TECHNICAL SPECIFICATION

ISO/TS 21476

First edition
2018-12

Road vehicles — Displacement calibration method of IR-TRACC devices

Véhicules routiers — Méthode d'étalonnage de déplacement des dispositifs IR-TRACC

Reference number
ISO/TS 21476:2018(E)

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Published in Switzerland

Contents

Page

Foreword

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This document was prepared by Technical Committee ISO/TC 22, *Road vehicles*, Subcommittee SC 36, *Anthropomorphic test devices*.

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 was written to address the need of the automotive crash testing community for a well-defined calibration method of non-linear telescopic displacement sensors known as IR-TRACC. This device is commonly used on crash dummies to measure the chest deflection as injury an assessment parameter. Various aspects specific to this type of sensors are addressed in this procedure, among others linearization of the exponential voltage output and the sensitivity to tubes position of the telescopic devices.

Road vehicles — Displacement calibration method of IR-TRACC devices

1 Scope

This document establishes a procedure to calibrate IR-TRACC displacement transducers. Like all other sensors used on dummies, calibration is required. The calibration is carried out with the sensor disassembled from the dummy. The procedure is valid for sensors with analogue as well as digital output.

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 6487, *Road vehicles — Measurement techniques in impact tests — Instrumentation*

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:

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

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

3.1
IR-TRACC
Infra-Red Telescoping Rod for the Assessment of Chest Compression
non-ratiometric displacement transducer used to measure chest deflection in crash dummies

Note 1 to entry: The technology of the transducer was described in a paper by Rouhana et al. [1998][1]. The measurement principle is based on emission of infra-red light by an LED and a phototransistor sensitive to irradiance. The transducer is a non-linear device, as the irradiance and output voltage is proportional to the inverse square of the distance between the emitter and the phototransistor. The distance between the phototransistor and the LED is theoretically proportional to the inverse square root of the phototransistor output voltage: $d = C/\sqrt{U_{IR}}$. The inverse square root of the output voltage can also be written as the output voltage to the power of minus 0,5, therefore $d = C \times U_{IR}^{-0,5}$

3.2
Displacement Calibration
classic compression method where the zero mm starting point is defined close to the extended range of the sensor

Note 1 to entry: When the IR-TRACC overall length decreases (IR-TRACC compresses), its calibrated mm output increases. The IR-TRACC linearized output is negatively proportional to its length. During displacement calibration components are used to fix the transducer to a calibration fixture. These components do not necessarily belong to the final assembly of the sensor as used in the dummy. The displacement calibration therefore is not an absolute point to point (distance) calibration against a fixed reference. This is not necessary as the chest deflection of the dummy is calculated with respect to the IR-TRACC displacement at time zero. The IR-TRACC displacement output is associated with the ISO MME[2] Code DS for Displacement.