



SLOVENSKI STANDARD
SIST EN 1152:1995

01-september-1995

Traktorji, kmetijski in gozdarski stroji - Ščitniki za priključne gredi - Preskus obrabe in trdnosti

Tractors and machinery for agriculture and forestry - Guards for power take-off (PTO) drive shafts - Wear and strength tests

Traktoren und Maschinen für die Land- und Forstwirtschaft - Schutzeinrichtungen für Gelenkwellen - Verschleißprüfungen und Festigkeitsprüfungen

Tracteurs et matériels agricoles et forestiers - Protecteur d'arbres de transmission a cardans de prise de force - Essai d'usure et de résistance

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Ta slovenski standard je istoveten z: EN 1152:1994

ICS:

65.060.10 Kmetijski traktorji in prikolice Agricultural tractors and
trailed vehicles

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EUROPEAN STANDARD

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NORME EUROPÉENNE

EUROPÄISCHE NORM

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Descriptors: Agricultural machinery, agricultural tractors, forest equipment, driveshaft, cardan shafts, safety devices, safety of machines, tests, wear tests, wear resistance, mechanical strength, durability

English version

**Tractors and machinery for agriculture and
forestry - Guards for power take-off (PTO) drive
shafts - Wear and strength tests**

Tracteurs et matériels agricoles et forestiers
- Protecteur d'arbres de transmission à cardans
de prise de force - Essais d'usure et de
résistance

Traktoren und Maschinen für die Land- und
Forstwirtschaft - Schutzeinrichtungen für
Gelenkwellen - Verschleißprüfungen und
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This European Standard was approved by CEN on 1994-06-16. CEN members are bound to comply with the CEN/CENELEC Internal Regulations which stipulate the conditions for giving this European Standard the status of a 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.

The European Standards exist 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, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Luxembourg, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland and United Kingdom.

CEN

European Committee for Standardization
Comité Européen de Normalisation
Europäisches Komitee für Normung

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

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Foreword

In November 1991, the draft standards ISO/DIS 5674-1 "Tractors and machinery for agriculture and forestry - Guards for power take off (PTO) drive-shafts - Test methods and requirements - Part 1 : Strength test" and ISO/DIS 5674-2 "Tractors and machinery for agriculture and forestry - Guards for power take off (PTO) drive-shafts - Test methods and requirements - Part 2 : Wear test" were submitted, at the CEN/TC 144 "Tractors and machinery for agriculture and forestry" request, to the Primary Questionnaire procedure.

After analysis of the procedure results, BTS 2 requested CEN/TC 144 to prepare, with a view to submitting it to formal vote, a draft standard based on ISO 5674-1 : 1992 and ISO 5674-2 : 1992 and taking into account the comments worded by the CEN Member Committees during these procedures, particularly to be in accordance with the Essential Safety Requirements of the Machinery Directive.

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

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 December 1994, and conflicting national standards shall be withdrawn at the latest by December 1994.

In accordance with the CEN/CENELEC Internal Regulations, following countries are bound to implement this European Standard: Austria, Belgium, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Luxembourg, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland and United Kingdom.

1 Scope

This European Standard specifies the test methods and acceptance criteria for determining resistance against wear, robustness and durability of non rotating guards for power take-off (PTO) drive shafts as defined in clause 2.

Pending the results of work being conducted in European Committee for Standardization level on this subject matter, the requirements and test methods relative to the ultraviolet radiation resistance of such guards when they are manufactured in plastics materials are not dealt with in this standard.

Such equipment is part of world-wide trade, which implies re-export of PTO drive-shafts to countries with extreme temperatures, therefore a temperature of - 35 °C has been specified for some tests.

2 Definitions

For the purposes of this European Standard, the following definitions apply :

2.1 power take-off (PTO) drive-shaft : Shaft with universal joints that connects the power take-off of a self-propelled machine or a tractor to the first fixed bearing of a recipient machine.

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2.2 closed length (of shaft) : Distance between the centres of the outermost cross-assemblies, when the PTO drive shaft is fully closed.

2.3 extended length (of shaft) : Distance between the centres of the outermost cross-assemblies, when the PTO drive shaft is extended to the maximum length recommended by the manufacturer.

2.4 non-rotating PTO drive-shaft guard : PTO drive shaft guard held stationary while the shaft is rotating.

3 Test conditions

3.1 The guard shall be taken from production and be within the tolerances shown on production drawings. The operating and maintenance instructions shall be complied with as described by the manufacturer. The guard shall be restrained from rotating during the tests. The guard shall be tested in conjunction with a PTO drive-shaft of 1 m closed length (as defined in 2.2) for which it is intended. The results obtained from a sample shall be presumed valid for guards of shorter and longer length. The same guard shall be used throughout the test.

The guard shall be subjected to the appropriate tests given in clauses 4 and 5 following the test sequence given.

After each test, note and record the condition of the guard with particular reference to any fractures, permanent deformation or detachments of components.

Maintenance operations shall not be made between the wear test and the strength tests.

3.2 Unless otherwise specified the test shall be carried out at an ambient temperature between 5 °C and 35 °C.

3.3 Where a test procedure requires the shaft to be rotated, the rotational frequency shall be 1 000 min⁻¹.

4 Wear test

4.1 Test equipment

4.1.1 The wear test equipment shall consist of a cabinet capable of holding the PTO drive-shaft and its guard horizontal, and of rotating the PTO drive-shaft at a frequency of 1 000 min⁻¹. The size and shape of the cabinet shall be such that an even distribution of the spray of salt-water solution or dust is ensured. The upper parts of this cabinet shall be shaped so that drops of sprayed solution which accumulate on them do not fall onto the PTO drive-shaft guard.

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4.1.2 When the tests require the use of water, the water shall be potable.

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4.1.3 The dust shall consist of a mixture composed of equal parts, by mass, of organic and mineral dust.

4.1.3.1 The organic dust shall be ground lucerne with a maximum percentage of 12 % water and with a maximum particle size of 2 mm.

4.1.3.2 The mineral dust shall be a simple phosphated fertilizer. This product is obtained during the production of steel, by the treatment of steel or of phosphorous cast iron. It contains, as principal elements, the silicophosphates of calcium having the following characteristics :

- minimum content : 12 % of the mass of P₂O₅ total ;
- other : 75 % at least of the of the mass of P₂O₅ total declared shall be soluble in 2 % concentration of citric acid.

Table 1 : Fineness of grinding

Sieve mesh mm	Minimum percentage of undersize by mass %
0,16	> 75
0,63	> 96

4.1.4 When using salt-water solution, it shall be prepared by dissolving sodium chloride in water to produce a concentration of $50 \text{ g/l} \pm 5 \text{ g/l}$. The sodium chloride shall be white and shall give a colourless solution in water. It shall be substantially free from copper and nickel, and shall not contain more than 0,1 % of sodium iodine and not more than 0,4 % of total impurities calculated for dry salt. The solution shall be filtered before it is used in the test in order to remove any solid matter which might block the apparatus of the spraying device.

4.2 Wear test procedure

4.2.1 During a complete test, the guard with the shaft is operated for 290 h.

4.2.2 During operation in the test sequence described in 4.2.3, the shaft shall be rotated and, while rotating, shall be extended to its maximum length for 1 min of each 5 min cycle and held at its minimum length for the other 4 min.

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4.2.3 The test consists of the following four parts :

a) for 120 h, operate in alternating 24 h cycles at $85 \text{ }^\circ\text{C} \pm 5 \text{ }^\circ\text{C}$ and at ambient temperature, commencing with a cycle at $85 \text{ }^\circ\text{C}$.

Immediately before commencing the next part of the test, immerse the PTO drive-shaft with guard in water (see 4.1.2), remove from the water and allow any water which may run off under gravity to do so for 1 min with the guard horizontal and at its minimum length ;

b) for 120 h, operate at ambient temperature in an atmosphere containing $0,5 \text{ kg/m}^3$ of dust (see 4.1.3) ;

c) for 2 h, operate at ambient temperature in an atomized solution of salt-water (see 4.1.4) sprayed at a rate of $2 \times 10^{-5} \text{ m}^3/\text{s}$ per m^2 . After the 2 h of operating, leave the PTO drive-shaft with guard, stationary for 46 h ;

d) for 48 h, operate at ambient temperature.

4.2.4 Before the start and at the end of the test described in 4.2.3, measure the torque which needs to be applied to each guard end in order to immobilize it while the shaft rotates at $1\ 000 \text{ min}^{-1}$.

5 Strength tests

5.1 Axial loading test at ambient temperature

5.1.1 With the PTO drive-shaft and guard stationary, apply an axial force of 250 N between the cone and the tube in both directions. Gradually apply the force and then hold for 60 s. If the cones, or method of attaching them to the tubes, are not the same, each cone end shall be tested.

5.1.2 With the PTO drive-shaft and guard stationary, apply an axial force of 1 000 N for 60 s between each guard tube and the drive-shaft. Apply the force in both directions.

5.2 Radial loading test at ambient temperature

5.2.1 Support the guarded PTO drive-shaft in a horizontal, straight line by its usual end connections, extended to the maximum length recommended by the manufacturer.

5.2.2 Rotate the PTO drive-shaft and, using a smooth flat 100 mm wide wooden beam, apply a direct load of 500 N for 60 s at right-angles to the shaft-guard at its mid-point.

To avoid excessive vibration, the wooden beam shall be supported by a 20 mm thick rubber backing of approximately A/20 Shore hardness (see figure 1).

When applying the load, care shall be taken to ensure that no impact load is applied.

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5.2.3 Rotate the PTO drive-shaft and, using the wooden beam described in 5.2.2, apply a direct force of 500 N to the cone over the centre of the articulation of the universal joint, when in line with the PTO drive-shaft, for 60 s as shown in figure 1. The force shall be applied perpendicular to the PTO drive-shaft.

If the method of attachment of the guard to the shaft is not identical at each end, then test both ends.

5.2.4 Record whether any additional part of the shaft was no more guarded during or after the test.