TECHNICAL SPECIFICATION

ISO/TS 22239-1

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Road vehicles — Child seat presence and orientation detection system (CPOD) —

Part 1: Specifications and test methods

Véhicules routiers — Système de détection de la présence d'un siège enfant et de son orientation (CPOD) —

Partie 1: Spécifications et méthodes d'essai

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Foreword

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International Standards are drafted in accordance with the rules given in the ISO/IEC Directives, Part 2.

The main task of technical committees is to prepare International Standards. Draft International Standards adopted by the technical committees are circulated to the member bodies for voting. Publication as an International Standard requires approval by at least 75 % of the member bodies casting a vote.

In other circumstances, particularly when there is an urgent market requirement for such documents, a technical committee may decide to publish other types of document:

— an ISO Publicly Available Specification (ISO/PAS) represents an agreement between technical experts in an ISO working group and is accepted for publication if it is approved by more than 50 % of the members of the parent committee casting a vote;

— an ISO Technical Specification (ISO/TS) represents an agreement between the members of a technical committee and is accepted for publication if it is approved by 2/3 of the members of the committee casting a vote.

An ISO/PAS or ISO/TS is reviewed after three years in order to decide whether it will be confirmed for a further three years, revised to become an International Standard, or withdrawn. If the ISO/PAS or ISO/TS is confirmed, it is reviewed again after a further three years, at which time it must either be transformed into an International Standard or be withdrawn.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights.

ISO/TS 22239-1 was prepared by Technical Committee ISO/TC 22, *Road vehicles*, Subcommittee SC 12, *Passive safety crash protection systems*.

ISO/TS 22239 consists of the following parts, under the general title *Road vehicles — Child seat presence and orientation detection system (CPOD)*:

— *Part 1: Specifications and test methods*

— *Part 2: Resonator specification*

— *Part 3: Labelling*

Introduction

This part of ISO/TS 22239 specifies a detection system for the automatic recognition of child seat presence and orientation detection system (CPOD) child seats placed on CPOD passenger seats.

The purpose of this detection system is to improve the overall safety performance of passenger restraint systems, particularly by reducing the risk of an airbag being deployed against a child seat placed on a passenger seat.

The CPOD system is not intended to encourage the placing of children on the front passenger seats of cars. However, in view of the fact that the following scenarios do occur in real life, children can be placed on front passenger seats in these cases:

- in 2-seater vehicles, which have no rear seats;
- when there are more than 2 or 3 children in one vehicle;
- when back seats are folded down for the transport of cargo;
- when the installation of a rearward-facing child restraint system (CRS), and the placing of the child in the CRS on the rear seats, is very difficult or impossible (e.g. in 2-door vehicles);
- when the driver wants to see the baby and have easy access to it.

There might be benefit to be gained by encouraging the use of airbags on rear seats.

For the cases cited above, CPOD technology offers a reliable automatic solution for the protection of children against any possible risk caused by non-deactivated airbags.

Road vehicles — Child seat presence and orientation detection system (CPOD) —

Part 1: Specifications and test methods

1 Scope

This part of ISO/TS 22239 specifies a child seat presence detection system that enables child seats placed on any passenger seats to be automatically detected where a child is at risk from an active airbag. The system provides the option of using additional information about the orientation of the child seat.

This part of ISO/TS 22239 describes the main system functionality, and provides design recommendations and requirements, compatibility measurements and labelling requirements.

Compliance with the requirements of this part of ISO/TS 22239 ensures compatibility between child seat presence and orientation detection system (CPOD) child seats and CPOD passenger seats.

ISO/TS 22239 applies only to child restraint systems in which the child is orientated in the forward or rearward driving direction.

NOTE 1 Throughout this part of ISO/TS 22239, the term “child seat” is used as an abbreviation of “CPOD child seat”.

NOTE 2 Throughout this part of ISO/TS 22239, the term “passenger seat” is used as an abbreviation of “CPOD-equipped passenger seat”.

2 Normative references

The following referenced documents are indispensable for the application of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

ISO/TS 22239-2:2009, *Road vehicles — Child seat presence and orientation detection system (CPOD) — Part 2: Resonator specification*

ISO/TS 22239-3, *Road vehicles — Child seat presence and orientation detection system (CPOD) — Part 3: Labelling*

ISO 6549:1999, *Road vehicles — Procedure for H- and R-point determination*

UNECE Regulation No.14, *Uniform provisions concerning the approval of vehicles with regard to safety-belt anchorages, ISOFIX anchorages systems and isofix top tether anchorages*

UNECE Regulation No.16 (2005), *Uniform provisions concerning the approval of safety belts, restraint systems, child restraint systems and ISOFIX child restraint systems for occupants of power-driven vehicles*

UNECE Regulation No.44 (2008), *Uniform provisions concerning the approval of restraining devices for child occupants of power-driven vehicles (“child restraint system”)*

3 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

3.1
child seat presence and orientation detection system
CPOD
radio frequency identification (RFID) system delivering information on the presence, orientation and type of a child seat

3.2
passenger seat reference point
CRP
point located on the centre line of the passenger seat, determined by the procedure in Annex A

3.3
child seat reference point
CRC
point identical to the intersection of the centre plane of the child restraint system and the CR axis defined in UNECE Regulation No.44

3.4
resonator reference point
RRP
point located in the geometrical centre of the base surface of the resonator

3.5
resonator pair reference point
RPRP
point located in the centre between two resonator reference points

3.6
reference co-ordinate system
Cartesian coordinate system associated with the passenger seat and the compatibility test bench, having its origin in the passenger seat reference point, as shown in Figure B.4

3.7
CPOD detection area
3-dimensional area above the passenger seat cushion, where all relevant child seat information needed to adapt the airbag deployment are transmitted to the restraint control module, provided that the resonator pair reference point is located within this area

3.8
CPOD failsafe area
3-dimensional area above the passenger seat cushion, where either all relevant child seat information needed to adapt the airbag deployment or information indicating an incorrect positioning of the child seat is transmitted to the restraint control module, provided that the resonator pair reference point is located within this area

3.9
ISOFIX
system for the connection of child restraint systems to vehicles which has two rigid anchorages in a vehicle seating position located near the seat bight, corresponding rigid attachments on the child restraint system, and a means to limit the pitch rotation of the CRS

[ISO 13216-1:1999]

4 Abbreviated terms

CPOD Child seat presence and orientation detection system

CRC Child seat reference point

CRP Passenger seat reference point

CRS Child restraint system

CTB Compatibility test bench

ECU Electronic control unit

FFCS Forward facing child seat

PSCTD Passenger seat compatibility test device

RCM Restraint control module (electronic unit controlling deployment of supplemental restraints)

RFCS Rearward facing child seat

RFID Radio frequency identification

RMI Restraint system malfunction indicator (vehicle-manufacturer-specific)

RPRP Resonator pair reference point

RRP Resonator reference point

5 Principle

5.1 General

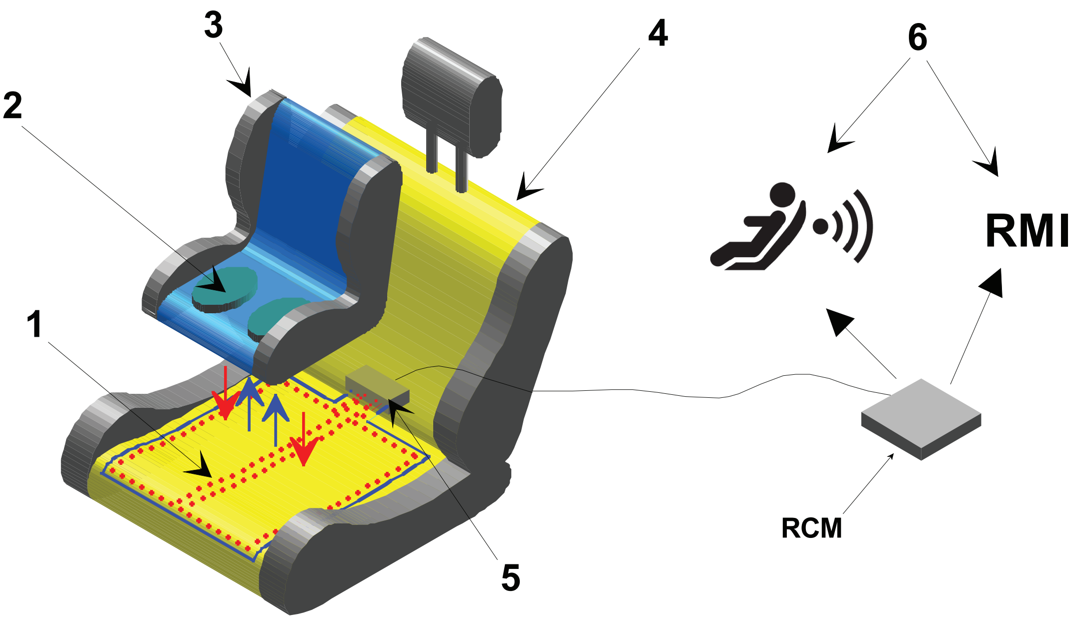
CPOD is an RFID sensing system which is capable of determining the presence and orientation of a CRS placed on a passenger seat. Depending on the positioning of the CRS, different types of information are transmitted to the RCM.

If the CRS is correctly placed on the passenger seat such that its RPRP is located within the CPOD detection area (see 3.7), the CRS is detected by the system.

If the CRS is placed outside of the CPOD detection area but within the CPOD failsafe area (see 3.8), the system either detects the CRS or recognizes an incorrect CRS positioning.

The gathered information is sent to the central RCM, which enables the adaptation of the airbag deployment specific to the occupancy situation.

NOTE The specifications of this part of ISO/TS 22239 are in compliance with Reference [6].



Key

1 CPOD sensor consisting of
- one transmitting antenna
- two receiving antennas

2 CPOD resonators

3 CPOD child seat

4 passenger seat

5 CPOD electronics

6 in-vehicle information

Figure 1 — CPOD system topology

5.2 Compatibility

The compatibility of the system is given if the CPOD component compatibility checks have been passed. These compatibility checks consist of the following parts:

a) CRS compatibility check to verify the performance of the CRS design;

b) resonator compatibility check to verify the electrical performance of the resonators;

c) passenger seat compatibility check to verify the performance of passenger seat and CPOD sensor design.

The flow chart in Figure 2 shows how these compatibility checks fit together to assure CPOD compatibility of the entire system.

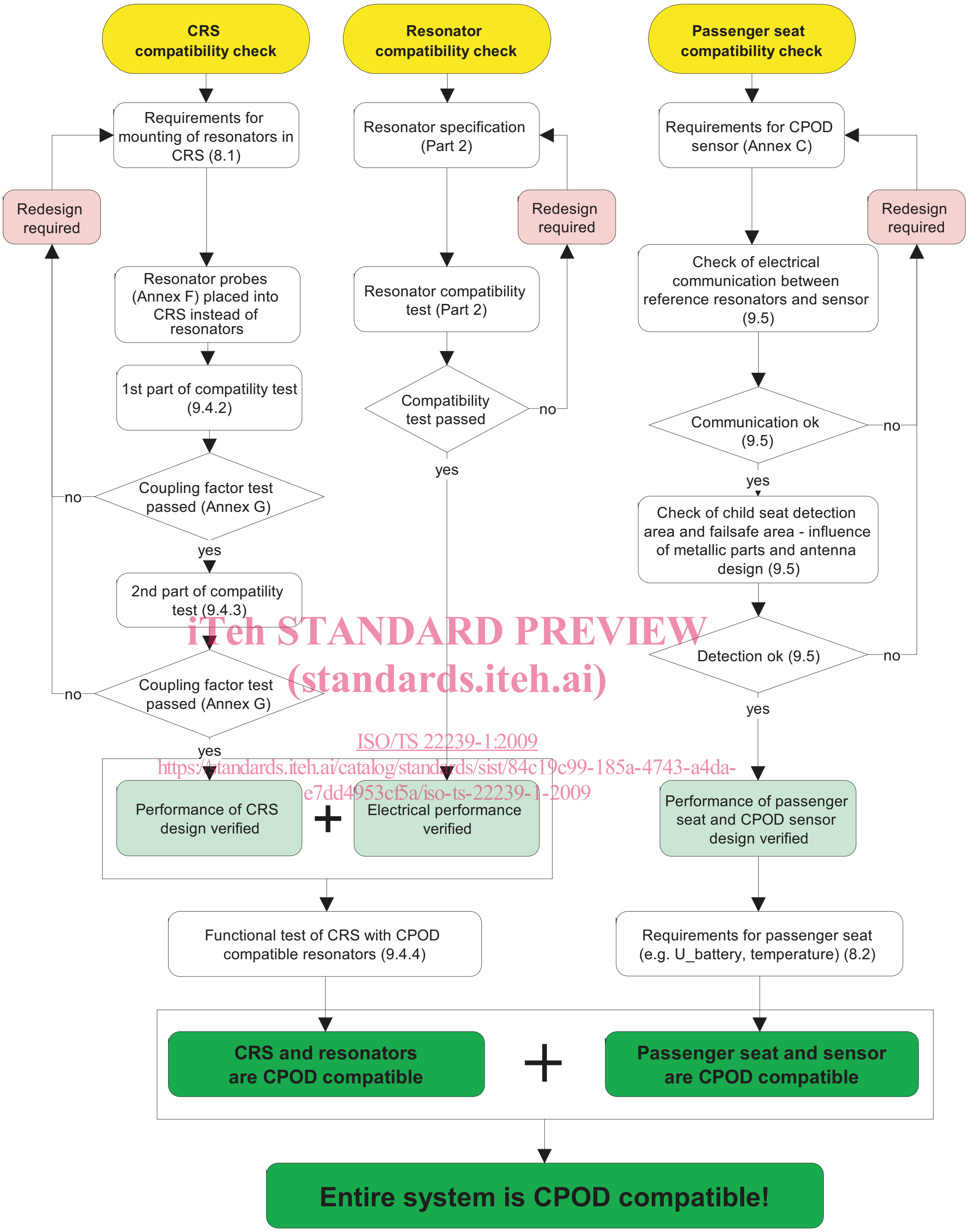


Figure 2 — Main steps for obtaining CPOD compatibility of the entire system

6 System functionality

In order to achieve its performance and, in addition, to provide failsafe behaviour in case of an error, the following features are implemented in the CPOD system:

- generation of a sinusoidal signal in the 130 kHz band for contact-less energy and information transmission;
- adaptation of the transmitting signal to different environmental conditions by variation of frequency and amplitude;
- demodulation of the signal phase modulated by the CRS resonators;
- monitoring of the power and demodulation circuits of the system via integrated self-diagnosis;
- interface to RCM for transmission of CPOD data;
- monitoring of transmitting and receiving antennas for disconnections and short circuits;
- detection of presence of CRS which are compliant with this part of ISO/TS 22239;
- detection of the orientation of CRS which are compliant with this part of ISO/TS 22239 in vehicles where the orientation of the CRS impacts the airbag deployment.

Examples of CRS orientations are given in Figures 3 to 5.

Compliance with the detailed system functionality specifications of Annex C shall be provided.

Figure 3 — CRS in forward facing position

Figure 4 — CRS in rearward facing position

Figure 5 — Example of CRS wrongly positioned

Depending on the positioning of the CRS, the CPOD system delivers the information to the RCM as shown in Figure 6, provided that the RPRP is located within the CPOD detection area.

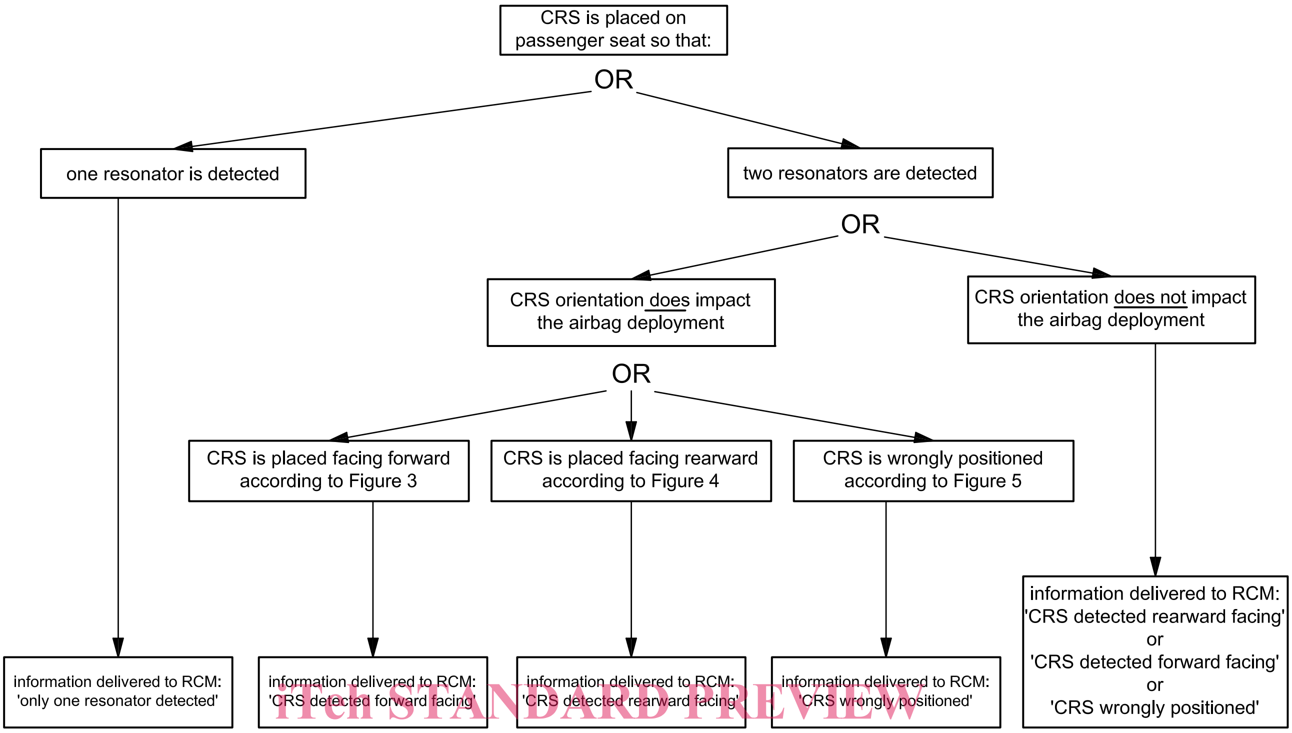


Figure 6 — Information to be submitted to RCM

7 Design recommendations

7.1 General

In order to maximize the chance of passing the compatibility measurements successfully, the following recommendations should be respected during the design of CRSs and passenger seats fitted with CPOD.

7.2 Installation of CPOD resonators into CRS

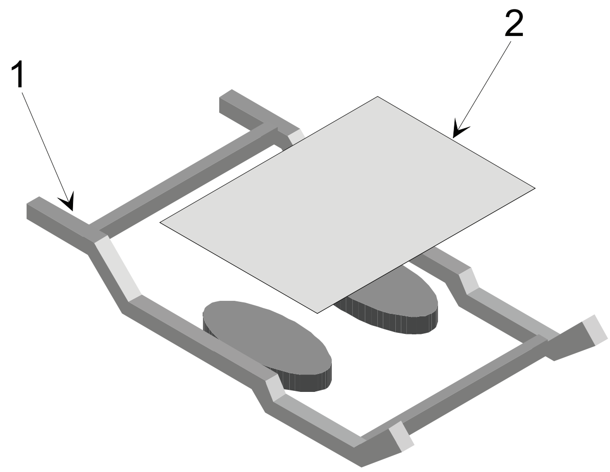
7.2.1 Electroconductive materials might have an influence on the resonator detection in the CRS. Therefore, the distance between large electroconductive materials and the resonators in the CRS should be maximized during the design of the CRS.

The detection capability of the system is very sensitive to electroconductive materials above the resonator pair or directly between the resonator pair and the CPOD passenger seat. Possible problems can be avoided by replacing these materials by non-electroconductive materials, as shown in Figure 8.

7.2.2 Closed electroconductive loops as indicated by Figure 7 might have an influence on the resonator detection in CRS. Therefore, the distance between closed electroconductive loops and the resonators in the CRS should be maximized during the design of the CRS.

Closed electroconductive loops, which surround the volume above or below the resonator pair, should be avoided. This can be achieved by cutting closed loops using non-electroconductive materials, as shown in Figure 8.

7.2.3 The distance between the bottom of the resonators inside the CRS and the surface of the CRS compatibility test bench should not exceed 30 mm when the CRS is placed correctly on the CTB in accordance with Annex D (see Figure 9). In addition, in that position, the bottom of the resonator should be parallel with the corresponding seat surface below it. An inclination of ± 15° should not be exceeded (see Figure 9).

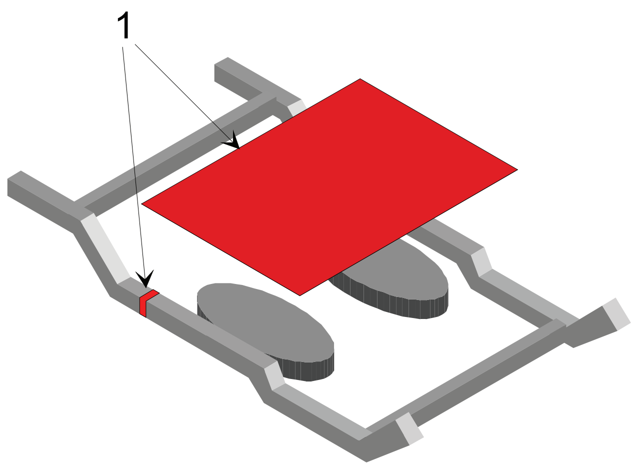


Key

1 electroconductive loop

2 electroconductive surface

Figure 7 — Closed electroconductive loop or surface close to the resonators



Key

1 non-electroconductive

Figure 8 — Closed conducting loop opened using a non-electroconductive connection

Dimensions in millimetres

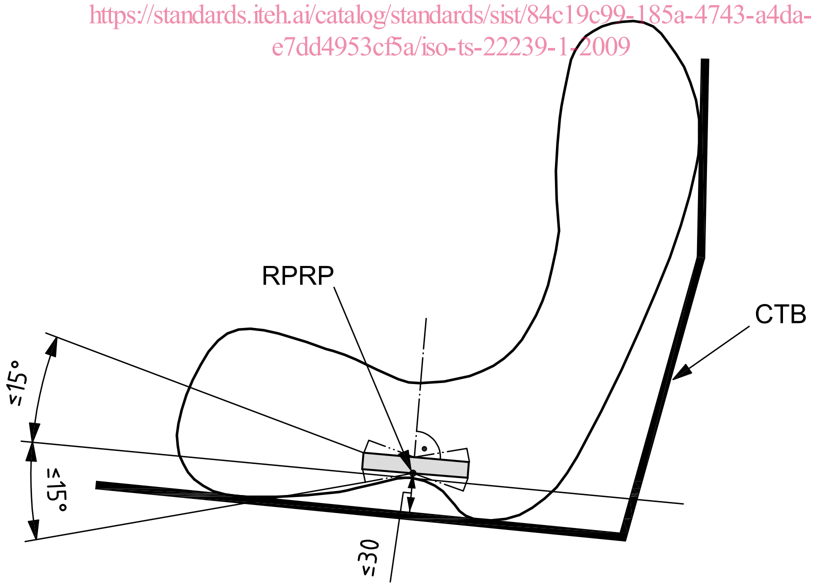
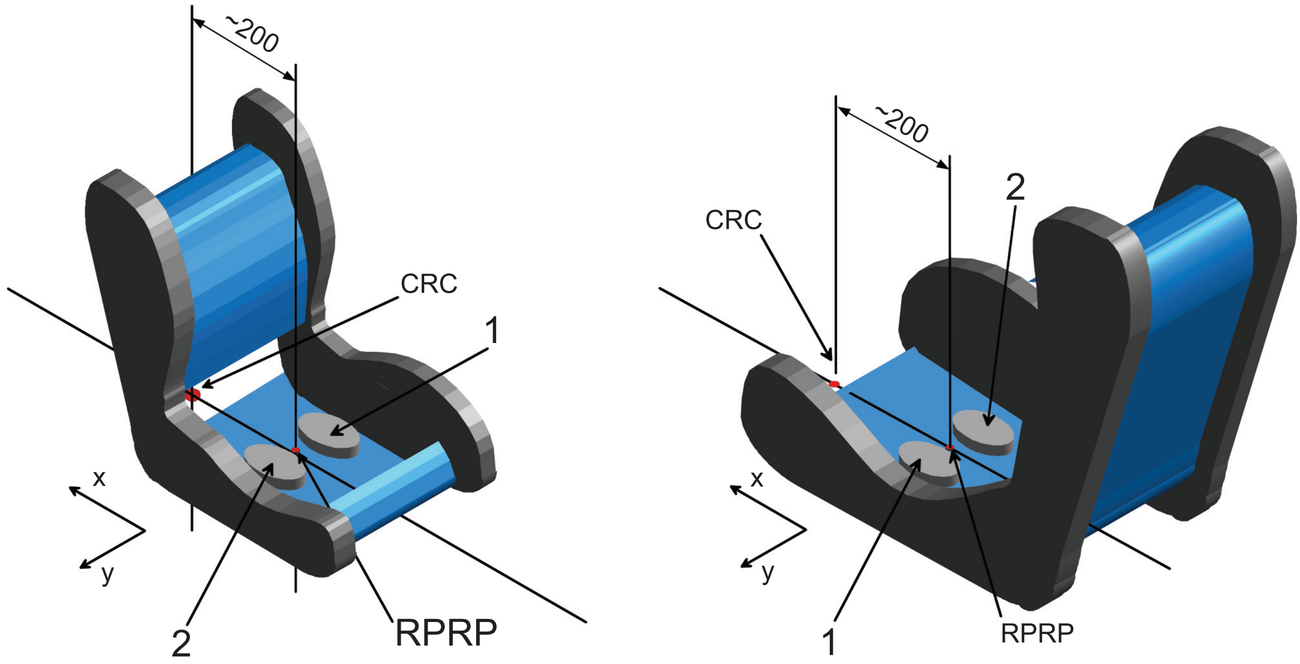


Figure 9 — Distance between resonator reference point and CTB surface

7.2.4 The distance between the CRC and RPRP (see Figure 10) should be chosen in such a way that the resonator pair reference point remains within the CRS detection area when varying the CRS compatibility test bench adjustments in accordance with 9.4.2 and 9.4.3. A value as close as possible to 200 mm is recommended for this distance.

Dimensions in millimetres



a) Forward facing CRS   b) Rearward facing CRS

Key

1 left resonator

2 right resonator

Figure 10 — Assembly of resonators in CRS

7.3 Installation of CPOD sensors into passenger seats

With respect to the installation of CPOD sensors into passenger seats:

— it is recommended to position the CPOD sensors directly under the seat cover instead of foaming them;

— the maximum distance between CPOD sensor and surface of the seat cover should not exceed 20 mm;

— the seat area should be designed to be as flat as possible (see Clause A.2, Note);

— for non-adjustable seat cushions, the distance between CPOD sensor and the passenger's seat metal shell should be maximized;

— the distance between the seat's CRP and the centre of the CPOD sensor should be as close as possible to 200 mm, as indicated by Figure 11;

— during CPOD sensor design, account should be taken of any possible seat adjustment and/or feature that could affect the performance of the system; in order to improve the detection performance of a CRS, the two receiving antennas should overlap (see Figure 11).