Euro NCAP
For Safer Cars

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Occupant Stature Classification Dossier Guidance

Safe Driving

Technical Bulletin SD 103

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PREFACE

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).

CONTENTS

INTRODUCTION

The assessment of Occupant Stature Classification systems is detailed in the Euro NCAP Occupant Monitoring protocol. This assessment is based on information provided to Euro NCAP by the Vehicle Manufacturer, along with checks conducted during the crash protection assessment.

Euro NCAP requires the Vehicle Manufacturer to provide a dossier, that contains sufficient technical evidence. This shall be provided to the Euro NCAP Secretariat at least 2 months before any testing begins.

This Technical Bulletin is supplementary to the assessment protocol and provides guidance on the recommended structure and content of the dossier. They may be adapted by the OEM, provided that it includes a comprehensive description of the system, detailing the hardware, its capabilities, and the justification demonstrating how the system classifies the front occupants. Further details on how this can be achieved are provided in the subsequent sections of this Technical Bulletin.

NOTES:

The information in this document is for guidance only and only complements the assessment protocol. If any information is missing or contradicting the information in the assessment protocol, it is the responsibility of the OEM to ensure that the information required in the assessment protocol is provided.

DEFINITIONS

Stature – The stature is a combination of human anthropometric data.

Occupant class – An occupant class is defined as a set of attributes allowing to differentiate occupants (e.g. size, weight, seat position, etc.).

1 GENERAL INFORMATION

Item	Details
Manufacturer	[Enter]
Vehicle Model	[Enter]
Direct input sensors	[Enter]
Indirect input sensors	[Enter]
Crash severity input	[Enter]
Number of adaptivity settings	[Enter]
Common system with other models	[Enter]
S/W version at the time of the assessment	[Enter]
Report date [dd/mm/yyyy]	[Enter]

2 OCCUPANT CLASSIFICATION

2.1 Human dataset for the system development

2.1.1 Driver

This sub-section should present the targeted driver human dataset used for system development. Relevant stature attributes used by the system are expected to be shown using bell curves illustrating dataset distribution (an example is provided in Figure 1). If the dataset is based on various populations (not limited to Europe), it should be shown how the different attributes relate to the European population.

The bell curves of the stature attributes should clearly highlight the position of the Euro NCAP reference dummies (5th, 50th and 95th).

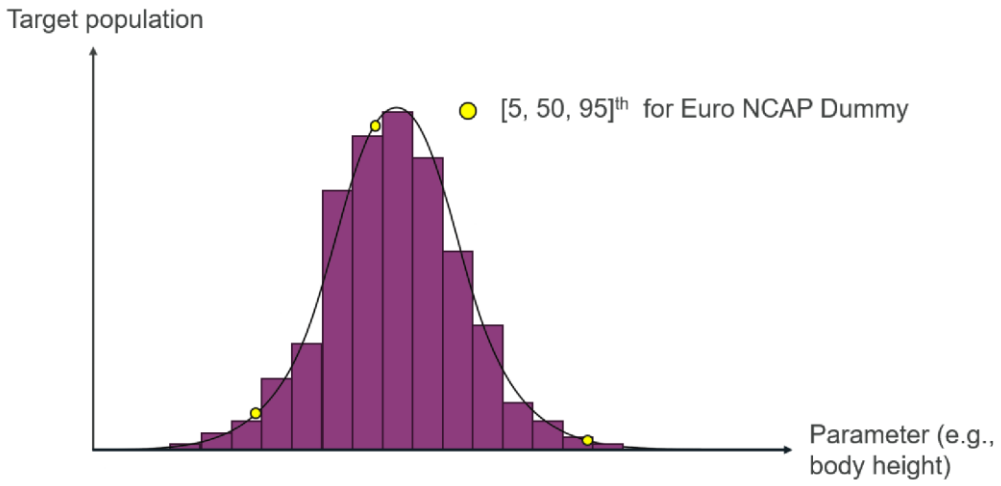

Figure 1. Example of bell curve showing the parameter (e.g., body height) distribution

Additionally, a single combined graph containing all physical attributes is recommended. When multiple attributes are used, advanced representation techniques (e.g., Principal Component Analysis) may be used.

If a camera is part of the sensing system for the driver and/or front passenger, additional evidence should be provided demonstrating that all physical attributes that may affect detection (e.g., skin complexion) have been considered in the dataset.

2.1.2 Front passenger

This sub-section should contain the same information as in 2.1.1, but for the front passenger human participants.

2.2 Sensing

2.2.1 Driver

This sub-section should provide an overview of the sensing principles used to deliver input to the adaptive restraints. All sensors should be listed and described, including sensing technology and mounting position.

Sensor #	Item	Details
1	Type (e.g., seat position sensor, weight sensor)	[Enter]
	Mounting position (schematics with relevant parameters)	[Enter]
…	Type	[Enter]
	Mounting position	[Enter]

Figure 2, the output of the seat track position sensor is illustrated with a bell curve showing the distribution of the human dataset presented in the previous section.

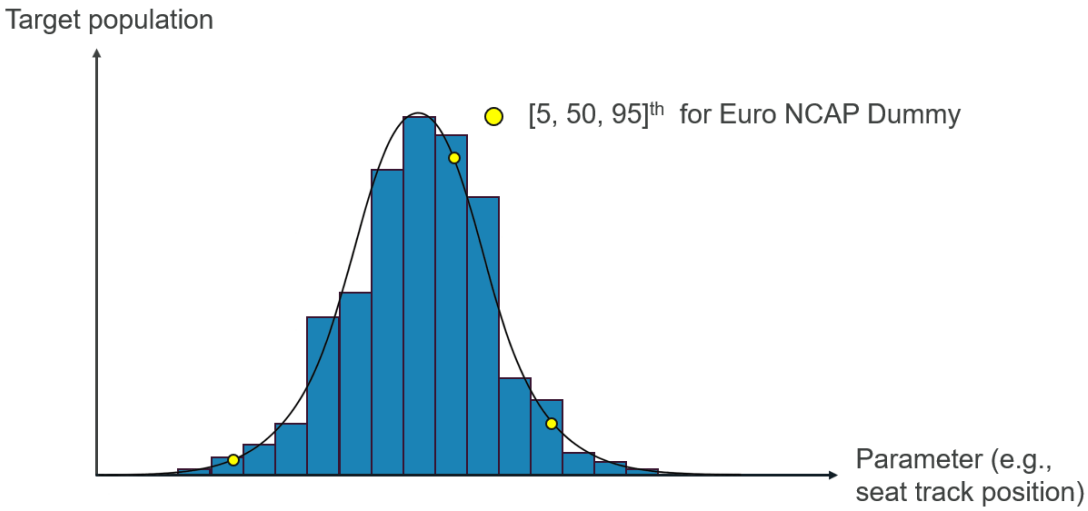

Figure 2. Example of bell curve showing the seat track distribution across the driver human dataset

The sensor output bell curves should clearly indicate the position of the Euro NCAP reference dummies.

2.2.2 Front passenger

This sub-section should contain the same information (sensor list and sensor-output bell curves) as in 2.2.1, but for the front passenger.

2.3 Occupant classification

2.3.1 Processing of sensor information

If at least two distinct sensor outputs are used for occupant classification, the sensor-fusion strategy should be explained. If the strategy differs between the driver and front passenger (e.g., different sensor types), each should be explained in a dedicated sub-section.

2.3.2 Classification of the occupants

2.3.2.1 Driver

This sub-section should first describe the occupant classes the system can identify. It is expected to include:

- a list of occupant classes,
- explanations of how the system determines the class, and
- a bell curve illustrating how occupant classes are distributed across individual or combined sensor outputs.

An example of bell curve is given in Figure 3. Example of a combined parameters bell curve mapped with the occupant classes for a system which has only 2 occupants classes.

The graph should clearly indicate the position of the Euro NCAP reference dummies.

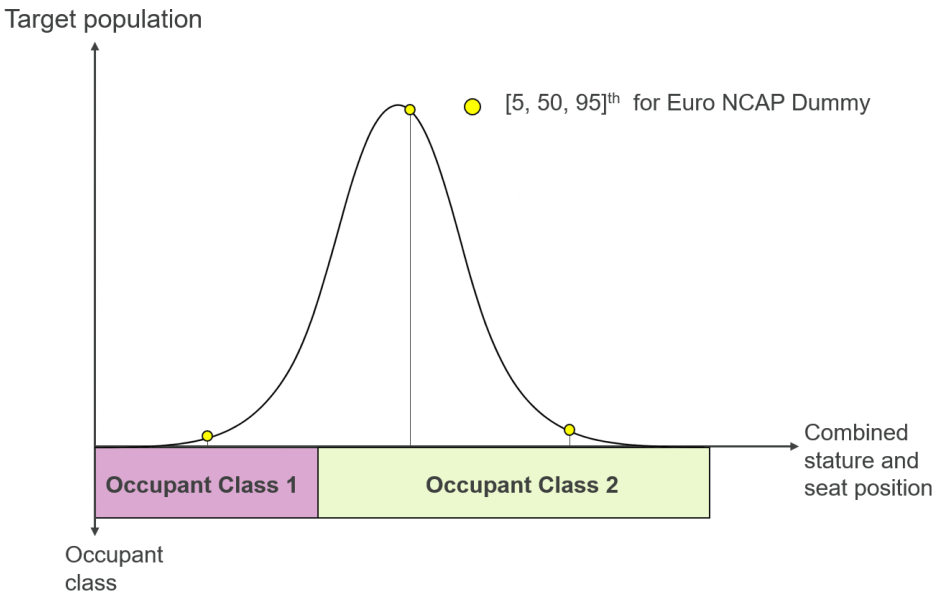

Figure 3. Example of a combined parameters bell curve mapped with the occupant classes

Optionally, an illustration showing the cloud points distribution of the human participants (e.g., stature and seat position) across the different occupant classes is recommended. An example is given in Figure 4.

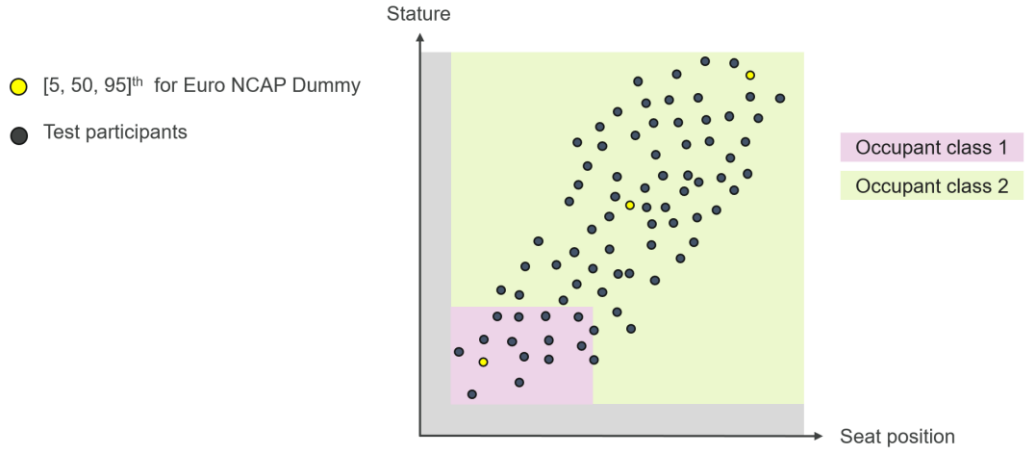

Figure 4. Example of the mapping between the occupant classes, test participant stature and seat position

The dossier should then explain how the system reacts when it cannot classify the occupant.

2.3.2.2 Front passenger

This sub-section should contain the same information (occupant class determination and fallback reaction) as in 2.3.2.1, but for the front passenger.

3 ADAPTIVITY STRATEGIES

3.1 Additional Sensor/Sources

If the system uses inputs other than occupant class to adjust adaptivity settings (e.g. crash severity), these should be detailed here. An example can be found in the appendix.

3.2 Settings description

3.2.1 Driver

Settings #	Item	Details
1	Occupant class (e.g., Class 1)	[Enter]
	Additional inputs (e.g., crash severity)	[Enter]
	Adaptivity component (i.e. which restraint system component is adapted)	[Enter]
…	Occupant class	[Enter]
	Additional inputs	[Enter]
	Adaptivity component	[Enter]
Fallback (i.e., unclassified)	Additional inputs	[Enter]
	Adaptivity component	[Enter]

Optionally, details may be provided describing how adaptivity parameters vary between settings.

3.2.2 Front passenger

This sub-section should contain the same information (settings list and, optionally, information about the setting parameter variations) as described in 3.2.1, but for the front passenger.

3.3 Adaptivity strategy

3.3.1 Driver

This sub-section should describe how the system transitions between settings. If the system uses a specific strategy when an occupant is very close to a transition threshold, this should be detailed.

3.3.2 Front passenger

This sub-section should contain similar information as in 3.3.1, but for the front passenger.

3.4 Transitions and safety performance

3.4.1 Driver

The dossier should explain the conditions under which the system enters the fallback setting.

The dossier should demonstrate that the level of protection does not result in critical red body regions if an occupant is classified in an adjacent setting or falls into the fallback setting for all three crash severities if applicable.

Dummy	Situation	Requirement
5th	50th percentile setting (when different)	Head & Neck ≠ RED Chest & Abdomen ≠ RED
	Fallback setting (when different)	
50th	5th percentile setting (when different)	Head & Neck ≠ RED Chest & Abdomen ≠ RED
	95th percentile setting (when different)	
	Fallback setting (when different)	
95th	50th percentile setting (when different)	Head & Neck ≠ RED Chest & Abdomen ≠ RED
	Fallback setting (when different)	

3.4.2 Front passenger

This sub-section should have the same content as in 3.4.1, but for the front passenger.

APPENDIX

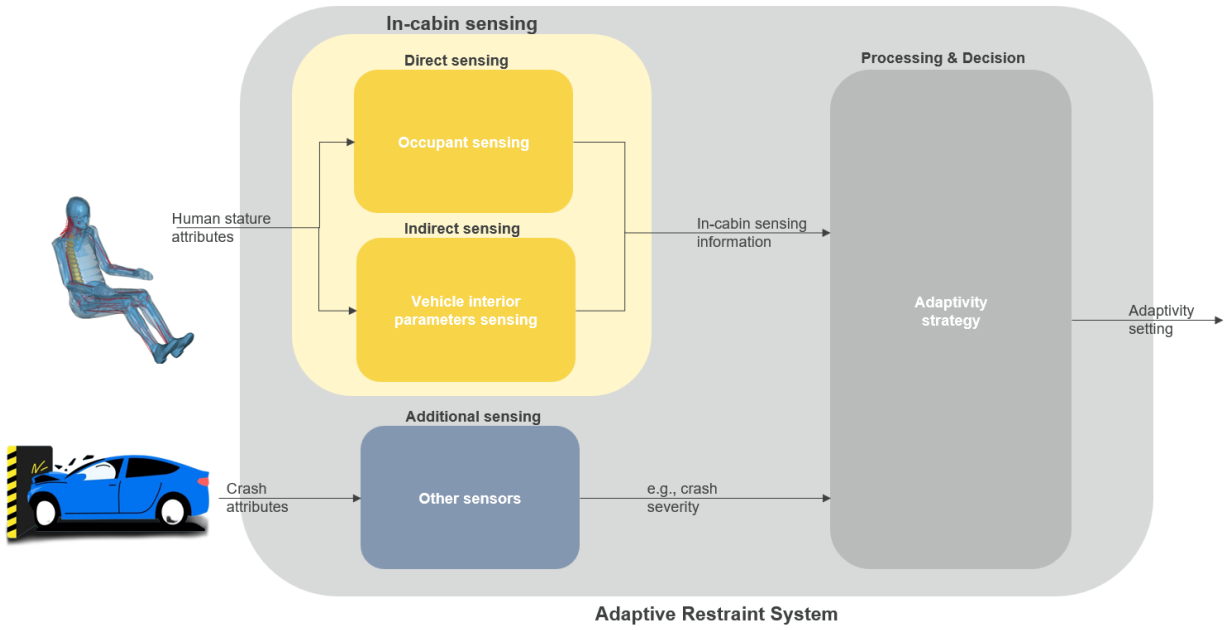

Figure 5. Example of adaptive restraint system architecture