



SLOVENSKI STANDARD
oSIST prEN ISO 5674:2022
01-julij-2022

Traktorji ter kmetijski in gozdarski stroji - Ščitniki za priključne gredi - Preskusi trdnosti in obrabe ter merila sprejemljivosti (ISO/DIS 5674:2022)

Tractors and machinery for agriculture and forestry - Guards for power take-off (PTO) drive-shafts - Strength and wear tests and acceptance criteria (ISO/DIS 5674:2022)

Traktoren und land- und forstwirtschaftliche Maschinen - Schutzeinrichtungen für Gelenkwellen - Festigkeits- und Verschleißprüfungen und Annahmekriterien (ISO/DIS 5674:2022)

Tracteurs et matériels agricoles et forestiers - Protecteurs d'arbres de transmission à cardans de prise de force (p.d.f) - Essais de résistance mécanique et d'usure et critères d'acceptation (ISO/DIS 5674:2022)

Ta slovenski standard je istoveten z: **prEN ISO 5674**

ICS:

65.060.01	Kmetijski stroji in oprema na splošno	Agricultural machines and equipment in general
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Tractors and machinery for agriculture and forestry — Guards for power take-off (PTO) drive-shafts — Strength and wear tests and acceptance criteria

Tracteurs et matériels agricoles et forestiers — Protecteurs d'arbres de transmission à cardans de prise de force — Essais de résistance mécanique et d'usure et critères d'acceptation

ICS: 65.060.01

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Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

The procedures used to develop this document and those intended for its further maintenance are described in the ISO/IEC Directives, Part 1. In particular, the different approval criteria needed for the different types of ISO documents should be noted. This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2 (see www.iso.org/directives).

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights. Details of any patent rights identified during the development of the document will be in the Introduction and/or on the ISO list of patent declarations received (see www.iso.org/patents).

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For an explanation of the voluntary nature of standards, the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the World Trade Organization (WTO) principles in the Technical Barriers to Trade (TBT), see www.iso.org/iso/foreword.html.

This document was prepared by Technical Committee ISO/TC 23, *Tractors and machinery for agriculture and forestry*, Subcommittee SC 2, *Common tests*.

This third edition cancels and replaces the second edition (ISO 5674:2004), which has been technically revised.

The main changes compared to the previous edition are as follows:

- The wording of [Annex B](#) line 8 has been clarified regarding “spectral irradiance”
- The Type 4 Power Take-Off from ISO 500-1:2014 has been added.

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.

European Foreword

NOTE European Foreword is not included in the final ISO publication.

This document (EN ISO 5674:YEAR) 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 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 Date1 and conflicting national standards shall be withdrawn at the latest by Date2.

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This document 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).

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- The Type 4 Power Take-Off from ISO 500-1:2014 has been added.

For relationship with EU Directive(s), see informative [Annex ZA](#), which is an integral part of this document.

According to the CEN-CENELEC Internal Regulations, the national standards organizations of the following countries are bound to implement this European Standard: Austria, Belgium, Bulgaria, Croatia, Cyprus, Czech Republic, Denmark, Estonia, Finland, Former Yugoslav Republic of Macedonia, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Romania, Serbia, Slovakia, Slovenia, Spain, Sweden, Switzerland, Turkey and the United Kingdom.

2022

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Introduction

This document is a type C standard as stated in ISO 12100.

This document is of relevance, in particular, for the following stakeholder groups representing the market players with regard to machinery safety:

- machine manufacturers (small, medium and large enterprises);
- health and safety bodies (regulators, accident prevention organizations, market surveillance, etc.).

Others can be affected by the level of machinery safety achieved with the means of the document by the above-mentioned stakeholder groups:

- machine users/employers (small, medium and large enterprises);
- machine users/employees (e.g. trade unions, organizations for people with special needs);
- service providers, e.g. for maintenance (small, medium and large enterprises);
- consumers (in the case of machinery intended for use by consumers).

The above-mentioned stakeholder groups have been given the possibility to participate at the drafting process of this document.

The machinery concerned and the extent to which hazards, hazardous situations or hazardous events are covered are indicated in the Scope of this document.

When requirements of this type-C standard are different from those which are stated in type-A or type-B standards, the requirements of this type-C standard take precedence over the requirements of the other standards for machines that have been designed and built according to the requirements of this type-C standard.

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Tractors and machinery for agriculture and forestry — Guards for power take-off (PTO) drive-shafts — Strength and wear tests and acceptance criteria

1 Scope

This International Standard specifies laboratory tests for determining the strength and wear resistance of guards for power take-off (PTO) drive-shafts on tractors and machinery used in agriculture and forestry, and their acceptance criteria. It is intended to be used in combination with ISO 5673-1:2005.

It is applicable to the testing of PTO drive-shaft guards and their restraining means. It is not applicable to the testing of guards designed and constructed to be used as steps.

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.

EN 20105-A02:1994, *Textiles - Tests for colour fastness - Part A02: Grey scale for assessing change in colour (ISO 105-A02:1993)*

ISO 500-1:2014, *Agricultural tractors — Rear-mounted power take-off types 1, 2, 3 and 4 — Part 1: General specifications, safety requirements, dimensions for master shield and clearance zone*

ISO 500-2:2004, *Agricultural tractors — Rear-mounted power take-off types 1, 2 and 3 — Part 2: Narrow-track tractors, dimensions for master shield and clearance zone*

ISO 500-3:2014, *Agricultural tractors — Rear-mounted power take-off types 1, 2, 3 and 4 — Part 3: Main PTO dimensions and spline dimensions, location of PTO*

EN ISO 4892-1:2016, *Plastics - Methods of exposure to laboratory light sources - Part 1: General guidance (ISO 4892-1:2016)*

EN ISO 4892-2:2013, *A1:2021, Plastics - Methods of exposure to laboratory light sources - Part 2: Xenon-arc lamps - Amendment 1: Classification of daylight filters (ISO 4892-2:2013/Amd 1:2021)*

ISO 5673-1:2005, *Agricultural tractors and machinery — Power take-off drive shafts and power-input connection — Part 1: General manufacturing and safety requirements*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO 5673-1:2005 and the following 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 <https://www.electropedia.org/>

3.1

ambient temperature

any temperature between 5 °C and 35 °C

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4 General test conditions

4.1 Guard

4.1.1 The guard shall be representative of a production model and be within the tolerances specified for the guard. The results obtained from the sample can be used to certify guards of shorter or longer lengths, provided the basic design remains the same. When a guard is designed for use with several drive shaft types, a representative selection of shaft and guard combinations shall be tested.

4.1.2 If the guard is made of plastic material (or any other material susceptible to degradation by UV radiation), it shall be certified by the manufacturer to be resistant to degradation from UV radiation under an appropriate, recognized method. See [Annex B](#) for an example.

4.1.3 During testing, all operating and maintenance instructions specified for the shaft and guard shall be complied with, except where specifically mentioned by this International Standard.

4.1.4 The guard shall be tested in conjunction with a PTO drive shaft of between 900 mm and 1 010 mm closed length for which it is intended. The same guard shall be used throughout all the tests.

4.2 Other conditions

4.2.1 Where specified in this International Standard that the PTO drive shaft shall be rotating, its rotational frequency shall be 1 300 r/min for PTO drive shafts designed to be used for Type 4 PTO and 1 000 r/min for all other PTO drive shafts.

4.2.2 All tests shall be carried out in accordance with the schedule and in the sequence given in [Annex A](#).

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5 Test equipment

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5.1 General

5.1.1 Wear test equipment shall be capable of holding the PTO drive shaft and rotating it at a frequency of 1 300 r/min for PTO drive shafts designed to be used for Type 4 PTO and 1 000 r/min for all other PTO drive shafts.

The shafts and guards shall be mounted as specified for operational use and only fixed by their designated restraining device. The fixing points shall be in accordance with ISO 500-1:2014 and the equivalent machine standard unless otherwise specified for that type of shaft. The size and shape of the wear test equipment shall be such that an even test environment is maintained, e.g. heat and the dust specified in [5.2.3](#).

5.1.2 Strength test equipment shall allow the accurate application of known loads at controlled temperatures and at the required frequency of rotation within the tolerances stipulated in [Table 1](#).

5.2 Test parameters

5.2.1 Measuring accuracy

All measurements shall be within the tolerances given in [Table 1](#) except where otherwise required by this International Standard.

Table 1 — Measuring accuracy

	Measuring accuracy	Test tolerance
Rotational speed	± 0,5 %	+ 5 %
Temperature	± 1,0 °C	± 5 %
Time	± 0,2 %	+ 5 %
Length	± 0,5 %	± 2 %
Force	± 1,0 %	+ 2 %

5.2.2 Potable and salt water

5.2.2.1 When a test requires the use of water, it shall be potable (i.e. drinking water).

5.2.2.2 When a test requires a saltwater solution, it shall be prepared by dissolving sodium chloride in water to produce a concentration of 50 g/l ± 5 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.

5.2.3 Test dust

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

5.2.3.2 The organic dust shall be ground lucerne with a maximum percentage of 12 % water and with a maximum particle size of 2 mm. An environment of 0,5 kg/m³ shall be maintained.

5.2.3.3 The mineral dust shall be a simple phosphated fertilizer, and shall contain as principal elements silicophosphates of calcium having the following characteristics:

- minimum content: 9 % of P₂O₅ total (± 3 %);
- other: at least 75 % of the P₂O₅ total declared, soluble in a 2 % concentration of citric acid.

See [Table 2](#).

Table 2 — Mineral dust specifications

Mesh opening of sieve mm	Minimum fineness of grinding, after sifting %
> 0,063	—
> 0,125	—
> 0,16	75
> 0,63	96

6 Tests

6.1 General

After each test, note and record the condition of the guard, with particular reference to any fractures, permanent deformation or detachment of components which could contribute to the deterioration of the guard.

For the test sequence, see [Annex A](#).

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The PTO drive shaft guard is deemed to have passed the test if

- the guard has no holes or deformation which leave the shaft unprotected,
- the guard has no breakage, crack or part separation, and
- the guard freely rotates separately from the PTO drive shaft when the PTO drive shaft is rotated.

6.2 Wear test

6.2.1 For the whole test, the shaft shall be rotating and, while rotating, shall be repeatedly extended to its *extended length* (see ISO 5673-1:2005), held for 1 min, then returned and held at its *closed length* (see ISO 5673-1:2005) for 4 min. This shall be repeated for the duration of the test period. See [Annex A](#) for the test sequence.

Guards shall only be fixed using the normal fixing and restraining system as specified by the manufacturer.

Before the start and at the end of each of the wear test cycles, measure the torque required for the immobilization of any part of the guard, having first run the guard for 1 min. The torque measured shall not exceed 2,5 N·m per bearing race up to a maximum of 10 N·m per complete drive shaft.

6.2.2 At the start and at the end of the wear test, measure the running torque that needs to be applied to each guard tube in order to immobilize it when the shaft is rotating at 1 300 r/min for PTO drive shafts designed to be used for Type 4 PTO and 1 000 r/min for all other PTO drive shafts.

6.2.3 For wear tests with dust, the test atmosphere shall contain 0,5 kg/m³ of dust according to [5.2.3](#).

6.3 Bearing corrosion test (Perform only if the guard has bearings running in contact with the PTO drive shaft)

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Taking the shaft with the bearing in place, but with the rest of the guard removed, and supported horizontally and stationary, apply salt water (see [5.2.2.2](#)) to all bearings for the first 5 min of every hour for 48 h, then leave to dry in free air (i.e. 48 cycles consisting of salt water application for 5 min of each cycle and drying in free air for the other 55 min of each cycle).

The salt water may be applied by spraying, flooding or any other suitable method, provided that it at least flows over all the metallic parts of the bearing system at some stage during the 5 min. It might be necessary to rotate the shaft during the process to ensure good coverage, but this should only be done very slowly so as not to throw the liquid off. The application of the salt water shall be carried out such that salt solution corrosion of its inner tubes is avoided.

6.4 Strength tests

6.4.1 Dynamic radial loading test at defined temperature limits

Subject the guarded drive shaft to a radial loading test at ambient temperature after each complete cycle of the wear test (See [A.1](#) and [D.9](#)).

The PTO drive shaft guard is deemed to have passed the test if

- the guard has no holes or deformation which leave the shaft unprotected, and
- the guard has no breakage, crack or part separation.