SLOVENSKI STANDARD
SIST EN 709:1998/A1:1999

01-december-1999

Kmetijski in gozdarski stroji - Enoosni traktorji s priključ nimi prekopalniki, motorni prekopalniki, motorni prekopalniki s pogonskimi kolesi - Varnost

Machinery for agriculture and forestry - Pedestrian controlled tractors with mounted rotary cultivators, motor hoes, motor hoes with drive wheel(s) - Safety

Maschinen für die Land- und Forstwirtschaft - Einachstraktoren mit angebauter Fräse, Motorhacken, Triebadhacken - Sicherheit

Matériel agricole et forestier - Motoculteurs avec fraises portées, motobineuses et fraises a roue(s) motrice(s) - Sécurité

Ta slovenski standard je istoveten z: EN 709:1997/A1:1999

ICS:

65.060.10	Kmetijski traktorji in prikolice	Agricultural tractors and trailed vehicles
65.060.20	Oprema za obdelovanje tal	Soil-working equipment

SIST EN 709:1998/A1:1999 en

EUROPEAN STANDARD

NORME EUROPÉENNE

EUROPÄISCHE NORM

EN 709:1997/A1

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ICS 65.060.10; 65.060.20

English version

Machinery for agriculture and forestry - Pedestrian controlled tractors with mounted rotary cultivators, motor hoes, motor hoes with drive wheel(s) - Safety

Matériel agricole et forestier - Motoculteurs avec fraises portées, motobineuses et fraises à roue(s) motrice(s) - Sécurité

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This amendment A1 modifies the European Standard EN 709:1997; it was approved by CEN on 1 July 1999.

CEN members are bound to comply with the CEN/CENELEC Internal Regulations which stipulate the conditions for inclusion of this amendment into the relevant national standard without any alteration. Up-to-date lists and bibliographical references concerning such national standards may be obtained on application to the Central Secretariat or to any CEN member.

This amendment exists in three official versions (English, French, German). A version in any other language made by translation under the responsibility of a CEN member into its own language and notified to the Central Secretariat has the same status as the official versions.

CEN members are the national standards bodies of Austria, Belgium, Czech Republic, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Luxembourg, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland and United Kingdom.

EUROPEAN COMMITTEE FOR STANDARDIZATION
COMITÉ EUROPÉEN DE NORMALISATION
EUROPÄISCHES KOMITEE FÜR NORMUNG

Central Secretariat: rue de Stassart, 36 B-1050 Brussels

Ref. No. EN 709:1997/A1:1999 E

Foreword

This Amendment EN 709:1997/A1:1999 to the EN 709:1997 has been prepared by Technical Committee CEN/TC 144 "Tractors and machinery for agriculture and forestry", the secretariat of which is held by AFNOR.

This Amendment to the European Standard EN 709:1997 shall be given the status of a national standard, either by publication of an identical text or by endorsement, at the latest by January 2000, and conflicting national standards shall be withdrawn at the latest by January 2000.

This Amendment to the European Standard EN 709:1997 has been prepared under a mandate given to CEN by the European Commission and the European Free Trade Association, and supports essential requirements of EU Directive(s).

According to the CEN/CENELEC Internal Regulations, the national standards organizations of the following countries are bound to implement this European Standard: Austria, Belgium, Czech Republic, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Luxembourg, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland and the United Kingdom.

This amendment fulfils the «under study» NOTE which is located after the first paragraph of the present text of 5.14.1.

Contents

Change Annex C to become Annex D and add after Annex B the following:
"Annex C (normative) Measurement of vibration at the handlebars."

2 Normative references

Add after the reference to prEN 1553:1996 the following:

"CR 1030-1:1995, *Hand-arm vibration – Guidelines for vibration hazards reduction – Part 1: Engineering methods by design of machinery*

ISO 5805:1981, *Mechanical vibration and shock affecting man - Vocabulary"*

5.14 Vibration

Replace existing sub-clauses by the following:

"5.14.1 Reduction by design and protective measures

The machine shall be designed to generate a vibration level as low as practicable. The main sources causing vibration are:

— oscillating forces from the engine;

— tools;

— unbalanced moving parts;

— impact in gears, bearings and other mechanisms;

— interaction between operator, machine and material being worked;

— machine design related to mobility;

— travelling speed, tyre(s) pressure.

NOTE: CR 1030-1 gives general technical information on widely recognised technical rules and means to be followed in the design of machines for low vibration solutions. Besides the vibration reduction of the source technical measures to isolate the vibration source from the handle may be used, when appropriate, such as isolators and resonating masses.

5.14.2 Reduction by information

After taking possible technical measures for vibration reduction it is still recommended that the instruction handbook precise, when appropriate:

— the use of low-vibration operating modes, and/or limited time of operation;

— the wearing of personal protection equipment (PPE).

5.14.3 Vibration measurement

The level of vibration on handlebar grips shall be measured in accordance with Annex C.

Change Annex C to become Annex D and add new Annex C after Annex B as follows:

Annex C
(normative)
Measurement of vibration at the handlebars

C.1 General

This Annex specifies the laboratory method for measuring the vibration at the handlebars of pedestrian controlled tractors with mounted rotary cultivators, motor hoes and motor hoes with drive wheels.

The vibration level of the handlebars shall be measured in accordance with EN 1033:1995. If for a typical machine there is no dominant axis, tests shall be carried out on all three axes on the grip.

NOTE: Operators working around the machine under test shall be informed about the existence and location of danger zone (see figure 1 of EN 709:1997).

C.2 Quantities to be measured

Quantities to be measured:

— weighted acceleration of the hand-machine interface surfaces of the machinery under test, expressed as the root-mean-square (r.m.s.) acceleration, a_{hw}, in meters per second squared (see 3.1 and 3.2 of EN 1033:1995);

— maximum operating engine/motor speed, i.e. the highest operating engine/motor speed obtainable when adjusted in accordance with the machine manufacturer's specifications and/or instructions with the rotary cutting tools disengaged.

C.3 Instrumentation

C.3.1 General

Tachometers shall have an accuracy of ± 2,5 %. For specification of other instrumentation see clause 4 of EN 1033:1995.

C.4 Fastening of the transducer

The method of fastening the transducer shall be in accordance with 4.2 of EN 1033:1995. If a resilient coating is used between the hand and vibration structure (for example, a cushioned handle), it is permissible to use a suitable mounting for the transducer (for instance, a thin suitably formed metal sheet) placed between the hand and the surface of the resilient material. In all cases however care shall be taken to ensure that the size, shape and mounting of the transducer or the special transducer support does not significantly influence the transfer of vibration to the hand particularly ensuring that mounted transducer supports have a flat transfer function up to 1.5 kHz in all three directions.

NOTE: The proposed method for use of a resilient coating between the hand and the vibration structure is not satisfactory for all conditions, particularly in the case of thin cushions which mainly affect the transfer of higher frequencies. In such cases it is preferable to make the measurements with the special transducer support rigidly attached to the grip or to the handle and to report separately the type, thickness and physical properties of the cushioning material (figure C.2).

C.5 Calibration

Calibration shall be carried out in accordance with 4.7 of EN 1033:1995.

C.6 Measurement location and direction

The origin of the three-dimensional system of co-ordinates (see ISO 5805:1981) is located on the surface of the handlebar grip. The measuring directions for the right or left grip of the handlebars are shown in figure C.1. The z axis is located in the plane formed by the longitudinal axis of the grip and the hypothetical line between the centres of the grips.

C.7 Pre - test

Pre-test shall be carried out to identify the grip with the highest a_{hw} (vibration total value, see formula in clause C.9). Subsequent tests shall be carried out on this grip.

C.8 Test conditions

C.8.1 Machine set-up

Measurements shall be carried out on a new, normal production machine.

The machine shall be run in and warmed up for 15 min. The setting of the carburettor and the ignition timing as well as the tyre pressure shall conform to the manufacturer's specifications. The fuel tank shall be full.

Adjustable handlebar height shall be set to suit the operator.

The machine under test shall be equipped with rotary cultivating tools, maintained and serviced in accordance with the manufacturer's instructions.

C.8.2 Operating conditions

The vibration level measurement shall be carried out under the following operating conditions:

— the machine shall stand on hard ground (concrete, asphalt), with a maximum slope of 0,5°;

NOTE: The hand-arm vibration surface will be reviewed at the next revision taking into account ongoing research.

— the ground speed selector shall be in neutral position. For machines equipped with centrifugal clutch, the clutch itself shall be mechanically disengaged before the test;

— accelerometers shall be placed on the handlebar grip in accordance with figure C.2;

— the engine shall at maximum operating engine/motor speed;

— during the test, the operator shall support the grips without coming in contact with the accelerometers so that the angle between his upper-arm and fore-arm is greater than 90° and smaller than 135°;

— the operator shall support a pedestrian controlled tractor or motor hoe with drive wheel(s) by its grips in such a manner that the tool is not in contact with the ground; for motor hoe without support wheels (there is contact with the ground by the working tools) by its grips in such a manner that the transport wheel and the skid are not in contact with the ground.

For all types of machines the drive to the tools shall be disengaged during the test.

C.8.3 Operator

The measurements shall be carried out by means of one operator.

NOTE: The vibration measurements are influenced by the operator. They should therefore be familiar with the normal operation with the machine. During the next revision further tests will be carried out to define whether only one operator or three are requested.

C.9 Measurement procedure

With the machine operating under the conditions given in C 8, the vibration level at the grips shall be measured with an integration time of at least 8 s. Measurement shall be made simultaneously for the three (3) axis x, y and z (see figures C.1 and C.2).

Between two subsequent test runs the operator shall remove his hands from the handlebar grips.

Five measurements shall be made for each axis of grip under test.

For each axis the arithmetical mean shall be evaluated. From these arithmetical mean values the vibration total value (a_{hw}) resultant shall be calculated using the formula:

$$a_{hw} = \sqrt{\left(a_{hwx}^2 + a_{hwy}^2 + a_{hwz}^2\right)}$$

where :

a_{hw} , the vibration total value, is the square root of the sum of the squares of frequency weighted r. m. s. acceleration values determined from the arithmetical means of vibration measured in orthogonal co-ordinates.

C.10 Test report

The test report shall be based on clause 7 of EN 1033:1995 and shall contain the following information:

— the type of ground;

— the mass and height of the operator;

— the measurement location and the kind of fastening of transducer used;

— a description of machine tested (manufacturer, type, model number, engine type, power, mass and tyre pressure(s));

— a description of the rotary cultivator (manufacturer, type, model, mass);

— a description of resilient cover of the grip, if any;

— the manufacturer, type and relevant specifications of the instruments used;

— the method of determining the weighted accelerations;

— the description of the test runs carried out;

— the engine speed during the tests.