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ISO/TR 12369

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AMENDMENT 1
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Agricultural tractors and machinery — Electric power transmission connector

AMENDMENT 1

Tracteurs et matériels agricoles — Connecteur de transmission de puissance électrique

AMENDEMENT 1

Reference number
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Foreword

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International Standards are drafted in accordance with the rules given in the ISO/IEC Directives, Part 3.

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.

In exceptional circumstances, when a technical committee has collected data of a different kind from that which is normally published as an International Standard ("state of the art", for example), it may decide by a simple majority vote of its participating members to publish a Technical Report. A Technical Report is entirely informative in nature and does not have to be reviewed until the data it provides are considered to be no longer valid or useful.

Attention is drawn to the possibility that some of the elements of this Amendment to ISO/TR 12369 may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights.

Amendment 1 to Technical Report ISO/TR 12369:1994 was prepared by Technical Committee ISO/TC 23, *Tractors and machinery for agriculture and forestry*, Subcommittee SC 4, *Tractors*.

Agricultural tractors and machinery — Electric power transmission connector

AMENDMENT 1

Page 1, clause 1

In the first paragraph, insert the following after the first sentence:

> "It also specifies the environmental conditions for electric power transmission connectors of type 1 (see clause 4)."

Page 1, clause 2

Add the following to the list of normative references:

> ISO 5011:—[1)], *Inlet air cleaning equipment for internal combustion engines and compressors — Performance testing*.
>
> IEC 60068-1:1988, *Environmental testing — Part 1: General and guidance*.
>
> IEC 60512-2:1985, *Electromechanical components for electronic equipment — Basic testing procedures and measuring methods — Part 2: General examination, electrical continuity and contact resistance tests, insulation tests and voltage stress tests*.
>
> IEC 60512-3:1976, *Electromechanical components for electronic equipment — Basic testing procedures and measuring methods — Part 3: Current-carrying capacity tests*.
>
> IEC 60512-5:1992, *Electromechanical components for electronic equipment — Basic testing procedures and measuring methods — Part 5: Impact tests (free components), static load tests (fixed components), endurance tests and overload tests*.
>
> IEC 60512-6:1984, *Electromechanical components for electronic equipment — Basic testing procedures and measuring methods — Part 6: Climatic tests and soldering tests*.
>
> IEC 60512-7:1993, *Electromechanical components for electronic equipment — Basic testing procedures and measuring methods — Part 7: Mechanical operating tests and sealing tests*.
>
> IEC 60512-8:1993, *Electromechanical components for electronic equipment — Basic testing procedures and measuring methods — Part 8: Connector tests (mechanical) and mechanical tests on contacts and terminations*.
>
> IEC 60512-9:1992, *Electromechanical components for electronic equipment — Basic testing procedures and measuring methods — Part 9: Miscellaneous tests*.
>
> IEC 60529:1989, *Degrees of protection provided by enclosures* (IP Code).

1) To be published. (Revision of ISO 5011:1988)

Page 4

Add the following:

6 Requirements

6.1 Test procedure

6.1.1 Current-carrying capacity

The current-carrying capacity is measured according to IEC 60512-3. At a cross-sectional conductor area of 2,5 mm², a tension of 12 V and an ambient temperature of components of 85 °C, the permanently permissible current for a pair of contacts shall be at least 25 A. Accordingly, the permanently permissible current for a cross-sectional conductor area of 1 mm² shall be at least 5 A.

6.1.2 Test category

According to IEC 60068-1: 40/085/56.

6.1.3 Degree of protection

The degree of protection shall be IP 65, in accordance with IEC 60529, when connected and locked.

6.1.4 Test pins

Material: Steel, grade according to the choice of the manufacturer.

Design: Hardened.

See Figure 4 and Table 2.

Dimensions in millimetres

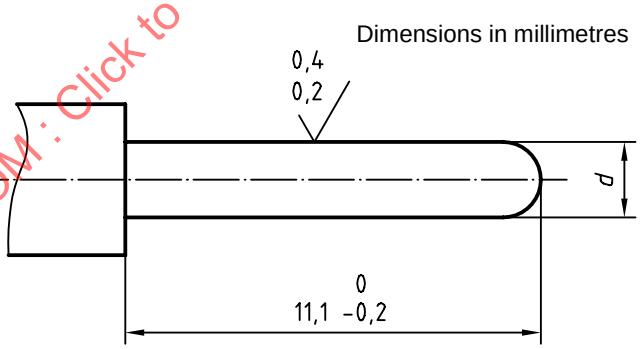


Figure 4 — Test pin

Table 2 — Dimensions of test pins

Dimensions in millimetres

Test pin	Function	Nominal dimension d	Permissible deviation
P1	Widening	5	+ 0,01 0
P2	Widening	3,5	+ 0,01 0
P3	Measurement of retention force	4,97	0 – 0,01
P4	Measurement of retention force	3,47	0 – 0,01

6.1.5 Material

Shell: In the case of plastics: polyamide or comparable material

Pins and sockets: The contacts shall be durably surface-protected (for instance nickel-plated or equivalent surface protection).

6.1.6 Testing programme

For type testing, a number divisible by 3 of fully contact-equipped specimens (at least 6) is necessary. Pairs shall be formed which remain pair during the whole testing procedure. If not otherwise stated, the connected and locked pair shall be tested.

The testing programme fixes the order of the examinations, the test conditions and the requirements to be met. Measurements of strains shall be taken immediately after strain is applied. After the basic tests of all specimens (test group P) the specimens are divided into 2 equal test groups (test group A and B). Tables 3, 4, and 5 describe the test programme for the different test groups P, A and B.

Table 3 — Basic tests, test group P

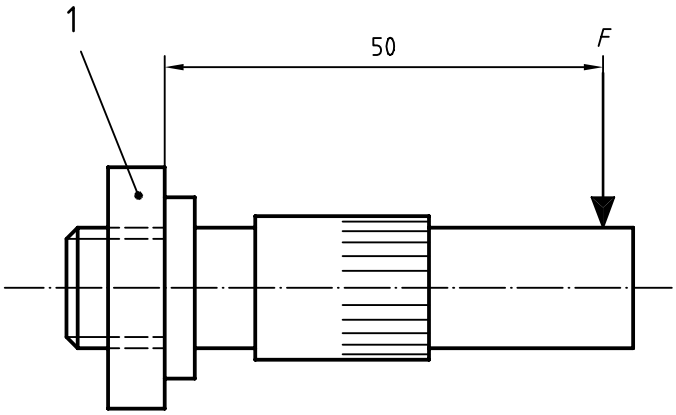
Test phase	Title	Test No.	According to	Severity or conditions of test	Requirements
P1	Visual examination Examination of dimensions	1 a 1 b	IEC 60512-2 IEC 60512-2		Dimensions according to ISO/TR 12369:1994, clause 4. There shall be no damage which could impair normal operation.
P2	Correct mating	13 e	IEC 60512-7	Operating force: 200 N	
P3	Contact resistance with a prescribed current (25 A)	2 b	IEC 60512-2	Three contacts per specimen Measuring points: at the respective contact	$\leqslant$ 3 mΩ
P4	Insulation resistance	3 a	IEC 60512-2	Test voltage: U = (500 $\pm$ 50) V; Method C	$\geqslant 10^8$ Ω

Table 4 — Test group A

Test phase	Title	Test No.	According to	Severity or conditions of test	Requirements
AP1	Gauge retention force for spring holding contacts	16 e	IEC 60512-8	Three contacts per specimen Widening: test pin P1, P2 according to 6.1.4 Measurement: test pin P3, P4 according to 6.1.4	⩾ 0,4 N for contact 82 ⩾ 1 N for contacts 15/30 and 31
AP2	Mechanical durability	9 a	IEC 60512-5	Average insertion speed: 0,1 m/s Interval when extracted separated: 30 s	500 insertion cycles
AP3	Contact spring and protection against overstretching	16 a	IEC 60512-8	Transverse moment: 0,06 Nm at contact 82 Transverse moment: 0,1 Nm at contact 15/30 and 31	
AP4	Damp heat, steady state	11 c	IEC 60512-6	Electrode-voltage: 60 V d.c.; Recovery time: 1 h to 2 h	56 days
AP5	Contact resistance	2 b	IEC 60512-2	as P3	< 3 mΩ
AP6	Insulation resistance	3 a	IEC 60512-2	as P4	⩾ 10^8 Ω
AP7	Insertion and withdrawal forces	13 b	IEC 60512-7		⩽ 100 N engagement ⩽ 200 N separation
AP8	Gauge retention force for spring holding contacts	16 e	IEC 60512-8	Same contacts as AP1 Measurement: test pin P2, P4 according to 6.1.4	as AP1
AP9	Static load, transverse	8 a	IEC 60512-5	Mounting of the test specimen according to Figure 5 Test force: 100 N	
AP10	Visual examination	1 a	IEC 60512-2	Unmated connectors	There shall be no damage which could impair normal operation
AP11	Contact retention in insert	15 a	IEC 60512-8	Minimum three contacts per specimen After the fifth[a] mounting of contacts applied force: 30 N	Displacement within the permissible longitudinal deviation of the contact components
AP12	Visual examination	1 a	IEC 60512-2		There shall be no damage which could impair normal operation, nor wear-through of the contact material at the contact point.

[a] Only for snap-on contacts

Dimensions in millimetres



Key

1 Mounting plate

Figure 5 — Measuring arrangement for transverse static load tests

Table 5 — Test group B

Test phase	Title	Test No.	According to	Severity or conditions of test	Requirements
BP1	Dry heat	11 i	IEC 60512-6	Operating temperature: 85 °C Operating time: 96 h	
BP2	Cold	11 j	IEC 60512-6	Operating temperature: – 40 °C Operating time: 2 h	
BP3	Degree of protection			According to IEC 60529	Degree of protection: IP 65
BP4	Cable-clamp resistance to cable pull (tensile)	17 c	IEC 60512-9	2 mm displacement	300 N
BP5	Visual examination	1 a	IEC 60512-2		There shall be no damage which could impair normal operation

6.2 Environmental conditions

6.2.1 Temperature

The operating temperature is between T_{max} = 85 °C and T_{min} = – 40 °C. The test shall be carried out in accordance with IEC 60512-6 (see Table 5).

6.2.2 Dust (inorganic)

Test the component in a dust chamber containing the equivalent of coarse dust with a particle size distribution described in ISO 501-1. Sufficient air movement shall be provided to maintain a minimum suspended concentration of 0,88 g/m³ with the component positioned in its normal mounting orientation. Run the test for a minimum of 24 h. Upon completion, test for impaired function at elevated humidity and inspect for dust leaks.

— Level 1: Dust inside the component and/or impaired function caused by the presence of dust.

— Level 2: Impaired function caused by the presence of dust.

Application guideline: Determine the level of severity, dependent upon the component location and function.

6.2.3 Solar radiation

6.2.3.1 Ultraviolet effects

Expose the component to 43 W/m² to 75 W/m² of ultraviolet radiation (280 mm to 400 mm wavelength) at a distance of 0,75 m from the light source for 300 h. Inspect for degradation beyond a previously specified limit or impaired function after exposure.

Application guideline: Consideration should be given to the filtering effects of windscreen glass on the specified UV frequency spectrum.

6.2.3.2 Readability

Observe information displayed on component for legibility at both the maximum and minimum operating ambient light levels. Test for impaired readability beyond a predefined acceptance level.

— Level 1:

  — max.: 108 000 lx (exposed location/sunny day)

  — min.: 0 lx

— Level 2:

  — max.: 36 000 lx (shaded location)

  — min.: 0 lx

Application guidelines: Non-cab installations: level 1

Cab installations: level 1 or 2

6.2.4 Wash

Expose the component, in its normal mounting orientation, to the appropriate wash conditions specified. Check for impaired function after exposure.

— Level 1: 7 000 kPa (pump pressure) and 16 l/min. High pressure wash with spray nozzle held at a distance of 0,1 m from the component surfaces for a total of 2 min. Use a detergent degreaser and a water temperature of 60 °C. Examine for presence of entrapped water which could potentially impair operation.

— Level 2: 375 kPa (pump pressure) and 8 l/min. Spray wash held at a distance of 0,1 m from component for 10 min. Use a water temperature of 15 °C.

Application guidelines: Outside cab-mounting locations: level 1

Inside cab-mounting locations: level 2

6.2.5 Chemicals

Use either spray or brush, whichever is appropriate for the product application. If more than one chemical is specified, each chemical should be applied to a different component under test.

6.2.5.1 Spray exposure

The component shall be mounted in its normal orientation. Subject the normally exposed surfaces of the component to the specified chemicals, sprayed at low pressure not exceeding 375 kPa at an angle of ± 45° to the surface of the component, for 2 min/day for a total of five days. Check for impaired function or detrimental corrosion during the test and at the end of a 100 h minimal interval following final exposure to test conditions.

6.2.5.2 Brush exposure

Apply the specified chemical solution with a brush until evenly coated over the normally exposed surface area. Repeat once per day for three days. Check for impaired function or detrimental corrosion during the test and at the end of a 100 h minimal interval following final exposure to test conditions.

6.2.6 Salt exposure

With the component mounted in its normal orientation, expose it for 48 h to an atomised fog made from a 5 % aqueous solution of NaCl with a temperature of 35 °C and pH between 6,5 and 7,2.

— Level 1: Check for evidence of salt inside the component, impaired function, or excessive corrosion immediately after the test and at the end of a 100 h minimal interval following the test.

— Level 2: Check for impaired function immediately after the test and at the end of a 100 h minimal interval following the test.

6.2.7 Mechanical shock

The connector shall be break-proofed to fall from a height of 2 m.

6.2.8 Mechanical vibrations

The random vibration is described as follows.

Vibration in each of three orthogonal axes at 3 *g* RMS overall acceleration and power spectral density of 2 m^2/s^3 from 50 Hz to 2 000 Hz. Spectral density curve shall conform to profile illustrated in Figure 6.

Control the functional performance of the component under the specified vibration. The vibration level should be measured and controlled at fixturing near the component. Check for impaired function during test, loose parts on fatigue cracks.

6.2.9 Combined environment

The appearance of several factors at the same time shall be taken into consideration.