SLOVENSKI STANDARD
SIST EN 15433-6:2008
01-februar-2008

Obremenitve pri transportu - Merjenje in analiza dinamiļ no mehanskih obremenitev - 6. del: Sistemi za avtomatsko beleģenje pri merjenju nakljuļ nih sunkov, ki se pojavljajo med spremljanjem transporta

Transportation loads - Measurement and evaluation of dynamic-mechanical loads - Part 6: Automatic recording systems for measuring randomly occurring shock during monitoring of transports

Transportbelastungen - Messen und Auswerten von mechanisch-dynamischen Belastungen - Teil 6: Transportüberwachung mit automatischen Aufzeichnungsgeräten zur Messung stochastisch auftretender Stöße

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Charges de transport - Mesurage et analyse des charges mécaniques dynamiques - Partie 6 : Systemes d’enregistrement automatiques pour la mesure de choc aléatoire intervenant durant le suivi de transports

Ta slovenski standard je istoveten z: **EN 15433-6:2007**

ICS:
55.180.01

SIST EN 15433-6:2008 **en,de**

2003-01.Slovenski inštitut za standardizacijo. Razmnoževanje celote ali delov tega standarda ni dovoljeno.

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EUROPEAN STANDARD

NORME EUROPÉENNE

EUROPÄISCHE NORM

EN 15433-6

December 2007

ICS 55.180.01

English Version

Transportation loads - Measurement and evaluation of dynamic mechanical loads - Part 6: Automatic recording systems for measuring randomly occurring shock during monitoring of transports

Charges de transport - Mesurage et analyse des charges mécaniques dynamiques - Partie 6: Systèmes d'enregistrement automatiques pour la mesure de choc aléatoire intervenant durant le suivi de transports

Transportbelastungen - Messen und Auswerten von mechanisch-dynamischen Belastungen - Teil 6: Transportüberwachung mit automatischen Aufzeichnungsgeräten zur Messung stochastisch auftretender Stöße

This European Standard was approved by CEN on 28 October 2007.

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Ref. No. EN 15433-6:2007: E

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Foreword

This document (EN 15433-6:2007) 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of an identical text or by endorsement, at the latest by June 2008, and conflicting national standards shall be withdrawn at the latest by June 2008.

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

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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 analysis of dynamic mechanical transportation loads, thus enabling the achievement of standardized and adequately documented load values.

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This series of standards consists of the following parts:

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— 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.

This standard defines requirements that should be observed when automatic recording systems are being used for the purpose of a transportation survey. In this, it deviates from the characteristics of the other parts of the series, as in this case the prime concern is not the need for scientifically based and generally applicable data, which are to be used for standardization purposes, but to assist users "shock recorders“. Such automatic and computer-based recording systems have gone through remarkable developments, particularly in relation to their storage capacity and analysis capability. This, together with falling prices, has meant they are increasingly used for surveying specific transportations, especially inside packing. In general they do not reach the efficiency of a measuring chain such as used for test drives, especially in view of the storage capacity needed to measure unfiltered dynamic data during transportation.

1 Scope

This standard specifies the technical and functional properties of automatic recording equipment used to determine randomly appearing shocks during transportation.

Such automatic recording equipment can be used to:

— determine mechanical shock loads on individual transportations;

— monitor the transportation means to observe the limits of the shock parameters;

— determine the shock loads on the transported item.

This standard defines the sensors to be attached to the device, and specifies the minimum requirements for the parameters to be adjusted. It also defines the minimum requirements for the data analysis, as well as the data presentation.

This standard covers the complete recording equipment, including its accelerometers and the data analysis in an external data processing unit. The accelerometers can be integrated into the device or separately mounted from it (external sensors).

This standard also applies to the routine monitoring of individual transportations

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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.

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EN 15433-2, *Transportation loads — Measurement and analysis of dynamic mechanical loads — Part 2: Data acquisition and general requirements for measuring equipment*

EN 61000-6-1, *Electromagnetic compatibility (EMC) — Part 6-1: Generic standards — Immunity for residential, commercial and light-industrial environments (IEC 61000-6-1:2005)*

EN 61000-6-3, *Electromagnetic compatibility (EMC). — Part 6-3: Generic standards — Emission standard for residential, commercial and light-industrial environments (IEC 61000-6-3:2006)*

EN 60529, *Degrees of protection provided by enclosures (IP code) (IEC 60529: 1989)*

3 Terms and definitions

For the purposes of this European Standard, the following terms and definitions apply

3.1
sensor axes *x, y, z*
three Cartesian spatial axes that lie parallel to the measuring directions of the accelerometer

3.2
peak acceleration value
greatest positive or negative acceleration occurring during a shock event in a spatial axis or in a spatial vector: $\hat{a}_X, \hat{a}_Y, \hat{a}_Z, \hat{a}_R$

3.3
main axis *xyz* (max.)
spatial axis that shows the biggest peak acceleration value

NOTE Correspondingly $a_{xyz(max)}$ is the temporal course of the acceleration of the main axis and $\hat{a}_{xyz(\max)}$ is the peak acceleration of the main axis.

3.4
value of the spatial vector a_R
acceleration value of a randomly oriented spatial acceleration vector of a shock event

$$a_R = \sqrt{a_x^2 + a_y^2 + a_z^2} \quad (1)$$

3.5
shock duration T_{shock}
time at which the value of the acceleration of the main axis is equal to or greater than 10 % of the peak acceleration value of this axis (see 4.3.1)

3.6
frequency limit
frequency at which the signal level has dropped to a value of $1/\sqrt{2}$ compared to the mid-band frequency

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3.7
threshold values
magnitudes of the acquired measured values which when exceeded initiate the recording of an event: $a_{threshold}$, $T_{shock(min)}$

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3.8
values to be set
sum of all adjustments made to a recording equipment prior to a measuring event (e.g. measuring range, frequency limit, threshold values, storing modes, time modes, recording type or mail box content)

3.9
mailbox
device able to store data in an alphanumeric order, e.g. tracing program, order of transport, or mounting location of recording equipment

3.10
data memory
all data memory of a recording equipment in which measured and computed values as well as acquisition time span and set values are stored

3.11
acquisition time span
continuous time span during which the recording equipment is active

NOTE The beginning and end of an acquisition time span can be caused by switching on and off, set time modes, dropout of power supply, battery change, data evaluation or hardware errors.

3.12
time stamp
date and time of an event

3.13
sampling rate
number of digital measuring values produced for each time unit and for each sensor axis

4 Requirements for automatic recording devices

4.1 Accelerometers

Automatic shock recording equipment shall be equipped with three accelerometers arranged in a system of Cartesian axes, in order to record the acceleration acting in any direction.

Internal sensors are arranged inside the housing of the recording equipment.

External sensors shall be connected to the recording equipment by means of cables, such that no falsification of the measured values can occur.

The sensor axes shall be parallel or perpendicular to the edge of the recorder housing or the external sensor. The positive directions of the sensor axes shall be uniquely defined by arrows as well as by the designations *x, y, z*. When connecting external sensors, care shall be taken that no exchange of the axes or the direction of the measurement can occur.

4.2 Signal processing

Acceleration sensors have low pass or band pass behaviour. Their signals can further be processed in fixed or adjustable filters. The frequency limit, its characteristic and its order shall be declared. The declaration shall apply to the complete measuring chain.

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The measuring range is defined by the greatest acceleration value processed, and shall be adjustable.

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The signal processing as well as storage occurs digitally. The sampling rate shall be mentioned.

4.3 Recordings

4.3.1 Recording mode"event"

A random shock event occurs when the peak acceleration value in at least one spatial axis exceeds the set acceleration threshold value $a_{\text{threshold}}$ of that particular axis, and when the shock duration of that event is equal to or greater than the minimum shock duration $T_{\text{shock (min)}}$. See Figure 1.