TECHNICAL SPECIFICATION

ISO/TS 21002

First edition
2021-07

Road vehicles — Multidimensional measurement and coordinate systems definition

Véhicules routiers — Mesurage multidimensionnel et définition des systèmes de coordination

Reference number
ISO/TS 21002:2021(E)

COPYRIGHT PROTECTED DOCUMENT

ISO copyright office
CP 401 • Ch. de Blandonnet 8
CH-1214 Vernier, Geneva
Phone: +41 22 749 01 11
Email: copyright@iso.org
Website: www.iso.org

Published in Switzerland

Contents

Page

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).

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. Details of any patent rights identified during the development of the document will be in the Introduction and/or on the ISO list of patent declarations received (see www.iso.org/patents).

Any trade name used in this document is information given for the convenience of users and does not constitute an endorsement.

For an explanation of 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 www.iso.org/iso/foreword.html.

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

Any feedback or questions on this document should be directed to the user's national standards body. A complete listing of these bodies can be found at www.iso.org/members.html.

Introduction

This document provides a unified method to handle and process various types of multidimensional displacement sensors for use in crash dummies and automotive crash testing. The content covers existing sensors and dummies, but the document also offers a generic method to handle future new dummies and/or sensors.

Multidimensional measurement systems are used in crash dummies (ATD, or anthropomorphic test device) to monitor the position of dummy features (e.g. ribs, abdomen, etc.) for injury assessment. The dummy feature position is typically expressed in an orthogonal coordinate system which is fixed to the thoracic spine of the dummy, see Annex A. The systems covered in this document are an assembly of one distance sensor and one or two angle sensors, the axes of which are organised in a (rotating) spherical coordinate system, see Figure C.1. Other 2- and 3-dimensional position measurement systems are outside the scope of this document. Although in this document a suit of ATD's and their features are discussed to explain the methodology, its scope is not limited to these examples and can be applied to any other ATD and its features.

Road vehicles — Multidimensional measurement and coordinate systems definition

1 Scope

This document defines the measurement coordinate systems and presents the protocol to determine the sensor offsets to the chosen coordinate system. Finally, the method is presented how to process the sensor spherical coordinate system data to calculate the position of a dummy feature in three-dimensional space in the defined local orthogonal coordinate system.

2 Normative references

There are no normative references in this document.

3 Terms and definitions

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

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

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

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

3.1
multidimensional measurement system
system that measures spatial position of a crash dummy feature (e.g. rib, abdomen, etc.) with respect to a defined reference feature (e.g. dummy spine) and its local coordinate system origin.

Note 1 to entry: Examples of multidimensional sensors and applications are given in the NOTES of Figure 1, Figure 2 and Figure 3.

3.2
radius
distance between the centre of rotation at spine interface and centre of rotation at feature interface (e.g. dummy rib)

Note 1 to entry: The parameter radius (*R*) is associated with the ISO MME Code DC for Distance, ISO/TS 13499[2].

3.3
sensor Y-angle
angle of the multidimensional sensor along Y-axis with respect to local orthogonal coordinate system

Note 1 to entry: The positive rotation direction is defined following SAE sign convention right hand rule.

3.4
sensor Z-angle
angle of the multidimensional sensor along Z-axis with respect to local orthogonal coordinate system

Note 1 to entry: The positive rotation direction is defined following SAE sign convention right hand rule.

Note 2 to entry: Examples of the angle definitions are given in the NOTES of Figure 1, Figure 2 and Figure 3.