consumers must be able to rely on the information given in the vehicle handbook to determine which CRS suits them and their children best. The information provided should clearly state what is, and moreover, what is not possible in terms of installing child restraint systems on the different seating positions in the vehicle.

The vehicle handbook must detail, either in tabular format or with the use of pictograms, the CRS categories (Universal, ISOFIX and i-Size as defined in Regulation 16) that are suitable or not suitable for installation for each passenger seating position. The information must explicitly state which CRS weight and size groups can be installed on each passenger seating position. Where a seating position can accommodate all Universal categories (group 0, 0+, I, II and III), U may be used. For seating positions that do not cover all CRS groups, the handbook must indicate which groups are and are not covered.

Where any of the applicable information is not present, the CRS installation and vehicle based assessments will not be performed and **0 points** shall be awarded in these areas. It is acceptable for the information to be annexed in the vehicle handbook or provided on a permanent website provided that clear references are provided in the vehicle handbook.

Where the CRS information is provided according to R16/07, it must be clear which CRS weight and size groups can be installed on each passenger seating position. Where the R16/06 table is used for Universal, ISOFIX and i-Size CRS, Section 2.1.2.1-3 must be met.

##### 2.1.2.1 Universal (Belted) CRS Table

The Universal CRS table must clearly detail on which seating positions a Universal CRS can be installed (and not installed) using the vehicle's seatbelt. This is to be done for every Universal CRS weight group, using the following key of letters to be used in the table:

- U:** Suitable for "Universal" category restraints approved for use in this weight group. U(\*) or U(R) will also be permitted provided that there is an accompanying key.
- UF:** Suitable for forward-facing "Universal" category restraints approved for use in this weight group.
- L:** Suitable for particular child restraints given on attached list. These restraints may be of the "Specific vehicle", "Restricted" or "Semi-universal" categories.

- B:** Built-in restraint approved for this weight group.
- X:** Seat position not suitable for children in this weight group.

### 2.1.2.2 ISOFIX CRS Table

The ISOFIX CRS table must clearly detail which seating positions can be used (and not used) for installing an ISOFIX CRS. This is to be done for every ISOFIX CRS size class and/or type of fixture using the following key of letters to be used in the table:

- IUF:** Suitable for ISOFIX forward child restraints systems of Universal category approved for use in the weight group
- IL:** Suitable for particular ISOFIX child restraint systems (CRS) given in the attached list. These ISOFIX CRS are those of the "specific vehicle", "restricted" or "semi-universal" categories. IL-SU will also be permitted provided that there is an accompanying key.
- X:** ISOFIX position not suitable for ISOFIX child restraint systems in this weight group and/or this size class.

### 2.1.2.3 i-Size CRS Table

The must clearly detail which seating positions can be used for installing an i-Size CRS using the following key of letters to be used in the table:

- i-U / i-UF:** Suitable for i-Size "universal" CRS forward and/or rearward facing.
- X:** Seating position not suitable for i-Size "universal" CRS.

### 2.1.2.4 Airbag Disabling

- a) Where a passenger frontal airbag is fitted (both front and rear seats if applicable) all CRS tables in the vehicle handbook must clearly indicate that when these passenger airbags are active the seat is NOT suitable for any rearward facing CRS. This is to be done with the use of either two separate columns in the relevant tables, Universal, ISOFIX and i-size where appropriate. One column shall indicate the CRS installation options with the airbag ON and the second column with the airbag OFF. Alternatively, pictograms may be used to indicate the airbag status and equivalent readiness of the passenger seat for accommodating CRS providing the pictograms meet the requirements of Section 2.5.

Table example:

	Front passenger seat		Rear outboard seats	Centre rear seat
	Airbag activated	Airbag deactivated		
Group 0	X	U	U	U
Group 0+	X	U	U	U
Group I	X	U	U	U
Group II	U	U	U	U
Group III	U	U	U	U

- b) Where the passenger airbag cannot be activated and deactivated by either the user, or a fully automatic disabling system (assessed in accordance with TB023), the RWF CRS installations on the front passenger seat will automatically be deemed a fail.
- c) Where a vehicle is equipped with a low risk deployment frontal airbag, it is not necessary to deactivate the airbag but there must be information in the handbook indicating that this airbag can remain active when installing a RWF CRS. A clear explanation as to why it is safe for the airbag to remain enabled must also be provided in the handbook. The vehicle manufacturer must provide convincing data to Euro NCAP to show that the frontal airbag can indeed be considered as low risk.

## 2.2 Gabarit Installation on All Passenger Seats

Where the 2nd row outboard seats are in compliance with the requirements in UN Regulation 16 Annex 17 - Appendix 1 and meet the additional requirements specified below, **1 point** shall be awarded. Where, in addition, all other passenger seats comply, an additional **1 point** shall be awarded. For gabarit installations on the 3<sup>rd</sup> row seats, it is acceptable to move or fold the 2<sup>nd</sup> row seats to enable installation provided the vehicle handbook instructs the user to do so.

### 2.2.1 Additional Requirements for Gabarit Installation:

- a) Once the belt is correctly routed around the Gabarit fixture, it should be possible to draw a further 150mm of belt webbing from the reel.
- b) Where a passenger frontal airbag is fitted, it must be possible to activate and deactivate the passenger airbag, either automatically or manually. The requirements of Section 2.5 need not be met to qualify for this award, but the airbag disabling equipment must be standard and the requirements of 2.1.2.4 a) must also be met.
- c) In the case of an adult seat belt that is capable of being switched from an emergency locking retractor (ELR) to an automatic locking retractor (ALR), clear advice, obvious to the user, about how the ALR feature should be used needs to be present on any labels attached to the seat belt (information given in the handbook is not sufficient as reading of the handbook cannot be assumed for all users).

## 2.3 i-Size and TopTether Marking

### 2.3.1 Precondition

Where i-Size seating positions are offered, they need to comply with the following marking requirements to be eligible for scoring the available points specified below.

- a) The location of each i-Size anchorage must be marked.
- b) The location of each top tether anchorage must be marked and include both text and a pictogram.
- c) The i-Size markings must show the relevant i-Size pictogram detailed in UN Regulation 145. It is allowed to add the word ISOFIX adjacent to the i-Size pictogram.
- d) All markings must be of conspicuous design and both the text and pictogram must have colours which contrast with their background.
- e) All markings must be permanently visible. Flag type labels are not acceptable.
- f) All marking must be permanently attached to the vehicle.

### 2.3.2 i-Size Availability

Where the vehicle offers two or more i-Size seating positions that are able to accommodate the ISO/B2 i-size fixture, defined in R16 supplement 9, **2 points** are awarded.

### 2.3.3 Three i-Size Seating Positions

Where the vehicle is provided with three fully independent, correctly marked i-Size seating positions (Section 2.3.1) that can correctly accommodate i-Size CRS including top-tether (2.3.2), **1 point** shall be awarded. It will not be acceptable for any anchorages and the top-tether to be shared between seating positions.

## 2.4 Two or more ISO/R3 Positions

Where two or more seating positions are suitable for fully independent use with the largest size of rearward facing (Class C) ISOFIX CRS, Fixture (CRF) ISO/R3, **1 point** shall be awarded. The vehicle handbook must inform the user that the vehicle is capable of accommodating the ISO/R3 fixture.

When checking a CRF behind the driver seat, it may be adjusted longitudinally forward but not further than the mid position between its 95<sup>th</sup> and foremost positions. The seat backrest angle may also be adjusted, but not to a more upright angle than corresponding to a torso angle of 15 degrees. The full range of seat height adjustment can be used. All adjustments of any passenger seats are permissible to install the fixture.

## 2.5 Passenger Airbag Warning Marking and Disabling

If the vehicle is fitted with a passenger's frontal protection airbag as standard or optional, it must be marked with a permanent airbag warning label that meets the requirements of UN Regulation 94 to be eligible for scoring points under this section. For automatic switches, **4 points** will be awarded when the below requirements in sections 2.5.1 and 2.5.3 are met. For manual switches, **2 points** will be awarded when requirements for manual switches in sections 2.5.1 and 2.5.2 are met. If no passenger airbag is available on the entire model range, **2 points** will be awarded.

### 2.5.1 General Requirements for Automatic and Manual Switches

- a) Any text, labelling and instructions in relation to airbag disabling must be permanently attached to the vehicle.
- b) The information provided must be clear, without reference to the vehicle's handbook or other source.
- c) The information and warnings must be provided in such a way that they are visible for both the driver and front seat passenger, showing the status of the airbag.
- d) The status indicator must be labelled with the words 'Passenger AIRBAG OFF/ON'. Abbreviations such as 'Pass', 'AB' or any other combination is NOT acceptable. Supplementary warnings will be ignored.
- e) The AIRBAG ON pictogram must be based upon that of the sun visor label (ECE R94) as shown below:



- f) The AIRBAG OFF pictogram must be based upon that detailed in ECE R121 as shown below:



- g) Slight alterations to the ON/OFF pictograms above are acceptable provided that the basic geometry of the pictogram remains the same. Mirroring and monochrome colours are acceptable.
- h) If the information to indicate that the airbag is enabled is provided by a visual signal, the signal is only required to be shown for a period of 60 seconds after the ignition is switched on.
- i) Information to indicate that the airbag is disabled must be permanently displayed, when the ignition is on and the seat is occupied.
- j) If at any time the airbag is switched from the OFF position to the ON position, the status indicator showing that the airbag is ON must signal this immediately after checking period for at least 60 seconds, regardless of the length of time the ignition has been switched on, or until the ignition is switched off again.

#### 2.5.2 Additional Requirements for Manual Switches Only

- a) Where a manual switch is used, it must be labelled with the words 'Passenger AIRBAG OFF/ON' and the same pictograms detailed above indicating ON and OFF.
- b) The individual switch positions must be marked with the same pictograms that are used to indicate the airbag status. The two positions must be marked with the text ON & OFF along with the corresponding pictogram.
- c) Where the two switch positions are marked not on the switch but on an adjacent label, the label must be sufficiently close to the switch, such that the user clearly associates one with the other.
- d) Where a hardware switch is used, it must be accessible and clearly visible when installing CRS. For example, where a switch is located in the glove box, the presence of the switch must be clearly highlighted either by switch itself or an additional, permanent, label when the lid is open. For example, the switch may not be located on the driver's side of the vehicle
- e) It must not be possible for a rearward facing child; restrained on the front passenger seat; to operate the switch at any time.
- f) Where a software based switch is used, clear instructions detailing 'Passenger AIRBAG OFF/ON' (no abbreviations) must be presented in the menu at the same time as the corresponding pictograms used for the status indicator.

- g) If, with the ignition on and with engine running or not, the airbag status can be changed, the system must react correctly to the change immediately. Systems will be checked once the vehicle diagnostics/system checks have been completed.

### 2.5.3 Additional Requirements for Automatic Switches Only

- a) The system must ensure that the airbag is OFF for ANY rearward facing CRS and obviate any risk associated with airbag deployment
- b) If, with the ignition on and with engine running or not, the airbag status can be changed, the entire system must immediately react to the change correctly. Systems will be checked once the vehicle diagnostics/system checks have been completed.
- c) The system must automatically re-activate the airbag when the seat is occupied by a person who is not required to use a child restraint.
- d) The method for assessing automatic systems is detailed in TB023

## 2.6 Integrated Child Restraints

Where the vehicle is provided with at least one integrated CRS as standard equipment, **1 point** shall be awarded. If the vehicle offers two or more integrated CRS, as standard equipment, **3 points** shall be awarded.

### **3 INSTALLATION OF CHILD RESTRAINTS**

Euro NCAP rewards vehicles that can accommodate a broad variety of child restraints available on the European market. For this purpose, a limited number of popular CRS are installed in the vehicle. All CRS selected for the Euro NCAP fitment tests have demonstrated good (crash test) performance in leading independent consumer tests and are readily available in certain regions of the EEA, TB002. The groups and recommended installation modes of the CRS selected represent those commonly most observed on the market, including some Universal, ISOFIX and i-Size seats. This “top pick” list of CRS, how it is compiled and updated is explained in section 3.1 below. Where a vehicle is available with optional seat rows on any variant, the installation assessment will be based on a vehicle fitted with the optional seats.

#### **3.1 Top Pick List and Recommended Seats**

##### **3.1.1 Top Pick List (TPL)**

The child restraints used for the fitment assessment are detailed in Euro NCAP Technical Bulletin TB012.

##### **3.1.2 Manufacturer’s Recommendation**

The overall responsibility of the vehicle manufacturer for safe transport of children is also reflected in the recommendation that the vehicle manufacturer should make regarding the CRS to be used in the vehicle. Hence, besides ensuring that vehicles that can accommodate a broad variety of CRSs, Euro NCAP rewards vehicle manufacturers that recommend suitable CRS for each weight group and/or size range.

Any recommended CRS must meet the following requirements:

- a) The CRS must be recommended by the vehicle manufacturer, to their customers, in all countries of the European Union, where the vehicle is sold.
- b) Where the recommended CRS are not on the top-pick list, the CRS must be available for purchase by the public from both vehicle dealers and independent retail outlets in all countries defined in TB002 where the vehicle is sold. The CRS system must be available to the public within 5 working days of an order being made.
- c) The recommended CRS must have been fully type approved and evaluated by the ETC (or similar) programme (including dynamic tests) and obtain a ‘good’ performance rating. This is the case for CRS on the top pick list. For CRS not on the top pick list, it is the vehicle manufacturer’s responsibility to provide evidence of ‘good performance’ at the time of CRS recommendation, following the procedure described in Technical Bulletin 012. For Integrated CRS, booster seat with detachable backrests or booster cushion CRS no ETC testing is necessary.
- d) Recommendation of ‘OEM rebranded’ CRS that are already on the top pick list can be accepted. Information will be added to the results to highlight the equivalency between original top pick list seat and ‘OEM rebranded’ seats to the consumer.
- e) Euro NCAP verifies the problem-free installation of manufacturer’s recommended CRS for Q6 and Q10 on the 2<sup>nd</sup> row rear outboard positions only. The installations will be performed using the CRS installation mode and settings/adjustments recommended by the vehicle manufacturer for dynamic testing in the same way as it does top pick list seats but a separate score will be attributed (see section 3.3). The other recommended CRS

will not be installed.

### 3.1.3 CRS for dynamic tests

- a) The Q6 dummy shall be seated in an appropriate CRS for a six year old child or a child with a stature of 125cm. This will be the CRS recommended by the vehicle manufacturer in the vehicle handbook. If there is no recommendation made in the vehicle handbook for a six year old child a suitable CRS will be chosen from the top pick list (TB012).
- b) The Q10 dummy shall be seated on a booster cushion only. This will be the booster cushion recommended by the vehicle manufacturer in the vehicle handbook. Where the vehicle manufacturer recommends, in the vehicle handbook, a high back booster seat with detachable backrest, it will be used without the backrest. If there is no recommendation made in the vehicle handbook or a booster seat with a non-removable backrest is recommended, a suitable booster cushion will be chosen from the list of booster cushions in TB012. Booster cushions will be accepted for use in the tests provided that when the Q10 dummy is seated on the booster, no part of the head is higher than 840mm vertically above the Cr-point. Booster cushions that have R44 or R129 approval will not need to meet this requirement.
- c) Where a vehicle is equipped with an integrated CRS covering the Q6 and/or Q10 on the rear outboard 2<sup>nd</sup> row test positions, the integrated CRS will be used in the dynamic tests. Integrated CRS will be used even if they are optional equipment. Where a vehicle is equipped with only one integrated CRS on either outboard position covering both or only one of two child ages, the integrated CRS will be used only where applicable. If only one integrated CRS is present, the vehicle manufacturer shall recommend a suitable CRS to accommodate the other child dummy. Where this is not the case the steps detailed in a) and/or b) will be followed.

## 3.2 Installation Matrix

The Vehicle Based Assessment (Section 2) determines the eligibility for scoring for the combinations of CRS's and seating positions in the vehicle. The following provides an overview of the relationship between the Vehicle Based Assessments and the Installation Matrix.

### 3.2.1 Universal (Belted) CRS

Seating positions must meet the extended Gabarit check (Section 2.2) to be included in the Installation Matrix for the Universal CRS's. In addition, these seating positions must be marked with 'U' or 'UF' in the Universal CRS table. A combination of Universal CRS group and seating position that do not meet these requirements will automatically fail the CRS installation assessment for Universal CRS of that group on the Top Pick list. Where a vehicle can be equipped with optional inflatable seatbelts or other advanced adult restraint systems, this equipment will not be assessed provided that the vehicle handbook clearly states that CRS cannot be installed when this equipment is present. The vehicle manufacturer is asked to contact Euro NCAP in advance of the vehicle assessment to confirm this exemption.

The semi-universal CRS on the top pick list that are installed with the adult belt and support leg will be exempted from installation on any seating position when the CRS vehicle list identifies that the CRS cannot be used on this seating position and that it is clearly identified in the vehicle handbook (adjacent to the Universal CRS table) not to install a belted CRS with a support leg, for example in the central sitting position where the tunnel interferes with the support leg. When

this is the case, the belted semi-universal CRS installation score on that seating position will be awarded the available points (see section 3.3).

### 3.2.2 I-Size CRS

These seating positions must be marked with ‘i-U’ in the i-Size CRS table (‘i-UF’ will be accepted only for seating positions equipped with airbags). A seating position that does not meet these requirements will automatically fail the CRS installation assessment for i-Size CRS on the Top Pick list.

### 3.2.3 ISOFIX CRS

These seating positions must be marked with ‘IL’ or ‘IUF’ in the ISOFIX CRS table. A combination of ISOFIX size class and seating position that does not meet these requirements will automatically fail the CRS installation assessment for ISOFIX CRS of that size class on the Top Pick list.

ISO/R3 size class seats listed on the Top Pick list will be exempted from installation on any seating position when the CRF ISO/R3 cannot be installed according to section 2.4 and is clearly identified with an “X” in the ISOFIX CRS table as unsuitable for this size. When this is the case, the combination of ISO/R3 size class CRS given installation score on that seating position will be awarded the available points (see section 3.3).

### 3.2.4 Passenger Airbag Warning and Disabling

Seating positions which have a frontal passenger airbag present must meet the requirements for Passenger Airbag Warning Marking and Disabling (Section 2.5) to be included in the Installation Matrix. A seating position that does not meet these requirements will automatically fail the CRS installation assessment for all rearward facing Universal belted, ISOFIX and i-Size seats on the Top Pick list for these seating positions.

### 3.2.5 Integrated Child Restraints

Where an integrated CRS is offered as standard and indicated as such in the vehicle handbook, this seating position will automatically pass the assessments and no installation check is required with the Top Pick List-CRS of the weight/size group covered by the integrated CRS.

## 3.3 CRS Installation Scoring

Each CRS-seating position combination from the Installation Matrix will be used for scoring. When all of the requirements are met for a given CRS-seating position, it is awarded the points available and is shown as a “Pass”.<sup>1</sup>

Where the vehicle based assessment result prevented scoring or where the requirements are not met and the requirements on which the CRS installation failed are considered to be safety critical, the CRS-Seating position combination is considered a “Fail”. When a non-safety critical requirement is not met, it is considered to be a “Partial Fail” (P Fail). For both cases, “Fail” and “P Fail”, no points are awarded for the CRS-seating position combination, however the results will be differently communicated.

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1) ISO/R3 size class exemptions (see section 3.2.3) will be treated as “Exemption” to calculate the installation score.

The score for each individual CRS on the installation matrix,  $CRS_i$ , will be calculated by dividing the number of successful installations in the vehicle by the total number of suitable passenger seating positions in the vehicle.

**Table 1. Installation score for individual CRS on the top pick list.**

<b>CRS<sub>i</sub></b>	<b>Installed in</b>	<b>CRS<sub>i</sub> Installation Score</b>
Universal	All passenger positions	Number of “Pass” / All passenger positions
ISOFIX	All ISOFIX or i-Size positions	Number of “Pass” / All ISOFIX and/or i-Size positions
i-Size	All i-Size positions	Number of “Pass” / All i-Size positions

Separate points will then be given for fitment of the CRS from each category as follows:

Universal CRS	4 point
ISOFIX CRS	2 point
i-Size CRS	4 point

The score for each CRS category is calculated by taking the average of the  $CRS_i$  scores in the category and applying the percentage to the points allocated for this category of CRS.

Where the manufacturer recommends appropriate CRS for all child statures up to and including 135cm (section 3.1.2) **1 point** will be awarded. An additional **1 point** will be awarded where there is a recommended CRS for statures up to and including 150cm. If the recommended CRS are to be used in the dynamic tests they **MUST** meet the installation requirements on the 2<sup>nd</sup> row rear outboard positions.

The maximum available score for the installation assessment will be **12 points** and is independent of the number of seats on the top pick list. If there is no recommendation for CRS, the maximum available score for CRS fitment will be **10 points**.

### 3.3.1 Rounding

The resulting point scores per CRS is expressed as numbers, with 3 decimal points. The total score for CRS installation is the sum of the points for fitment all CRS’s.

**Table 2. Example of top pick list installations**

CRS Installation Assessment					SEATING POSITION									SCORING				
					Front			2nd row			3rd row			Pass	Fail	Exempt	Score	
					Left	Centre	Right	Left	Centre	Right	Left	Centre	Right					
					N/A	N/A	Belt	i-Size	Belt	i-Size	Belt	N/A	Belt					
UNIVERSAL	Group 0+	Maxi Cosi Cabriofix	B _ _ _	U	N/A	N/A	Pass	Pass	Fail	Pass	Pass	N/A	Pass	5	1		83.3%	
		Maxi Cosi Cabriofix & EasyBase2	B _ L _	VEHICLE LIST	N/A	N/A	Pass	P Fail	Exempt	P Fail	Pass	N/A	Pass	3	2	1	66.7%	
	Group I	Römer King II LS	B _ _ _	U / UF	N/A	N/A	Pass	Pass	Pass	Pass	Fail	N/A	Fail	4	2		66.7%	
	Group II/III	Römer KidFix XP	B _ _ _	U / UF	N/A	N/A	Pass	Pass	P Fail	Pass	Fail	N/A	Fail	3	3		50.0%	
ISOFIX	Group 0+/I	BeSafe iZi Kid X4 ISOfix	_ I L _	ISO/R3	N/A	N/A	Fail	Pass	Exempt	Pass	N/A	N/A	N/A	2	1	1	75.0%	
	Group II/III	Römer KidFix XP	B I _ _	VEHICLE LIST	N/A	N/A	P Fail	Pass	N/A	Pass	N/A	N/A	N/A	2	1		66.7%	
i-Size	67-105cm	Maxi Cosi 2way Pearl & 2wayFix	_ I L _	i-Size	N/A	N/A	N/A	Pass	N/A	Pass	N/A	N/A	N/A	2	0		100.0%	
	>15m-105cm		_ I L _	i-Size	N/A	N/A	N/A	Pass	N/A	Pass	N/A	N/A	N/A	2	0		100.0%	
	61-105cm		BeSafe iZi Kid X2 i-Size	_ I L _	i-Size	N/A	N/A	N/A	Pass	N/A	Pass	N/A	N/A	N/A	2	0		100.0%
	76-105cm		Römer Trifix2 i-Size	_ I _ S	i-Size	N/A	N/A	N/A	Pass	N/A	Pass	N/A	N/A	N/A	2	0		100.0%
	100-135cm		BeSafe iZi Flex Fix i-Size	B I _ _	i-Size	N/A	N/A	N/A	Pass	N/A	Pass	N/A	N/A	N/A	2	0		100.0%
OEM	Group 0+	Maxi Cosi 2way Pearl & 2wayFix	_ I L _	ISO/R1														
	Group I	Romer Duo Plus	_ I _ S	ISO/F2X													1.000	
	Group II	Takata Maxi Plus	B I _ _	VEHICLE LIST			Pass		Pass					2	0			
	Group III	Romer Kidfix XP SICT	B I _ _	VEHICLE LIST			Pass		Pass					2	0		1.000	
<b>SUMMARY</b>																		
Universal assessment					2.667													
ISOFIX assessment					1.417													
i-Size assessment					4.000													
OEM assessment					2.000													
<b>TOTAL INSTALLATION ASSESSMENT</b>					<b>10.083</b>													

Legend:

- Pass** CRS can be installed correctly
- P Fail** CRS can be installed correctly but more actions are needed that do not meet the requirements of Euro NCAP and 0 points are awarded
- Fail** safety critical issues exist, 0 points awarded
- Exempt** Vehicle handbook or CRS Vehicle list exempt the CRS from being installed on that seating position
- N/A** This combination of CRS and seating position is not applicable

## 4 DYNAMIC ASSESSMENT

The starting point for the dynamic assessment of child occupant protection is the dummy response data recorded in two different test configurations: frontal impact in offset and side impact. All criteria used are calculated according to Technical Bulletin 21. Initially, each relevant body area is given a score based on the measured dummy parameters. These scores can be adjusted after the test based on the defined modifiers.

From the information collected in the two test scenarios, individual test scores are computed for both the Q6 and Q10 dummy. Where a vehicle is available with optional 2<sup>nd</sup> seat row on any variant, the dynamic assessment will be based on a vehicle fitted with the optional seats.

### 4.1 Points Calculation

A sliding scale system of points scoring is used to calculate points for each measured criterion where a higher and lower performance limit exists. Where a value falls between the two limits, the score is calculated by linear interpolation. If only a lower performance limit is available for a criterion, this limit is used as a “Pass”/ “Fail” criteria.

Capping limits are applied to both child dummies and exceeding a capping limit generally indicates unacceptable high risk of injury. Where a dummy measurement has exceeded a capping limit, the score of that entire dummy will be 0 points in the impact in which the limit was exceeded.

### 4.2 Criteria and Limit Values

The basic assessment criteria used for frontal impact, with the upper and lower performance limits for each parameter, are summarised below. Where multiple criteria exist for an individual body region, the lowest scoring parameter is used to determine the performance of that region. Injury parameter assessments highlighted in Table 3 and Table 4 will not be evaluated during the rebound phase.

#### 4.2.1 Precondition

If the restraint system is unable to keep the child dummy restrained that dummy will be penalised for its dynamic performance in the impact in which the issue occurred.

##### 4.2.1.1 Restraint

- a) During the forwards movement of the dummy only, the diagonal belt slips off the shoulder. Where this occurs **zero points** will be awarded to the dummy. Slipping of the shoulder is when the belt moves below the shoulder joint down the upper arm.
- b) During the forwards movement of the dummy only, the diagonal belt moves into the gap between the clavicle and upper arm with folding of the belt webbing. Where this occurs a penalty of **-4 points** will be applied to the overall dummy score of the impact in which it occurs.
- c) At any time throughout the impact either the pelvis of the dummy submerges beneath the lap section of the belt or the lap section does not prevent the dummy from moving upwards during rebound and is no longer restraining the pelvis. Where this occurs **zero points** will be awarded to the dummy.

#### 4.2.1.2 Ejection

Dummy ejection will be evaluated at any time throughout both the front and side impacts.

- a) The dummy pelvis does not remain in the booster seat or on the booster cushion and is not correctly restrained by the lap section of the seatbelt.
- b) The CRS does not remain within the same seating position or is no longer correctly restrained by the adult belt. It must not be displaced onto the floor or any other part of the rear seat/occupant compartment.

#### 4.2.1.3 Failure of restraint system components

Failure of the restraint system components will be evaluated at any time throughout both the front and side impacts.

- a) There is any breakage or fracturing of load-bearing parts of the belt system including buckles, webbing and anchorage points.
- b) There is any breakage or fracturing of any seat belt lock-offs, tethers, straps, ISOFIX anchorages, backrest to booster cushion connections or any other attachments which are specifically used to anchor the CRS to the vehicle fail.

### 4.2.2 Frontal Impact

#### 4.2.2.1 Head contact

If there is no hard contact seen on the high speed film, the head score is based on the Resultant 3ms acceleration only.

#### 4.2.2.2 Head excursion modifier

The head score is reduced for excessive forward excursion. Where the head of the Q6 exceeds the 550mm forward excursion line a **4 point modifier** is applied. For the Q10 a stepped modifier is used, where the Q10 head exceeds the 450mm or 550mm forward excursion line, a 2 or 4 point modifier respectively is applied. The excursion will be measured from the H-point location of the 5th female occupant with the rear seats adjusted in accordance with the Frontal ODB test protocol.

#### 4.2.2.3 Frontal Impact Criteria

**Table 3. Frontal impact criteria, limits and available points per body region for Q6, Q10**

	Criteria	Performance limits			Available points
		Higher	Lower	Capping	
Head Score	HIC <sub>15</sub> (with hard contact)	500	700	800	4 points
	Resultant acceleration 3ms	60g	80g	80g	
	Head excursion				
	Q6	NA	550mm	NA	
	Q10	450mm	550mm	NA	
Upper Neck	Tension Fz	1.7kN	2.62kN	NA	2 points
	Extension My (with head to interior contact)				
	Q6	NA	36Nm	NA	
	Q10	NA	49Nm	NA	
Chest (T4)	Resultant 3ms acceleration*				NA
	Q6	NA	NA	NA	
	Q10	41g	55g	55g	2 points
	Deflection				
	Q6	30mm	42mm	NA	<u>2 points</u>
	Q10	(monitoring)	(monitoring)	NA	<u>NA</u>
Pelvis	ASIS load	NA	NA	NA	
<b>TOTAL</b>					<b>8 points/dummy</b>

\*Chest acceleration peaks caused by the firing of seatbelt pretensioners early in the loading event will be ignored.

### 4.2.3 Side Impact

#### 4.2.3.1 Head contact

If there is no hard contact seen on the high speed film, the score is based on the Resultant 3ms acceleration only.

#### 4.2.3.2 Side Impact Criteria

**Table 4. Side impact criteria, limits and available points per body region for Q6, Q10**

	Criteria	Performance limits			Available points
		Higher	Lower	Capping	
Head Score	HIC <sub>15</sub> (with hard contact)	500	700	800	2 points
	Resultant acceleration 3ms	60g	80g	80g	
Upper Neck	Resultant Force Q6 Q10	NA	2.4kN	NA	1 point
		NA	2.2kN		
Chest (T4)	Resultant acceleration* 3ms		67g	NA	1 point
<b>TOTAL</b>					<b>4 points/dummy</b>

\*Chest acceleration peaks caused by the firing of seatbelt pretensioners early in the loading event will be ignored.

The contribution of the Dynamic Score to the Child Occupant Protection Score is calculated by summing the body scores for the relevant body regions for the Q6 and Q10 in both front and side impact (24 in total).

## 5 TWO SEATERS AND VEHICLES WITH LIMITED REAR SPACE

This Section details how protection for children is assessed by Euro NCAP in vehicles equipped with two seats and in vehicles where space is limited in the rear.

### 5.1 Vehicles with only Two Seats

#### 5.1.1 Vehicle based assessments

For two seater vehicles, the same precondition as described in Section 2.1 apply for the passenger seat. Furthermore an adjusted vehicle based assessment will be applied to two seater vehicles:

##### 5.1.1.1 Gabarit Installation on all Passenger Seats

Where the passenger seat is in compliance with the requirements in Section 2.2, **2 points** shall be awarded.

##### 5.1.1.2 i-Size and TopTether Marking

Where the passenger seat is in compliance with the requirements in Section 2.3, **3 points** shall be awarded.

##### 5.1.1.3 One ISO/R3 Position

Where the passenger seat is suitable for use with the largest size of rearward facing (Class C) ISOFIX CRS, Fixture (CRF) ISO/R3, **1 point** shall be awarded.

##### 5.1.1.4 Passenger Airbag Warning Marking and Disabling

Where the vehicle is in compliance with the requirements in Section 2.5, **4 points** shall be awarded to fully automatic systems, **2 points** shall be awarded to manual systems.

##### 5.1.1.5 Integrated Child Restraints

Where the vehicle is provided with an integrated CRS as standard equipment, **1 point** shall be awarded. Where this integrated CRS in the vehicle is homologated to cover “Group I-III”, as standard, **2 additional points** shall be awarded.

#### 5.1.2 CRS installation assessment

For two seater vehicles, all of the requirements and scoring principle in Chapter 3 apply (front passenger seat only).

#### 5.1.3 Dynamic assessment

For two seater vehicles the dynamic assessment will be performed with the Q6 dummy sitting on the front passenger seat in both ODB and AE-MDB impacts. The dynamic performance in the ODB impact will be based on Manufacturer’s in house data. The official AE-MDB test, conducted by Euro NCAP, will include the Q6 dummy for side impact assessment. Where the manufacturer provides no data zero points will be awarded for the dynamic tests.

The head excursion in the ODB impact will be measured from the H-point location of 5th female dummy with the front passenger seat adjusted in accordance to the user manual information for

the seating position with child restraints. The passenger frontal airbag will be set by the manual switch according user manual, in case of automatic deactivation systems, the airbag status will be determined by the vehicle.

## **5.2 Vehicles with Limited Rear Space**

A vehicle will be deemed as having limited rear space as defined in Section 3.5 of the COP Testing protocol. Where this is the case, the test laboratory will confirm that child dummy cannot be installed in the frontal ODB and/or side MDB test without interference from the vehicle.

All assessments will be applied as normal, except the assessment of dynamic performance which will be based on Manufacturers data from test(s) with modified seating settings, as described in the Testing Protocol – COP. Where the manufacturer provides no data zero points will be awarded for the dynamic tests.

A “hybrid rating” would be produced using the adult data from the official full scale test (performed without CRS but with compensation for the reference mass) and the child data from the additional tests. In the final vehicle rating, Euro NCAP will indicate that it was not possible to install the CRS and/or child dummy with and adult in the normal Euro NCAP front seat test position.

## 6 SCORING & VISUALISATION

### 6.1 Scoring

The maximum number of points available for child protection (including limited rear space and two seaters) is 49. The maximum points available in each assessment area is as follows:

	With rear seats	without rear seats
• Dynamic Assessment	24	24
• Installation of Child Restraints	12	12
• Vehicle Based Assessments	13	13

The child protection score will be the sum of all three areas. The tables below summarise the maximum possible score in each (sub)category.

#### 6.1.1 Normal and Limited Rear Space Vehicles

Category	Total points 49
<b>Dynamic Assessment</b>	<b>(24)</b>
Frontal Impact	16
Side Impact	8
<b>Vehicle Based Assessments</b>	<b>(13)</b>
Gabarit Installation on all Passenger Seats	2
i-Size and TopTether Marking	3
Two or more ISO/R3 Positions	1
Passenger Airbag Warning Marking and Disabling	4 or 2
Integrated CRS	3
<b>Installation of Child Restraints</b>	<b>(12)</b>
Universal seats	4
ISOFIX seats	2
i-Size seats	4
Recommended seats	2

#### 6.1.2 Two Seater Vehicles

Category	Total points 49
<b>Dynamic Assessment</b>	<b>(24)</b>
Frontal Impact	16
Side Impact	8
<b>Vehicle Based Assessments</b>	<b>(13)</b>
Gabarit Installation on all Passenger Seats	2
i-Size and TopTether Marking	3
One ISO/R3 Positions	1
Passenger Airbag Warning Marking and Disabling	4 or 2
Integrated CRS	3
<b>Installation of Child Restraints</b>	<b>(12)</b>
Universal seats	4
ISOFIX seats	2
i-Size seats	4
Recommended seats	2

## 6.2 Visualisation

### 6.2.1 Dynamic protection

The dynamic protection provided to children for each body region is presented visually using coloured segments within body outlines. The colour used is based on the points awarded for that body region (rounded to three decimal places), as follows:

Number of points available for body region:		4 points	2 points	1 point
Green	‘Good’	4.000	2.000	1.000
Yellow	‘Adequate’	2.670 – 3.999	1.335 – 1.999	0.667 – 0.999
Orange	‘Marginal’	1.330 – 2.669	0.665 – 1.334	0.333 – 0.666
Brown	‘Weak’	0.001 – 1.329	0.001 – 0.664	0.001 – 0.332
Red	‘Poor’	0.000	0.000	0.000

### 6.2.2 Top pick installation

The results of the top pick CRS installation check will be shown in terms of “Pass”, “P Fail”, “Fail”, “Exempt” or “N/A” in tabular format.

### 6.2.3 Visualisation of top pick installation.

The website will present the installation results of each top pick CRS in a map of the vehicle. Four possible outcomes will be presented to indicate the following:

#### ● Install without problem

The CRS could be installed on that seating position safely, easily and without any issues.

#### ● Safety critical problem

The CRS could not be installed on that seating position. Issues arose that prevented the CRS from being installed correctly and safely.

#### ● Install with care

The CRS could be installed on that seating position but it could not be done easily and without problems. The vehicle may not be on the list of approved vehicle for that particular CRS.

#### ✗ Installation prohibited - Where X is in handbook –

It is prohibited to install a CRS on this seating position. The vehicle handbook indicated X for that particular seating position or the CRS approved vehicle list indicated that a semi-universal CRS with support leg cannot be installed on that position. Also, indicates there are no ISOFIX anchorages fitted to that seating position.

