TECHNICAL SPECIFICATION

ISO/TS 22239-1

Second edition
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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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Contents

Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

The procedures used to develop this document and those intended for its further maintenance are described in the ISO/IEC Directives, Part 1. In particular the different approval criteria needed for the different types of ISO documents should be noted. This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2 (see www.iso.org/directives).

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For an explanation on the voluntary nature of standards, the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the World Trade Organization (WTO) principles in the Technical Barriers to Trade (TBT) see the following URL: www.iso.org/iso/foreword.html.

This document was prepared by Technical Committee ISO/TC 22, *Road vehicles*, Subcommittee SC 36, *Safety and impact testing*.

This second edition cancels and replaces the first edition (ISO/TS 22239-1:2009), which has been technically revised to take into account the development in technology since the first edition was published.

A list of all parts in the ISO/TS 22239 series can be found on the ISO website.

Introduction

This document 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 document 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 document specifies the minimum functional requirements in order to ensure compatibility between child seat presence and orientation detection system (CPOD) child seats and CPOD passenger seats. Compatibility measurements and labelling requirements complement the obligatory specifications of this document.

This document also provides design recommendations which are not compulsory when claiming compliance with ISO/TS 22239. However, these recommendations, based on experience of proven designs, provide useful guidance to designers to avoid erroneous designs and thus, enable designers to reduce time and cost of CPOD development.

The tell-tale "child seat detected" required for a CPOD vehicle, the specific labelling required for a CPOD vehicle and CPOD child seat and the detailed information about the CPOD system functionality required for owner's manuals of CPOD vehicles and CPOD child seats will mitigate considerably the misuse probability. The document does not provide a failsafe physical mechanism that prevents the installation of non-CPOD child seats in a CPOD vehicle or vice versa.

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 document, the term "child seat" is used as an abbreviation of "CPOD child seat".

NOTE 2 Throughout this document, the term "passenger seat" is used as an abbreviation of "CPOD-equipped passenger seat".

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. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

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

ISO/TS 22239-2:2018, *Road vehicles — Child seat presence and orientation detection system (CPOD) — Part 2: Resonator specification*

ISO/TS 22239-3:2017, *Road vehicles — Child seat presence and orientation detection system (CPOD) — Part 3: Labelling*

3 Terms and definitions

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

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

— IEC Electropedia: available at http://www.electropedia.org/

— ISO Online browsing platform: available at https://www.iso.org/obp

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

Note 1 to entry: The CR axis is shown in Figure D.7.

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* (3.4)

3.6
reference coordinate system
Cartesian coordinate system associated with the passenger seat and the compatibility test bench, having its origin in the *passenger seat reference point* (3.2), as shown in Figure B.4

3.7
CPOD detection area
three-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* (3.5) is located within this area

3.8
CPOD failsafe area
three-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* (3.5) 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

[SOURCE: ISO 13216-1:1999, 3.6]

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 sea
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

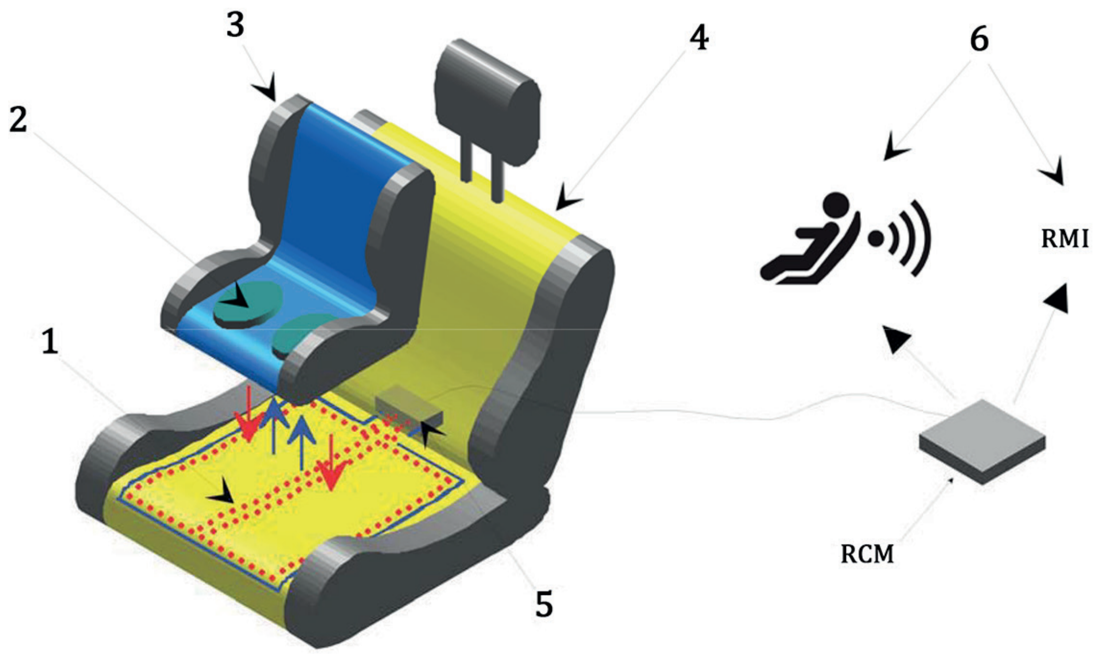
CPOD is an RFID sensing system which is capable of determining the presence and orientation of a CRS placed on a passenger seat. Depending on the positioning of the CRS, different types of information are transmitted to the RCM.

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 document are in compliance with Reference [7].



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 the CPOD compatibility of the entire system.

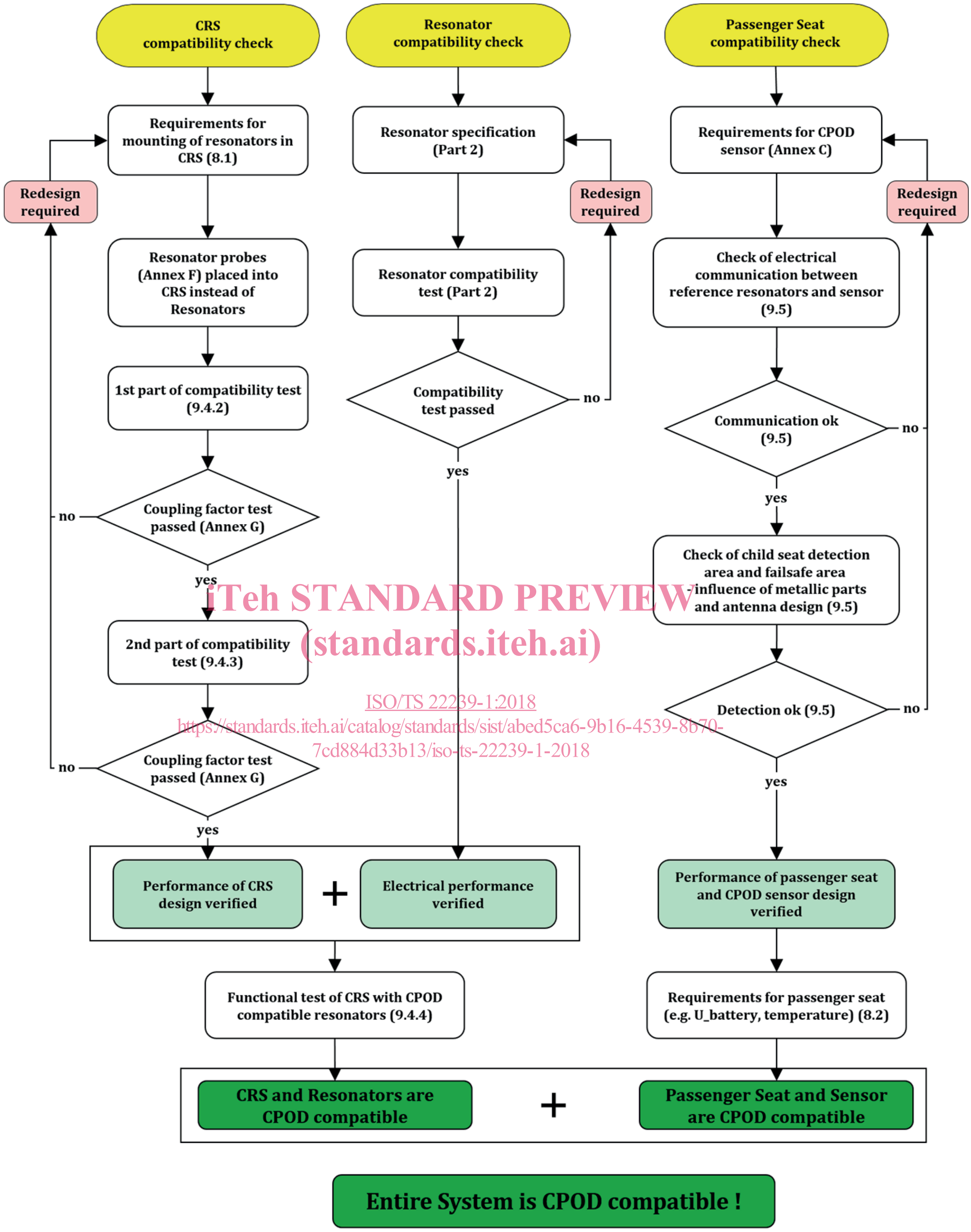


Figure 2 — Main steps for obtaining the CPOD compatibility of the entire system

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 the presence of CRS which is compliant with this document;

— detection of the orientation of CRS which is compliant with this document 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.

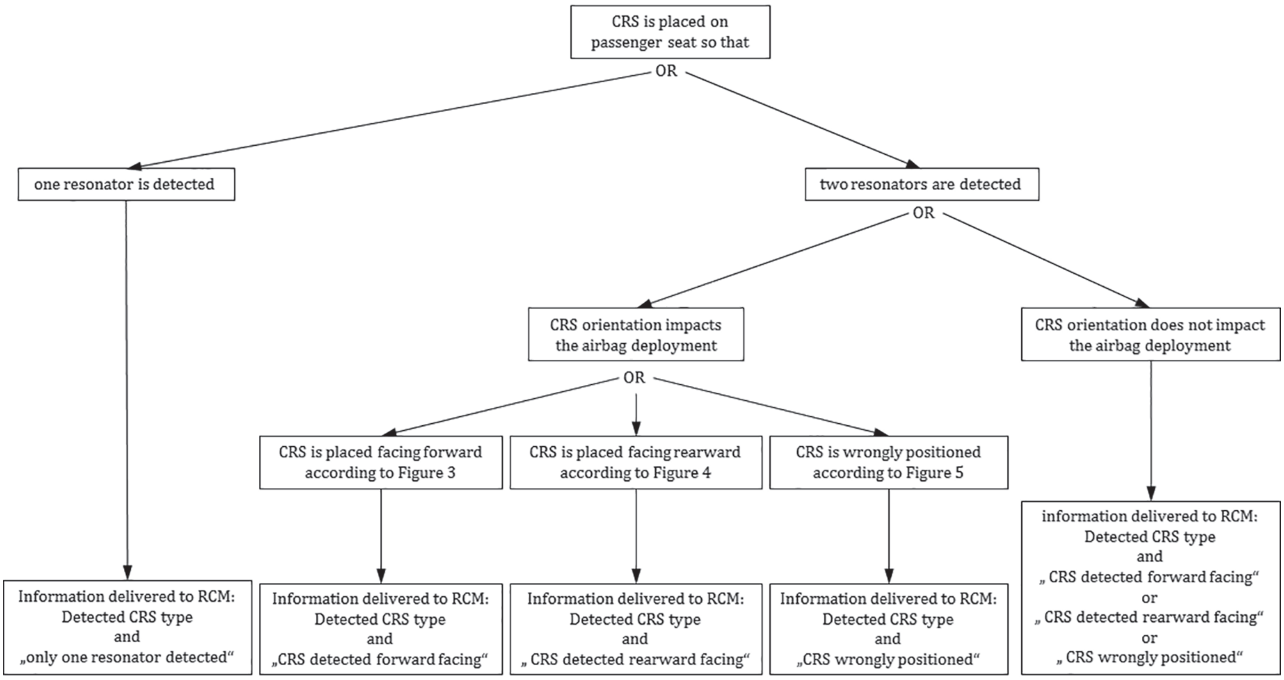


Figure 6 — Information to be submitted to the RCM

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 the CRS

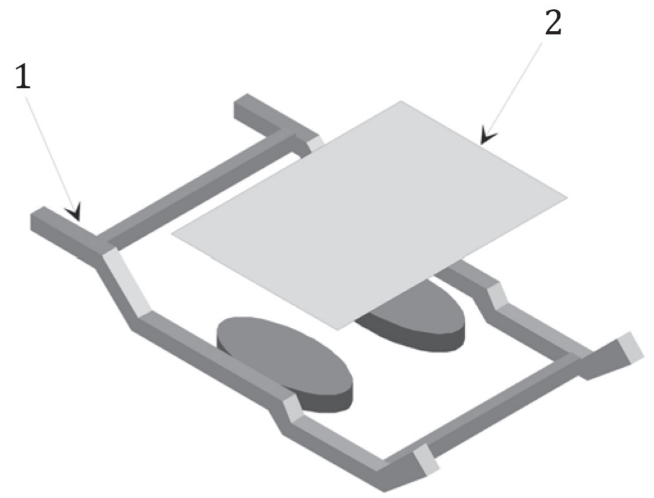
7.2.1 Electroconductive materials might have an influence on the resonator detection in the CRS. Therefore, the distance between large electroconductive materials and the resonators in the CRS should be maximized during the design of the CRS.

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 the 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 ±3° should not be exceeded (see Figure 9).

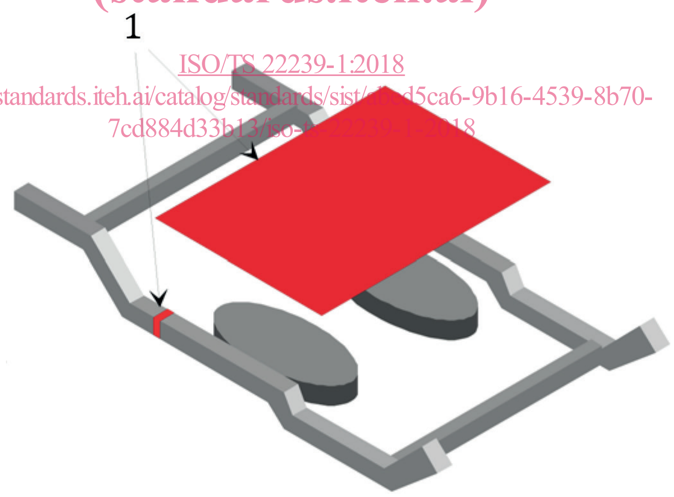


Key

1 electro-conductive loop

2 electro-conductive surface

Figure 7 — Closed electro-conductive loop or surface close to the resonators



Key

1 non-electro-conductive

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