INTERNATIONAL 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

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

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ISO copyright office
Case postale 56 • CH-1211 Geneva 20
Tel. + 41 22 749 01 11
Fax + 41 22 749 09 47
E-mail copyright@iso.org
Web www.iso.org

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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.

International Standards are drafted in accordance with the rules given in the ISO/IEC Directives, Part 2.

The main task of technical committees is to prepare International Standards. Draft International Standards adopted by the technical committees are circulated to the member bodies for voting. Publication as an International Standard requires approval by at least 75 % of the member bodies casting a vote.

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.

ISO 5674 was prepared by Technical Committee ISO/TC 23, *Tractors and machinery for agriculture and forestry*, Subcommittee SC 2, *Common tests*.

This second edition of ISO 5674 cancels and replaces the first editions of ISO 5674-1:1992 and ISO 5674-2:1992, of which it constitutes a technical revision.

This corrected version of ISO 5674:2004 incorporates the following corrections or modifications.

— An error in the second column heading of Table 2 ("m/m") has been eliminated.

— Figure 1 has been modified, and numbering of elements and a key added.

— The wording of the third sentence of 6.5.2 has been changed.

— The title of 6.6 has been corrected from "specified temperature" to "ambient temperature".

— The system of numbering and the wording of A.1 has been altered to avoid possible confusion.

— Figure A.1 has been changed to show the blows at three locations, and "h" has been deleted from the drawing and the legend as a result of the change to 6.5.2.

— Cross-references have been added to the legend to Figure D.1.

— The system of numbering and the wording of D.9 has been altered to avoid possible confusion.

Introduction

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

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

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

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.

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 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.

ISO 105-A02, *Textiles — Tests for colour fastness — Part A02: Grey scale for assessing change in colour*

ISO 500 (all parts), *Agricultural tractors — Rear-mounted power take-off types 1, 2 and 3*

ISO 4892-1, *Plastics — Methods of exposure to laboratory light sources — Part 1: General guidance*

ISO 4892-2, *Plastics — Methods of exposure to laboratory light sources — Part 2: Xenon-arc sources*

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

ISO 5673-2, *Agricultural tractors and machinery — Power take-off drive shafts and power-input connection — Part 2: Specification for use of PTO drive shafts, and position and clearance of PTO drive line and PIC for various attachments*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO 5673-1 and the following apply.

3.1
ambient temperature
any temperature between 5 °C and 35 °C

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

4.2.1 Where specified in this International Standard that the PTO drive-shaft shall be revolving, its rotational frequency shall be 1 000 r/min.

4.2.2 All tests shall be carried out in accordance with the schedule and in the sequence given in Annex A.

5 Test equipment

5.1 General

5.1.1 Wear test equipment, which shall be capable of holding the PTO drive-shaft and revolving it at a frequency of 1 000 r/min.

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 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, which 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/m^3 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 P_2O_5 total (± 3 %);

— other: at least 75 % of the P_2O_5 total declared, soluble in a 2 % concentration of citric acid.

See Table 2.

Table 2 — Mineral dust specification

Mesh opening of sieve mm	Fineness of grinding, after sifting min. %
> 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.

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.

6.2 Wear test

6.2.1 For the whole test, the shaft shall be revolving and, whilst revolving, shall be repeatedly extended to its *extended length* (see ISO 5673-1), held for 1 min, then returned and held at its *closed length* (see ISO 5673-1) 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 driveline.

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 revolving at 1 000 r/min.

6.2.3 Carry out the following procedure, in the sequence given.

a) For 48 h, operate at 85 °C.

b) For 48 h, operate at ambient temperature.

c) For 96 h, operate at ambient temperature in an atmosphere containing 0,5 kg/m^3 of dust according to 5.2.3.

d) For 24 h, operate at 85 °C.

e) For 24 h, operate at ambient temperature.

f) For 48 h, operate at ambient temperature in an atmosphere containing 0,5 kg/m^3 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-shaft)

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.

6.4.2 Test on guard component covering joints

Revolve the PTO drive-shaft and, using a smooth, flat, 100 mm wide wooden beam, apply a direct force of 500 N to the cone of the universal joint for 60 s, in accordance with Annex A, perpendicular to the PTO drive-shaft.

To avoid excessive vibration, the wooden beam shall be supported by a 20 mm thick rubber backing of approximately A 20 Shore hardness. When applying the load, care shall be taken to ensure that no impact load is applied.

Test over every joint.

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.

6.4.3 Test on tubes

Support the guarded PTO drive-shaft in a horizontal, straight line by its usual end connections, at its *extended length* (as specified by the manufacturer).

Revolve 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 midpoint, in accordance with Annex A.

Record whether any part of the revolving shaft was exposed during or after the test that would allow a 30 mm probe to come into contact with that revolving part.

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.

6.4.4 Dynamic swivel test

The dimensions of the cone guarding the universal joints shall be such that the cone will not be damaged by contact with the master shield (see ISO 500), when the drive-shaft and guard are at the maximum allowable angle and while the shaft is rotating as specified by the manufacturer in the instruction handbook.

If the guard cone does not come into contact with the master shield or any part of the drive-shaft when the drive-shaft is at the specified maximum rotating angular position, this test need not be carried out.

To verify this requirement, perform the following procedure, with the PTO drive-shaft revolving at 1 000 r/min.

a) Test the drive-shafts with a nominal torque rating of $< 1\,000$ N·m or a nominal transmitted power < 57 kW at 540 r/min with the test master shield for PTOs of types 1 and 2.

b) Test the drive-shafts with a higher nominal torque rating or nominal transmitted power with the test master shield for PTOs of Type 3.

Couple the PTO drive-shaft to a fixture with the test master shield integrated as shown in Figure 1. Use the dimensions given in Table 3 and the nominal torque as specified.

Move the drive-shaft and guard repeatedly from the in-line position in a horizontal plane out to the maximum operational angle specified by the manufacturer for the universal joint and back. Include in this cyclic movement a dwell period of $5\text{ s} \pm 2\text{ s}$ at the maximum angle position. Complete 100 cycles within $15\text{ min} \pm 3\text{ min}$.

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.

6.4.5 Static axial loading test at ambient temperature

With the PTO drive-shaft and guard stationary, gradually apply an axial force of 250 N between each cone and tube in both directions, holding the force for a minimum of 60 s. See Annex A.

With the PTO drive-shaft and guard stationary, apply an axial force of 1 000 N between the guard tube and the PTO drive-shaft at every attachment bearing in both directions, holding the force for a minimum of 60 s. See Annex A.

Test each end.

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.

6.4.6 Dynamic axial loading test of the bearings at ambient temperature

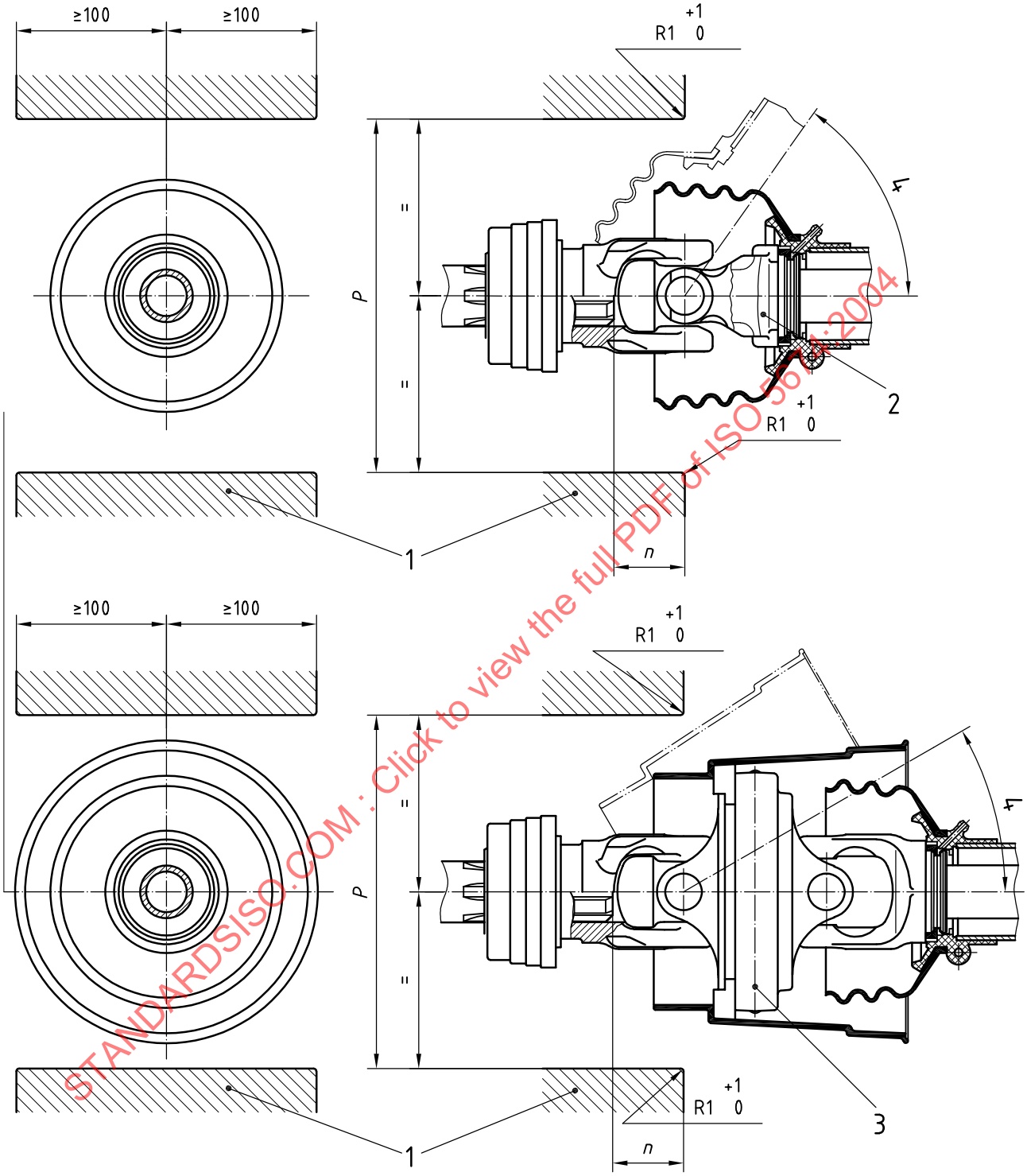
With the PTO drive-shaft revolving and the guard stationary in the test equipment, apply an axial force of 500 N in both directions between the guard and the PTO drive-shaft bearings for 60 s. See Annex A.

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.

Dimensions in millimetres



Key

1 test fixture
2 universal joint
3 wide-angle universal joint
4 maximum operational angle

Figure 1 — Test master shield and fixture for PTO types 1, 2 and 3

Table 3 — Dimensions of fixture

Dimensions in millimetres

PTO type	Dimension	
	n	P
1 and 2	85^{+2}_{0}	280^{+2}_{0}
3	105^{+2}_{0}	350^{+2}_{0}

6.5 Tests at sub-zero temperature

6.5.1 Impact test at sub-zero temperatures

6.5.1.1 Support the PTO drive-shaft and guard, as shown in Annex A, in a horizontal straight line by the normal end connections and at the extended length.

6.5.1.2 Maintain the PTO drive-shaft and guard at − 35 °C for at least 1 h before starting the test. Take measures to ensure that the shaft and guard do not rise above − 35 °C at the moment of the test.

6.5.1.3 With the PTO drive-shaft and guard at − 35 °C, strike the blows in accordance with the sequence a) to c) below using a pendulum as shown in Figure 2. The contact face shall be flat and have a diameter of 50 mm and the contact face edge shall have the radius according to Figure 2.

For drive-shafts weighing > 200 N (in the test configuration specified in Clause 4), apply an impact energy of 98 J.

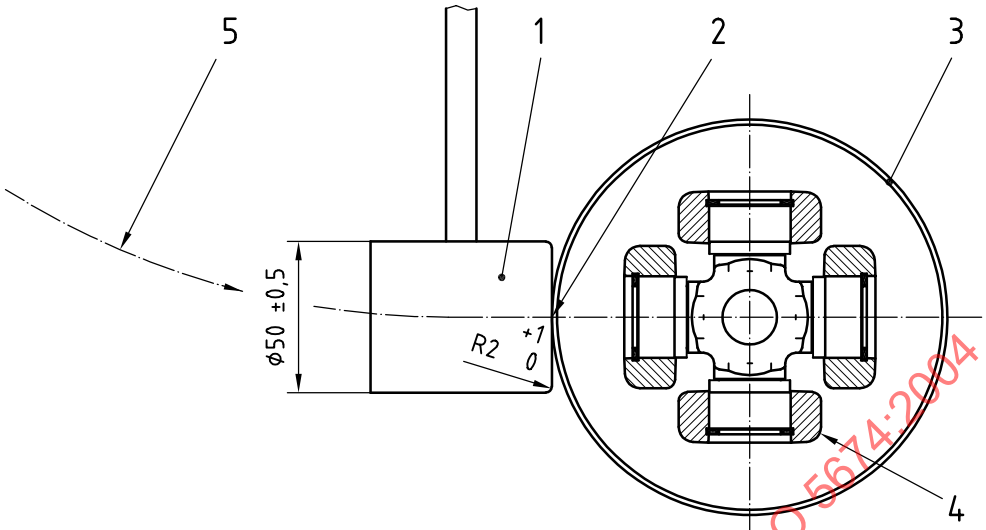
For drive-shafts of ⩽ 200 N (in the test configuration specified in Clause 4), use half the weight of the drive-shaft in newtons as the value of the impact energy in joules.

a) Strike one blow to each cone (to only one cone if both are identical) over the centre of articulation of the universal joint when in line with the PTO drive-shaft — the end yoke positioned such that the face of the yoke is parallel to the contact (see Figure 2).

b) Strike one blow midway on one of the tubes.

c) Strike one blow at the midpoint of the overlap of the tubes.

Dimensions in millimetres



Key

1 pendulum
2 contact face
3 guard cone
4 end yoke position
5 path of pendulum

Figure 2 — Impact test

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.

Cuts caused by the edge of the pendulum are admissible.

6.5.2 Static axial loading test at sub-zero temperatures

Carry out the following test procedure.

Lower the temperature to − 35 °C and maintain the PTO drive-shaft and guard at that temperature for 1 h.

With the PTO drive-shaft and guard at a standstill and at − 35 °C, apply an axial force between the guard tube and the PTO drive-shaft in both directions, holding the force for a minimum of 60 s. See Annex A.

— If the inner diameter of the outer guard tube, D, is $\leqslant$ 80 mm, the axial force shall be 2,5 kN.

— If D is $>$ 80 mm, the force (F) to be used shall be calculated by $D \times 0{,}031$, where F, expressed in kilonewtons, is a maximum of 3,5 kN, and D is expressed in millimetres.

Test each end.

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.

6.6 Restraining means test at ambient temperature

6.6.1 Conventional means of attachment

Perform the following test procedure on conventional means of attachment (chains, ropes, etc.) connected to each independent guard component or assembly.

a) Apply a force of 400 N to each fitted restraining member for 60 s, once tangentially and once radially, in a plane perpendicular to the axis of the PTO drive-shaft. The means of holding the guard stationary shall not cause damage or permanent deformation to the guard.

b) After 60 s, increase the radial load further until the restraining member fails. The restraining member shall fail at its weakest point, which shall be at the guard end only. The weak point shall fail at a force below 800 N.

At the end of the test, the restraining system (the restraining member or attachment means) shall have no change which impairs its function except for the weak point.

6.6.2 Other restraining means

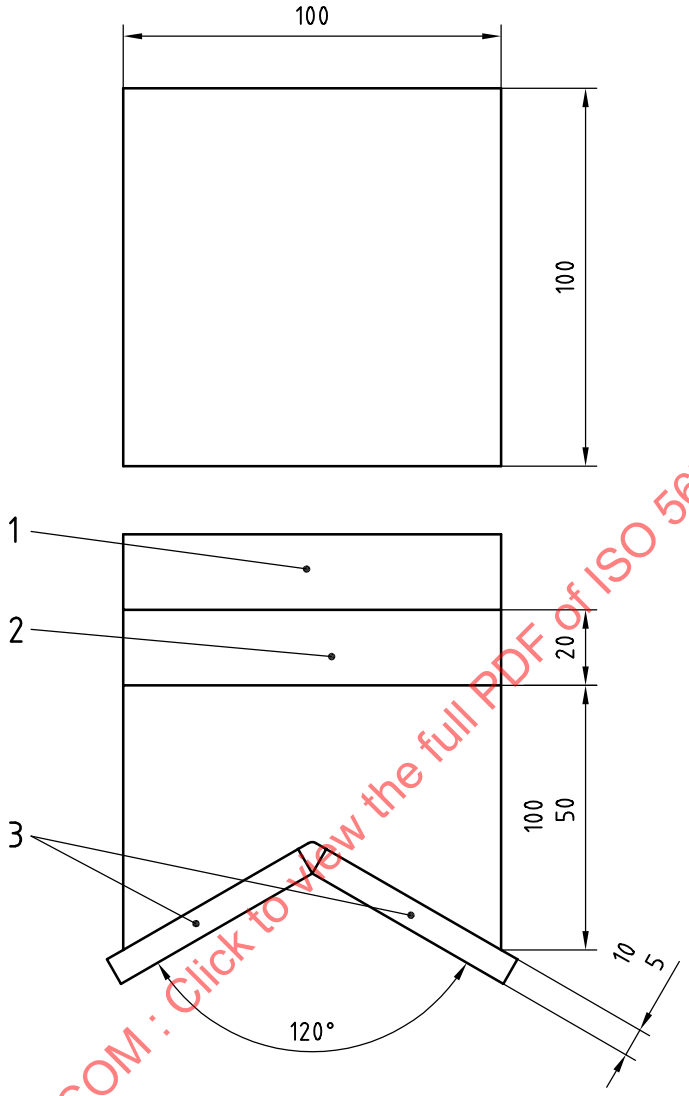
Perform the following test on any other restraining means.

a) To test the immobilizing torque of guards, support the guarded PTO drive-shaft in a horizontal, straight line by its usual end connections, compressed to the minimum length recommended by the manufacturer. Repeat the test for the extended shaft and on both halves. The wear test cabinet (see D.3) may be used for this test.

b) With the drive-shaft rotating and no restraining system attached or operating, gradually apply a direct load of 100 N perpendicular to the guard at the midpoint of the overlap of the tubes, to each half of the guard tubing. The load shall be applied using a 100 mm wide, 100 mm long and 50 mm to 100 mm thick beam with a 120° “V”-shaped groove cut through the width. The entire length of the groove of this V-block (see Figure 3) shall be lined with rubber 5 mm to 10 mm thick Shore hardness of A 50 approximately. The rubber shall be attached such that the fastening method does not touch guarding. The beam shall be supported by a 20 mm thick rubber backing of Shore hardness of A 20.

Once the load is fully applied, the guards shall stop rotating completely within 3 s. Record whether the guards stopped rotating with the load applied within the 3 s limit.

Dimensions in millimetres



Key

1 steel
2 Shore A 20 rubber
3 Shore A 50 rubber

Figure 3 — V-block

7 Final acceptance criteria

The final acceptance criteria are as follows.

a) The guard and restraining means are deemed to have passed the test only when all the applicable tests have been carried out.

b) The identification markings shall still be readable and still present after the tests have been carried out.

c) The guard shall still function after all the tests have been carried out and shall have no breakages, cracks or part separation, and no holes or deformations which leave the shaft unprotected.

d) After all the tests have been carried out, the guard shall not have moved on the shaft with reference to its initial position, e.g. the bearing shall remain in the shaft groove.

8 Test report

The test report shall include the following:

— details of PTO drive-shaft guard, including all identification marks for the guard and the PTO drive-shaft;

— results of all tests;

— a statement to that effect if the guard meets the requirements of Clause 7.

A typical test report is given in Annex C.

Annex A
(normative)

Test schedule

A.1 Test sequence for cone and tube guards

A.1.1 Measure the immobilization torque.

A.1.2 Carry out the wear test at 1 000 r/min:

— first, for 48 h at 85 °C;

— then, for 48 h at ambient temperature.

A.1.3 Measure the immobilization torque.

A.1.4 Carry out maintenance (lubrication, etc.) of the guard bearings, if necessary, according to the maintenance instructions.

A.1.5 Perform the dynamic radial load test of the joint at ambient temperature.

A.1.6 Perform the dynamic radial load test of the tube at ambient temperature.

A.1.7 Perform the dynamic axial load test at ambient temperature.

A.1.8 Measure the immobilization torque.

A.1.9 Carry out the wear test at 1 000 r/min for 96 h at ambient temperature with dust.

A.1.10 Measure the immobilization torque.

A.1.11 Dismantle the guard from the PTO shaft according to the maintenance instructions given in the instruction handbook, and rebuild.

A.1.12 Perform the bearing corrosion test.

A.1.13 Carry out maintenance (lubrication, etc.) of the guard bearings, if necessary, according to the maintenance instructions.

A.1.14 Measure the immobilization torque.

A.1.15 Carry out the wear test at 1 000 r/min:

— first, for 24 h at 85 °C;

— then, for 24 h at ambient temperature.

A.1.16 Measure the immobilization torque.

A.1.17 Carry out maintenance (lubrication, etc.) of the guard bearings, if necessary, according to the maintenance instructions.

A.1.18 Perform the dynamic radial load test of the joint at ambient temperature.

A.1.19 Perform the dynamic radial load test of the tube at ambient temperature.

A.1.20 Perform the dynamic axial load test at ambient temperature.

A.1.21 Measure the immobilization torque.

A.1.22 Carry out the wear test at 1 000 r/min, for 48 h at ambient temperature with dust.

A.1.23 Measure the immobilization torque.

A.1.24 Dismantle the guard from the PTO shaft according to the maintenance instructions given in the instruction handbook, and rebuild.

A.1.25 Perform the dynamic swivel test.

A.1.26 Perform the static axial load test of the cone at ambient temperature.

A.1.27 Perform the static axial load test of the tube at ambient temperature.

A.1.28 Carry out the impact test at − 35 °C.

A.1.29 Perform the static axial load test at − 35 °C.

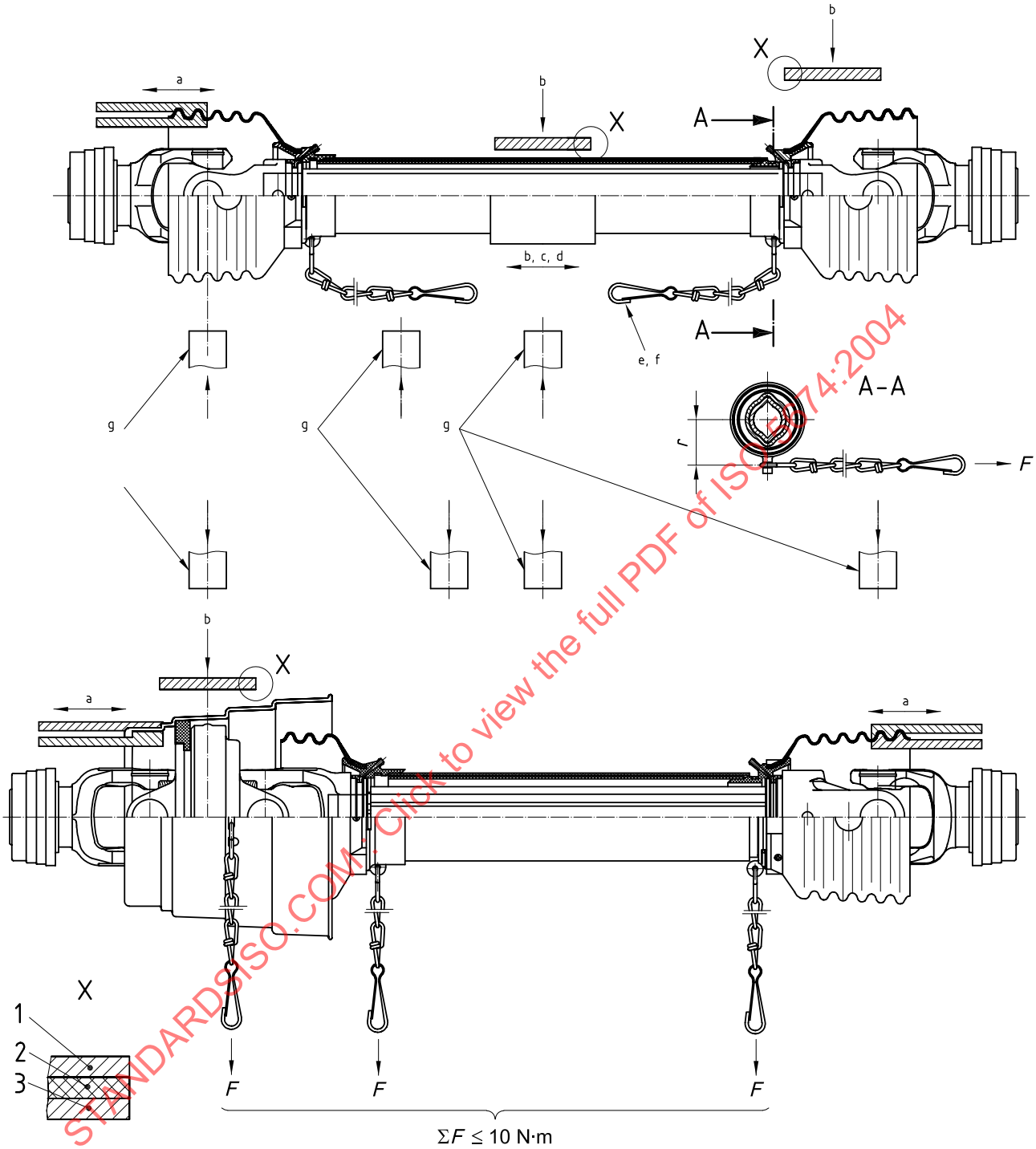
A.1.30 Perform the restraining member attachment test at ambient temperature.

A.1.31 Perform the restraining member test at ambient temperature.

A.1.32 Check the UV test data (see Annex B).

A.1.33 Complete the test report.

See Figure A.1.



Key

1 load 2 rubber 3 wooden beam

a 250 N for 60 s, each cone (see 6.4.5).

b 500 N for 60 s at 1 000 r/min (see 6.4.2, 6.4.3, 6.4.6).

c 1 000 N for 60 s (see 6.4.5).

d 2,5 kN to 3,5 kN at – 35 °C (see 6.5.2).

e 400 N for 60 s (see 6.6.1).

f > 400 N and < 800 N for 60 s: weak link shall open (see 6.6.1).

g Blows of up to 98 J at – 35 °C (see 6.5.1).

NOTE The figure does not include all test requirements.

Figure A.1 — Guard test diagram

Annex B
(normative)

UV test for plastic guards

The following are requirements when using methods of exposure to laboratory light sources in tests of UV-radiation on plastic guards.

The test specimens and their number shall be in accordance with ISO 4892-1.

Test specimens shall be sample sections of plastic guard components. A minimum of one piece of each different material from the guard of at least 10 mm by 10 mm shall be tested.

Test conditions shall be in accordance with ISO 4892-2.

The black-panel temperature shall be 65° ± 3° C.

Relative humidity shall be 65 % ± 5 %.

The spray cycle shall be

— 18 min ± 0,5 min wet, and

— 102 min ± 0,5 min dry.

Relative spectral irradiance (Table 1, Method A) — UV-radiation shall be 505 W/m^2.

The test time shall be 1 000 h.

Test report/results: include a description of the specimen and method of test.

a) Colour test: grey-scale colour change shall be in accordance with ISO 105-A02, minimum rating 3.

b) Mechanical test:

   — no cracks shall be detected from checking at 100 × magnification;

   — a manual bending test shall be carried out without visual cracks appearing.

Annex C
(informative)

Typical test report

Description

Report on test of ..... power take-off shaft guard

Mounted on ..... power take-off shaft

Length of shaft Closed: ..... mm

Extended: ..... mm

Identification mark on shaft: .....

Identification mark on guard: .....

Type of guard: .....

Maintenance requirements: Frequency: .....

Type of lubricant: .....

UV test data

Test data supplied? Yes/No (delete as applicable)

Comments on data: .....

Cones

Material: .....

Length: ..... mm

Maximum diameter: ..... mm

Tubes

Material: .....

Dimensions:

	Outside diameter		Wall thickness		Length	
outer tube	.....	mm	.....	mm	.....	mm
inner tube	.....	mm	.....	mm	.....	mm

Method of attachment on shaft: .....

Type of bearings: .....

Other features: .....

Wear test

Torque needed to immobilize guard

Did the torque needed to immobilize the guard while the shaft rotated exceed 10 N·m

— before the wear test? Yes/No (delete as applicable);

— after the wear test? Yes/No (delete as applicable).

Comments, if any: .....

Did the guard meet the requirements of 6.2? Yes/No (Delete as applicable).

Strength tests

Axial loading test at ambient temperature

Ambient temperature: ..... °C

Did cones remain attached on tubes? Yes/No (delete as applicable).

Did guard remain functional? Yes/No (delete as applicable).

Comments, if any: .....

Radial loading test at ambient temperature

Ambient temperature: ..... °C

Did guard remain stationary during the 60 s period? Yes/No (delete as applicable).

Was any additional part of the shaft exposed during or after the test?

Yes/No (delete as applicable).

Did guard remain functional? Yes/No (delete as applicable).

Comments, if any: .....