SLOVENSKI STANDARD
SIST HD 464 S1:1997/A2:1997

01-oktober-1997

Dry-type power transformers (IEC 726:1982 + A1:1986 modified)

Dry-type power transformers

Trockentransformatoren

Transformateurs de puissance de type sec

Ta slovenski standard je istoveten z: **HD 464 S1:1988/A2:1991**

ICS:

29.180 Transformatorji. Dušilke Transformers. Reactors

SIST HD 464 S1:1997/A2:1997 **en**

HARMONIZATION DOCUMENT

DOCUMENT D'HARMONISATION

HARMONISIERUNGSDOKUMENT

HD 464 S1/A2

May 1991

UDC 621.314.211.016.2-777.001.2.001.4.12 (083.71)

Descriptors: Dry-type power transformers, requirements, testing, properties, definitions

ENGLISH VERSION

DRY-TYPE POWER TRANSFORMERS
(IEC 726:1982 + A1:1986, modified)

Transformateurs de puissance de type sec
(CEI 726:1982 + A1:1986, modifiée)

Trockentransformatoren
(IEC 726:1982 + A1:1986, modifiziert)

This amendment modifies the Harmonization Document HD 464 S1:1988. It was approved by CENELEC on 1990-09-11. CENELEC members are bound to comply with the CEN/CENELEC Internal Regulations which stipulate the conditions for implementation of this amendment on a national level.

Up-to-date lists and bibliographical references concerning national implementation may be obtained on application to the Central Secretariat or to any CENELEC member.

This amendment exists in three official versions (English, French and German). versions.

CENELEC members are the national electrotechnical committees of Austria, Belgium, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Luxembourg, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland and United Kingdom.

CENELEC

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

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FOREWORD

On 22nd May 1987, during the meeting held in London, TC 14 appointed a Working Group (WG 2) in "To determine the minimum test requirements to confirm the suitability of dry-type transformers manufactured to meet the Class 1 or Class 2 climatic conditions classified in Harmonization Document HD 464 S1, including the suitability for exposure to low ambient temperatures".

To this task WG 2 devoted four meetings and TC 14 approved on 3rd March 1988 in Brussels in principle the guidelines of this document.
The work having been completed, the resulting document was issued by the secretary of TC 14 and sent to the Central Secretariat for 6MP.

During the meeting of TC 14 held in Brussels on 1st and 2nd June 1989, the document has been revised and this version groups the following:

- additional common modifications to Publication IEC 726 in order to:
  - make some editorial variations to the French text,
  - modify subclause 2.1 to state climatic conditions for storage and transport,
  - mention in clause 8 the environmental, climatic and fire behaviour classes introduced in Appendix B,
  - introduce low temperature test and thermal shock test in Section Five
  - redefine environmental and climatic classes in Appendix B,
  - introduce fire behaviour classes in Appendix B.

- the revised text originally circulated with this Amendment (Annex ZA and ZB). Annex ZC concerning trial guidance tests to prove suitability to F1 fire behaviour class will be added at a later stage.

- the previous prAM A to HD 464 S1 is withdrawn as a common modification and included as a B-deviation for France, Italy, United Kingdom and Spain.

The text of the draft was approved by CENELEC as amendment A2 to HD 464 S1 on 11 September 1990. (Amendment A1 is incorporated in HD 464 S1).

The following dates were fixed:

- latest date of announcement of the HD at national level	(doa)	1991-03-15
- latest date of publication of a new harmonized national standard	(dop)	1991-09-15
- latest date of withdrawal of conflicting national standards	(dow)	1991-09-15

Annexes designated "normative" are part of the body of the standard.
Annexes designated "informative" are given only for information.
In this standard, annexes ZA, ZB and ZC are normative and annex ZD (B-deviations) is informative.

The following common modifications supplement or modify the common modifications to IEC 726:1982 + Amendment 1:1986 given in HD 464 S1.

1 **Scope**

Modification to the French text only.

2 **Service conditions**

2.1 Add after the fourth line of item b):

Note: both outdoor and indoor dry-type transformers are suitable for transport and storage at ambient temperatures down to -25°C.

8 **Rating plates**

Add after point u):

v) Indication of environmental, climatic and fire behaviour classes (see Appendix B) to which the complete transformer complies, as follows: EX - CX - FX (X can be 0 or 1 or 2 as applicable).

Section Five - Tests

Add after clause 23 new clauses 24 and 25 (with subsequent renumbering of following clauses):

24 **Low temperature test** (special test)

The low temperature test consists of submitting the transformer to a cooling cycle in a climatic chamber.

Note: A guidance for this test is given in Annex ZB.

25 **Thermal shock test** (special test)

The thermal shock test consists of a combined application of both cooling and heating cycles to a transformer. The lowest temperature applied shall be equal to the lowest ambient temperature to which the transformer may be exposed during normal operation.

Note: A guidance for this test is given in Annex ZB.

Appendix B

In the text entered in HD 464 S1:

- Replace the title of appendix B by: Environmental, climatic and fire behaviour classes

- Add as a title for B1: Environmental and climatic classes

- Modify the symbols defining environmental classes with regard to humidity, condensation and pollution as follows:

  "Class E0" instead of "Class 0"
  "Class E1" instead of "Class 1"
  "Class E2" instead of "Class 2"

- Modify the sentence after the definition of Class E2 as follows:

  The manufacturer shall declare and state on the rating-plate the environmental Class for which the transformer is suitable. Special tests ..."

- Replace the last sentence of clause B1 by:

  With regard to the minimum ambient temperature to which the transformer can be exposed, the following climatic classes are defined:

  Class C1: Indoor installation. The transformer is suitable for operation at ambient temperatures not below -5 °C but may be exposed during transport and storage to ambient temperatures down to -25 °C.

  Class C2: Outdoor installation. The transformer is suitable for operation, transport and storage at ambient temperatures down to -25 °C.

  The manufacturer shall declare and state on the rating-plate the climatic class for which the transformer is suitable. Special tests may be agreed to prove suitability to Class C1 or C2.

- Add clause B3 as follows:

B3 **Fire behaviour classes**

Three fire behaviour classes are defined:

Class F0: No special fire hazard is envisaged.
Except the characteristics inherent to the design of the transformer, no special measures are taken to limit flammability.

Class F1: Transformers subject to fire hazard.
Restricted flammability is required.
Self-extinction of fire (poor burning is permitted with negligible energy consumption) shall take place within a specified time period to be agreed between purchaser and manufacturer, unless specified by National Specification.
The emission of toxic substances and opaque smokes shall be minimized.
Materials and products of combustion shall be practically halogen-free and shall contribute with a limited quantity of thermal energy to an external fire.

Class F2: By means of special provisions, the transformer shall be able to operate for a given time period if subject to an external fire. The requirements of class F1 shall also be met.

The manufacturer shall declare and state on the rating-plate the fire behaviour class to which the transformer belongs.
Special tests to prove the suitability of a transformer for a certain fire class may be agreed between manufacturer and purchaser. If required, Annex ZC gives a guidance for test procedures.

Add:

ANNEX ZA (normative)

TRIAL USE GUIDE FOR SPECIAL TESTS TO PROVE SUITABILITY TO ENVIRONMENTAL CLASSES

ZA.1 The test conditions laid down in the following clauses are a guide for a learning period to obtain testing experience and to verify the usefulness of this kind of tests by comparison with the behaviour of the transformers in service.

These tests are only provisional and do not overrule manufacturers' statements according to Appendix B.

The tests considered in this Annex ZA as well as those considered in the following Annexes ZB and ZC are to be jointly taken into account insofar as agreed between manufacturer and purchaser.

The tests, for which guidance is given in Annexes ZA, ZB, and ZC are summarized in the following table:

TABLE ZA.1

Classes		Humidity & pollution			Climatic		Fire behaviour		
Tests	Clauses	E0	E1	E2	C1	C2	F0	F1	F2
1) Low ambient temperature	ZB.2	-	-	-	YES	YES*)	-	-	-
2) Thermal shock at -5 °C	ZB.3.1	-	-	-	YES	NO	-	-	-
3) Thermal shock at -25 °C	ZB.3.2a/b	-	-	-	NO	YES	-	-	-
4) Condensation test	ZA.2.1	NO	YES	NO	-	-	-	-	-
5) Condensation and humidity penetration test	ZA.2.2a/b	NO	NO	YES	-	-	-	-	-
6) Fire behaviour test	ZC.2;ZC.3	-	-	-	-	-	NO	YES	YES
7) Operation under external fire (to be defined)	-	-	-	-	-	-	NO	NO	YES

*) Not necessary if test ZB.3.2a is undertaken

When a transformer is declared as suitable for a combination of environmental, climatic and fire behaviour classes, those tests which are agreed between manufacturer and purchaser, to prove compliance with said classes, are to be carried out on the same transformer or coil in the sequence given in the above table ZA.1.

The tests specified are carried out on one transformer being representative of a certain design series (transformers having different ratings but designed adopting the same criteria).

ZA.2 Special tests to prove suitability to class E1 or E2 as defined by clause B1 of appendix B

If not otherwise specified, the tests shall be performed on one transformer completely assembled, fitted with its accessories (relevant for the test).

The tests are not required for sealed transformers.

The transformer and its accessories shall be new and clean without any additional surface treatment of the insulating parts.

These requirements apply to transformers which have at least one winding with $U_m \geq 7{,}2$ kV. By agreement between manufacturer and purchaser they may be extended to lower values of highest voltage for equipment.

ZA.2.1 Class E1 transformers

The transformer shall be placed in a test chamber in which temperature and humidity are kept under control.

The volume of the chamber shall be at least five times that of the rectangular box circumscribing the transformer. The clearances from any part of the transformer to walls, ceiling and spraying nozzles shall be not less than the smallest phase-to-phase clearance between live parts of the transformer and not less than 0,15 m.

The temperature of the air in the test chamber shall be such as to ensure condensation on the transformer.

The humidity in the chamber shall be maintained above 93%. This may be achieved by periodically atomizing a suitable amount of water. The conductivity of the water shall be in the range 0,1 S/m to 0,3 S/m.

The position of the mechanical atomizers shall be chosen in such a way that the transformer is not directly sprayed.

No water shall drop from the ceiling upon the transformer under test.

The transformer shall be kept in the test chamber for not less than 6 hours, without being energized.