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SIST EN 60214:1998

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EUROPEAN STANDARD  
NORME EUROPÉENNE  
EUROPÄISCHE NORM

**EN 60214**

August 1997

ICS 29.120.40

Supersedes HD 367 S2:1992

Descriptors: Power transformer, on-load tap-changers, motor-drive mechanism, requirement, test, nameplate

English version

**On-load tap-changers**  
(IEC 60214:1989, modified)

Changeurs de prises en charge  
(CEI 60214:1989, modifiée)

Stufenschalter  
(IEC 60214:1989, modifiziert)

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

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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

Central Secretariat: rue de Stassart 35, B - 1050 Brussels

## Foreword

The text of the International Standard IEC 60214:1989, prepared by IEC TC 14, Power transformers, together with common modifications prepared by the Technical Committee CENELEC TC 14, Power transformers, was approved by CENELEC as HD 367 S2 on 1992-03-24.

A draft amendment to HD 367 S1:1992 was submitted to the formal vote and was approved by CENELEC on 1997-03-11.

HD 367 S1 and its amendment were combined and submitted to the formal vote for conversion into a European Standard, which was approved by CENELEC as EN 60214 on 1997-07-01.

The following dates were fixed:

- latest date by which the EN has to be implemented  
at national level by publication of an identical  
national standard or by endorsement (dop) 1998-03-01
- latest date by which the national standards conflicting  
with the EN have to be withdrawn (dow) 1998-03-01

Annexes designated "normative" are part of the body of the standard.

Annexes designated "informative" are given for information only.

In this standard, annexes B and ZA are normative and annexes A and C are informative.

Annex ZA has been added by CENELEC.

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**Endorsement notice**

The text of the International Standard IEC 60214:1989 was approved by CENELEC as a European Standard with agreed common modifications as given below.

**COMMON MODIFICATIONS****5 Definitions relating to motor-drive mechanisms**

*Additional subclause:*

**5.13 Protective device against running-through**

An electrical device stopping the motor-drive mechanism in case of a failure of the step-by-step control circuit which would cause a running-through of the motor-drive mechanism.

**7** *Replace the title of the clause by:*

**7 Design, construction and safety**

*Replace the title of subclause 7.3 and the text of the main subclause by:*

**7.3 Safety requirements for protection devices against increase of pressure**

In order to minimize the risk of fire or explosion resulting from an internal failure within the diverter switch or selector switch compartments one or more of the following devices shall be fitted.

NOTE: The tap selector compartments of air environment tap-changers are usually piped to the main transformer buchholz relay. Consideration should also be given to fitting a separate buchholz relay between the tap-selector compartment and the main transformer relay.

**7.3.3 Add:**

Where a pressure relief device is the sole protection, it shall also be arranged with contacts to enable the transformer to be tripped

NOTE: If a pressure relief device is fitted, the use of a self-sealing diaphragm type is possible. Consideration should also be given to fitting an outlet from the pressure relief device to protect personnel from the displaced oil. The use of such devices shall be subject to agreement between the manufacturer and purchaser.

## 8 Type tests

### 8.2.1 *Add at the end of the subclause:*

During service duty test shall be verified the switching chamber tightness by means of gas-in-oil analysis.

The diverter switch unit and its housing has to be placed in a container with a volume not exceeding 10 times that of the switching chamber, filled with clean and new transformer oil.

From this container oil samples have to be taken at the beginning and at the end of the service duty test operations. The comparison of the results of gas-in-oil analysis, performed on the above mentioned oil samples, shall not show a total increase greater than 10 ppm of the gases usually developed during arcing phenomena, namely H<sub>2</sub>, CH<sub>4</sub>, C<sub>2</sub>H<sub>4</sub>, C<sub>2</sub>H<sub>2</sub>, C<sub>2</sub>H<sub>6</sub>.

### 8.3 *Add after the first paragraph:*

NOTE: In special cases, if necessary, longer durations up to 5 s may be specified.

### 8.6.4 *Add at the end of the subclause:*

NOTE: In certain applications with very special system conditions the specification of other combinations of withstand voltages may be justified. In such cases general guidance shall be obtained from IEC 71-1.

- 10** *Replace the title of the clause by:*
- 10** **Nameplate and manufacturer's handbook**

*Add:*

The manufacturer shall provide a handbook to facilitate the safe and proper operation of the tap-changer including maintenance criteria.

The handbook shall cover but not be limited to installation, operation, maintenance criteria and in addition identify any inherent dangers or risks (e.g. electric shock, stored energy devices, unexpected starting of the mechanism following interruption of supply, etc.).

11 *Replace the title of the clause by:*

**11 Design, construction and safety**

11.13 *Replace "IEC Publication 144" by "EN 60947-1" (twice).*

*Additional subclauses:*

11.14 *Protective device against running-through*

A device to prevent the motor-drive mechanism from running through in case of failure of the step-by-step control circuit shall be provided.

11.15 *Protection against access to hazardous parts*

Driving mechanism cubicles fitted with doors shall continue to provide protection to at least category IP1X with any door open.

NOTE: This will provide protection against accidental "back of hand" contact as a minimum.

14 *Replace the title of the clause by:*

**14 Nameplate and manufacturer's handbook**

*Add:*

The manufacturer shall provide a handbook to facilitate the safe and proper operation of the tap-changer including maintenance criteria.

The handbook shall cover but not be limited to installation, operation, maintenance criteria and in addition identify any inherent dangers or risks (e.g. electric shock, stored energy devices, unexpected starting of the mechanism following interruption of supply, etc.).

## Annex ZA (normative)

Normative references to international publications  
with their corresponding European publications

This European Standard incorporates by dated or undated reference, provisions from other publications. These normative references are cited at the appropriate places in the text and the publications are listed hereafter. For dated references, subsequent amendments to or revisions of any of these publications apply to this European Standard only when incorporated in it by amendment or revision. For undated references the latest edition of the publication referred to applies (including amendments).

NOTE: When an international publication has been modified by common modifications, indicated by (mod), the relevant EN/HD applies.

<u>Publication</u>	<u>Year</u>	<u>Title</u>	<u>EN/HD</u>	<u>Year</u>
IEC 60060	series	High-voltage test techniques	HD 588.1 S1 EN 60060-2	1991 1994
IEC 60076-1 (mod)	1976	Power transformers Part 1: General	HD 398.1 S1 <sup>1)</sup>	1980
IEC 60076-3 (mod)	1980	Part 3: Insulation levels and dielectric tests	HD 398.3 S1	1986
IEC 60137	1984 <sup>2)</sup>	Bushings for alternating voltages above 1 kV	-	-
IEC 60144 <sup>3)</sup>	1963	Degrees of protection of enclosures for low-voltage switchgear and controlgear	-	-
IEC 60270	1981	Partial discharge measurements	-	-
IEC 60296	1982	Specification for unused mineral insulating oils for transformers and switchgear	-	-
IEC 60354	1972	Loading guide for oil-immersed transformers	-	-
IEC 60542	1976	Application guide for on-load tap-changers	-	-

1) HD 398.1 S1 is superseded by EN 60076-1:1997, which is based on IEC 60076-1:1993, mod.

2) IEC 60137:1995 is harmonized as EN 60137:1996.

3) IEC 60144 is superseded by IEC 60947-1:1988, mod., which is harmonized as EN 60947-1:1991.



NORME  
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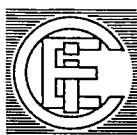
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Changeurs de prises en charge

On-load tap-changers  
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Numéro de référence  
Reference number  
CEI/IEC 214: 1989

ДЕЛАТОРИЈИ ; МОЏУЏИСТАВИ ТРАНСФОРМАТОРИЈИ ; ВКЛОПНИКИ ; ПРЕКЛОП ПОД ОБРЕМЕНИЈИ

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## INTERNATIONAL ELECTROTECHNICAL COMMISSION

## ON-LOAD TAP-CHANGERS

## FOREWORD

- 1) The formal decisions or agreements of the IEC on technical matters, prepared by Technical Committees on which all the National Committees having a special interest therein are represented, express, as nearly as possible, an international consensus of opinion on the subjects dealt with.
- 2) They have the form of recommendations for international use and they are accepted by the National Committees in that sense.
- 3) In order to promote international unification, the IEC expresses the wish that all National Committees should adopt the text of the IEC recommendation for their national rules in so far as national conditions will permit. Any divergence between the IEC recommendation and the corresponding national rules should, as far as possible, be clearly indicated in the latter.
- 4) The IEC has not laid down any procedure concerning marking as an indication of approval and has no responsibility when an item of equipment is declared to comply with one of its recommendations.

## PREFACE

This standard has been prepared by Sub-Committee 14B: On-load tap-changers, of IEC Technical Committee No. 14: Power transformers.

This third edition of IEC Publication 214 replaces the second edition issued in 1976.

The text of this standard is based upon the following documents:

Six Months' Rule	Report on Voting
14B(C0)14	14B(C0)17

Full information on the voting for the approval of this standard can be found in the Voting Report indicated in the above table.

*The following IEC publications are quoted in this standard:*

Publications Nos. 60: High-voltage test techniques.

76-1 (1976): Power transformers, Part 1: General.

76-3 (1980): Part 3: Insulation levels and dielectric tests.

137 (1984): Bushings for alternating voltages above 1 000 V.

144 (1963): Degrees of protection of enclosures for low-voltage switchgear and controlgear.

270 (1981): Partial discharge measurements.

296 (1982): Specification for unused mineral insulating oils for transformers and switchgear.

354 (1972): Loading guide for oil-immersed transformers.

542 (1976): Application guide for on-load tap-changers.

## ON-LOAD TAP-CHANGERS

## SECTION ONE - GENERAL

## 1. Scope

This standard applies to on-load tap-changers\* for power transformers and their motor-drive mechanisms. It relates mainly to tap-changers immersed in transformer oil according to IEC Publication 296, but may also be used for gas-insulated tap-changers in so far as conditions are applicable.

*Note.*- For the purpose of this standard, a synthetic insulating liquid is regarded as an oil. A synthetic insulating liquid can be used for a tap-changer only if it is compatible with the tap-changer design.

Tap-changers for transformers for railway rolling stock are excluded from this standard.

In selecting a tap-changer for a particular application, reference should be made to IEC Publication 542.

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## 2. Service conditions

a) *Temperature of tap-changer environment*

Unless more onerous conditions are specified by the purchaser, tap-changers are regarded as suitable for operation over the ranges of temperature given in Table 1.

Table 1 - Temperature of tap-changer environment

Tap-changer environment	Temperature	
	Minimum	Maximum
Air	-25 °C	40 °C
Oil	-25 °C	100 °C

\* See Note to Sub-clause 4.1.

*Notes* 1.- The tap-changer environment is the medium immediately surrounding the complete tap-changer, i.e., if the latter is enclosed in a separate external container, intended for mounting outside the transformer tank, the tap-changer environment is "Air"; if the complete tap-changer is intended for mounting inside the main transformer tank and not in a separate external container, then the tap-changer environment is "Oil" (i.e. the oil in the transformer tank).

2.- The value of 100 °C quoted above is based on a maximum ambient temperature of 40 °C as specified in IEC Publication 76.

#### *b) Temperature of motor-drive mechanism environment*

Unless more onerous conditions are specified by the purchaser, motor-drive mechanisms are regarded as being suitable for operation in any ambient temperature between -25 °C and 40 °C.

*Note.*- For more onerous conditions for tap-changer or motor-drive mechanism environments, reference should be made to IEC Publication 542, Sub-clause 5.3, Items 5 and 6.

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#### *c) Overload conditions*

Tap-changers which comply with this standard and are selected and installed in accordance with Sub-clause 2.3.2 of IEC Publication 542 are compatible with loading of the transformer according to IEC Publication 354, where the oil temperatures are detailed.

### 3. Information required with enquiries and orders

For the information required with enquiries and orders, see IEC Publication 542.

## SECTION TWO - DEFINITIONS

### 4. Definitions relating to on-load tap-changers (excluding motor-drive mechanisms)

For the purpose of this standard, the following definitions apply:

#### 4.1 *On-load tap-changer*

A device for changing the tapping connections of a winding, suitable for operation whilst the transformer is energized or on load. Generally, it consists of a diverter switch (see Sub-clause 4.3) with a transition impedance (see Sub-clause 4.6) and a tap selector (see