SLOVENSKI STANDARD

SIST EN 15433-2:2008

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Obremenitve pri transportu - Merjenje in analiza dinamiļ no mehanskih obremenitev - 2. del: Pridobitev podatkov in splošne zahteve za merilno opremo

Transportation loads - Measurement and analysis of dynamic mechanical loads - Part 2: Data acquisition and general requirements for measuring equipment

Transportbelastungen - Messen und Auswerten von mechanisch-dynamischen Belastungen - Teil 2: Datenerfassung und allgemeine Anforderungen an Messeinrichtungen

Charges de transport - Mesurage et analyse des charges mécaniques dynamiques - Partie 2 : Acquisition des données et exigences générales pour l'équipement de mesure

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Transportation loads - Measurement and evaluation of dynamic mechanical loads - Part 2: Data acquisition and general requirements for measuring equipment

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COMITÉ EUROPÉEN DE NORMALISATION
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Foreword

This document (EN 15433-2:2007) has been prepared by Technical Committee CEN/TC 261 “Packaging”, the secretariat of which is held by AFNOR.

This European Standard shall be given the status of a national standard, either by publication of an identical text or by endorsement, at the latest by June 2008, and conflicting national standards shall be withdrawn at the latest by June 2008.

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Introduction

This standard was originally prepared by working group NAVp-1.4, Requirements and Testing, of the German Standardization Institute (DIN). It is part of a complete normative concept to acquire and describe the loads acting on goods and influencing them during transport, handling and storage.

This standard becomes significant when related to the realisation of the European Directive on Packaging and Packaging Waste (Directive 94/62 EC, 20 December 1994). This directive specifies requirements on the avoidance or reduction of packaging waste, and requires that the amount of packaging material is adjusted to the expected transportation load, in order to protect the transportation item adequately. However, this presumes some knowledge of the transportation loads occurring during shipment.

At present, basic standards, based on scientifically confirmed values, which can adequately describe and characterize the magnitudes of transportation loads, especially in the domain of dynamic mechanical loads do not exist nationally or internationally. Reasons for this are mainly the absence of published data, insufficient description of the measurements or restrictions on the dissemination of this information.

This standard will enable the measurement and evaluation of dynamic mechanical transportation loads, thus enabling the achievement of standardized and adequately documented load values.

This series of standards consists of the following parts:

— Part 1: General requirements

— Part 2: Data acquisition and general requirements for measuring equipment

— Part 3: Data validity check and data editing for evaluation

— Part 4: Data evaluation

— Part 5: Derivation of test specifications

— Part 6: Automatic recording systems for measuring randomly occurring shock during monitoring of transports.

1 Scope

This standard specifies requirements for the preparation, performance and documentation of transportation measurements.

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.

EN 15433-3, *Transportation loads — Measurement and evaluation of dynamic-mechanical loads — Part 3: Data validity check and data editing for evaluation*

EN 15433-4, *Transportation loads — Measurement and evaluation of dynamic-mechanical loads — Part 4: Data evaluation*

ISO 8002, *Mechanical vibrations — Land vehicles — Method for reporting measured data*

3 Terms and definitions

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

3.1
data acquisition
acquisition of raw data by measuring the load-time function with the aid of a measuring device

3.2
measuring equipment
measuring chain consisting of at least a sensor, signal conditioner, data recorder and data-storing device

3.3
source data
time function of a viewed stress amplitude, e.g. acceleration, acquired with a measuring device, but without analysing same, e.g. by frequency analysis

3.4
measuring report
documentation covering the particularities gained during the acquisition of raw data

4 Measurement of dynamic mechanical transportation loads

4.1 General

Measurements shall be performed independently of the transported item and performed at the site where the load is inserted into the cargo, i.e. as a rule on the cargo platform of the various transportation vehicles.

NOTE Exceptions are measurements during storage, handling, and in-plant transportation (see Annex C).

4.2 Fundamental requirements

Dynamic mechanical loads shall whenever possible be acquired and recorded in an unbiased form as source data, i.e. without immediate processing, such as frequency analysis. An immediate

processing during the measurement is only permissible when the source data is stored together with the measurement in a separate storage device in such a manner that it is left accessible for further examinations, and if necessary for different processing procedures.

NOTE 1 Due to various reasons, experience shows that the acquisition and data analysis of dynamic data can easily be subject to error. As a rule, errors in the analysis can be corrected by reanalysis, whereas errors occurring during data acquisition often demand a costly repetition of the measurements. Separate storage of the raw data ensures that analysis errors or any other analysis procedures do not necessarily require new test drives.

The selection of measuring systems and their specific parameters, e.g. frequency range, shall be done in such a way that the acquired raw data can be analysed universally and reused at any other time. A deliberate limitation of the measurement to a smaller measuring range than one that is possible with a justifiable technical effort can lead to faulty analysis and conclusions, and therefore shall be avoided.

The measuring system shall comply with the technical state of the art, the relevant specifications and technical rules, e.g. relating to calibration, and shall correspond with the aims of the measuring task.

The engineering personnel performing the measurements shall have the necessary knowledge to perform the measurements appropriately and plan and perform the measuring task carefully.

All significant circumstances and technical parameters of the measurement are to be recorded in a measuring report (see 4.4). Deviations from this measuring report shall be justified.

NOTE 2 Occasionally, after measurements have been performed, it is necessary to retrace the conditions that occurred during the data acquisition. Only a complete description of the measuring process, as required by the measuring report, enables the inspection and interpretation of the measurement. Otherwise, the measured data can become invalid. Also, apparently unimportant information, (e.g. a detailed description of the vehicle type) used for the measurement can be of great importance for later interpretation of the measured data values.

4.3 Preparation of the measurement

During the planning stage of the measurement, various aspects shall be considered, in particular the:

— intended utilisation of the data;

— selection of the sensors and their number;

— frequency and amplitude range of the measuring chain;

— number of measuring points, their spatial distribution and their axes of measurement;

— definition of the extent of this measurement, including the selection of the transportation routes and the required test time;

— consideration and estimation of possible error sources.

NOTE In order to reduce expensive and time-consuming test drives to a minimum, careful planning of the measurements is necessary. Here one especially has to take into account the ratio between cost and profit, and to compare the total costs of a measuring program with the possible costs that an insufficient data acquisition can cause.

Data validation and editing, as well as analysis of the measured data, shall be performed according to EN 15433-3 and EN 15433-4, and the presentation of the analysed data shall comply with ISO 8002.

4.4 Measurement

The measuring report for each transportation category is defined in a corresponding annex, as follows:

— road transportation (Annex A);

— in-plant transportation; measurements on the transportation means (Annex B);

— storage, handling and in-plant transportation; measurements in/on the packed item (Annex C);

— rail transportation (Annex D);

— sea transportation (Annex E);

— combined transportation (Annex F).

4.5 Measuring report

4.5.1 General

The measuring report shall be set up in the form of a questionnaire in order to achieve uninterrupted, uniform and comparable data.

The required statements are explained in 4.5.2 to 4.5.7.

4.5.2 Scope of measuring report

The measuring report shall describe the means of transportation for which the data is being required (see e.g. A.1).

4.5.3 General information

The name and address of the institution performing the measurements shall be mentioned, as well as the name of the responsible test manager and any further persons attending the measurements. A summary of the test route, as well as the possible duration of the measurement, shall also be given (see e.g. A.2).

NOTE The designation of persons present during the test can be helpful for subsequent procedures.

4.5.4 Data transportation means

The data transportation means section shall contain a technical description of the transportation means and its actual condition. These data contain information concerning the goods being transported, load factor, location of load gravity centre and method of restraint (see e.g. A.3).

NOTE Experience shows that analyses can become useless due to missing information on transportation means. This can lead to a repetition of the test drive, thereby causing considerable additional costs.

4.5.5 Measuring points and measuring chain

A detailed description of the location of the measuring points on the transportation means shall be given, as well as the measuring chain used (see e.g. A.4).

NOTE When acquiring data on various means of transportation, numerous parameters need to be considered. Correspondingly, suitable sensors, amplifiers and filters should be selected for the specific measuring task. A complete listing of technical data of the instruments used is essential to perform a proper analysis and for subsequent procedures. As a rule, these values can be taken from the instrument data sheets.

4.5.6 Performing the measurement

Information shall be provided concerning the transportation route, dynamic particularities and climatic conditions during the measurement (see e.g. A.5).

4.5.7 Data acquisition

Information shall be given concerning the mode of measuring, measuring range, and dynamic range of the measuring chain. Certain aspects of the data acquisition shall be pointed out to the user, e.g. to check the gain (saturated signals are invalid), means of transportation, and frequency range to be analysed, as this defines the required frequency range of the measuring chain (see e.g. A.6).

Annex A
(normative)

Road transport (blank measuring report)

NOTE The user of this measuring report is permitted to copy this document.

A.1 Scope of measuring report

The information requested in A.2 to A.5 shall be completed prior to or during the measurement.

A.2 General information

A.2.1 All values in A.3.2 to A5.3 that are marked with (✳) are interdependent, and shall therefore be recorded under that particular route section in Figure A.4.

A.2.2 Name and address of the institution performing the measurements:

.....

A.2.3 Name of test manager and persons present during the measurements:

.....

A.2.4 Date and duration of the measurements:

.....

A.2.5 Test circuit (transportation route):

.....

A.3 Data on transportation vehicle

A.3.1 Technical description of transportation vehicle

NOTE As a rule, the following information can be gathered from the vehicle registration papers. It is recommended that photographs of the vehicle are added to the measuring report.

A.3.1.1 Vehicle category, e.g. commercial vehicle, general-purpose goods vehicle, goods trailer, road train, articulated vehicle, etc.:

.....

A.3.1.2 Vehicle manufacturer and type designation according to the manufacturer:

.....

A.3.1.3 Vehicle identification number:

.....

A.3.1.4 Vehicle registration number, country of registration:

.....

A.3.1.5 Manufacturer(s) of vehicle body, articulated vehicle and trailer:

.....

A.3.1.6 Year(s) of manufacture:

.....

A.3.1.7 Suspension, e.g. leaf spring, coil spring, torsion bar, air spring, shock absorbers (yes/no), stabilizers (yes/no):

.....

A.3.1.8 Vehicle dead weight:

.....

A.3.1.9 Permissible total vehicle weight:

.....

A.3.1.10 Permissible load:

.....

A.3.1.11 Number of axles, and which of these are steerable, driven and retractable:

.....

A.3.1.12 Information concerning axle design, e.g. rigid/swing axle:

.....

A.3.1.13 Permissible load per axle:

.....

A.3.1.14 Number of tyres (single/twin):

.....

A.3.1.15 Vehicle body design, e.g. cargo platform of metal/wood, tarpaulin, box car, container:

.....

A.3.1.16 Vehicle particularities, e.g. refrigerating van:

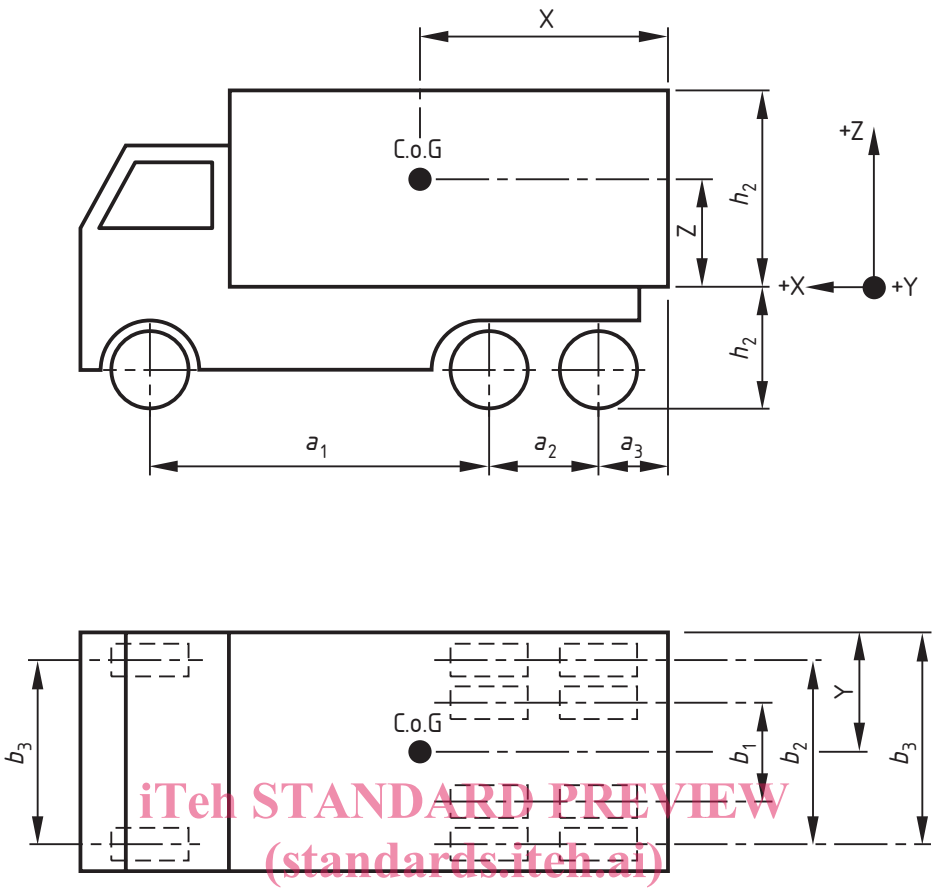
.....

A.3.1.17 Sketch of vehicle dimensions (see Figure A.1):

.....

A.3.1.18 Further relevant information concerning the test vehicle (if applicable):

.....



Key
CoG Centre of Gravity

Figure A.1 — Vehicle dimensions (example)

NOTE It is recommended that a photograph of the vehicle is added to the measuring report

A.3.2 Description of actual vehicle condition

A.3.2.1 Kilometre reading (✳)

A.3.2.2 Tyre-size, manufacturer and type:

-front:.....
-rear:.....

A.3.2.3 Tyre pressure:

-front:.....
-rear:.....

A.3.2.4 Date of last vehicle maintenance:
.....

A.3.2.5 Shock absorber condition:
.....

NOTE Oscillatory behaviour is greatly influenced by the vehicle maintenance condition and the shock absorber condition, as well as by tyre imbalance and wobble. It is therefore desirable to describe these conditions,

although in practice it might cause problems to determine these properties. Certain noticeable characteristics should at least be described.

A.3.2.6 Imbalance and wobble of tyres/wheels (see Note to A.3.2.5):
.....

A.3.2.7 Load factor (as a percentage of the maximum permissible useful load) (✳)

A.3.2.8 Load (amount and description) (✳)

A.3.2.9 Loading condition, method of restraint, e.g. packed/unpacked, stapled/restrained, stapled/not restrained, palletized and restrained, palletized but not restrained (✳)

A.3.2.10 Estimation of load damping properties (large damping, e.g. bulk goods, or small damping) (✳)

A.3.2.11 Additional loads, e.g. measuring personnel, measuring equipment, auxiliary equipment, declaration of weight of above-mentioned items (✳)

A.3.2.12 Centre of gravity of the total load on the cargo platform (centre of gravity to be estimated and reported) (✳)

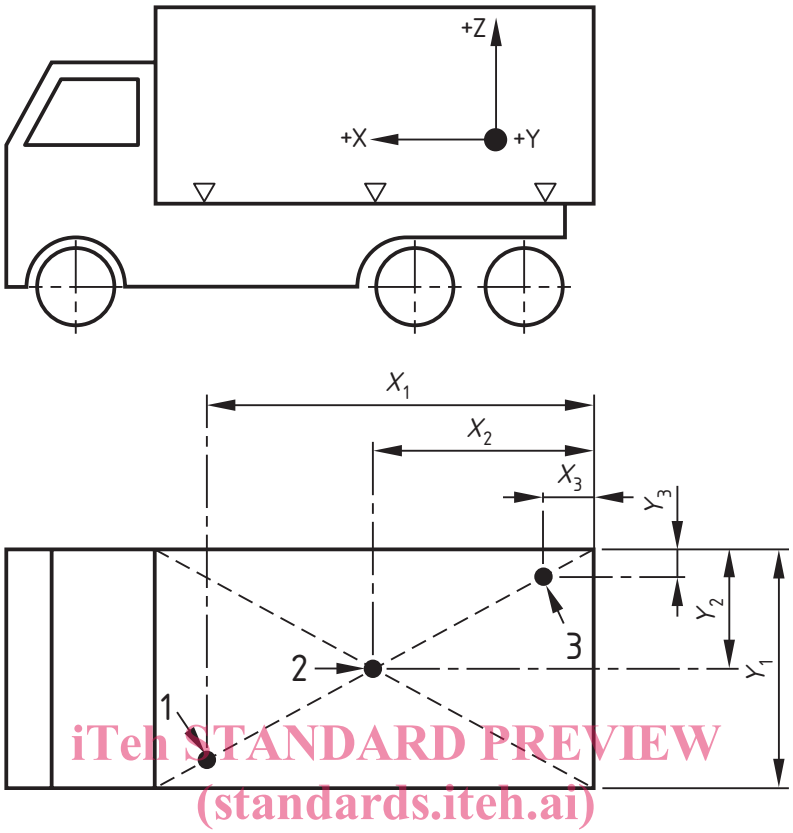
NOTE A change of the load factor and/or of the centre of gravity should be recorded.

A.4 Measuring points and measuring chain

A.4.1 Mounting of the sensors on the vehicle

A.4.1.1 Location of the sensors and description of orientation of the sensors (see Figure A.2):
.....

NOTE It is advantageous to mount the sensors on the bottom side of the cargo platform, in order to facilitate loading and unloading,



Key

1 measuring point 1
2 measuring point 2
3 measuring point 3

Figure A.2 — Location of the measuring points on the vehicle (example)

A.4.1.2 Method of mounting of the accelerometers (e.g. magnet, bonded or screwed) and auxiliary fixing means (e.g. mounting cubes):

.....

A.4.1.3 Description of the measuring axes of the sensors, e.g. 1z, 2z, 3x, 3y, 3z:

.....

A.4.2 Instrumentation flow chart

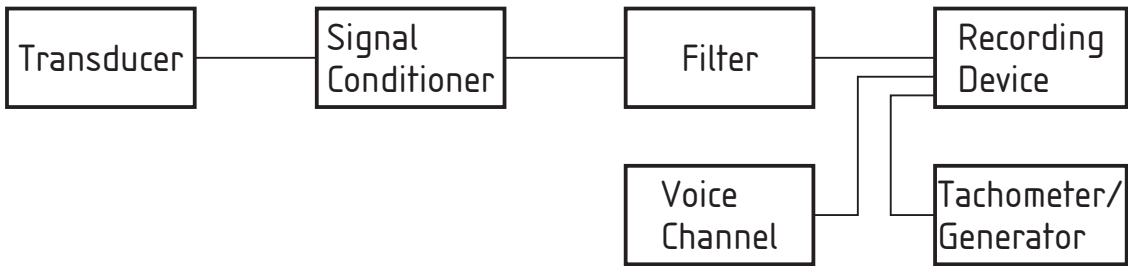


Figure A.3 — Instrumentation flow chart (example)