



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

ASSESSMENT PROTOCOL – OVERALL RATING

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Table of Contents

<i>1</i>	<i>INTRODUCTION</i>	<i>1</i>
<i>2</i>	<i>OVERALL RATING CALCULATION</i>	<i>2</i>
2.1	Method.....	2
2.2	Weight Factors and Limits	2
2.3	Balance Criteria.....	3
2.4	Rounding	5
	<i>APPENDIX I</i>	<i>6</i>

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1 INTRODUCTION

Euro NCAP introduced the overall rating scheme in 2009. Individual documents are released for the four main areas of assessment:

- Assessment Protocol – Adult Occupant Protection
- Assessment Protocol – Child Occupant Protection
- Assessment Protocol – Vulnerable Road User Protection
- Assessment Protocol – Safety Assist

In addition to these four assessment protocols, the present document is provided describing the method and criteria by which the overall safety rating is calculated on the basis of the car performance in each of the above areas of assessment.

2 OVERALL RATING CALCULATION

2.1 Method

The overall rating is composed of scores achieved in the four areas of assessment, also referred to as “boxes”: Adult Occupant, Child Occupant and Vulnerable Road User Protection and Safety Assist. The score in each box is based on the car performance in different tests.

For each box, a total score is normalised with respect to the maximum achievable score available for the box. In this way, the maximum score for each box, and hence the total maximum score, is a constant. The weighted overall score is calculated from the individual assessment scores using weight factors. These weight factors reflect the relative importance of the four.

The weighted overall score, determined by taking the weighted average of the scores in the four boxes, is only used to rank cars for determining the best in class vehicles at the end of each year. Vehicles that show a poor performance in one of the boxes will have their star rating restricted to show that they do not provide good all-round protection. There will be a minimum score required in each box to validate a star rating. See Figure I.1 (Appendix I) for a flow diagram of the method of calculation of the overall star rating.

2.2 Weight Factors and Limits

The weighted overall score is calculated from the individual scores in each box using weight factors. Theoretical limits apply which are at the moment equal to the minimum weighted overall score per star rating.

The weight factors are fixed but may be updated from time to time as priorities or the contents of the boxes change. Table 3.1 summarises the weight factors applied in the upcoming period.

Table 2.1
Weight factors

Year	2020-2022	2023-2024
Box 1: Adult Occupant Protection	40%	40%
Box 2: Child Occupant Protection	20%	20%
Box 3: Pedestrian Protection	20%	20%
Box 4: Safety Assist	20%	20%

2.3 Balance Criteria

Balance criteria are applied to the individual box scores in order to assess all-round performance. The limits given in Tables 2.2 and 2.3a are applied after the individual test scores have been rounded.

A vehicle that meets all of the balance criteria for a 5-star overall rating cannot have any red rated body regions after modifiers are applied. In case of a red body region as detailed in Table 2.2, the vehicle is limited to a maximum of 4-stars.

This prerequisite for 5-star overall ratings is applied to all official full scale and sub-system tests performed by Euro NCAP:

Table 2.2
Tests and key body regions

Full Scale Test	Body Regions per Occupant		
	Driver	Front Passenger	Rear Passenger(s)
Frontal MPDB	Head & Neck Chest	Head & Neck Chest	Head Chest ¹
Frontal FW	Head Neck Chest	Head Chest	Head Chest
Side MDB	Head Chest Abdomen Pelvis		Head
Side Pole	Head Chest Abdomen Pelvis		
Sub-System Test	Body Regions per Stature		
	Pedestrian Adult	Pedestrian Child	Cyclist
Vulnerable Road User	Head Pelvis Femur Knee & Tibia	Head	Head

1. Applicable to Q10 Chest 3ms exceedance calculation, 2023-2024.

Table 2.3a
Balance limits for years 2023 and 2024

2023-2024	Box 1: Adult Occupant	Box 2: Child Occupant	Box 3: Pedestrian	Box 4: Safety Assist
5 stars	80%	80%	70%	70%
4 stars	70%	70%	60%	60%
3 stars	60%	60%	50%	50%
2 stars	50%	50%	40%	40%
1 star	40%	40%	30%	30%

2.4 Rounding

The following rounding rules will be applied in the calculation of the overall rating.

- Data is entered to 2 decimal places.
- Intermediate calculations (e.g. calculations needed to derive parameters which are then used to calculate scores) are not rounded.
- Calculation of points scores (e.g. for individual body regions) are rounded to 3 decimal points e.g. a head score of 3.1238 in frontal impact would be rounded to 3.124.
- The total points score in each box is the sum of scores rounded to 3 decimal points. To calculate the percentage score in each box, the 3 decimal points total is divided by the maximum points available for that box and the resulting percentage is rounded *down* to the nearest integer. In the example case: $25.124 / 36 * 100\% = 69.789$ is rounded to 69%.
- That integer is then compared with the balance percentage thresholds for the box in Table 3.3. In the example case, 69% qualifies for 3 stars AOP in 2013.
- The overall weighted score is calculated as follows:
 - The 3 decimal point score in each box is divided by the maximum points available in that box.
 - The resulting percentage in each box is rounded to 2 decimal places.
 - The percentages are multiplied by the respective weighting factors for each box, and then added.
 - The resulting sum is rounded *down* to the nearest integer.
 - This integer is compared with the threshold requirements for star ratings for the relevant year.

Euro NCAP provides a Calculation Spreadsheet on their website.

APPENDIX I

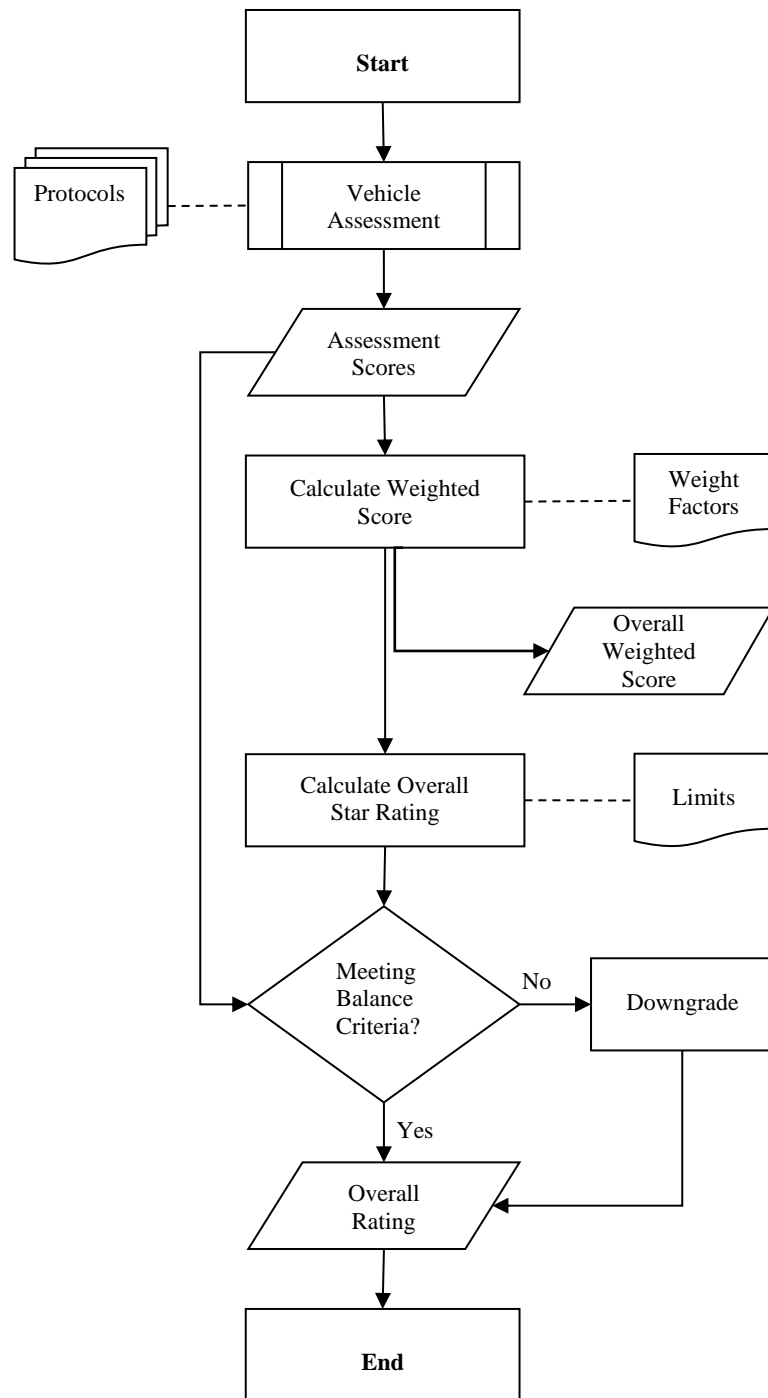


Figure I.1
Flowchart for the Calculation of the Overall Star Rating